BIENNIAL CONFERENCE
OF
INDIAN SOCIETY OF WEED SCIENCE

MARCH 4-5, 1990

ABSTRACTS OF PAPERS

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JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA
JABALPUR - 482004 (M. P.)
INDIA

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JAWAHARLAL NEHRU KRISHI VISHWA VIDYALAYA
JABALPUR - 482004 (M. P.)
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CONTENTS

WEED CONTROL IN CEREALS

RICE

EFFECT OF TIME AND RATE OF APPLICATION OF PENDIMETHALIN ON RICE NURSERY AND ASSOCIATED WEEDS

O. P. Mishra, S. Tiwari and K. Ram

Department of Agronomy
G. B. Pant University of Agriculture and Technology
PANTNAGAR (NAINITAL)–263145

Field experiments were carried out during *Kharif*, 1987 and 1988 to study the effect of pendimethalin and thiobencarb at 0.5, 1.0 and 1.5 kg/ha applied at 2, 4 and 6 days after seeding of sprouted rice seeds in wet rice nursery beds for weed control and its effect on rice seedlings. Major weeds in rice nursery were *Echinochloa colonum*, *Cyperus rotundus* and *Trianthema monogyna*. There was a considerable reduction in the density and dry weight of weeds due to application of pendimethalin at all the rates, irrespective of time of application. Less weed control was observed at 0.5 kg/ha of pendimethalin at all the time of application. Application of 1.5 kg/ha pendimethalin at 2 and 6 days and that of thiobencarb 1.5 kg/ha at 4 days after seeding of sprouted rice seeds were more effective in reducing the weed density and growth of weeds. Application of pendimethalin 2 days after sowing was toxic to seedlings.

STUDIES ON WEED CONTROL IN DIRECT SEEDED RICE THROUGH HERBICIDES

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Application of butachlor, benthiocarb, oxadiazon, pendimethalin and anilophos was made as preemergence whereas haloxyfop was applied as postemergence 15 days after sowing in direct seeded rice. All the herbicides appeared to be significantly superior over unweeded control in reducing the weed growth and registering

higher grain yield of rice. Among the herbicides anilophos, oxadiazon and pendimethalin were found significantly better to that of butachlor, benthiocarb and haloxyfop. Anilophos application produced the highest grain yield, but it was not significantly different than the yields obtained under oxadiazon and pendimethalin. Butaclor and benthiocarb were at par and produced significantly more yield over haloxyfop herbicide.

EFFICIENCY OF WEED CONTROL PRACTICES IN UPLAND RICE UNDER DIFFERENT NITROGEN LEVELS

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Field experiments were conducted on drilled upland rice to evaluate the efficiency of various weed control practices (cultural, mechanical and chemical) under varying nitrogen levels (0, 30, 60 and 90 kg N/ha) during *Kharif*, 1985 and 1986. The dominant weed flora of experimental field was *Echinochloa crusgalli Cyperus iria, C. rotundus, Commelina communis, Eclipta alba, Trianthema monogyna, Digitaria adscendens, Corchorus olitorius and Ageratum, conyzoides*.

Results revealed that preemergence application of oxadiazon 1 kg / ha supplimented with postenergence applicetion of 2, 4-D 1 kg / ha 30 days was equally good to hand weeding twice at 15 and 40 days in controlling the weeds Application of nitrogen significantly responded upto 90 kg / ha under all methods of weeds control. However, chemical method of weed control proved to be more effective and economical upto the highest level of nitrogen (90 kg N / ha) than other methods. Application of nitrogen at higher rate in unweeded plots appeared to be the waste.

STUDIES ON WEED CONTROL IN DRILL SOWN INTAN RICE IN HILLY ZONE OF KARNATAKA

Sharanappa and K. Maharudrappa
University of Agricultutal Sciences. G. K V. K.
BANGALORE—65

The field experments were conducted during *Kharif*, 1986-87 at the Reginoal Research Station, Mudigere. The dry weight of weeds was significantly reduced by hand weeding twice at 25 and 50 days after sowing. Butachlor at 1.0 and 1 . 25 kg /

ha as preemergence, pendimethalin 2.0 kg/ha as postemrgence ond combination of molinate + propanil were found quite effective in reducing weed dry weight Grain yields were significanly higher with butachlor 1.25 kg/ha followed by butachlor at 1.0 kg/ha.

The pendimethalin at 2.0 kg/ha post, thiobencarb at 1.0 kg/ha, combination of molinate+2, 4 DEE (1.5 kg/ha) as post had higher grain yields The increase in grain yield was due to more number of grains per ear and number of panicles m-2 The weed control efficiency was higher with butachlor 1.25 kg/ha followed by 1.0 kg/ha, pendimethalin 2.0 kg/ha, thiobencarb 2.0 kg/ha, combination of thiobencarb (2.0 kg/ha)+2,4 DEE (1.5 kg/ha) and molinate+propanil.

EVALUATION OF OXADIAZON, PRETILACHLOR AND THIOBENCARB FOR WEED CONTROL IN DRILLIED RICE

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Relative efficacy of oxadiazon at 1.0, 1 5 and 1.0 kg/ha followed by one hand weeding, pretilachlor at 0 6, 0 75 and 0 9 kg/ha followed by one hand weeding were tested for weed management in upland rice during *Kharif*, 1987 and 1988 All the herbicides were applied next day of sowing and hand weeding under specific treatments was done at 30 days after sowing. The dominant weed species were *Echinochloa colcnum*, *Cyperus rotundus*, *Trianthema monogyna* and *Celosia argentia*. All the herbicide treatments reduced weed density and dry weight of weeds over weedy 'check. Uncontrolled weeds caused 90 percent reduction in grain yield of rice. Weed control was better at lower rates follcowed by one hand weeding Highest grain yield was recorded under weed free followed by thiobencarb at 1.5 kg/ha supplemented with one hand weeding.

EFFECT OF VARIETIES, CULTIVATION AND WEED MANAGEMENT PRACTICES ON GROWTH AND YIELD OF DIRECT SEEDED LATE SOWN RICE

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Culture – 1 was found most promising for growing as direct seeded crop during September to December which recorded the highest grain yield of 19.4 /ha. Use of calcium peroxide significanly increased crop emergence, plant population, plaut dry matter with the highest crop growth rate (6. 67 g/m2 day) and increased the grain yield by 60 percent. Hand weeding twice at 20 and 40 DAS gave the best weed control followed by butachlor at 1.5 kg/ha. Grain yield was significantly higher in hand weeding (18. 3 q/ha) than butachlor (16. 4 q/ha). Yield in weedy check was 39 percent lesser than hand weeded plots.

EFFECT OF DIFFERENT METHODS OF SOWING AND WEED CONTROL MEASURES ON YIELD OF RAINFED RICE

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Seeding rice in line either by drill or behind plough furrow line and integrated method of weed control showed minimum competition for light by per–mitting maximum radiation through the crop canopy. Significantly higher uptake of moisture and nutrients by weeds producing maximum weed dry weight was observed under broadcast and unweeded rice crop. The uptake of nutrients by rice plants and concentration in grain and straw was significantly higher in line sown and cultural method of weeding. Significantly more effective tillers were produced under broadcasting method of sowing, but the panicle weight was mini–mum and the spikelet sterility was maximum, resulting in significantly reduced grain yield.

Among weed control methods, significantly more uptake of nutrients by rice plants and concentration in grain and straw was recorded when two cultural weedings at 30 and 50 DAS were applied. The yield and yield attributes were also significantly higher under cultural weeding followed by integrated and chemical weed control. A maximum net return of Rs. 3,329 and 3,237/ha was obtained when crop was sown by drilling and cultural weeding twice at 30 and 50 DAS, respectively.

EFFECT OF FREQUENCY AND TIME OF HAND WEEDING ON *ECHINOCHLOA CRUSGALLI* AND YIELD OF NON-PUDDLED DIRECT SEEDED RICE

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Field experiments were conducted during *Kharif*, 1984 and 1985 to study frequency and time of hand weeding in direct seeded non-puddled rice. Treatments comprising of one hand weeding (15, 30, 45 or 60 DAS), two hand weeding (15+30, 15+45 or 15+60 DAS) and three hand weeding (15+30+45 or 15+30+60 DAS) were compared with unweeded, weed free and transplanted puddled paddy treated with butachlor 1.5 kg/ha as check.

Three-hand weeding either 15, 30 and 45 days after sowing or 15, 30 and 60 days after sowing gave an effective control of *E. crusgalli* and yielded significantly higher than one and two hand weeding. Three hand weeding yielded at par with weed free and transplanted paddy treated with butachlor 1.5 kg/ha. Direct seeded rice crop receiving three hand weeding yielded at par with transplanted rice treated with butachlor 1.5 kg/ha.

STUDIES ON WEED ASSOCIATION, UPTAKE OF NUTRIENTS AND WEED CONTROL AS CONSTRAINT IN DIRECT SEEDEC UPLAND RICE

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Field studies were conducted during *Kharif*. 1976 and 1977 to know the weed population and NPK losses through weeds in direct seeded upland rice. The grasses and sedges were the most dominant weeds responsible for competition and nutrient losses in rice crop. The nutrient losses through weeds in one weeding treatment was 3.5 times more than three weedings. The loss of nitrogen was 22.40 and 27.80 kg and of phosphorus was 4.5 and 6.0 kg and that of potassium was 42.70 and 76.50 kg/ha during 1976 and 1977, respectively.

COMPARTIVE EFFECTIYENSS OF NON-CHEMICAL AND CHEMICAL METHODS IN CONTROLLING WEEDS IN UPLAND RICE

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In the field experiment conducted during *pre-kharif*, 1986, 28 weed species were found to be present, of which 6 species were grasses, 16 were broadleaved and rest 6 were sedges. The predominant weed species were *Echinochloa colonum* (L.) Link., *Digitaria sanguinalis* (L.) Scop., *Dactyloctenium aegyptium* (L.) Richter (grasses), *Eclipta alba* (L) Hassk., *Lindernia ciliata* (Colsm) Pennel, *Cyanotis axillaris* (L.) D. Don, *Trianthema portulacastrum* L., *Alternanthera philoxeroides* (Mart) Griseb. (broadleaved) and *Cyperus iria* L., *Fimbristylis dichotoma* (L.) Vahl. (sedges), present in the experimental field.

Butachlor as pre-emergence at 1.5 kg/ha showed the lowest density of weed population and weed dry weight. Addition of one hand weeding to butachlor

did not show any significant superiority in the reduction of weed population and weed dry weight. The next superior treatment in reducing weed competition was stale seedbed technique. Skipping basal dose of nitrogen followed by one hand weeding even though showed higher population of weed but the weeds were small showing considerable low weed dry weight. Integrating butachlor 1.5 kg/ha at one day after sowing (DAS) followed by one hand weeding at 25 DAS produced the highest grain yield of rice (3.13 t/ha). Next superior treatment in increasing the grain yield was integrated method of the treatment of stale seedbed and hand weeding at 20 DAS. As high as 51.12% less in yield of rice grain was observed under no weeding when compared between the best yield treatment (butachlor 1.5 kg/ha pre-em.+one hand weeding) and unweeded control.

EFFECT OF SUMMER PLOUGHING AND WEED MANAGEMENT PRACTICES IN DIRECT SEEDED SEMI - DRY RICE

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ADUTHRAI-613

Eight integrated weed control methods viz. working with tine plough (5 and 11 days after germination)+one hoeing (30 DAG) as T_1. T_1+ one HW (40 DAG) as T_2. thiobencarb 1.5 kg/ha (1 DAG) sand mixed + one HW (30 DAG) as T_3. thiobencarb 1.5 kg/ha 1 DAG) as T_4. thiobencarb 1.5 kg/ha (8 DAG) sand mixed+one HW (3.5 DAG) as T_5. and thiobencarb 1.5 kg/ha (8 DAG) as T_6 were evaluated against weed free (hand hoeing and weeding as and when required) as T_7 and weedy check (T_8) under two methods of field preparation (summer ploughing in May, June and July, and ploughing once in July) during *Kharif*, 1988 in direct seeded semidry rice.

The predominant weeds were *Echinochloa colonum* L., *Cyperus iria* L. *Cyperus difformis* L., *Cyperus rotundus* L., and *Eclipta alba* L. Results revealed that summer ploughing thrice in May, June and July and sowing in August was effective in reducing the weed density and dry matter production and resulted in increased straw and grain yield as compared to ploughing once in July. All weed control methods reduced the weed density and weed biomass yield as compared to no weeding treatment Among herbicidal methods, thiobencarb 1.5 kg /ha applied with sand carrier at 1 DAG and followed by one hand weeding 30 DAG proved potential in respect of higher weed control index (WCI), improved yield attributes (panicle numbers/clump) as well as grain yield of rice in Cauvery Delta of Tamil Nadu.

YIEID AND YIEID ATTRIBUTES OF RAINFED UPLAND RICE AS AFFECTED BY VARIOUS WEED CONTROL TREATMENTS

Prem Singh and Ved Prakash

Vivekanand Parvatiya Krishi Anusandhan Shala
ALMORA-263601

A field trial was conducted during *Kharif,* 1988 and 1989, in sandy loam soils of medium fertility with butachlor 2 kg/ha pre, butachlor 1. 5 kg/ha pre +2,4-D 0 . 6 kg/ha 4 weeks after sowing (WAS), butachlor 1 . 5 kg/ha pre-+one HW (4 WAS) pendimethalin I . 5 kg/ha pre. pendimethalin 1.0 kg/ha pre-+2 4-D 0.6 kg/ha (4 WAS), pendimethalin 1.o kg/ha pre + 1 HW (4 WAS) weed free, handweeding twice (3 and 6 WAS) and unweeded check. The crop was heavily infested by grassy as well as non-grassy weeds. Treatments significanty influenced weed dry matter production, grain yield, panicle number m^{-2} and grain yield panicle^{-1} in both the years. Average values have shown that butachlor 1 . 5 kg/ha + 1 HW (4 WAS), pendimethalin 1.0 pre+1 HW(4 WAS), weed free and weeding twice gave quite comparable weed control efficiency (84.9 to 99.9 per cent), grain yield (22.3 to 22.5 q/ha) and panicle number (279-299 m^{-2}) and grain weight panicle^{-1} (0.92-0.96g). These treatments were markedly superior than all other treatments for all characters studid

CHEMICAL CONTROL OF WEEDS IN UPLAND DIRECT SEEDED RAINFED RICE WITH SPECIAL REFERENCE TO *OXALIS LATLFOLIA*

Prem Singh, Kamta Parsad and Ved Prakash

Vivekananda Parvtiya Krishi Anusandhan Shala
ALMORA – 263 601

An experiment was conducted during *Kharif,* 1988 and 1989,to control the *Oxalis latifolia* through selective hebricides in sandy loam soils of low fertiliy in upland direct seeded rainfed rice. The experiment was comprised of five treatments, viz.,unweeded check, oxadiazon 0.5 kg/ha pre, pendimethalin 1.0 kg/ha pre, oxyfluorfen 0.2 kg/ha and weed free check. Maximum grain yields of 15.76 and 16.94 q/ha were recorded in weed free plots during 1988 and 1989, respectively, which were at par with oxadiazon during both the yeats, On average basis 82.6, 53.6, 60.5 and 116 per cent higher grain yields wers obtained with oxadlazon, pendimethalin oxyfluorofen and weed free treatment, respectively, as compared to unweeded check.

The weed dry weights under all the hebrbicides were at par to weed free check and significantly lower than unweeded check.

EVALUATION OF BUTACHLOR IN DRILLED AND BROADCAST RICE UNDER UPLAND CONDITION

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Efficiency of butachlor under two seeding methods of rice was evaluated for weed control in upland rice during *Kharif*, 1987 and 1988. *Echinochloa colonum* being the major weed species and uncontrolled weeds caused 77% reduction in rice yield. Application of butachlor at 2 kg/ha 3 DAS produced significantly higher rice grain yield over delayed application. Butachlor applied on the same day of sowing was ranked second for rice grain yield. However, application of butachlor on the same day of sowing exhibited slight phytotoxic effect on the rice seedlings with broadcast method. Delay in application of butachlor beyond 6 DAS showed poor WCE, heavy weed competition and finally the reduced crop yield. The efficacy of butachlor application was not influenced due to seeding methods.

INFLUENCE OF WEED NANAGEMENT PRACTICES AND METHODS OF CULTIVATION ON THE PERFORMANCE OF RAINFED RICE

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The resuls obtained from the three field experiments conducted during wet season of 1988 and 1989 indicated that among the three methods of planting, the weed infestation was minimum under transplanting followed by broadcasting and line sowing. Among various methods of weed control, though the hand weedtng (HW) was the most effective in controlling the weeds but the mechanical+HW in line sowing, *Beusaing* or use of thiobencarb 1.5 kg/ha under broadcasting and mechanical or butachlor 2.0 kg/ha in transplanted rice were equally effective. There was

decrease in weed dry matter by 55.8 and 78·2 percent under hand weeding, 44.7 and 76.2 percent and 10.7 and 28.1 Percent under mechanical and chemical methods during 1988 and 1989 as compared to unweeded check. The predominant weeds under unweeded check were *Fimbristylis miliaceae* (L) vahl., *cyperus rotundus*, L., *Cynodon dactylon* [L] pers., *Echinochloa colona* Link., and *Digitaria sanguinalis* [L] Scop. which contributed 56 3, 18.8, 11.3, 7.8 and 3.8 per cent to the total dry matter and 49.2, 18.0, 11.2, 8.8 and 4.2 per cent to the total number of weeds.

STUDIES ON WEED FLORA, WEED DYNAMICS AND THEIR CONTROL UNDER DIFFERENT METHODS OF RICE CULTURE

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Field experiments were conducted for two consecutive years during *Kharif*, 1988 and 1989. The treatments consisted of three methods of rice culture viz., dry seeding, wet seeding and trasplanting and five weed control measures such as pre-emergence application of anilofos and oxadiazon each 0·5 kg/ha, butachlor 1.25 kg/ha, repeated weeding and weedy check.

Results revealed that the *Echinochloa colonum*(L) Link. and *Leptochloa chinensis*(L,) Nees were dominant weeds in dry seeded, whereas, *Echinochroa crusgulli* L. Beauv.was the pre dominant monocot weed in wet and transplanted rice, *Eclipta alba* L. and *Alternanthera sessilis* L. were the major weeds under all the three methods of rice culture. Transplanting and wet seeding brought down the growth of monocot weeds apperciably over dry seeding. Contrary to this, the weed growth of dicot weeds was significantly higher under wet and transplanted than dry seeding condition.

The yield attributes grain and straw yield and uptake of nutrients by rice were significantly more under transplanting and wet seeding as compared to dry seeding. Preemergence application of anilofos, oxadiazon and repeated weeding, enhanced significantly the yield attributing characters, grain and straw yields and improved the uptake of nutrients by rice crop to a level of significance over butachlor and weedy check.

CHEMICAL WEED CONTROL IN DIRECT SEEDED PUDDLED RICE

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Field experiment was conducted during *Kharif*, 1988 to develop herbicidal schedule for direct seeded puddled rice. The treatments comprised of untreated, manual weeding once, manual weeding twice, thiobencarb (2 kg/ha), oxadiazon (0.8 kg/ha and butachlor (2.0 kg/ha). Removal of weeds manually at 20 days after sowing boosted the grain yield of rice to the exrent of 23.52% Subseqent weeding brought about little increase in grain yield (27.89%). Herbicidal control of weeds through oxadiazon (0.8 kg/ha) recorded 19.30% increase in grain yield and was almost at par to hand weeding once. However, this herbicide showed little scorching to rice seedlings which could be vanished within short time. Butachlor inhibited the germination of rice seeds markedly though the effect on weed control was excellent. Thiobencarb was good against *Ehcinochloa colonum* but ineffective aganist *Trianthema monogyna*.

VARIETAL REACTIONS OF PUDDLE SEEDED RICE TO PREEMERGENCE HERBICIDES

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An experiment was conducted during summer 1989 to find out the response of short duration varieties of rice i.e. Vanaprabha, Kalinga-III and Annada under puddle seeded conditions to butachlor (0.75 kg/ha), thiobencarb o.75 kg/ha) and pendimethalin (1.0 kg/ha) all as preemergence were compared with mannual weeded and unweeded check. Results revealed that among the herbicides, butachlor and thiobencarb showed no phytotoxicity to rice seedlings while pendimethalin caused red uction in germination and adversely affected the yield and yield attributing characters.

The reduction in yield was estimated to be 45.6% in Vanaprabha, 17.6% in case of Kalinga III and 30.6% in Annada. The weed control efficiency was in the orderr of pendimethalin (58.0%) thiobencarb(64.7%),butachlor(73.3%)and hand weeding (73.3%). The highest yield (3.6 t/ha) was recorded with the variety Annada followed by Kalinga III (3.20 t/ha), irrespective of weed control treatments.

RELATIVE EFFICACY OF CERTAIN HERBICIDES, THEIR FORMU LATIONS AND LEVELS OF NITROGEN ON WEED CONTROL AND GRAIN YIELD IN TRANSPLANTED RICE

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Experiment was carried out on a sandy clay loam soil during *Kharif* 1987 to study the effect of certain herbicides with their formulations at two levels of nitrogen on weed control and yield in transplanted rice The treatments consisted of two nitrogen levels (60 and 90 kg N ha^{-1}) and three herbicides (butachlor,benthiocarb and anilophos) each tried with three formulations EC and granular formulation and coating of prilled urea granules with EC formulation). Butachlor 1.5 kg ha^{-1} was most effective in controlling the grasses ard broad leaved weeds with less weed density, dry weight and less weed index values. Among the formulations studied, coating of prilled urea 60 kg N/ha with EC formulation of herbicides resulted in significant reduction in weed density, drymatter and weed index. Coating of urea, particularly with butachlor resulted in comparatively less weed density and higher weed control effeciency and grain yield than the other herbicides.

WEED MANAGEMENT STUDIES IN RELATION TO WATER MANAGEMENT IN TRANSPLATED LOW LAND RICE

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COIMBATORE-641003

Field experiments were conducted during *Kharif* 1988 and 1989 to findout the effective weed management practice in relation to different water management practice adopted by the farmers viz., Saturation throughout, 5cm submergence and 10 cm submergence. In the weed control methods, preemergence anilophos 0.4 kg, thiobencarb 1.25 kg, pendimethalin 1.0 kg and oxadiazon 0.75 kg/ha alone and combined with post emergence application (15 DAT) of 2, 4-D Na salt 1 0 kg/ha were tried. In all treatments one late hand weeding (35 DAT) was given.

Results of both the trials showed same trend.. The dry matter production of weeds under 5 cm and 10 cm submergence were lower and comparable even though 10 cm submergence recorded lowest DMP. All the herbicide treatments were found equally effective. Between the herbicide treatments combination of preemergence followed by post-emergence. 2, 4—D Na salt reduced the weed DMP in general. However, these were not stastically different from preemergence herbicides alone Among the herbictde treatments preemergence oxadiazon 0.75 kg/ha followed by postemergence 2, 4—D 1.0 kg/ha was found to be effective in controlling the weeds. The rice grain yield was higher at 10 cm submergence and was comparable with 5 cm submergence. Among weed control methods preemergence anilophos 0.4 kg + postemergence 2, 4—D Na salt 1.0 kg/ha with one late hand weeding gave highest grain yield.

STUDIES ON WEED CONTROL BY BROADCAST APPLICATION OF BUTACHLOR WITH DIFFERENT CARRIERS IN LOWLAND RICE CV. ADT—36

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The suitability of different carrier materials like sand, dried biogas slurry, gypsum, burnt rice husk, s perphosphate and coconut coirpith for broardcast application of butachlor were studied along with unweeded control and twice handweeding treatment during November, 1987 to March, 1988. Among the carriers, sand and urea performed superior by recording higher weed control effeciency and grain yields at par with twice hand weeding treatment. Regarding economics, butachlor+sand gave the highest net return per rupee invested (Rs. 1.93).

EFFICACY OF 2, 4-D COMBINATION ON WEED CONTROL IN LOW LAND RICE

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A field experiment on weed control was conducted with transplanted low land rice in two seasons viz., *Kuruvai* and *Navarai*. The predominant weeds in the East Coastal region were annual grasses viz., *Echinochloa* spp., *Paspalum scrobiculatum* sedges viz, *Cyperus* spp, *Fimbristylis miliaceae* and broad leaf weeds viz, *Sphenoclea Zeylanica*, *Monochoria Vaginalis*, *Ludwigia Parviflcra* and *Marsilea quadrifoliata* etc. Among various weed management practces tested, butachlor in combination with *2*, 4-D at 0,5 kg/ha, each applied on 5th day after transplanting as sand mix, was effective in controlling the above weeds and thereby, resulted in increased yields. This combination produced the highest grain yield of 5.41 q/ha with a cost benefit ratio of Rs 1 : 2.80.

EVALUATION OF FLUROXYPYR (EC) AND TRIDIPHANE (EC) IN TRANSPLANTED RICE

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The efficacy of fluroxypyr (EC) at 0.2, 0.3, and 0.4 kg/ha and granular 0,3 kg/ha 4 DAT and 10 DAT and tridiphane 0.24, 0.48 and 0.72 kg/ha at 4-DAT and 10 DAT and granular 0.3 kg/ha at 4 DAT were tested against butachlor *2* kg/ha. thiobencarb 2 kg/ha, 4 DAT *2*, 4-D 1 kg/ha 25 DAT mechnical weeding, hand weeding and weedy check in transplanted rice in sandy loam soil during *Kharif* 1985 and 1986. The major weed spp. were *Echinochloa cursqalli, Cyperus compresus, Cyperus difformis, Cyperus rotundus, Cynodon dactylon, Commelina communis, Eclipta alba, Paspalum distichum, Monochoria vaginalis, Alternenthera sessilis, ceasulia axillaris, Sphoeranthus indicus* and *Ludwigia parvifolia*. The greater weed control efficiency was noted in fluroxypyr 0.4 kg/ha at 4 DAT (56%). At 0 *2* kg/ha WCE was almost similar at 4 and 10 DAT. Tridiphane had lower weed control efficiency than fluroxypyr. The granular formulation of both the herbicides had less efficacy than E. C. formulations The WCE was higher in fluroxypyr as compared to butachlor and almost similar to thiobencarb (54%).

2, 4—D had 60% weed control efficiency while mecanical and hand weeding had 55% ahd 82% WCE, respectively. The effect on crop revealed that higher concentration of fluroxypyr caused yellowing of leaves which recovered after about a week. The greater yield was noted under fluroxypyr 0.*2* kg/ha 4 DAT (37.71 q/ha) followed by 0.3 kg/ha 4 DAT (37.02 q/ha), 0.4 kg/ha fluroxypyr 10 DAT (37.55 q/ha) and mechnical weeding (36.59 q/ha). Tridiphane did not increase the yield as compared to weddy check (27 q/ha).

EFFFCT OF CINMETHYLIN ON TRANSPLANTED RICE AND ASSOCIATED WEEDS

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Cinmethylin at 0. 04, 0.06, 0 08, 0.10 and 0.16 kg/ha applied one and two weeks after transplanting of rice was evaluated for weed control eificacy. The field was infested with *Echinochloa colonum*, *E. crusgalli*, *Cyperus iria*, *Ichaemum rugosum* aud *caesulia axillaris*, *Echinochloa colonum* was the most dominant weed.

Application of cinmethylin one week after rice transplanting was more effective than two weeks after tranplanting. Cinmethylin at 0.04, and 0.06 kg/ha applied one week after transplanting was less effective than higher rates in reducing weed density and weed dry weight. There was not much variation in the weed control efficacy at rates more than 0.06 kg/ha. Cinmethylin applied one week after transplanting at 0.08 kg/ha produced grain yield at par with weedfree and butachlor at 1.5 kg/ha. Application of cinmethylin two weeks after transplanting at any rate of applicaton, could not produce yield at par with weedfree or butachlor.

EVALUATION OF PROMISING NEW HERBICIDES FOR TRANSPLANTED RICE

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In a two years yield experimentaton on red sandy loam soils, anilofos 0.4 aud 0.6 kg/ha Doweo 356, 0.4 and 0.6 kg/ha pretilachlor 0.50, 0.75 and 1.00 kg/ha benthiocarb 1.5 kg/ha controlled the weeds effectivcly in transplanted rice. The maximum grain yield was recorded with pretilachlor 1.0 kg/ha and butachlor 1.5 kg/ha.

The common weeds observed were, *Echinochloe cursqalli*, *Echinochloa colonum*, *Eirocaulon sp*, *Cyperus iria Cyperus difforms*, *Rotala verticellestra Caperonia castanaefolia*

EFFECT OF DURATION OF KEEPING WATER STANDING ON BIOEFFICACY OF HERBICIDES IN PUDDLED TRANSPLANTED PADDY

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Field studies conducted for three years to study effect of duration of keeping water standing on bioefficacy of herbicides applied in transplanted puddled rice, revealed that keeping water standing for one week after herbicide application significantly improved the efficacy of butachlor and thiobencarb. Submergence for two weeks drastically reduced population and dry matter of weeds as compared to submergence for 0 to 1 week. Keeping water standing for 2 to 3 weeks effectively checked weed growth and produced yield at par with herbicide treatment. Population and dry matter of weeds and paddy yield did not differ significantly in herbicide treated and untreated plots when water was kept standing for 2 to 4 weeks after herbicide application.

EFFICACY OF CERTAIN WEEDS AS GREENLEAF MANURES IN TRANSPLANTED RICE CV. ADT-36

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A field experiment was conducted during November, 1988 to March, 1989 in transplanted ADT-36 rice to test the efficacy of certain weeds as green leaf manures. The main plot treatments consisted of (MT_0) - 100 : 50 : 50 kg/ha through fertilizers alone, (MT_1)- *Calotroois* sp. 5t + 75 : 50 : 50 kg NPK/ha, *Eichhornia* sp. 5t + 75 : 50 : 50 kg NPK/ha, (MT3) Ipomoea sp. 5t + 75 : 50 : 50 kg NPK/ha and (MT4) *Glyricidia* sp. 5t + 75 : 50 : 50 kg NPK/ha. The subtreatments consisted of

(ST_1) - 1/3 N + GLM incorporation 10 days before planting, (ST_2)-GLM incorporation 10 days before planting, (ST_3)-1/3 N+50% P_2O_5+GLM incorporation 10 days before planting and (ST_4) - 1/3 N + 100% P_2O_5+ GLM incorporation 10 days before planting. Among the weeds, *Ipomoea* incorporation (MT_3) significantly increased the and yield parameters of rice and quite comparable to the traditional *Glyricidia* GLM compensating 25 kg N/ha. Regarding subtreatments, greenleaf manure incorporation along with 1/3 N + 100%P_2O_5 10 days before planting proved superior to hasten the decomposition process and to record maximum yield and yield parameters.

RICE PRODUCTIVITY UNDER WEEDFREE AND WEED INFESTED ECOSYSTIMS AT VARYING LEVELS OF MANURING AND PLANT POPULATION

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Two field experiments were conducted during *Kharif* and *Rabi*, 1988 and 1989 in transplanted ADT-36 rice under weedfree and weed infested ecosyatems as two main treatments. Varied levels of manuring viz., (S_o) - no manure (S_1)-50 : 25 ; 25, (S_2) - 100 : 50 : 50 and (S_3) - 150 : 75 : 75 kg NPK/na constituted sub-plot treetments while two levels of spacing viz., (T_1) - 15 cm x 10 cm and (T_2) 15cm x 15 cm comprised sub - sub plots. ADT-36 rice crop suffered significantly under weed infested ecosystem during *Rabi* season due to increased weedflora, weed biomass and weed competition with poor yield Despite higher trends of weed infestation the increasing levels of manuring significantly compensated weed competition and favourably increased the rice yield. Closer spacing of rice significantly reduced weed competition due to shading and smothering effect on weeds with reduced weed biomass. Increased levels of manuring and closer spacing complemented each other and recorded overriding effect to dissipate weed competiton leading to higher rice production-

ASSESMENT OF YIELD LOSSES DUE TO WEEDS IN MEDIUM LAND TRANSPLANTED AND DIRECT SEEDED RICE

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The present study was under taken to measure the yield losses due to weeds over unweeded 'check' intransplanted and direct seeded rice during *Kharif*, 1985 and 1986 with IR -36. The results revealed that variable cost of cultivation was found to be higher incase of transplanted rice than direct seeded rice. The cost of weeding per hectare was maximum in case of manual weeding than mechanical and chemical weeding due te more use of labour for weeding opreation. Weeding cost was higher in direct seeded rice than transplanted rice due to high intensity of weeds in direct seeded rice. But yield per hectare was more in transplanted rice than direct seeded rice. Same trend was observed for gross return and return over cost of weeding.

In transplanted rice, the percentage loss in yield due to weeds was higher in case of manual weeding (8.99) followed by mechanical (6.87) and chemical weeding (6.18). But in case of direct seeded rice, the percentage of yield loss due to weeds was more in mechanical weeding (39 74) followed by chemical and manual weeding (23.00) in *Kahrif*, 1985, whereas it was higher in manual weeding (20 81) followed by chemical (11.89) and mechanical weeding (3.18) in *Kharif*, 1986.

It is concluded from the study conduted during two years that in transplanted rice on the basis of return over cose of weeding, manual weeding (Rs. 5841) was more profitable than mechanical (Rs 5773) and chemical weeding Rs (5725) due to less weed infestation. But in direct seeded rice mechanical weeding (Rs. 4516) was more economical than chemical (Rs. 4352) and manual weeding (Rs. 4289) because of the more competition of weeds with rice which required more labour.

COMPARATIVE STUDIES ON WEED CONTORL METHODS UNDER BARIOUS RICE CULTIVATION METHODS

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Six weed control techniques viz. thiobencarb and butachlor both at 2.5 kg/ha and oxadiazon 1.0 kg/ha all preemergence and superimposed with 2,4-D 1.0 kg/ha postemergence, hoeing (15+21 DAS), hand weeding (25 DAS) and weedy check were evaluated under four methods of cultvation (broadcasting, drilling' *Lehi* and transplanting) during *Kharif*, 1987 on sandy loam soils of average fertility.

The weed flora comprised of *Cyperus* sp. (41.3%), *Echinochioa* (21.5—) followed by *Corchorus* sp. (11.5%) and *Commelina communis* (8.2%). Among cultivation metods, transplanting and *Lehi* were similar but both reduced significantly the weed density and biomass production than drilling and broadcasting which were at par. oxadiazon 1.0 kg/ha preemergence, superimposed with 2,4-D 1.0 kg/ha postemergence had lowest weed population as well as weed biomass and was comparable with hand weeding. The remaining herbicides were at par but significantly superior than hoeing and weedy 'check' under all the methods of cultivation. *Lehi* planting with 41.4 q/ha grain yield was significantly superior than transplanting (36.2 q/ha) which in turn, yielded significantly higher than driling (28.1 q/ha) and broadcasting (27.01 q/ha). Among weed control treatments, hand weeding 40.2 q/ha and oxadiazon (37.1 q/ha) were at par while thiobencarb (36.7 q/ha) and butachlor were also similar but all these treatments gave significantly higher yield than hoeing (31.3 q/ha) which in turn, was significantly superior over weedy check (20.5 q/ha.)

INVESTIGATIONS ON PERIODIC DRY MATTER PRODUCTION AND NUTRIENTS UPTAKE BY RICE AS AFFECTED BY PLANTING METHODS AND WEED CONTROL TREATMENTS

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Investigation involving three methods of planting i. e planting on puddled and non puddled-soil using paraquat 1 kg/ha one week before planting and direct seeding on non-puddled soil with ten weed management treatments consisting of two granular formulations of preemergence herbicides butachlor and thiobencarb each 1 kg/ha applied separately and in four combinations of two granular preemergence herbicides followed by two liquid (formulation propanil and bentazon each 2 kg/ha), hand weeding and unweeded control were conducted to study the periodical dry matter production and nutrient uptake by the crop.

The results showed that at 60 days of crop growth the dry matter production in direct seeded rice was the highest in both seasons but at 90 days and harvest the dry matter production under puddled transplanted and without puddled transplanted was more as compared to direct seeding. Among weed control treatments thiobencarb, bentazon and thiobencarb followed by propanil were comparable to hand weeding in the first year while in the second year hand weeding occupied the peak position in respect of dry matter production of rice. The uptake of NPK was more under transplanting on puddled and non puddled soil over direct seeding. Likewise NPK uptake by rice was also improved due to weed control treatments as compared to weedy check.

STUDIES ON WEED FLORA, WEED DYNAMICS AND THEIR CONTROL UNDER DIFFERENT METHODS OF RICE CULTURE

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Field experiments were conduced for two consecutive years during *Kharif*, 1988 and 1989. The treatments consisted of three methods of rice culture viz., dry seeding wet seeding and transplanting and five weed control measures such as preemergence application of anilofos and oxadiazon each 0.5 kg/ha, butachlor 1.25 kg/ha, repeated weeding and weedy check.

Reculs revealed that the *Echinochloa colonum* (L.) Link. and *Leptochloa chinensis* (L.) Nees. were dominant weeds in dry seeded, whereas, *Echinochloa crusgalli* (L) Beauv. was the pre-dominant monocot weed in wet and transplanted rice. *Eclipta alba* (L.) and *Alternanthera sessilis* (L.) were the major weeds under all the three methods of rice culture. Transplanting and wet seeding brought down the growth of monocot weeds appreciably over dry seeding. Contrary to this, the weed growth of dicot weeds was significantly higher under wet and transplanted than dry seeding conditions.

The yield attributes, grain and straw yields and uptake of nutrients by rice were significantly more under transplanting and wet seeding as compared to dry seeding. Preemergence application of anilofos, oxadiazon and repeated weeding, enhanced significanlly the yield attributing characters grain and straw yields and improved the uptake of nutrients by rice crop to a level of significance over butachlor and weedy check.

WEED MANAGEMENT IN TRANSPLANTD RICE

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Field experiment was conducted during *Kharif*, 1989 with three levels of nitrogen (0, 60 and 120 kg/ha) and weed control treatments viz., preemegence application of thiobencarb 1.0, 1.5 and 2.0 kg/ha, 2, 4-D 0.5, 1.0 and 1.5 kg/ha, hand weeding twice (20 and 40 DAT) and unweeded control.

The grain yield increased with increasing rate of N application. However, significant increase was only upto 60 kg N/ha. Two hand weedings recorded significantly higher grain yield than all the herbicidal treatments. In herbicidal treatments, thiobencarb 2 kg/ha had significantly higher grain yield than rest of the treatments. All the herbicidal treatments produced more grain yield than unweeded control, which had lowest yield. with the effective control of weeds by treatments, two hand weedings, thiobencarb 2.0 kg, the nitrogen response was observed upto 120 kg/ha. The dry weight of weeds at harvest was significantly lowest in hand weeded plots followed by thiobencarb 2.0 kg, whereas maximum dry weight was maintained in unweeded plots. Increasing levels of N increased the dry weight of weeds.

COMPARATIVE EFFECTIVENESS OF THE NEW TYPE OF LOW DOSE HIGH EFFICIENCY CINMETHYLIN (ARGOLD), HERBICIDE IN CONTROLLING WEEDS IN RICE

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Field experiment was conducted during the warm–wet season, 1988 to evaluate the comparative efficiency of cinmethylin (Argold) in controlling weeds in transplanted rice. The pre-dominant weed species were *Echinochloa colona* (L.) Link., *Digitaria sanguinalis* (L,) Scop. *Sphenoclea zeylanica* Gaertn., *Hydrolea* zeylanica (L) Voht., *Ludwigia parviflora* Roxb. *Hydrilla hyaline*, *Cyperus iria* L. and *Fimbristylis miliscea* (L.) Vahl. Cinmethylin 0.08 to 0.10 kg/ha was at par with butachlor 1.5 kg/ha to reduce the total weed population and weed dry weight resulting in yield to the extent of 47.37 and 47.33 q/ha respectively and at par to 1.5 kg butachlor (47.90 q/ha)

EVALUATION OF HERBICIDES UNDER PRE AND POST TRANSPLANTED SITUATIONS IN RICE

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Field experiment was conducted during *Rabi*, 1989 to evaluate the herbicides viz., butachlor, thiobencarb, anilofos and oxyfluorafen under pre (3 DPP) and post (3 DAP) transplanting situations in rice. Weed count and weed dry weight on 45 DAP revealed that butachlor (3 DPP and 3 DAP), thiobencarb 3 DAp and anilofos 3 DPP and 3 DAP significantly decreased the weed population and weed dry matter. All the three herbicides may be used under pre and post transplanted situations.

WHEAT

EFFECT OF FERTILIZER PLACEMENT AND WEED CONTROL MEASURES ON THE PERFORMANCE OF RAINFED WHEAT

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Field experiments on rainfed wheat (Var. Sonalika) were conducted during *Rabi* 1987-88 and 1988-89 with two methods of fertilizer application (line placement and broadcasting) and four weed control measures (grubbing, dryland weeder, hand weeding at 25 days after seeding and weedy 'check') at Jorhat. Results indicated that both the methods of fertilizer application exerted similar effects on weed population and dry matter. During 1987-88, line placement increased grain yield significantly over broadcasting of fertilizer. The highest weed control efficiency (27.05%) was recorded under hand weeding which resulted in 21.39 percent yield increase over weedy check.

RESPONSE OF WHEAT AND ASSOCIATED WEEDS TO NITROGEN AND ISOPROTURON APPLIED POSTEMERGENCE

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Three field experiments were conducted on *a* sandy loam soil to evaluate the changes in the density and dry weights of weeds as affected by nitrogen rates and isoproturon in wheat. The weed density in the field dominated by broad leaf weeds at 60 days after sowing was about 44, 29 and 15 percent more in the unfertilized plots than fertilized with 120, 80 and 40 kg N/ha, respectively. Dry weight of total and individual weeds at 60 days after sowing was greater in the fertilized plots than unfertilized plots. Isoproturon 1.0 kg/ha plus 2,4-D 0.5 kg/ha was most effective in controlling the broad leaf weeds and wild oats (*Avena* spp.).

Isoproturon 0.75 kg/ha plus surfactant 0.1 percent improved the control of yellow sweet clover and wild oats. Length of heads, number of spikelets/spike and 1000 grain weight were favourably affected by the increased nitrogen rates and isoproturon. Competition by broad leaf weeds reduced the grain yield of wheat by 34, 14, 17 and 17 percent at 0, 40, 80 and 120 kg N/ha, respectively. The reduction in grain yield of wheat in the presence of 180 wild oat plants/m² were 32, 25, 12, and 19 percent at 0, 40, 80, and 120kg N/ha. Isoproturon plus 2,4-D reduced the grain yield of wheat. Efficiency of isoproturon was more in the fertilized plots than unfertilized plots.

INFLUENCE OF PLANTING TIME ON ISOPROTURON EFFICIENCY AGAINST WILD OATS

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A field experiment was conducted on sandy loam soil to evaluate the changes in the density and dry weight of *Avena ludoviciana* L. as affected by planting time and isoproturon in wheat. Wheat sown beyond 30th November recorded significantly lower population of wild oats as compared to early sowing. Isoproturon applied a day before first irrigation was more effective than its application at 30 days after sowing. A delay in sowing upto 30th November increased the damage caused by isoproturon to wild oats. Interactions of low weed population and leaf stage of wild oats increased the activity of isoproturon. Isoproturon 0.5 kg/ha applied before first irrigation was as effetive as 1.0 kg/ha applied at 30 DAS. The losses in grain yield of wheat in weedy check decreased with the delay in sowing.

EFFECT OF CHEMICAL WEED CONTROL UNDER DIFFERENT PLANTING GEOMETRY AND SOWING DATES OF DWARF WHEAT *(Triticum aestivum)* ON WEED

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Performance of six weed control treatments viz. isoproturon 1.0 kg/ha pre and post, metoxuron 2.0 kg/ha pre, pendimethalin 1.5 kg/ha pre, HW (20 & 40 DAS) and weedy check was evaluated under normal (20-30 Nov.), midlate (5-15 Dec) and late sowing (20-30 Dec.) with solid (20 cm) and square planting (20x 20cm) for controlling weeds in wheat on sandy-loam soils of average fertility during *Rabi*, 1986 and 1987.

The major weed flora comprised of *Phalaris minor* Retz. (304.5 m^{-2}), *Trifolium flagiferum* (17.6 m^{-2}), *Melilotus alba* (10.9 m^{-2}) and *Medicago denticulata* (6 9 m^{-2}). The maximum weed density (277m^{-2}) was registered under normal sowing which declined by 38.6 aud 57.0 percent under midlate and late sowings. The weed biomass also had the same trend. Cross planting reduced both, weed density and biomass as compared to solid planting which were much higher in 1986 than 1987. Herbicides proved effective on majority of monocot and dicot weeds except *Cyperus rotundus* and *Cynodon dactylon*. Isoproturon 1.0 kg/ha pre proved better for control of *P. minor* and other dicot weeds except *Medicago denticulata*. Isoproturon and metoxuron as post were less effective while pendimethalin pre was least effective on weeds. The weed density and dry matter yield was in the order of HW (31m^{-2}, 232 kg/ha), isoproturon (69m^{-2}, 337 kg/ha), metoxuron post (76m^{-2}, 371 kg/ha), isoproturon post (84m^{-2}, 412 kg/ha), pendimethalin pre (117m^{-2}, 620 kg/ha) and weedy check (610m^{-2}, 1748 kg/ha),respectively,

EFECT OF CHEMICAL WEED CONTROL UNDER DIFFERENT PLANTING GEOMETRY AND DATES OF SOWING ON GROWTH AND SINK POTENTIAL OF DWARF WHEAT

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Normal sowing exhibited the highest grain yield (39.9 q/ha) and net profit (Rs. 640 /ha) which declined by 6.2 q/ha and Rs.1382/ha under midlate and 17. 8 q/ha and Rs. 4726/ha under late sowing, respectively, during 1986. During 1987 normal and midlate planting were at par in grain yield (51 0 and 51.1 q/ha) but both outyielded late sowing (41.1 q/ha). Similar trend was noted for profit. The height, tillers / plant and LAI were higher under normal sowing than midlate and late sowing. Ear length and number of grains were higher in delayed plantings than normal but ear and 1000 grain weight showed reverse trend. Cross sowing exhibited significantly more grain yield (3.0 and 1.4 q/ha) and profit (Rs. 63/ha and 293/ha) over solid planting in two years. LAI and CGR followed the trend of grain yield but NAR showed reverse trend. Test weight remained unaffected.

Isoproturon 1.0 kg/ha pre produced maximum grain yield (35.4 and 53.3 q/ha) while the lowest yield (24.8 and 36.8 q/ha) was noted in 'check' Isoproturon post (33.3 and 50.0 q/ha) and HW (33.8 and 50.5 q/ha) produced identical grain yield, but in turn, proved superior to pendimethalin. Effects of metoxuron were not consistent. Isoproturon recorded the highest net profit under two methods of applications over all the weed control treatments.

EFFECT OF METHOD AND TIME OF APPLICATION OF ISOPROTURON ON THE CONTROL OF *Phalaris minor* RETZ IN WHEAT

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The experiment was conducted on loamy sand soil to evaluate the twelve treatment combinations consisting of isoproturon 1.0 kg/ha as spray, urea mix and sand mix applied at 15, 25 and 35 days after sowing of wheat.

Phalaris minor and *Anagallis arvensis* were predominant weeds, however, few plants of *Avena ludoviciana* were also observed. Isoproturon applied at 15 and 25 days after sowing exhibited some crop injury, however, controlled the weeds more effectvely. Minimum grain yield (3284 kg/ha) was recorded from weedy plots which was significantly lower than other treatments. In general, spraying method was more effective than urea mixing and sand mixing methods.

WEED MANAGEMENT STUDIES IN WHEAT WITH TRIALLATE APPLIED ALONE AND IN SEQUENCE WITH OTHER HERBICIDES

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Trials were conducted to test the efficiency of triallate applied alone and with the sequential application of herbicides on weed control in wheat during 1988-89. Maximum and minimum wheat yields were obtained under season long weed free and weedy conditions. Among different herbicides, triallate 1.0 hg/ha applied pre plant incorporation followed either by isoproturon, 2, 4-D, fluroxypyr or tralkoxydim applied either before or after first irrigation produced wheat yields at par to season long weed free situtations. Triallate 1.5 kg/ha ppi alone or application of isoproturon tralkoxydim or triallate alone as post and preemergence also produced satisfactory wheat yield as compared to other treatments. Siginificantly better yield in sequential application of triallate and other herbicides was owing to the efficient control of weeds as well as higher number of tillers/meter row length of wheat.

COMPARAIVE EFFICIENCY OF HERBICIDES AND CULTURAL METHODS OF GROWTH, YIELD ATTRIBUTES AND YIELD OF DWARF WHEAT

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A field experiment was conducted to evaluate twelve treartments involving hand weeding once, closer planting (15 cm) with normal (100 kg/ha) and 50 per—cent higher seed rates (150 kg/ha), cross sowing each at 15 and 22.5 cm with nor mal and 50 percent higher seed rates, isoproturon 1 kg/ha pre applied alone and through superphosphate carrier as pre sowing treatment fluroxypyr 0.75 kg/ha post and 2, 4—D EE 0.75 kg/ha+3 percent urea as post emergence were compared with no weeding treatment in wheat crop during *Rabi* 1987-88.

The dominant weeds associated wheat were *phalaris minor* (23.02%), *Medicago denticulata* (18.70%) *Trifolium flagiferum* (16.80%) *Melilotus alba*, (10.02%), *Anagallis arvensis* (9.87). Hand weeding and is proturon 1 kg/ha pre proved potential in reducing the weed dry matter resulting 4.87 and 10 70 q/ha as aganist 44. 47 q/ha under no weeding. The highest weed control efficiency of 68.75 percent was registered with hand weeding followed by isoproturon pre (52 56%). The lowest weed control efficiency (11.67%) was noted under closer planting with 50% higher seed rates. Hand weeding registered 101.34 and 49 03 q/ha while isoproturon recorded 90.53 and 43.22 q/ha, biomass and grain yield, respectively. The larger net paofit of Rs. 3645.25 and 2469.05/ha was under hand weeding (once) and isoproturon 1 kg/ha, respectively. Fluroxypyr post alone, cross sowing with closer planting (15cm) and normal seed rate was uneconomical.

INTEGRATED MANAGEMENT OF *Phalaris minor* Retz. IN WHEAT UNDER NORMAL AND STALE SEED BED CONDITIONS

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Two herbicides viz. isoproturcn 1 kg/ha and metoxuron 1.5 kg/ha as pre and postemergence application were evaluated at row width of 15cm solid rows and square planting at rows width of 20 cm with seed raies of 100, 125 and 150 kg/ha under normal and stale seed bed conditions in 1983 & 1984. The field was infested with *Trifolium flagiferium, Medicago denticulata, Melilotus alba* and *Chenopodium album* despite *Phalaris minor* which alone consistituted more than 75% of the total weed flora. Density of *P. minor* under stale seed bed was reduced drastically to the tune of 26 plants m^{-2} as compared to normal seed bed in first year (166.7 plants m^{-2}). The trend was not consistent during second year. Conversely, the density of *Phalaris minor* remained unaltered due to seed bed preparations. Application of herbicides as preemergence was potential over post-emergence application as regards reduction in weed density, greater in normal seed bed than stale seedbed in both the years.

Metoxuron was more efficacious during first year than the following year. However, isoproturon was better than metoxuron in reducing the weeds, under both types of seed beds in second year. Higher rates of seeding reduced the population of *P. minor* remarkably. Square planting proved effective over solid planting, irrespective of seed beds. Similar trend was also noted in LAI and biomass production of *P. minor* under these treatments.

INFLUENCE OF HERBICIDES ON GROWTH OF *Phalaris minor* Retz. IN DWARF WHEAT UNDER DIFFERENT SOWING DATES AND PLANTING GEOMETRY

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Growth of *Phalaris minor* was studied under three herbicides viz. isoproturon (1.0 kg/ha pre and post), metoxuron (2.0 kg/ha post) and pendimethalin (1.5 kg/ha pre) and compared with hand weeding twice and weedy check under different planting dates (normal, midlate and late), and geometry (solid and square during *Rabi*, 1986 and 1987 in rice-wheat cropping system. The plant density, height, total and effective tillers per plant, LAI and WGR of *Phalaris minor* exhibited significantly greater values under normal planting which declined as the sowing was delayed however, NAR and RGR showed the reverse trend. The planting in straight rows registered greater height while square planting reduced the height in the range of 4.63 to 7.76 cm in two years. Consistently, similar Trend was noted in tiller production, earlength, LAI, WGR and RGR but not in NAR. Among weed control treatments isoproturon 1 kg/ha pre was most effective followed closely by isoproturon and metoxuron post as regrds plant height, tillers ear length, LAI, CGR and RGR. NAR showed the reverse trend in all the growth characters.

EFFICACY OF FLUROXYPYR, ISOPROTURON AND 2, 4-D AGAINST WEEDS IN WHEAT

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An experiment was carried out in *Rabi*, 1985–86 with fluroxypyr at 0.1. 0.2, 0.3, 0.4 and 0.5 kg/ha post emergence (25 DAS) as alone, and 0.2 and 0.3 kg along with 2,4–D 0.5 kg/ha or isoproturon 0.5 kg/ha as post and compared with 2,4–D 1.0 kg/ha post, isoproturon 1.0 kg/ha pre or post, hand weeding one 25 DAS and a weedy check. Weed flora of the experimental field was consisted of broad-leaf weeds, viz., *Chenopodium album* L , *Melilotus alba* L., *Madicago denticulata* Willd. etc., to the tune of 29.1 lakh weeds/ha as against 15.1 lakh weeds/ha of monocot group mainly *Phalaris minor* Retz. while other weeds estimated to be 8.97 lakh/ha. The total weed count of mixed weed flora was 52.12 lakh/ha under un-weeded plot.

Amongst all the 14 treatments, the highest weed control efficiency (94.86%) was noted under hand weeding but application of isoproturon 1.0 kg/ha alone as pre or post emergence was effective (89.28 and 90 78%) against both monocot as well as dicot groups. Amongst the various levels of fluroxypyr, only 0.3 kg/ha gave satisfactory control (25.25%) of dicotyledonous weeds whereas combination of fluroxypyr 0.3 kg + isoproturon 0.5 kg/ha gave 89.22% weed control efficiency. Fluroxypyr 0.2 kg and 0.3 kg/ha when superimposed with isoproturon 0.5 kg/ha gave significantly higher grain yields as compared to control. The grain yield under fluroxypyr 0.3 kg with isoproturon 0.5 kg/ha was the highest amongst herbicidal treatments and it was at par to hand weeding and isoproturon alone as pre or postemergence. Thus, isoproturon alone as pre or postemergence and fluroxypyr with isoproturon gave excellent results in controlling weeds as well as higher grain yields.

EFFECT OF SURFACTANTS ON EFFICACY OF ISOPROURTON AND METHABENZTHIAZURON IN CONTROLLING *Lolium temulentum* AND OTHER WEEDS OF WHEAT

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The efficacy of isoproturon and methabenzthiazuron with and without surfactants in controlling *Lolium temulentum* and other weeds in wheat was studied during *Rabi*, 1986-87 and 1987-88. Two herbicides (H_1 –isoproturon and H_2 methabenz–thiazuron) with three doses (D_1 -5o per cent of the recommended, D_2 -75 per cent of the recommeded and D_3- recommended i.e. 1.5 kg per ha) and unweeded check (H_0) in main plots and four surfactants (S_0 -no surfactant, S^1 Selwet E o.5%V/V, S_2-Triton X-100 0.1% V/V and S_3-Teepol 0.5% V/V) in sub plots. Surfactants increased the efficacy of both the herbicides in controlling *Lolium temulentum* and other weeds. By use of surfactants the dose of both the herbicides could be reduced by 25 per cent for controllirg *Lolium temulentum* and by 50 per cent for controlling other weeds without any phytotoxic effect. Use of Teepol with 50 per cent of the recommended dose and Selwet-E with 50 and 75 per cent of the recommended dose of both the herbicides produced significanly higher net return and benefit/cost ratio over recommended rate without surfactants.

EFFECT OF TILLAGE AND WEED CONTROL ON WHEAT YIELD IN AN ENTISOL UNDER IRRIGATED AND RAINFED CONDITIONS

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Changes in soil physical properties, weed infestation and yield response of wheat (*Triticum aestivum*) in relation to tillage and weed control methods were evaluated on a sandy loam (Fluvent) soil under irrigated (1986–87, 1987-88) and rainfed (1985-86, 1986-87) conditions. The treatments comprised of three tillage treatments (zero, minimum and conventional tillage) and two weed control methods (hand weeding and chemical weeding). Highest bulk density and lowest air-filled porosity of 0–150 mm soil were observed in zero tillage. Minimum and conventional tillage

were at par for both these parameters. The effect of bulk density on wheat yield varied with the soil moisture regime. Weed infestation and cost of weeding were highest in zero tillage. Chemical weeding (Nocilon 1.7 kg/ha) was more economical than hand weeding. Cost of hand weeding was higher under rainfed than under irrigated conditions. Wheat yield with minimum and conventional treatments, under both irrigated and rainfed conditions were statistically same, but significantly higher than zero tillage. However, under irrigated conditions zero tilled plots treated with herbicide produced the same yield as exhibited minimum under conventionaly tilled plots. On the basis of cost benefit ratio, zero tillage with chemical weeding and minimum tillage are recommended for wheat under irrigated and rainfed conditions, respectively, in coarse textured soils of lower Shiwaliks.

RESPONSE OF WHEAT CULTIVARS TO HERBICIDES

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The responses of four wheat genotypes (U. P. 262, H. P. 1102, H. P. 1209 and HUW 206) to three herbicides (pendimethalin, isoproturon and 2,4-D) each applied at three levels were studied and compared with hand weeding and weedy 'check' during 1986-87 and 1987-88. Pendimethalin as pre-emergence, isoproturon and 2, 4-D as postemergence at their different rates caused significant reduction in weed biomass production and resulted in increased grain yields of wheat. Weed control efficiency was lower in hand weeding than the herbicides treated plots The highest grain yield was obtained with pendimethalin 1.5 kg/ha pre and isoproturon 1.5 kg/ha postemergence and the lowest was recorded in the unweeded check. Genotype HUW 206 showed some sensitivity to high dose of 2,4-D 2.5 kg per hectare but the other varieties did not show sensitivity to any dosage of the herbicides tried.

INTEGRATED WEED MANAGEMENT IN IRRIGATED WHEAT

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To workout the suitable weed management practice for wheat, field experiments were conducted during winter 1987 and 1988. Combination of two row spacing (15 and 22.5 cm), two seed rates (100 and 150 kg/ha) and two methods of sowing (normal and cross) were used in main plots and four weed control treatments in sub-plots viz., preemergence pendimethalin 0.5 and 1.0 kg/ha, weed free 'check' and weedy 'check' were studied.

Among the mainplot treatments combination of 15 cm row spacing with 150 kg of seed/ha sown in cross method recorded the lowest weed dry matter production and was comparable with 22.5 cm row spacing with 150 kg seed/ha sown in cross line method, and 22 5 cm row spcaing with 100 kg seed sown in cross row Generally, cross sowing reduced the weed DMP significantly than normal sowing. The weed free check had the lowest weed DMP and was comparable with preemergence application of pendimethathalin 1.0 kg/ha. The grain yield of the mainplot and subplot treatments also showed the same trend.

STUDIES ON BROAD SPECTRUM CONTROL OF WEEDS IN WHEAT

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Field experiments were conducted for 3 consecutive years (1986-87 to 1988-89 ot develop an effectiv eherbicidal schedule for controlling the weeds of wheat. The treatments consisted of weedy check, weed free, 2,4-D 0.5 kg/ha, 2,4-D 0.5 kg/ha+2% Urea, isoproturon 0.75 kg/ha, isoproturon 0.75 kg/ha+2,4-D 0.5 kg/ha, isoproturon 0.75 kg/ha+2,4-D 0.5 kg/ha+Uera 2%, isoproturon 0.5 kg/ha, isoproturon 0.5 kg/ha+2,4-D 0.5 kg/ha and isoproturon 0.5 kg/ha+2,4-D 0.5 kg/ha+2%Urea. On an average, season long weed competition caused 21.36 % decline in grain yield of wheat. Application of isoproturon 0.75 kg/ha mixed with 2,4-D 0.5 kg/ha brought about satisfactroy mortality of weeds, enhanced the grain yield significantly and proved almost equivalent to weed free treatment.

EFFICACY OF BROAD-SPECTRUM HERBICIDES IN CONTROLLING WEEDS IN WHEAT *(Triticum aestivum)*

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To compare the efficacy of broad-spectrum herbicides and to determine the optimum dose and stage of application of these herbicides in controlling weeds in wheat, field experiments were conducted during *Rabi*, 1981-82 and 1982-83, The experiment was laid out in a split-split plot design by keeping 4 herbicides viz., isoproturon, methabenzthiazuron, metoxuron and terbutryn in main plots, 3 times of herbicide application viz., preemergence, seedling and maximum tillering stages of the crop in subplots, and 4doses of each herbicide viz.,recommended, 25perecnt lower than the recommended 25percent higher than the recommended and unweeded check in sub-sub-plots. The predominant weeds of the experimental site were *Phalaris minor* (Retz)*Lolium*., *temulentum* L., *Avena fatua* L., *Coronopus didymus* L. and *Vicia Sativa* L. constituting 41.9. 23.4, 21.5 and 13.3 per cent of the total weed flora, respectively. These weeds caused 31.3 percent reduction in grain yield of wheat. Among all the treatments isoproturon 1.5 kg/ha preemergence or at seedling stage of the crop was the most effective in terms of growth, yield and yield attributes of wheat crop by reducing the weed dry matter and weeds count. Higher rate (2.0 and 2.5 kg/ha) of isoproturon controlled the weed but were phytotoxic to the crop. The next best herbicide was methabenthiazuron 1.44 kg/ha pre or at seedling stage.

ECONOMIC ANALYSIS OF BROAD SPECTRUM HERBICIDES IN CONTROLLING WEEDS IN WHEAT UNDER MID-HILL CONDITIONS

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To determine the optimum doses of broad-spectrum herbicides viz. isoproturon, methabenzthiazuron, metoxuron and terbutryn for controlling weeds in wheat, an experiment was conducted during *Rabi*, 1981-82 in split-split plot design keeping 4 herbicides in main plots, 3 times of application viz., pre-emergence, seedling stage and maximum tillering stage in sub-plots and 4 doses of each herbicide viz. recommended, 25 per cent lower and 25 per cent higher than recommended and unweeded check in sub-sub plots. To the mean wheat grain yield quadratic regression equations ($Y = a+bx+cx^2$) were fitted by solving the normal equations obtained by the least square method. Economic analysis of herbicide application indicated that 1.638, 1.449, 2.193 and 1.776 kg/ha were the yield maximising doses of isoproturon, methabenzthiazuron, metoxuron and terbutryn, respectively. Yield maximising efficiency of these herbicides ranked in the decreasing order of methabenzthiazuron, isoproturon, terbutryn and metoxuron. The optimum doses of isoproturon, methabenzthiazuron, metoxuron and terbutryn obtained from response curves were 1.203, 1.214, 1.715 and 1.470 kg/ha, respectively. Among all the herbicides methabenzthiazuron 1.214 kg/ha was most economic for controlling weeds in wheat followed by terbutryn 1.470 kg/ha. These two herbicides gave Rs. 1.84 and Rs. 1.69 profit per rupee invested, respectively. Isoproturon gave the least profit per rupee invested on it.

EFFECTS OF DATES OF SOWING, PLANTING GEOMETRY AND WEED CONTROL METHODS ON UPTAKE OF NUTRIENTS BY WEEDS AND WHEAT CROP

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Studies were conducted in wheat on nutrients uptake by weeds and crop to elucidate the influence of weed coutrol methods viz. isoproturon 1.0 kg pre and post, metoxuron 2.0 kg/ha post, pendimethalin 1.5 kg/ha pre, hand weeding twice and weedy check under three dates (normal, midlate and late) and two planting geometries (Solid and square) on sandy loam soils of average fertility during *Rabi*, 1986 and 1987.

The results revealed that nitrogen and phosphorus absorption by weeds and crop was maximum and significantly higher under normal than midlate and late sowing. Uptake of potassium by weeds was significantly more under normal and midlate sowing as compared to late in the second year only, while it was least by crop under normal sowing and increased with delayed sowing.

Significantly, greater amount of NPK was removed under solid planting than cross geometry by weeds but the crop indicated the reverse trend. The highest NPK uptake (46, 30, 32 kg/ha) was under the weedy check by weeds but the lowest by crop (84,21 81 kg/ha). Amongst herbicidal treatments, removal of nutrients was significantly higher and lower under pendimethalin and isoproturon applied as pre emergence respectively by weeds and vice versa in crop. Hand weeding and other herbicides were more or less comparable with isoproturon pre in this respect.

WEED CONTROL IN WHEAT *(Triticum durum)* BY HERBICIDES

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A field experiment was conducted during 1985-86 and 1986-87 with 2,4-D 0.4 kg/ha post, methabenzthiazuron 1.0 kg/ha post, metoxuron 1.5 kg/ha post, isoproturon 0.75 kg/ha post, pendimethalin 1.0 kg/ha pre, diuron 0.5 kg/ha pre, isoproturon 0.5+2,4-D 0.4 kg/ha post and weedy check. It was observed that the post emergence spray (30 DAS) of tank mixed isoproturon 0.5 kg/ha + 2,4-D 0.4 kg/ha resulted in the lowest weed biomass (monocot as well as dicot), maximum weed control efficiency and the highest grain yield of wheat,

EVALUATION OF HERBICIDES FOR WEED CONTROL IN WHEAT

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An experiment was conducted to study the effectiveness of 2,4-D amine and sodium salt, isoproturon, metoxuron and pendimethalin at recommended rates and 50% higher rates in comparison to the two hand weedings for weed control in wheat, during *Rabi*,1988. *Cyperus rotundus*, *Eragrostis* sp., *Chenopodium album*, *Convolvulus arvensis* and *Melilotus alba* were the dominating weeds in the experimental field. Application of pendimethalin 1.0—1.5 kg/ha proved the most efficient treatment in reducing the weed intensity and weed biomass. The highest grain yield of wheat was obtained with two hand weedings closely followed by 2.4-D amine 0.6 kg/ha, pendimethalin 1.5 kg/ha and metoxuron 1.5 kg/ha.

STUDIES ON THE CHEMICAL CONTROL OF WEEDS IN WHEAT

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A field experiment was conducted during 1979-80 to evaluate the efficacy of different weedicides in wheat, Unchecked weeds reduced the grain yield by 18.5 per cent. Among different weedicides, isoproturon (Tolkan) 1.0 kg/ha proved most efficient by giving highest grain yield followed by Goal, Stomp, Arelon and Graminon at 0.15, 1.0, 1.0 and 1.0 kg a. i./ha, respectively. Two hand weedings given at 4 and 6 weeks after sowing were fairly comparable to weed free condition.

BARLEY

A STUDY ON WEED MANAGEMENT IN RAINFED BARLEY
(Hordeum vulgare)

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An experiment was conducted during *Rabi* 1987-88 and 1988-89 to study the effect of different weed management treatments on rainfed barley. The treatment were one hand-weeding (40 DAS), two handweeding (40 and 60 DAS), 2, 4-D amine 0.4,0.7,and 1,0 kg/ha, 2,4.D ester 0.4, 0.7 and 1.0 kg/ha, isoproturon 0.5, 0.75 and 1.0 kg/ha and weedy check. Major weeds were *Lolium temulantum, Medicago* spp., *Phalaris minor, Avena* spp. and *Anagallis arvensis*. The highest grain yield (23.3 q/ha) was recorded with isoproturon 0.75 kg/ha. This was followed by 2.4-D amine 0.71 kg/ha and two handweedings (40 aud 60 DAS). Minimum yield (6.9 q/ha) was obtained in weedy check. The weed dry weight was minimum and maximum in isoproturon 0.75 kglha and weedy check, respectively.

MAIZE

INTEGRATED WEED MANAGEMENT IN MAIZE UNDER SUB-TEMPERATE MID HILL CONDITIONS

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To work out the best suited integrated weed management system in maize, three weed control methods (unweeded 'check', hand weeding twice 30 and 60 DAS and alachlor 1.5 kg/ha pre-emergence) were tested in main-plots, two cropping systems (solid maize, maize+soybean-one row of soybean two rows of maize) in sub-plots and combination of three maize plant populations (50,000, 75,000 and 90,000 plants per hectare) and three fertility levels (recommended–120 kg N. 60 kg P_2O_5 and 60 kg K_2O ha, 50% higher than the recommended and 50% lower than the recommended) in sub-plots were tested. The results on integrated weed management index, weed count,weed dry matter, maize and maize equivalent yield revealed that the best integrated weed anagement system was pre-emergence application of alachlor 1.5 kg/ha, maize+soybean cropping system, with maize population of 75,000 plants/ha and 50 per cent higher than the reocmmended fertility. In this system hand weeding twice was next best to chemical weed control.

STUDIES ON INTEGRATED WEED MANAGEMENT IN MAIZE

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Field investigations were taken up with maize Ganga-3 to evaluate the effectiveness of stale seedbed technique in the suppression of weed flushes and the ability of blackgram as an intercrop in suppressing the weed growth and the role of low doses of herbicides after stale seedbed preparation. Results revealed that the stale seedbed appeared very effective in checking the successive weed flushes before planting and increasing the yield significantly. Maize and blackgram were quite compatable and excellent combination for reducing weed growth and improving maize yield. Blackgram inclusion as an intercrop suppressed the weeds without any adverse effect on maize yield and produced an additional yield of blackgram to the tune of 4 q/ha. Stale seedbed technique allowed non-significant weed population to be associated with maize which was easily kept under check either by giving one weeding at 21 days after sowing or spraying a very low dose (0.5 kg/ha) of atrazine as pre-emergence or planting blackgram as an intercrop.

INTEGRATED WEED MANAGEMENT IN RAINFED KHARIF MAIZE IN CALCAREOUS SOIL

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A field experiment was conducted during the *Kharif*, 1984,1985 and 1986 toevaluate the effect of herbicides along with hand weeding and weedy check on the control of weeds and yield of maize. The treatments consisted of 3 herbicides viz, atrazine 1.5 kg/ha, atrazine 1.5 kg/ha + hand weeding, isoproturon 1.5 kg/ha, isoproturon 1.5 kg/ha +H. W., blackgram + alachlor 1.5 kg/ha, hand weeding (two) and weedy check. Uuweeded control recorded the maximum weed dry matter (1983, 1625 and 1725 kg/ha) during the respectiue years. While assessing the weed control efficiency it was found that atrazine + H. W. recorded higher weed control efficiency than atrazine alone. Alachlor 1.5 kg/ha pre in with blackgram (a smother crop) was effective which had the maximum yield (22.35 to 35.40 g/ha) and was at par with other weed control treatments but in turn, proved significantly superior to unweeded check (12.14 to 14.17 g/ha) due to intense weed compatition. Complete weed free conditions gave the highest yield of maize. Alachlor+blackgram gave the highest yield return followed by atrazine alone. Thus, the integrated weed management system involving blackgram as an intercrop in maize appeared more promising than herbicides alone.

EFFECT OF INTEGRATED WEED MANAGEMENT ON MAIZE YIELD

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A field experiment during *Kharif*, 1989 on weed management in maize crop revealed that the yields were significantly higher under atrazine pre + handweeding 30 DAS (41.49 q/ha), atrazine pre+paraquat post (41.07 q/ha), atrazine pre+2, 4-D post (39.82 q/ha), atrazine pre+pendimnthalin post (39.24 q/ha), pendimethalin pre+handweeding 30 DAS (38.40 q/ha) and pendimethalin pre+paraqat post (38.15 q/ha). All the above treatments (except weedy check) gave the yields at par with hand weeding at 15 and 30 DAS (39.78 q/ha), The yield under atrazine pre (36.57 q/ha) was signficantly superior to pendimethalin (34.90 q/ha).

CHEMICAL WEED CONTROL IN TRANSPLANTED WINTER MAIZE

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A field experiment was conducted for two years during 1985-86 and 1986-87 to find out effective dose and time of application of atrazine for weed control in transplanted winter maize. Atrazine (0.25 and 0.5 kg/ha) applied at transplanting, 1, 2, 3 or 4 weeks after transplanting gave complete control of grassy and broadleaf weeds. Herbicide application 5 weeks after transplanting gave slightly inferior weed control than early application Atrazine treatments yielded significantly higher than untreated control and at par with two weeding. Grain yield did not differ significantly due to doses of atrazine and timing of application.

WEED CONTROL IN MILLETS

INTEGRATED WEED MANAGEMENT IN PEARLMILLET

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In the present study three pearlmillet cultivars at two plant population with atrazine at two concentrations were tested. Frcm the study, it was revealed that cultlvars did not show significant effect in reduction of weeds. Manual weeding was found superior to atrazine 1.25 or 0.75 kg/ha in reducing weed biomass.

Grain yield of pearlmillet was significantly higher in cultivar GHB-30 compared to B-K 560 and GHB-27. The normal plant population increased the grain yield up to 22.6 percent over higher plant population. Hand weeding significantly increased grain and fodder yield to the the tune of 47.6, 22.8, 58.5 and 28.5, 42.1, 79.4 percent as compared to unweeded control, atrazine 0 75 kg and 1.25 kg, respectively. Manual weeding done at 30 DAS and 60 DAS was the most effective to reduce the infestation of *Cyperus rotundus* L. with respect to suppression of monocot and dicot weeds at all the stages of crop growth, higher plant population (30 cmx15cm) was significantly superior over normal plant population (45 cmx15 cm). In case of paucity of labourers, lower dose of atrazine 0.15 kg/ha could be recommended for better weed management and crop yield.

STUDIES ON THE INTERACTIVE EFFECT OF PEARLMILLET CULTIVARS AND ATRAZINE

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Twelve cutlvars, with four weed management treatments were compared for their competitive ability to withstand against weeds and also for the atrazine sensitivity. The results revealed that pearlmillet cultivars had not exhibited any suppression effect on monocot and dicot weeds at all the stages of crop growth. The results further revealed that two hand weedings consistently controlled monocot (88.5%) and dicot (87.1%) weeds up to harvest. Hand weeding atrazine 1.25 kg/ha and 0.75 kg/ha reduced total dry weight of weeds to the tune of 95.3, 71.0 and 59.9 percent, respectively as compared to unweed control.

Hand weeding gave increased grain yield to the extent of 15.9, 23.3 and 18.0 percent, respectively as compared to atrazine 0.75 kg, 1.25 kg and unweeded control The interaction between cultivar and weed management showd that under weedy condition cultivar GHB-30 gave 38.9 percent higher yield than GHB-32. In weed free situation cultivar HHB-45 gave the highetst yield (3657 kg). At higher dose of atrazine cultivar MH-179 expressed least phytotoxic effect (26.0%) and gave the highest grain yield.

EFFECTIVE HERBICIDES FOR DIRECT SOWN RAINFED FINGER MILLET

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Experiments were conducted during *Kharif*, 1988 and 1989 at Regional Research Station, Paiyur, Dharmapari to find out effective weed management practices and economical method of herbicide application to direct sown rained finger millet. *Kharif*, 1989 result showed that all the herbicide tried as pre emergence viz; pendimethalin 0.5 kg, butachlor 0.6 kg, 2.4-DEE 1.0 kg, anilophos 0.3 kg, end oxadiazon 0.3 kg/ha applied under both the methods viz; as spray and sand mixing and broad casting had phototoxic effect on the germination and establishment of finger millet upto 66 percent even though weed control efficiency was good and comparable between all herbicides when the same herbicides were applied as post emergence, only 2,4-D 1.0 kg either as Na salt or ehtyl ester showed less phytotoxicity and gave comparable grain yield that of hand weeded control. Between the two methods of application the sand mix and broadcasting recorded 74.6 percent WCE while spray recorded 80.0 percent During *Kharif*, 1989 three doses of 2,4-D Na salt and ethyl esters (0.5, 0.75 and 1.0 kg/ha) were applied on 10 and 15 DAS. Post emergence application of either 2,4-D Na salt or ethylester 0.5 kg/ha 10 DAS showed lower plant mortality and gave higher grain yield. When applied at 15 DAS, 0.75 kg/ha proved efficient dose for better weed control with lower plant mortality and higher grain yieid.

EFFECT OF TIME OF APPLICATION OF NITROGEN AND WEED MANAGEMENT ON PEARLMILLET

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An experiment conducted during *Kharif*, 1985 and 1986 showed that the application of nitrogen 1/2 at sowing and 1/2 at 3 WAS or 1/4th at sowing and 3/4th at 3 WAS or full at 3 WAS provided similar grain yield of pearlmillet. Application of atrazine 0.5 kg/ha or two hand weedings, 3 and 5 WAS resulted in a significant reduction in population and dry weight of weeds and registered grain yield statistically at par with season long weed free conditions.

The effect of nitrogen applied in full or half dose at 3 WAS and other at 5 WAS was same and significantly superior in lowering down the population and dry weight of weeds over the treatments where 1/2 or 1/4 was applied at sowing time. In the presence of *Trianthema* and *Digera* higher N rates even if applied at 3 WAS allowed the competition in favour of crop. The same holds good in the presence of grassy weeds like *Echinochloa colonum*.

INTEGRATED WEED MANAGEMENT IN DRILL SOWN FINGER MILLET *(Eleusine coracana Gaertn.)*

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Field experiment was conducted during *Kharif*, 1988–89 to study the effect of integrated approach on control of weeds and grain yield of drill sown finger millet. Two herbicides, i. e. isoproturon and metoxuron and their mixture (isoproturon+ metoxuron) each at two levels integrated with hand weeding and intercultivation along with controls were tried. The weed dry weight recorded at 30, 60, 90 days after sowing and at harvest was significantly reduced with the application of metoxuron 0.75 kg/ha as pre emergence spray followed by hand weeding at 30 days after sowing. Mixture spray of isoproturon 0.25 kg/ha and metoxuron 0.375 kg/ha as pre-emergence spray followed by hand weeding and also metoxuron 0. 50 kg/ha followed by hand weeding were next in order in their efficiency in controlling weeds.

The maximum grain yield (3351 kg/ha) was recorded in metoxuron 0.75 kg/ha followed by hand weeding which was significantly superior over only hand weeding treatment (2581 kg/ha). Even the mixture spray of isoproturon 0.25 kg/ha and metoxuron 0.375 kg/ha followed by hand weeding also recorded higher grain yield (3161 kg/ha) however at par with hand weeded treatment.

WEED CONTROL IN FORAGE CROPS

CONTROL OF *Trianthema monogyna* and *Echinochloa colonum* IN FORAGE MAIZE

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PANTNAGAR (NAINITAL)--263 145

Atrazine, pendimethalin, each at 0.5, 1.0 and 1.5 kg/ha and fluroxypyr at 0.3, 0.4 and 0.5 kg/ha alongwith weedy, weed-free and manual weeding at 20 days after sowing were evaluated for the control of *T. monogyna* and *E. colonum* in forage maize during rainy season. Density of *T. monogyna* and *E. colonum* in weedy plots ranged from 224 to 299 and 123 to 203/m^2, respectively, during different years. Atrazine at 1.0 and 1.5 kg/ha was very effective in reducing density and weight of *T. monogyna* and *E colonum*. Control of *T. monogyna* by pendimethalin was comparable to that of atrazine. Fluroxypyr was not effective against *T. monogyna*.

Infestation with these weeds caused more than 45% reduction in the green and dry fodder yield. Green and dry weight of fodder due to atrazine and pendimethalin each at 1.0 and 1.5 kg/ha were consistently at par with weed-free condition. Yields from fluroxypyr treated plots were almost similar to weedy condition.

EFFECTS OF ATRAZINE UNDER DIFFERENT NITROGEN LEVELS ON FORAGE YIELD OF SORGHUM *(Sorghum bicolor* (L.) Moench.)

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The investigation to evaluate the efficacy of atrazine (0.25, 0.50 and 1.00 kg/ha) as pre-emergence against hand weeding and weedy check to control weeds was carried out during *Kharif,* 1983. The results revealed higher efficacy of atrazine 1.0 kg/ha pre over all the treatments except hand weeding. Lower levels of atrazine (0.25 and 0.50 kg/ha) though were less effective on weeds but found better than weedy 'check'. The green fodder yield (372.1 q/ha) obtained with 1.0 kg/ha atrazine was significantly superior to weedy 'check' (304.1 q/ha), The lower doses of atrazine (0.25 and 0.50 kg/ha) pre though better in GFY (315.7 and 343.9 q/ha) but were at par with weedy check. Atrazine 1.0 kg/ha registered significantly higher dry matter yield of fodder (116.5 q/ha) as against weedy 'check' (81.3 q/ha) In case of dry matter accumulation in weeds, hand weeding registered the lowest dry matter (0.70 q/ha) followed by 1.0 kg/ha of atrazine (0.76 q/ha) as against 3.71 q/ha of weedy check. 120 kg N/ha. though yielded highest GFY and DMY but was at par with 60 kg N/ha. Thus application of 60 kg N/ha may be the economic dose in forage sorghum if weed control measures are adopted.

RESPONSE OF FORAGE SORGHUM *(Sorghum bicolor* L.*)* CULTIVARS TO RATE AND APPLICATION TIME OF ATRAZINE

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The investigation to evaluate tolerance of forage sorghum cultivars (J.S.20, J-6 and H. C. 136) to atrazine (0.25 and 0.50 kg/ha) pre and post with hand weeding once, weed free and weedy 'check' was carried out during *Kharif*, 1983. Varieties showed greater tolerance to all levels of atrazine either applied at 10 or 20 DAE. Atrazine at 0.50 kg/ha pre and post (20 DAE) established its effectiveness on existing weed flora of forage sorghum. Lower levels of atrazine at two intervals were less effective on weeds but proved superior to weedy 'check. Dry matter accumulation declined with two levels of atrazine as compared to hand weeding and no weeding treatments. Atrazine at both the rates potentially reduced the dry matter at 20 DAE as compared to 10 DAE. Weed free registered significantly low st dry matter over all the treatments. The highest seed yield (9.34 q/ha) exhibited with 0.5 kg atrazine applied at 20 DAE was proved significantly superior to one hand weeding and no weeding (7 54 and 5.07 q/ha yield) respectively, while lower rate of atrazine applied at 10 DAE was at par to its application at 20 DAE and one hand weeding. Highest weed index was noted under no weeding and closely followed by lower rates of atrazine and weeding treatment in variety HC-136.

SCREENING OF HERBICIDES FOR CONTROLLING THE WEEDS IN FORAGE SORGHUM *(Sorghum bicolor* (L.) *Moench.*

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A field experiment was conducted during *Kharif*, to study thc influence of atrazine 0.5, 1.5 and 2.0 kg/ha, simazinc 0.5, 1.0 and 2.0 kg/ha, diuron 0.6, 1.0 and 2.0 kg/ha and sirmate 2.0, 4.0 and 8.0 litre/ha as pre emergence for controliing the weeds in forage sorghum. Atrazine at 1.0 kg/ha produced the highest green fodder (750.24 q/ha) and dry matter yield (210 06 q/ha) followed by simazine 1,0 kg/ha, while weedy check gave 325.56 and 95.87 q/ha green and dry matter, respectively. The weed intensity was aiso significantly reduced in atrazine 1.0 kg/ha (130/m2) followed by simazine 1.00 kg/ha (182/m2) while control plot had 433.33/m2. The total dry weed biomass was also significantly reduced in atrazine 1.0 kg/ha (63.33 g/m2) as compared to control (190 g/m2). The weed control efficiency was the highest in atrazine 1.0 kg/ha (71.05%) followed by eimazine 1.0 kg/ha (66.66 g/m2).

HERBICIDAL TRIAL ON FORAGE COWPEA

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Field experiment was carried out during *Kharif*, to evaluate the efficacy of different herbicides (nitrofen 0.75, fluchloralin 1.5, alaclor 1.5 kg/ha as pre and bentazon and diuron at 3 litre and 3 kg/ha, respectively, as post) for the control of weeds and their affects on growth and forage yield of cowpea. Weed density and weed biomass were significantly affected by application of different herbicides. Auongst the herbicides,

bentazon produced higher green fodder (217.8 q/ha) and dry matter (36.74 q/ha) yield over others. The total weed density (181.7/m^2) and total weed biomass (63.43 g/m^2) were also reduced significantly over control (4 8 33/m^2) and 185.17 g/m^2). The weed control efficiency was higher in bentazon (65.74%) followed by fluchloralin (59.41%) and nitrofen (53,25%)

EVALUATION OF HERBICIDES FOR WEED MANAGEMENT IN BERSEEM

(Trifollium alexandrinum **L.***)*

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Butachlor 2.0 and 2.5 kg/ha pre emergence and fluchloralin 1.0 kg/ha ppi were applied under two sowing methods i. e. seed coated with activated charcoal and uncoated seed. The highest weed control efficiency was recorded under fluchoralin 1.0 kg/ha with charcoal treated seed (71.72%), closely followed by butachlor 2.5 kg/ha with charcoal treated seed (68.48%).

The seed yield increased significantly under all weed control treatments over weedy check (4.68 q/ha) and the highest was recorded with fluchloralin 1.0 kg/ha under seed coated with charcoal (7.58 q/ha), followed by fluchloration 1.0 kg/ha with uncoated seed (7.19 q/ha).

The green fodder and dry matter yield were also significantly increased under all weed control treatments over weedy check (817 and 66.54 q/ha). The highest green fodder yield was recorded under butachlor 2.0 kg/ha with activated charcoal treated seed (992 q/ha) followed by butachlor 2.5 kg/ha with activated charcoal treated seed (968 q/ha). The dry matter yield also had the same trend (122.4 q/ha. and 115,9 q/ha).

SENSITIVITY OF BERSEEM AND INDIAN MUSTARD TO ATRAZINE

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Studies conducted on sensitivity of berseem and Indian mustard to atrazine 0, 0.02, 0.04, 0.07, 0.09, 0.16, 0 18, 0.22 ppm by weight of soil corresponding to surface application of atrazine at 0.25, 0.50, 0.75, 1.00, 1.50, 2.00, 2.50 kg/ha showed that application of atrazihe at these doses did not adversely affect the emergence of crops. Atrazine at 0.04 ppm and higher concentrations caused complete mortality of seelings by 30 days. Yellowing of leaves occurred even in 0.02 ppm concentration but the crops recovered completely indicating 0.02 ppm atrazine as threshold value for tolerance in berseem and Indian mustard.

CONTROL OF ANNUAL BLUE GRASS *(Poa annua)* AND OTHER WEEDS IN FODDER OATS *(Avena sativa* L *)*

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Field studies carried out during 1986-87 and 1987-88 indicated that pre-emergence application of methabenzthiazuron or pendimethalin 0.75 kg/ha produced significantly higher green fodder yield of oats as compared to unweeded control. Lower dose of these herbicides (0.5 kg/ha) supplemented with one hoeing (7 WAS) gave as good results as

higher dose alone or two hand weedings (5 and 7 WAS). Pre-plant application of fluchloralin 0.75 kg/ha exhibited severe phytotoxicity on crop, however, gave good control of *Poa annua* and other weeds. Highest net returns (Rs 1034,5 /ha) over unweeded control were obtained under pre-emergence application of pendimethalin 0.75 kg/ha.

EVALUATION OF TWO SPECIES OF WEEDS AS FORAGE

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An experiment was conducted to study the quality of *Sonchus arvensis* and *Trifolium repens* and their suitability to the ruminants for nutritional purpose: Dry matter content, crude protein content, ether extract and total ash were determined. Both the plants disqualified biochemically as fodder except twig and flower of *Trifolium repnes* which had total ash content that was lower than 10%.

WEED CONTROL IN OIL SEED CROPS
SOYBEAN

WEED MANAGEMENT IN SOYBEAN *(GIycine max)*

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The experiment was conducted during, 1986 and 1987 with main treatments of three sowing methods viz, immediately after monsoon without killing the weeds, sowing after receiving first shower and killing the first flush of weeds and sowing after receiving second shower and killing the second flush of weeds and sub-plot treatments of weedy check, hand weeding 1 (20 DAS), fluchloralin 1.0 kg/ha ppi, oxadiazon 1.0 kg/ha pre-emergence and haloxyfop-methyl 0.25 kg/ha post emergence.

The sowing after receiving second shower and killing the second flush of weeds was the most effective in reducing the weed population and weed dry weight but decreased the seed yield slightly under HW. The hand weeding gave significantly higher yield than all other treatments. Amongst herbicides, oxadiazon was the best under all the sowing methods. Haloxyfop-methyl was less effective as it controlled only grassy weeds. The yield under herbicidal treatments were higher as compared to weedy check under all the methods of sowing. The major weeds were, *Echinochloa crusgalli, Euphorbia geniculata, Cyperus rotundus, Psoralea corylifolia, Commelina bengalensis, Rungia repens* and *Physallis minima*.

CULTURAL AND CHEMICAL WEED CONTROL IN KHARIF SOYBEAN UNDER DEEP VERTISOL CONDITIONS

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Efficacy of fluchloralin, metribuzin, oxadiazon, pendimethalin and haloxyfop-methyl, alone and in combination i. e. ppi plus pre, ppi plus post and pre plus post emergence and the cultural methods of weed control were evaluated in soybean during *Kharif*, 1985 and 1986.

Echinochloa crusgalli, *Cyperus rotundus*, *Cynodon dactylon*, *Commelina benghalensis*, *Corchorus acutangulus*, *Eclipta alba* and *Launea asplenifolla* constituted the major bulk of the weeds. The combination of treatments proved more efficient than the single herbicide treatments in reducing the weed competition. In 1985 the lowest weed intensity was recorded with oxadiazon 0.750 kg/ha plus haloxyfopmethyl 0.750 kg/ha closely followed by fluchloralin 1.125 kg/ha plus oxadiazon 0.750 kg/ha. The minimum weed shoot biomass was under hand weeded plots followed by metribuzin 0.375 plus haloxyfopmethyl 0.750, metribuzin 0.250 plus haloxyfopmethyl 0.500, fluchloralin 1.125 plus oxadiazon 0.750 and oxadiazon 0.750 plus haloxyfopmethyl 0.750 kg/ha. During 1986, fluchloralin 0.75 plus oxadiazon 0.5 kg/ha gave the minimum weed intensity at par with most of the combination treatments while interms of weed shoot biomass fluchloralin 0.75 kg/ha plus haloxyfopmethyl 0.5 and oxadiazon 0.5 plus haloxyfopmethyl 0.5 kg/ha appeared better herbicide at par to hand weeding.

During, 1985, the maximum grain yield was under fluchloralin 0.75 plus oxadiazon 0.5 kg/ha and at par to all the combinations as well as 2 or 3 handweedings.

The net returns were maximum with fluchloralin 0.75 plus oxadiazon 0.5 kg/ha and two blade harrowing treatments during 1985 and 1986, respectively, while the benefit/cost ratio was the highest under one blade harrowing during both the years.

CHEMICAL WEED CONTROL IN SOYBEAN

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The weed control experiment in soybean conducted during *kharif*, 1989 revealed maximum soybean seed yield (15.52 q/ha) under hand weeding (20 and 35 DAS). This was at par (14.76 q/ha) with hand-weeding (15 and 25 DAS) and hand-weeding 20 DAS (13.63 q/ha). The yield under herbicidal sprays viz, thiobencarb 3.0 kg/ha (13.44 q/ha), butachlor 2kg/ha (13.25 q/ha),fluchloralin 1.5 kg/ha, butachlor 2.5 kg/ha and thiobencarb 2.5 kg/ha (11.49 q/ha) did not differ significantly but were significantly superior to weedy creck (5.30 q/ha). Thiobencarb 3.0 kg/ha and butachlor 2.0 kg/ha were at par with handweedings to 20and35DAS while thiobencarb 2.5kg/ha, butachlor2.5kg/ha, fluchloralin 1.5 kg/ha were at par with hand weeding at 20 DAS.

WEED COTROL IN SOYBEAN

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JABALPUR-482 004

In an experiment four row spacings (22.5, 30, 37.5, 45 cm) as main treatment and seven weed control treatments viz, unweeded control, one hand weeding (30 DAS), two hand weedings (30 and 45 DAS) and four weedicides, fluchloralin 0.5 kg/ha ppi,

metribuzin 0.75 kg/ha pre, acifluorfen 0.50 kg/ha post and metolachlor 1.0 kg/ha pre as sub treatments were tested for weed control in soybean. The dominant weeds were *Phylanthus niruri, Echinochloa crusgalli, Cyperus* sp., *Eclipta alba, Ageratum conyzoides Cynotis axillaris, Digitaria adscendens* and *Ceasulia axillaris*.

The results revealed non-significant difference in yield among different row spacings. All the weed control treatments gave significantly higher seed yield as compared to control. Fluchloralin gave significantly higher yield (10.86 q/ha) over all other treatments. There was no significant difference in yield between hand weeding treatments, but these were superior to unweeded control (6.44 q/ha), acifluorfen (7.01 q/ha), metolachlor (8.77 q/ha) and metribuzin (7.73 q/ha). The later two treatments gave significantly higher seed yield over control.

CHEMICAL WEED CONTROL IN SOYBEAN

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Vivekananda Parvatiya Krishi Anusandhan Shala
ALMORA-263 601

Efficacy of fluchloraiin 0.5 and 1.0 kg/ha, pendimethalin 1.0 kg/ha, oxadiazon 0.5 kg/ha, metolachlor 0.5 and 1.0 kg/ha, oxyfluorfen 0.2 kg/ha, bentazone 1.5 kg/ha, alachlor 1.0 and 2.0 kg/ha, were compared with HW once (30 days) HW twice (30 and 45 days) in rainfed soybean during *Kharif*, 1984 and 1985. Crop was predominantly infested by *Golinsoga parviflora*; *Commelina benghalensis, Digitaria sanguinalis* and *Ageratum conizoides*.

Weed dry weight recorded at maturity was minimum in metolachlor 1.0 kg/ha during 1984 which was statistically at par with fluchloralin 0.5 kg/ha followed by one handweeding and oxadiazon 0.5 kg/ha. During 1985, the lowest weed dry weight was in two handweedings. Other treatments which produced equally lower weed dry weights were alachlor 2.0 kg/ha, one handweeding, oxyfluorfen and fluchloralin 0.5 kg/ha followed by one handweeding. Oxyfluorfen, alachlor and fluchloralin followed by one handweeding were quite effective for increasing the seed yield.

CROP-WEED ASSOCIATION IN SOYBEAN UNDER DIFFERENT SEED RATES, ROW SPACINGS AND WEED CONTROL METHODS

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Field studies on soybean (JS. 75-46) were conducted during *Kharif*, 1988 and 1989 with two seed rates (80 and 120 kg/ha), three row spacings (20, 30 and 40 cm.) and seven weed control treatments (weedy check, hand weeding 20 DAS, ethal fluralin 1.0, 1.5 and 2.0 kg/ha pre, trifluralin 1.8 kg/ha and fluchloralin 1 kg/ha ppi).

The dominant weeds associated with soybean crop were mainly *Echinochloa crusgalli* (38.38%), *Cyperus rotundus* (23.89%), *Commelina communis* (18 06%), *Phyllanthus niruri* (10.60%), *Eclipta alba* (4.40%) and other weeds (4.62%).

Higher seed rates reduced weed density and biomass and registered highest WCE (65.42%) and seed yield as compared to lower seed rates. Planting in narrow rows (20 cm) [registered lower weed density (73.50m^{-2}) and biomass (9.81 q/ha) than wider spacings. Both wider spacings had maximum weed density (82.58 and 91.48 m^{-2}) and biomass yield (11.54 and 11.30 q/ha) while seed yield and WCE showed the reverse trend,

Hand weeding had significantly higest seed yield (22.70 q/ha) and WCE (84.45%) and caused reduction in weed density and biomass (48.78 m^{-2} and 3.70 q/ha) as compared to no weeding treatment (142.31 m^{-2} and 23.27 q/ha). Among herbicides fluchloralin 1 kg/ha ppi established its superiority over trifluralin and ethalfluralin at all levels, but these proved superior to weedy check.

COMPARATIVE STUDIES OF HERBICIDES AND CULTURAL METHODS OF WEED CONTROL ON GROWHT AND YIELD PARAMETERS OF SOYBEAN

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Field experiment was carried out with five herbicides viz, fluchloralin 1.0 kg/ha ppi, butachlor 1.5 and 2.0 kg/ha pre, alone and with super phosphate carrier, metolachlor 2.0 kg/ha pre, trifluralin 2.0 kg/ha pre and butachlor 1.5 and 2.0 kg/ha as post (15 DAS) and two cultural treatments (hand weeding 30 DAS and hand hoeing 20 DAS) and were compared with no weeding, during *Kharif*, 1988-89.

Experimental field was mainly infested with monocot (88.52%) and dicot weeds (9.50%). Most dominant weeds were *Cynodon dactylon* (L.) Pers. (29.19%), *Paspalum sanguinale* L. (20.17%). *Commelina communis* L. (13.21%), *Caesulia axillaris* Robx. (9.50%), *Sehima nurvosum* L. (8.55%) *Echinochloa* spp. (7.37%), *Cyperus* spp. (5.15%) and *Echinochloa crusgalli* var. *oryzicola* (4.88%) at 75 DAS.

All weed control treatments except butachlor G. at both levels were found effective in reducing the weed intensity as well as weed biomass as compared to control. Significantly the lowest weed biomass (11.29 q/ha) was recorded in hand hoeing closely followed by hand weeding (13.70 q/ha). Metolachlor was effective in reducing the weed biomass significantly at harvest as compared to other treatments.

All treatments gave significantly higher seed yield as compared to control (6.35 q/ha). Maximum yield was under hand weeding (18.30 q/ha) followed closely by hand hoeing (15.96 q/ha) and metolachlor (15.59 q/ha). Trifluralin 2.0 kg/ha pre and butachlor 2.0 and 1.0 kg/ha pre with super phosphate carrier proved superior to rest of the weed control treatments.

RESPONSE OF SOYBEAN VARIETIES TO DIFFERENT WEED CONTROL METHODS UNDER VARIOUS SPACINGS

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The weed control efficiency of butachlor 2.0 kg/ha and fluchloralin 1.0 kg/ha was studied with two varieties of soybean namely JS 72-44and JS 75-46 at 20,30 and 40 cm row spacings. The weed flora of the field consisted of grasses (52.81%), sedges (9.37%), broad leaf weeds (31.81%) and others (6.01%.). Out of which *Echinochloa crusgalli* (L) Beauv. and *Phyllanthus niruri* (L) contributed 51.2 and 21.04% respectively. The highest weed shoot biomass was noted under weedy check (4.46 q/ha) followed by butachlor (3.25 q/ha) and fluchloralin (2.51 q/ha) The lowest biomass (0.19 q/ha) was under hand weeded plots. The highest seed yield and WCE (27.39 q/ha, 95.74%) and greater net profit (Rs. 5941.33 /ha) was noted in the hand weeded plots followed by fluchloralin (20.10 q/ha, 43.72%) and butachlor (15.14 q/ha, 21.71%). The lowest yield (10. 37 q/ha), was noted under weedy check. Amongst two varieties. JS 75-46 yielded significantly higher than JS 72-44. The row spacing treatments were nonsignificant.

EVALUATION OF DIFFERENT WEED CONTROL TECHNIQUES IN SOYBEAN

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Field experiments on weed management in soybean (*Glycine max* L. Merrill) were conducted on clay soils during 1987 and 1988 involving 12 treatments. The study revealed that cultural weed control measures involving manual weeding at 30 and 50 DAS and chemical weed control through fluchloralin 0.8 kg/ha ppi and butachlor 1.5 kg/ha pre controlled the weeds and increased the grain and straw yield of soybean significantly over weedy check. The value of weed index was maximum under weedy check and lower in weed control treatments. The siginficant negative correlation was existed between weed biomass and soybean yield.

Application of fluchloralin 0.8 kg/ha with sand carrier and pre plant soil incorporation produced maximum profit of Rs. 7.00 on per rupee investment followed by butachlor 1.5 kg ha pre which gave profit of Rs. 5.80 on weed control treatments.

STUDY ON THE EFFECT OF BUTACHLOR AND THIOBENCARB ON SOYBEAN AND ASSOCIATED WEEDS UNDER TWO DATES OF PLANTING

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Relative efficacy of butachlor and thiobencarb each at 1.0 and 1.5 kg/ha was evaluated in soybean var. P. K. 262 under two dates of planting (June, 25 and July, 10) during 1987 and 1988. Major weeds in the experimental field were *Echinochloa colonum* and *Celosia argentia*. Uncontrolled weeds caused 87 percent reduction in grain yield. Later date was significantly superior over earlier date. Both the herbicides reduced the weed density and dry weight of weeds. Significantly the highest grain yield was obtained under weed free condition. Butachlor and thiobencarb each at 1.5 kg/ha pre were the next best treatments in this respect.

INFLUENCE OF HERBICIDES ON WEEDS IN SOYBEAN UNDER DIFFERENT SPACINGS AND SEEDING RATES

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Efficacy of six herbicidal treatments viz., fluchloralin 1.0 kg/ha ppi, oxyfluorfen 0.2 kg/ha, metribuzin 0.5 and oxadiazon 1.0 kg/ha all as pre-emergence, two hand weedings and control was investigated under six cultural treatments viz, three row spacings (20, 30 & 40 cm) x two seeding rates (100 and 125 kg/ha) for weed control in soybean during *Kharif* 1986 and 1987.

The major weed species associated with soybean crop in experimental field were *Echinochloa crusgalli* (265.4 m^{-2}), *Digitaria adscendens* (23.3), *Cyperus rotundus* (13.5), *Commelina communis* (5·3) and *Phyllanthus* spp. (85.5).

The effects of row spacings and seed rate were not significant on weed population at different intervals, but the narrow row spacing (20 cm) and high seed rate (125 kg/ha) had greater stress on weed growth and decreased the weed biomass significantly.

The effects of different herbicides revealed greater weed control efficacy in oxadiazon (81.7%), followed by oxyfluorfen (64.9%), fluchloralin (64.6%) and metribuzin (63.7%). The perennial weeds were not controlled by any herbicide. The former two herbicides had broad spectrum effects and can substitute hand weeding where annual weeds are dominant. Fluchloralin was very effective against annual grasses.

EFFICIENCY OF HERBICIDES FOR CONTROLLING WEEDS IN SOYBEAN

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A field experiment was conducted during *Kharif*, 1984 on clayloam soils with seven herbicides of which five at two levels viz, fluchloralin 1.0 and 1.5 kg/ha, metribuzin 0.25 and 0.50 kg/ha, and oxadiazon 0.75 and 1.0 kg/ha, pendimethalin 1.0 and 1.5 kg/ha and oxyfldluorfen 0.15 and 0.20 kg/ha, while DOWCO 453 at 0.25 kg pre and fusilade at 0.50 kg post were compared with one and two hand weedings, two mechanical weedings and weedy check in soybean.

The most dominant weeds recorded at 20 DAS were *Cyperus* spp. (62.78%) and *Echinochloa* (13.01%) among monocots while *Physalis minima*, *Ageratum conyzoides* and *Phyllanthus* spp. were noted under dicot weeds

Results revealed that two hand weedings were most effective in controlling mixed weed flora and was followed by pre emergence application of oxadiazon, oxyfluorfen and metribuzin at both the levels which in turn, increased the crop shoot biomass and grain yield of soybean, markedly over rest of the treatments.

EFFECT OF HERBICIDES ON GROWTH AND YIELD OF SOYBEAN UNDER DIFFERENT SPACINGS AND SEEDING RATES

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The most advantageous herbicide was oxadiazon yielding 30.4 q/ha with net profit of Rs. 10,432/ha under favourable season while 18.03 q/ha yield and Rs. 4896/ha profit under less favourable season. Other better treatments were metribuzin (Rs. 9940, 4294/ha) and hand weeding (Rs. 9200, 3970/ha). The lowest profit was under weedy check (Rs. 4722, 2237/ha). The highest cost benefit ratio was under oxadiazon 1:3.34).

Significantly higher seed yield was obtained at 30 cm row spacing (21.93 q/ha) as compared to 40 cm (20.60 q/ha) but at par with 20 cm (21.43 q/ha) under less favourable season. While under favourable season, the variations amongst row spacing were not significant. The seed yield at 125 kg/ha seeding rate was higher than 100 kg/ha.

The interactions of herbicidal and cultural treatments were significant. The maximum yield of 34.8 and 21.03 q/ha was obtained under hand weeding at 20 cm row spacing with 125 kg/ha seeding rates while oxadiazon at 30 cm row spacing at 125 kg/ha seeding rates resulted 33.07 and 20.64 q/ha in first and second year, respetively.

NUTRIENT UPTAKE BY WEEDS AND SOYBEAN UNDER DIFFERENT ROW SPACINGS, SEED RATES AND HERBICIDES

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Nutrient utilization by weeds and soybean was evaluated under six herbicidal treatments viz, fluchloralin 1.0 kg/ha ppi, oxyfluorfen 0.2 kg, metribuzin 0.5 kg and oxadiazon 1.0 kg/ha all as pre em, hand weeding–2 and weedy check as sub-plot treatments and six cultural treatments viz., three row spacings (20,30 and 40 cm) X two seeding rates (100 and 125 kg/ha) as main plot treatments during *Kharif*, 1986 and 1987.

The greater NPK drain by weeds was under weedy check (23.5, 3.24, 55.61 kg/ha) while minimum under hand weeding (2.9, 0.46, 10.7 kg/ha) followed by oxadiazon (4.4, 0.48, 15.4 kg/ha). The maximum NPK uptake by soybean crop was under oxadiazon (168.1, 13.5, 100.1 kg/ha) as it also had the greater biomass and seed yield. The lowest utilization of NPK in crop biomass and seed was under control (92.9, 7.4, 52.3 kg/ha). Inverse relationship was obtained between nutrient uptake by weeds and crops.

Amnogst different row spacings, the greater NPK utilization by soybean was under 30 cm row spacing followed by 20 and 40 cm row spacing. The higher seeding rate of 125 kg/ha exploited greater NPK utilization by soybean.

RESPONSE OF SOYBEAN CULTIVARS TO HERBICIDES UNDER VARIOUS ROW SPACINGS

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The experiment with three varieties (JS 72-44, JS 72-280 and JS 75-46) and three row spacings (20 , 30 and 40 cm) in main plot treatments and four weed control treatments (weedy check, hand weeding at 15 and 30 DAS, fluchloralin 1.0 kg/ha ppi, butachlor 2.0 kg/ha pre in sub-plot treatments, was conducted during *Kharif*, 1988.

Weed flora consisted of *Digitaria adscendens* (L.) Scop., *Dinebra arabica* Jacq., *Echinochloa crusgalli* (L.) R. Beauv , *Eragrostis ciliaris* (L.) R Br., *Setaria glauca* (L.) Beauv., *Cynodon dactylon* (L.) Pers , *Cyperus rotundus* L , *Cyperus iria* L., *Ageratum conyzoides* L., *Amarnthus viridis* L., *Caesulia axlilaris*, *Commelina benghalensis* L.,*Ecilpta alba* (L.) Hassk. *Euphorbia hirta* L., *Phyllanthus niruri* L. and others.

Weed control efficiency (WCE) did not vary due to varieties but WCE of 20 30 and 40 cm, row spacings were 65.69, 64.42 and 60.95 %, respectively. Hand weeding, butachlor and fluchloralin had 94.00, 81.24 and 79.09% WCE, respectively. The highest grain yield was obtained in JS 72-44 followed by JS 75-46 and JS 72-280 with 1724, 1466 and 1413 kg/ha, respectively mainly due to higher leaf area index, branches/ plant, dry weight accumulation/plant, number of pods/plant, grain yield/plant and 100–seed weight Amongst row spacings highest yield was obtained from 30 cm followed by 20 and 40 cm with 16.8, 16.0 and 13.3 q/ha yield respectively. Amongst weed control treatments, hand weeding had highest of 18.8 q/ha followed by butachlor, fluchloralin and weedy check (15.8, 15.1 and 11.8 q/ha). Economically the combination of JS 72-44 in row spacing of 30 cm and butachlor at 2 kg/ha proved to be the best treatment.

INTEGRATBD WEED MANAGEMENT PRACTICES IN SOYBEAN

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Field experiment was conducted during *Kharif*, 1989 with fluchloralin 1 kg/ha ppi, pendimethalin 1.0 kg/ha, alachlor 2.0 kg/ha and metolachlor 1.0 kg/ha all pre with and without hand weeding (30 DAS), hand weeding twice and unweeded control. The other weed control treatments consisted of planting soybean at 22.5 cm row spacing with and without hand weeding and application of straw mulch (5 t/ha). Among the different herbicidal combinations, alachlor 2 kg/ha pre with one hand weeding recorded the lowest weed number and the highest grain yield and weed control efficiency followed by fluchloralin 1. 0 kg/ha ppi with one hand weeding and pendimethalin 1.0 kg/ha pre with one hand weeding and were comparable with each other. The weed control efficiency and the grain yield was higher in all the herbicidal treatments over the unweeded control.

GROUNDNUT

CHEMICAL WEED CONTROL IN GROUNDNUT
(Arachis hypogaea **L.***)*

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Four herbicides each alone and in combination with one hand weeding were evaluated for the control of carpet weed (*Trianthema portulacastrum* L.) in groundnut

during 1985 and 1986. Haloxyfop methyl and flauzifo pbutyl were not effective against this weed. Pendimethalin alone or with one hand weeding at 45 days after sowing provided 95 and 65 percent control of carpet weed, The dry weight of total weeds at 60 days and at harvest was not significantly different from the weedy check except, during 1985. One supplementary hoeing in pendimethalin treated plots was necessary to significantly reduce the dry weight of total weeds. None of the herbicides showed significant increase in the yield over weedy check. Presence of weed throughout the growing season reduced the yield by about 2900 to 3492 kg/ha.

ECONOMICS OF INTEGRATED WEED MANAGEMENT IN GROUNDNUT

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Field experiments were conducted durtng kharif 1984 and 1985 to determine the comparative efficiency of different weed control methods and their economics in rainfed groundnut (CV, AK 12-24). The treatments comprising of different rates of pre sowing soil incorporation of fluchloralin (0.5, 1.0 and 1.5 kg/ha) and pre-emergence application of each pendimethalin and fluazifop butyl (0.5, 1.0 and 1.5 kg/ha) alone and in combination with one hand weeding. Hand weeding treatments twice and thrice including weed free check and weedy control were also included.

The results showed that the plots treated with pendimethalin 1.5 kg/ha followed by one hand weeding gave the highest net profit to the tune of Rs. 10,780/ha with maximum

benefit-Cost ratio of 2.14. The next best treatment was fluchloralin 1.5 kg/ha followed by one hand weeding with net profit and benefit-cost ratio of Rs. 10,175 and 1.96, respectively. Further, monetary value of additional yield over unweeded control was highest under weed free check to the tune of Rs. 9,120/ha followed by pendimethalin 1.5 kg/ha supplemented with one hand weeding (8816/ha). But highest return on per rupee investment on weed control was Rs. 35.48 and 32.72 in case of pendimethalin 1.5 and 1.0 kg/ha, respectively, as against Rs. 8.88 under weed free check.

EFFECT OF DIFFERENT WEED CONTROL MEASURES AND PHOSPHORUS LEVELS ON WEED FLORA AND POD YIELD OF GROUNDNUT

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The field experiment was conducted to study the effect of different weed control measures and phosphorus levels on weed flora, pod yield of groundnut and its economics during *Rabi*, 1988. Higher weed control efficiency was recorded in weed free 'check' followed by application of trifluralin at 0.75 kg/ha supplimented with one hand weeding at 30 days after sowing. Amongst herbicidal treatments, trifluralin 1.5 kg/ha (pre-sowing) was superior. Similarly, maximum dry pod yield was recorded in weed free 'check' followed by the use of trifluralin 0.75 kg/ha + one hand weeding (30 DAS). Dry weight of weed was not significantly of 60 kg p_2 O_5 /ha produced significantly higher pod yield than 30 kg P_2 O_5 /ha which in turn, also recorded significantly higher pod yield than control.

EFFECT OF DIFFERENT METHODS AND TIME OF APPLICATION OF FLUCLORALIN ON WEED CONTROL AND YIELD OF GROUNDNUT

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In a study during *Kharif*, 1988, fluchloralin was applied as preemergence by spraying (water as carrier) and with sand, soil and urea as carriers and as early post-emeragence (12th day after sowing) with the above carriers. Early postemergence spray was incorporated by working with star weeder. The above treatments were compared with fluchloralin as ppi, star weeding and hand weeding twice (20 and 40 DAS) and unweeded 'check'.

Grassy weeds were completely controlled upto maturity with fluchloralin ppi ro pre-emergence spray. Application with soil as carrier was most effective in controlling *Cyperus rotundus* upto maturity and was second only to hand weeding. Preemergence application with soil reduced the weed number and weed weight, bringing out more than 80 per cent centrol while hand weeding resulted in nearly 90 per cent control. Post-emergence treatments were less effective but checked the sedges as compared to control. Star weeding following the preemergence spray did not cause any improvement. Pod yields were higher under hand weeding, but the net returns were low. The experimental results based on weed control, pod yields and net returns favour the preemergence use of fluchloralin with soil as carrier.

STUDIES ON WEED MANAGEMENT IN RAINFED GROUNDNUT
(*Arachis hypogaea* L.)

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Two sets of experiments were conducted during *Kharif*, 1984 and 1985. The first set of experiment on crop-weed competition in which different period of weed free environment for initial 15, 30, 45, 60, 75 days and upto harvest was maintained and for rest of the period, weeds were allowed to grow. Unweeded control plots were also kept for treatment comparison. The second set of experiment consisted of various weed management treatments which included different doses of pre-sowing soil incorporation of fluchloralin (0.5, 1.0 and 1.5 kg/ha) and pre-emergence applica'ion of pendimethalin and fluazifop butyl (0.5, 1.0 and 1.5 kg/ha) each applied alone or inccmbination with one hand weeding at 30 DAS. The effectivity of weed control treatments was measured in terms of weed population, phytobiomass accumulation and nutrient depletion by weeds at different stages and effectiveness of herbicides were assessed in terms of dry matter production, nutrient uptake, yield attributing characters and pod yield. The results revealed that *Cyperus rotundua* L. and *Cyperus iria* L. were the major weeds constiuting 75% of total weed flora of rainfed groundnut. The phytobiomass accumulation of weeds in weedy 'Check' plot was to the tune of 240 g/m_2 at 45 days of sampling. When groundnut fields were kept weed free for initial 45 days of sowing pod yields ob ained were almost similar to those obtained from fields kept weed free for entire crop period. Among weed management treatments pendimethalin 1.5 kg/ha followed by one hand weeding 30 DAS gave most effective weed control and fetched 2204 kg/ha more pod yield over weedy check (1285 kg/ha). None of the herbicides opplied in groundnut left residue in soil that could adversely effect plant population and yield of toria grown after groundnut.

EFFICACY OF FOUR HERBICIDES IN CONTROLLING WEEDS IN GROUNDNUT

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An experiment was conducted during *Kharif* 1986 and 1987 to test the efficacy of pendimethalin, oxadiazon, oxyfluorfen, fluchloralin alone and in combination with intercultivation followed by intra row hand weeding in controlling weeds associated with groundnut. On an average, 88.4% yield reduction was observed due to weed competition. The increase in groundnut pod yield was more when one intercultivation followed by one intra row hand weeding was supplemented with herbicide application at lower and higher rates. Pendimethalin 0.75 kg/ha, oxyfluorfen 0.125 kg/ha supplemented by one intercultivation followed by one intra-row weeding were equally effective in controlling weeds and increasing yields of groundnut.

INTEGRATED WEED MANAGEMENT IN GROUNDNUT

(Arachis hypogaea **L.** *)*

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A Field experiment on integrated weed management in groundnut (*Arachis hypogaea* L.) was conducted during summer, 1987. The efficacy of three pre-emergance herbicides alachlor, pendimethalin and oxy fluorfen alone or in combination with hand weedings or hoeing was studied. All three herbicides alone or in combination with cultural practices effectively checked the weed flora and weed biomass. The dry matter and pod yield of groundnut crop and the net returns significantly increased when the herbicides were used along with a single hand weeding or hoeing twice.

Alachlor 1.5 kg/ha with hand weeding once 30 DAS followed by alachlor 1.5 kg/ha with hoeing on 20th and 40th DAS and pendimethalin 0.75 kg/ha with hand weeding once on 30th DAS gave highest pod yield (30.21, 30.01 and 29.24 q/ha) and net returns (Rs. 12,647.75, 12,564.00 and Rs. 12,205.25/ ha). However, the oil content did not differ significantly.

CHEMICAL WEED CONTROL IN KHARIF GROUNDNUT

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An experiment involving herbicides viz. metolachlor 0.75 kg/ha, fluazifop-butyl 0.125, 0.25 and 0.50 kg/ha and farmer's practice of two weeding and hoeing at 15 and 25 days after germination was conducted with groundnut AK 12-24 during *Kharif* 1989. Farmers practice gave the maximum pod yield of 12.5 q/ha and recorded WCE of 89.7%. Among the herbicides metolachlor ranked first with pod yield of 10.14 q/ha followed by pendimethalin and butachlor which yielded 8.97 and 7.89 q/ha, respectively and corresponding WCE was 81 2, 75.6 and 74.7 percent, respectively.

EFFECT OF MANUAL, MECHANICAL AND CHEMICAL METHODS OF WEED CONTROL IN SESAMUM CROP AFTER RICE

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An investigation was carried out during summer for two consecutive years 1987 &

1988.The result revealed that the weed infestation could be reduced by 20to94 percent during 1987 and 13.6 to 75 percent during 1988 under different weed control methods as compared to unweeded check. Minimum weed growth was under integrated weed management where alachlor 1.0 kg/ha pre followed by mulching (1.6 q/ha) during 1988 and the seed yield was higher by 81%. Similarly during 1987, application of alachlor and hand weeding at 40 DAS increased the seed yield by 37 %. Use of black polythene (250 mili-micron) as mulch material in between crops rows was effective measure for controlling weeds in inter-row spaces and thereby increased yield by 135%. Maximum seeds yield under mulch treatment was due to better conservation of soil moisture along with control of weeds. Mechanical weeding by using IITWAM-82 was also effective in controlling weeds in inter-row space and increased the yield by 54% as compared to unweeded check.

The predominant weed species in the experimental plots were *Echinochloa crus-galli* (L.), *Cyperus rotundus*, *Cynodon dactylon*, *Digitaria sanguinalis* (L.) scop., *Croton bonpadianum* baik. contributing to about 35, 25, 15, and 10 percent of the total dry matter of weeds under the unweeded check.

MUSTARD

EFFECT OF WEED CONTROL METHODS ON PHOSPHORUS USE EFFICIENCY IN GOBHI SARSON

(Brassica napus var *oleracea)*

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A field experiment was conducted in acidic soils (PH 5.6) to study the effect of weed control methods for economising the phosphorus and their combined effect on

cropweed competition in *Gobhi* Sarson during *Rabi* 1987-88 and 1988-89. Sixteen treatment combinations of 4 weed control methods and four levels of phosphorus were tested. The percentage reduction in yield due to weeds at no phosphorus, 40, 60 and 80 kg phosphorus per hectare was 80.4, 70.2, 62.6 and 55.0 per cent, respectively over hand weeding twice at each of these phosphorus levels. Significantly higher yield was obtained with a combination of hand weeding twice and 60 kg phosphorus /ha, but at 40 kg phosphorus it was statisticaly at par with the combination of pendimethalin 1.5 kg/ha pre and 40-80 kg phosphorus per hectare. Significantly higher phosphorus use efficiency (45.8%) was obtained with combination of pendimethalin at 40 or 60 kg phosphorus and was statistically at par with combination of hand weeding twice at 40 or 60 kg phosphorus per hectare.

HERBICIDAL WEED CONTROL IN MUSTARD

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A field experiment was conducted during *Rabi*, 1987-88 to study the weed control efficiency of different herbicides in mustard (Var. Varuna). The important weeds associated with mustard crop were *Chenopodium album, Launea asplenifolia, Euphorbia dracunculoides, Anagallis arvensis, Cyperus rotundus, Polygonum plebejum* and *Phyllenthus niruri*. Weeding done by *Khurpi* at 25 and 45 DAS and application of fluchloralin 1.0 kg/ha ppi, benthiocarb 1.0 and 1.5 kg/ha pre and isoproturon 1.0 kg/ha post gave seed yield of mustard comparable to the weed free treatment and significantly higher than unweeded 'check' treatment. Weedy condition for the entire crop season reduced the seed yield by 42.3 per cent as compared with weed free treatment.

EFFECT OF CULTURAL AND HERBICIDAL METHODS OF WEED CONTROL IN MUSTARD (*Brassica juncea* L.) var. VARUNA

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Relative efficiency of isoproturon 1.0 kg/ha pre, butachlor 2.0 kg/ha, fluchloralin 1.0 kg/ha ppi, hand weeding 30 DAS and weedy check was investigated under two row spacings (20 and 30 cm) and three seeding rates (5.0, 6.25 and 7.5 kg/ha) for weed control in mustard during *Rabi*, 1988 on sandy-clay soils of moderate fertility

The major weeds were *Phalaris minor* Rezt. (183.11 m^{-2}), *Trifolium flagiferum* (92.39m^{-2}), *Melilotus alba* (91.72 m^{-2}) and *Medicago denticulata* (35.61m^{-2}). Closer planting proved potential in reducing weed density (10.54 plantsm^2) and weed biomass (11.1 kg/ha) as compared to wider row spacing (11.69/m^2 and 1246 kg/ha) but seed yield was significantly higher under wider planting (1581 kg/ha) than closer planting (1297 kg/ha) Increasing levels of seed rates caused marked reducton in weed density and weed biomass. Significantly the highest seed yield (1659 kg/ha) was obtained with seed rate of 6.25 kg/ha as compared to 5.0 kg/ha (1250 kg/ha), however decline was moderate at 7.5 kg/ha seed rate (1408 kg/ha).

Herbicidal treatments and hand weeding were significantly superior to weedy check in respect of weed intensity and crop biomass. The weed control efficiency was in the order of hand weeding (72.63%), butachlor (77.12%), isoproturon (81.99%) and fluchloralin (84.39%). The higher yield was under isoproturon (1625 kg/ha) and fluchloralin (1506 kg/ha) which in turn was significantly greater than hand weeding (1392 kg/ha) These treatments gave significantly higher seed yield than weed check (1206 kg/ha).

SAFFLOWER

DIFFERENTIAL TOLERANCE OF SAFFLOWER *(Carthamus tinctorius*L) VARIETIES TO HERBICIDIES

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A field study was conducted during *Rabi*, 1988 to find out tbe response of herbicides to safflower varieties. Two varieties (S-4 and N-62-8) and five weed control treatments viz., pendimethalin 0.75 and 1.00, oxyfluorfen 0.05 and 0.1 kg/ha and a control were tried. The dominant weeds associated with the crop were *Chrozophora rottleri, Euphorbia dracunculoides, Convolvulus* and *Cynodon dactylon*.

The results revealed that the two varieties did not differ due to herbicide treatments with regards to germination, root and sheet growth, seed yield and test weight. There was no significant difference amongst different weed management practices adopted.

LINSEED

RELATIVE PERFORMANCE OF WEED CONTROL METHODS UNDER FERTILITY LEVELS ON LINSEED *(Linum usitatissimum* L.)

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Relative performance of three herbicides viz, isoproturon, fluchloralin and butachlor and hand weeding against weedy check under three fertility levels

of 45:22.5:15, 60: 30 : 20: 75: 37 5:25 NPK kg/ha studied in linseed during *Rabi*, 1988-89. Isoproturon was most effective in reducing the weed density and dry weed biomass in early as well as at harvest stage. Fluchloralin was next best followed by hand weeding and were significantly superior to butachlor and weedy check. Recommended and higher fertility levels gave significantly more weed population and dry weed biomass.

As regards the crop yield growth and yield attributes characters, isoproturon proved superior over rest of the methods of weed control. It gave higher number of primary and secondary branches, number of capsules/plant and number of seeds/capsule which ultimately gave maximum grain yield (1290 kg/ha). The grain yield under weedy check was 980 kg/ha and reduction was 24% when compared to isoproturon treated plots. Maximum grain yield (1318 kg/ha) was recorded under 75 : 37. 5 :25 NPK kg/ha followed by 60 : 30 : 20 kg NPK/ha (1225 kg/ha). The positive correlation between grain yield and numer of capsules/plant and number of seeds/capsule was observed while weed biomass was inversely correlated with grain yield of crop.

WEED CONTROL IN PULSES

EFFECT OF DIFFERENT CULTURAL PRACTICES ON WEED CONTROL IN RAINFED PIGEONPEA *(Cajanus cajan* L.)

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Field experiments were conducted on sandy loam soils during rainy seasons of 1986 and 1987 to find out the influence of different cultural practices on weed control in rainfed pigeonpea. The treatments tried were deep ploughing (30 cm), dry sowing (after

receipt of soaking rain) fertilizer application (20 kg N and 50 kg P/ha) and one supplemental irrigation at flowering. The dominant weed spacies noticed were *Cyperus rotundus*, *Digitaria sanguinalis* and *Digera arvensis*.

The grassy weed population was not influenced by different cultural practices. The sedge population was 40.7/m^2 in deep ploughing and it was 193.3/m^2 with dry sowing. The broad leaved weed population was similar in both the deep ploughing and dry sowing treatments but less than wet sowing. The total weed population was significantly less in deep ploughing as compared to dry andwet sowings. The reduction in weed dry matter was significantly less by 90 percent in deep ploughing as campared to dry sowing. Weed growth in pigeonpea was considerably reduced by deep ploughing.

COMPARATIVE EFFICIENCY OF HERBICIDES IN PIGEONPEA (*Cajanus cajan* L.)

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An experiment was carried out during the two consecutive years of 1987–88 and 1988-89 to compare the relative efficacy of seven pre-emergence herbicides in pigeonpea var. Bahar. The treatments comprised of weedy check, H. W. (30DAS). mechanical weeding (30 DAS) and weed free 'check' (2 HW). The seven pre-emergence treatments were fluchloralin 1.0 kg/ha, pendimethalin 1.0 kg/ha, oxadiazon 0.5 kg/ha. thiobencarb

1.5 kg/ha, lentagran 1.0 kg/ha butachlor 1.0 kg/ha and oxyfluorfen 0.15 kg/ha. Weedy check recorded the significantly the lowest pigeonpea yield (28.24 and 24.16 q/ha) than cultural or chemical weed control. The cultural methods and herbicides were at par. The highest yield among the herbicides was obtained with lentagran (38.2 and 32.2 q/ha) and it had the highest weed control efficiency.

INTEGRATED WEED MANAGEMENT IN PIGEONPEA

(Cajanus cajan **L. Millsp***)*

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LUDHIANA-141004

Field studies were carrid out during *Kharif* 1984 and 1985 to evolve suitable integrated weed management approach in pigeonpea. Intercropping pigeonpea var. AL-15 with moong *Vigna radiata* (L.) Wilczek.) or mash *Vigna mungo* resulted good suppression of weeds but failed to produce significant increase in seed yield of the main crop. Fluchloralin 0.5 kg/ha ppi and pendimethalin 0.5 kg/ha pre produced as good seed yield of pigeonpea as obtained under one hand weeding (4 weeks after sowing). Lower dose of herbicides i. e. 0. 25 kg/ha followed by one hand weeding (4 WAS) remained at par with higher dose of herbicides i. e. 0.5 kg/ha. Pendimethalin proved potential over fluchloralin as regard weed control.

EFFECT OF DIFFERENT CULTURAL PRACTICES ON WEED CONTROL IN RAINFED PIGEONPEA

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A field experiment was conducted on a sandy loam soil during rainy seasons of 1986 and 1987. The treatments were deep ploughing (30 cm), dry sowing (7 to 10 days before the onset of monsoon) wet sowing (after receipt of soaking rain) fertilizer application (20 N, 50 P_2O_5 kg/ha) and one supplemental irrigation at flowering. The dominant weed species were *Cyperus rotundus, Digitaria sanguinalis* and *Digera arvensis*.

The grass weed population was not influenced by different cultural practices. The sedge population was 40.7/m^2 in deep ploughing as against 193.3/m^2 under dry sowing. The broad leaf weed population was similar in deep ploughing and dry sowing but was less in wet sowing. The total weed population was significantly less in deep ploughing as compared to dry and wet sowing. The reduction in weed drymatter was significantly less by 90 per cent in deep ploughing as compared to dry sowing. Weed growth in pigeonpea was considerably reduced by deep ploughing.

EFFICACY OF HERBICIDES ALONE AND IN COMBINATION WITH MECHANICAL PRACTICES TO COTROL WEEDS IN PIGEONPEA *(Cajanus cajan* (L.) Millsp.*)*

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A field experiment was conducted during *Kharif*, 1988 to study the efficacy of some

pre-emergence herbicides alone and in combination with mechanical practices to control weeds in pigeonpea. The herbicides included were alachlor, metolachlor and fluchloralin each at 1 kg/ha and oxyfluorfen 0.15 kg/ha and pendimethalin (0.5 kg/ha). All these herbicides at 50 per cent level were combined with either by menual one hand weeding or intercultivation at 45 DAS, weeding twice and herbicides combined with one hand weeding treatments recorded significantly higher seed yield and stalk as compared to herbicides alone, herbicides combined with one intercultivation and two intercultivation treatments. Yield reduction of 75.9 per cent was noticed in unweeded control followed by two intercultivation (57.6%).

Weed free, two hand weedings and herbicides combined with one hand weeding treatmets recorded higher number of branches, greater amount of crop dry weight, leaf area, greater number of pods, pod weight and seed weight as compared to all other weed control treatments Highest net return was realised in weed free treatment (Rs. 5,248.50/ha) followed by two hand weedings (Rs. 4,851/ha), alachlor 0.5 kg/ha plus one hand weeding (Rs. 4,807/ha) and fluchloralin 0.5 kg/ha plus one hand weeding (Rs. 4,475/ha). Unweeded control recorded a net loss of Rs. 261.50/ha.

CONTRIBUTION OF WEED MANAGEMENT IN PIGEONPEA PRODUCTION

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Studies were made to evaluate components viz, fertilizer application, weed management and plant protection in line-sown crop, which then compared against absolute control, broadcast sown crop with no fertilizer, no weed mangement and no

plant protection measures during 1982-85. Results revealed that line-sown fertilized crop gave 24.5 per cent higher yield while line-sowing+weed management resulted in 17.4 pre cent more yield over control yield of 15.21 q/ha. Fertilizer application+weed control measures in line-sown crop increased the yield by 27.2 per cent. Similarly, plant protection and fertilizer+plant protectian resulted in 15.3 and 35.6 per cent increase in yield over control, But when only weed control+plant protection was adopted, the increase was 25.1 per cent. The effects of fertilizer application+weed control+plant protection accounted for ultimate increase of 42.3 per cent over control. The contribution of weed control+fertilizer application, plant protection and fertlizer+protection measures was worked out to be 10,8 and 7 percent, respectively in pigeanoea.

UTILIZATION OF NUTRIENT ELEMENTS BY SUMMER MUNGBEAN (*Vigna radiata* L. wilczek.) IN RELATION TO WEED MANAGEMENT

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Field studies carried out, during 1986 and 1987 indicated that under unweeded eonditions, summer mungbean could utilize only 55.6, 10.2 and 49.1 kg/ha of N, P and K, respectively, whereas weeds removed 79.1 kg N, 19.8 kg P and 79.1 kg of K from the field. Effective weed management through fluchloralin 0.75 kg/ha ppi resulted in an uptake of 111.4 kg N, 22.7 kg P and 97.5 kg/ha K by the crop and allowed only 3.1 kg N, 0.7 kg P and 4.1 kg K to be depleted by weeds. Pendimethalin 0.75 kg/ha pre and two hand weedings (3 and 5 WAS) also proved equally effective in increasing uptake of nutrients by the crop. Cultural practice of closer-row-spacing (15 cm instead of 25 cm normal spacing) could not check the nuerients deplition by weeds. The studies emphasised importance of effective weed management in summer mungbean.

STUDY ON THE EFFECT OF ISOPROTURON ON PEA AND ASSOCIATED WEEDS

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Isoproturon applications both as pre and post emergence at 0.75, 1,0 and 1.25 kg/ha and pendimethalin 1.0 kg/ha pre were tested for weed control efficiency in pea var. Arkel during 1986 87 and 1987-88. Major weeds in the experimental field were *Chenopodium album*, *Fumaria parviflora*, *Melilotus alba M. indica*, *Vicia sativa*, *Anagallis arvensis* and *Phalaris minor*. Density and dry weight of weeds reduced significantly due to isoproturon, irrespective of rates and time of applications. Isoproturon post at all the rates was comparatively more effective than pre-em application in reducing the weed density and dry matter production. Uncontrolled weeds 55 caused per cent reduction in grain yield. Highest grain yield was recorded under weed free treatment followed by pendimethalin 1.0 kg/ha and isoproturon 1.0 kg/ha post.

NUTRIENTS REMOVAL BY WEEDS AND FIELD PEA AS INFLUENCED BY IRRIGATION, PHOSPHORUS AND WEED MANAGEMENT LEVELS

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Field experiments were carried out during winter, 1986-87 and 1987-88 to study the effect of different irrigation, phosphorus and weed control levels on the nutrient

uptake by weeds and field pea. The content of N and Pin weeds were not significantly altered by irrigation and phosphorus levels. However, the dry matter production by weeds increased significantly with irrigation and phosphate application. The total uptake of N and P by weeds was also reduced more by hand weeding than pendimethalin over weedy check. Similarly the N and P content in grain and straw of the crop did not differ significantly by irrigations but the increase in phosphorus dose increased the uptake of N and P content in seed as well as straw.

EVALUATION OF HERBICIDES FOR WEED CONTROL IN PEA

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Field experiments were conducted to measure the effects of five herbicides viz., alachlor, pendimethalin, fluchloralin, metribuzin and oxyfluorfen on pea (*Pisum sativum* L.) applied at different rates and were compared with weed free and weedy check during winter, 1987-88 and 1988-89. Application of pendimethalin 1.0-1.5 kg/ha, alachlor 1.5, fluchloralin 1.0 and metribuzin 0.15 kg/ha effectively minimised the density and dry weight of major weeds (*Chenopodium album* L,*Anagallis arvensis* L,*Lathyrus aphaca* L. and *Melilotus alba* Desr.) and resulted in significant increase in yield and yield attributes over weedy control. Oxyfluorfen applied at 0.10-0.15 kg/ha also controlled the weeds effectively but had an adverse effect on crop growth and consequently on seed yield. Except pendimethalin, lower rates of all the herbicides failed to provide desirable weed control.

CHEMICAL CONTROL OF WEEDS IN PEAS

(Pisum satium L.*)*

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The experiment was conducted to test the relative efficiency of various herbicides in pea crop var. GC-141. The treatments comprised of fluchloralin (0.5 & 1.0 kg/ha) ppi, methabenzthiazuron (1.0 & 1.5 kg/ha), oxadiazon (0.5 & 0.75 kg/ha), metribuzin (0.5 & 0. 75 kg/ha), oxyfluorfen (0.1 & 0 2 kg/ha), pendimethalin (0.5 & 1.0 kg/ha), all as pre-emergence and bentazon (0.5 & 1.0 kg/ha) post, and were compared with weed free and unweeded controls. The results indicated that all the herbicidal treatments significantly reduced the weed density and dry weight and increased the pod yield as compared to unweeded control. Among the herbicidal treatments, maximum pod yield was obtained from pendimethalin 1.0 kg/ha pre and was followed closely by oxadiazon 0.5 kg and methabenzthiazuron 1.0 kg/ha.

EFFECT OF ISOPROTURON AND LENTAGRAN ON GRAM AND ASSOCIATED WEEDS

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Isoproturon 0.75, 1.00 and 1.25 kg/ha pre and post-emergence, pendimethalin 1.00 kg/ha pre during 1986-87 and 1987-88 and lentagran 0.45, 0.90 and 1.35 kg/ha post

during 1987–88 were evaluated for weed control efficacy in gram var. Pant G-114. Pre dominant weed species were *Chenopodium album, Fumaria parviflora, Melilotus indica, M. alba, Vicia sativa. Anagallis arvensis* and *Phalaris minor*. Isoproturon, irrespective of rate and time of application, pendimethalin and lentagran caused significant reduction in the density and dry weight of weeds. Post-emergence application of isoproturon proved more effective than pre-emergence. Uncontrolled weeds caused 62 per cent reduction in grain yield. Though, significantly highest yield was obtained under weed-free treatment, however, pre and post-emergence application of isoproturon 1.25 kg/ha, pendimethalin 1.0 kg/ha pre and lentagran 0.90 and 1.35 kg/ha post produced grain yield at par with weed free treatment.

DETERMINATION OF ECONOMICAL METHOD OF WEED CONTROI IN CHICKPEA (*Cicer arietinum)*

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Field experiment to determine the economical method of weed control in chickpea was carried out during *Rabi*, 1987-88 with three seed rates and four weed management practices. Results showed that the combination of 75 kg seed ha^{-1} and HW 25 and 45 DAS gave the highest net income of Rs. 8260.73 ha^{-1} while 100 kg seed ha^{-1} coupled with HW 25 and 45 DAS recorded the net income of Rs. 6946.85 ha^{-1}

EFFECTS OF NITROGEN, INOCULATION AND HERBICIDE ON CHICKPEA *(Cicer arietinum* L.)

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Field experiment carried out during *Rabi*, 1988-89 to assess the effects of nitrogen (20 kg N/ha) , seed inoculation with *Rhizobium* culture and various weed management practices revealed that the grain yield increased significantly from 11.7 q/ha in control plot to 15.2 q/ha in nitrogen treated (uninoculated plot. Inoculation alone gave an yield of 13,9 q/ha and was at par with 20 kg N/ha. Inoculation + 20 kg N/ha recorded the highest yield of 16.5 q/ha which significantly out yielded inoculation alone. However, 20 kg N/ha and 20 kg N/ha + inoculation did not differ significantly.

Among the weed control methods unweeded control had the lowest seed yield (9. 5 q/ha) while the yield increased significantly under handweeding and herbicide applications. The herbicides viz. fluchloralin 1.0 kg, thiobencarb 1.5 k , pendimethalin 1.0 kg and alachlor 1.0 kg/ha all applied as preemergence, gave gram yield in the order of 15.1, 14.9, 15.2 and 14.9 q/ha, respectively. The handweeded plot recorded 16.4 q/ha being highest and was at par with all the herbicides tried. The interaction between inoculation, fertility levels and weed management systems was not significant.

WEED CONTROL AS A FACTOR FOR AUGPMENT GRAMING PRODUCTION

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Field experiment to assess the different production inputs in gram were carried out

during 1981 to 1983. The production factors consisted of fertilizer applications, irrigation weed control methods, plant protection measures conventional method (absolute control).

Weed control and fertilizer management practices contributed 16.20 and 22.70 percent towards potential yield, respectively. While the relative contribution of plant protection and irrigation in gram production was in the order of 11.90 and 8.40 percent, respectively. Adoption of full package of practices increased the gram yield by 33.90 percent over farmer's practice.

EFFECT OF ISOPROTURON ON LENTIL AND ASSOCIATED WEEDS

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Relative efficacy of pre and post-emergence application of isoproturon 0.75, 1.0 and 1.25 kg/ha and pendimethalin 1.0 kg/ha pre were evaluated for weed control in lentil var Pant L-406 during *Rabi* 1986-87. The dominant weed species in the experimental field were *Chenopoium album, Fumaria parviflora, Melilous alba, M. indica, Vicia sajiva, Anagallis arvensis* and *Phalaris minor*. Isoproturon post at all the rates was found superior to that of pre-emergence. Weed density and dry matter of weeds reduced significantly due to application of isoproturon and pendimethalin. Uncontrolled weeds reduced grain yield of lentil by 50 per cent. Pendimethalin 1.0 kg/ha pre and isoproturon 1.25 kg/ha post produced grain yield at par with weed free.

HERBICIDAL SELECTIVITY FOR TOLERANCE OF FABABEAN (*Vicia faba*) AND SUSCEPTIBILITY TO WEEDS

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Seventeen herbicides viz, oxadiazon, isoproturon, pendimethalin, metoxuron, methabenzthiazuron, metolachor each at 1.0 kg/ha, terbutryn 0.8 kg/ha, oxyfluorfen 0.2 kg/ha, butachlor 2.0 kg/ha and thiobencarb 2.0 kg/ha all as pre emergence, fluchloralin 1 kg/ha ppi, isoproturon 1.0 kg/ha, haloxyfop-methyl 0.25 kg/ha, fluzifopbutyl 0.25 kg/ha, flouroxypyr 0.25, fluroxypyr+2,4-D, fluroxypyr+MCPA and 2,4-D+flucloralin as post-emergence treatments were tested.

The bioefficacy of herbicides revealed that oxadazon, terbutryn, isoproturon, oxyfluorfen, methaben-thiazuron, metoxuron and pendimethalin were effec ive in controling the annual weeds viz, *Phalaris minor, Chenopodium album, Trifolium flagiferum, Cichorium intybus, Rumex dentatus, Spergula arvensis, Melilotus* spp., *Medicago denticulata* and *Anagallis arvensis*. Isoproturon did not control *Anagallis arvensis*. Fluroxypyr alone and along with 2,4-D or MCPA effectively controlled dicot weeds only. *Cyperus rotundus, Cynodon dactylon* and *Paspalum distichum* were not controlled by any of the herbicide except fluazifop-butyl and haloxyfop-methyl which controlled all the grassy weeds.

Post-emergence application of isoproturon, fluhloralin+2,4-D and fluroxypyr+ MCPA were phytotoxic to fababean. Fluroxypyr reduced the growth. Other herbicides were tolerant to this crop. The highest yield was obtained under oxyfluorfen (1964 kg), oxadiazon (908 kg), terbutryn (882 kg), methabenzthiazuron (713 kg), metoxuron (693 kg) and isoproturon (549 kg). All these treatments were better and economic than hand weeding (491 kg) and control (185 kg). The yield had negative correlation with population of *Phalaris minor, Medicago denticulata, Cichorium intybus* and *Trifolium fiagiferum*. However, the total weed population had non-signficant negative correlation. Crop plant population and crop biomass had positive correlation with yield.

WEED CONTROL IN COMMERCIAL CROPS

EFFECT OR HERBICIDE COMBINATIONS ON THE CONTROL OF WEEDS IN PLANTED CANE

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KARNAL-132 001

A Field experiment was conducted to find out the effect of herbicide combinations on weed control in sugarcane, during 1988-89. Eleven treatments consisted of alachlor and atrazine each at 2.0 kg/ha, metribuzin 1.0 kg/ha and their combinations with 50 percent of above rates applied at 3 WAP, alachlor, atrazine and metribuzin at above rates applied as pre-emergance followed by one hand hoeing at 6 WAP, weedy and weedfree.

Cyperus rotundus.*Trianthema portulacastrum* and *D.aegyptium* were the dominating weed species. Atrazine 2.0 kg/ha or metribuzin 1.0kg/ha or atrazic 1.0kg/ha + metribuzin 0.5kg/ha applied 3 WAP provided significantly less dry weight of total weeds as compared to alachlor 2.0 kg/ha and the weedy check. Atrazine or metribuzin provided excellent control of *T. portulacastrum* but alachor did not control this weed. Application of herbicides alone or tank mixed except alachlor increased the cane yield significantly. The potential cane yield was reduced by 26.5 percent due to crop weed competition. Cane height and CCS percent were not affected significantly.

PERFORMANCE OF EXISTING HERBICIDES AND MULCHING IN SUGARCANE

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An Experiment was conducted during 1988-89 with treatments of white polyethylene mulch upto 30 DAP followed by one hand hoeing 60 DAP, atrazine 2.0 kg/ha pre, metribuzin 1.0 kg/ha 3 WAP, 2, 4-D 1.0 kg/ha each at 30 and 60 DAP, a weedy and weedfree check.

Crop had predominance of *Cyperus rotundus, Trianthema portulacastrum* and *Dactyloctenium aegyptium* Atrazine 2.0 kg/ha or metribuzin 1.0 kg/ha 3 WAP controlled *T. portulacastrum* and *D. aegypticum* very effectively and resulted statistically at par cane yield with weed free. Potential cane yield in the weedy plots was reduced by 38.4 per cent.

EFFECT OF METRIBUZIN ON GROWTH AND YIELD OF SUGARCANE AND ASSOCIATED WEEDS

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Metribuzin 0.5, 1.0, 1.5 and 2.0 kg/ha applied at preemergence, three and six weeks after planting along with atrazine 2.0 kg/ha as pre-emergence was compared with hand hoeing at 30 days interval till 120 days after planting and weedy and weed free 'check' during 1986-88.

Metribuzin 1.0 and 1.5 kg/ha as pre and 3 WAP controlled all the weeds except *Convolvulus arvensis* and *Cynodon dactylon* and produced maximum cane yield (91 to 94 t/ha). Cane yield was reduced by 42% in weedy plots due to heavy weed-crop competition. Quality of juice was not influenced significantly by any of the treatments. Metribuzin 2.0 kg/ha three weeks or six weeks after planting revealed high degree of toxicity but the plants recouped later.

EFFECT OF DIFFERENT WEED MANAGEMENT PRACTICES IN SPRING PLANTED SUGARCANE

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LUCKNOW-226 002

A field experiment was conducted during 1985-86 and 1986-87 to evaluate the most feasible and economic weed management practice for spring sown sugarcane. The treatments consisted of differeint herbicidal and cultural practices. The experin ental field was badly infested with *Cyperus rotundus* and grasses with broad leaved weeds. The result indicated that minimum dry matter of weeds (7.9 q/ha) was observed in manual hoeing with spade and maximum (34.1 q/ha) in weedy 'check'. All weed management practices were significantly better than weedy 'check'. From yield point of view 2,4-D 2.0 kg pre-emergence followed by paraquat 2.0 kg/ha 10 WAS, interculture with tractor drawn cultivator and interculture with 3 tyned bullock drawn cultivator proved better and were in the same group of manual hoeing with spade which, however, gave the maximum yield.

EFFICIENCY OF DIFFERENT METHODS OF APPLICATION OF HERBICIDES IN COTTON

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A field experiment was conducted during winter 1987 to assess the efficiency

of methods of application of herbicides for cotton raised in ridges and furrow.s Four pre-emergence herbicides viz; fluchloralin 1.0 kg, pendimethalin 1.0 kg, butachlor 1.25 kg and diuron 0.4 kg/ha and five methods of application viz; spraying with knap-sack sprayer, power sprayer, sand mixing and broadcasting, alongwith irrigation water and controlled droplet application using ULV sprayer were compared with hand weeding twice at 15 and 30 DAS and unweeded control.

The results revealed that pendimethalin 1.0 kg/ha through CDA recorded the lowest weed DMP and was comparable with hand weeded plot. The interaction between method of application and herbicide was also significant. Application of diuron through CDA method, irrigation water and sand mixing proved less effective on weed control efficiency. Kapas yield showed equal performance with all herbicides used. Between different methods of application kapas yield was higher with hand operated spray and was comparable with all other methods except sand mixing and broadcasting.

BIOEFFICACY OF PRE AND POST-EMERGENCE HERBICIDES FOR CONTROLLING WEEDS IN AMERICAN COTTON

(Gossypium hirsutum)

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Field experiments were conducted during *Kharif*, 1988 and 1989 in order to find out selective herbicides for American cotton. Pre-emergence application of pendimethalin 0.75 kg, alachlor 2.5 kg, ethalfluralin 1.0 and 1.2 kg/ha, pendimethalin+diuron (0.56+0.8

kg/ha) and alachlor + diuron (1.2 and 0.8 kg/ha) were at par and produced significantly more seed cotton yield than two hand hoeings during 1988 and unweeded control, during 1989. During first year, diuron 1.2 kg and racer 1.5 and 2.0 l/ha (commercial product) showed toxicity to crop because of rain immission after sowing.

In post-emergence application layby application (after first irrigation) of pendimethalin 0.75 kg, diuron 1.2 kg, alachlor 2.5 kg and pendimethalin + diuron 0.37 and 0.6 kg/ha gave significantly superior weed control and seed cotton yield as compared to unweeded control.

STUDIES ON CROP WEED COMPETITION IN RELATION TO NUTRIENT UPTAKE IN COTTON

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Field experiment was conducted during 1988 with cotton var. MCU-5. The treatments constituted weed infested condition upto 15, 35 and 55 days and upto harvest and weed free condition upto 15,35 and 55days and upto harvest and compared with farmers practice of two manual weedings on 15 and 35 DAS. The highest weed number and dry matter was registered in weed infested plots upto 35 DAS while the weed number and dry matter was the lowest in weed free condition upto 25 DAS, followed by weed free condition upto 15 days, indicating the critical period of weed competition as 35 days. The nutrient uptake by weeds and cotton crop revealed that the nutrients uptake of N. by crop

drastically reduced from 87.4 to 19.7 per cent as the weeds persisted for more periods which consequently reduced the yields. The nutrient uptake was on the increasing side when weed free situations existed. The available nutrient in the post-harvest soil samples did not differ much indicating that the nutrient status of the soil was not much reduced though the percentage share between crop and weeds varied widely.

NITROGEN USE ECONOMY THROUGH INTEGRATED WEED MANAGEMENT IN RAINFED COTTON

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Field studies were conducted during *Kharif* 1988 to explore the possibility of saving of nitrogen through weed management in rainfed cotton (H. 4). Three weed control and four nitrogen treatments were tried. The weeds associated with the crop were *Digera arvensis , Acalypha indica, Corchorus acutangulus, Merremia emarginata, Allotropsis cimicina, Cynodon dactylon* and *Cyperus rotundus*. Fluchloralin 0. 90 kg/ha with hand weeding and hoeing at seven weeks after sowing gave significantly higher yields over unweeded control. Similarly application of nitrogen 40, 60 and 80 kg/ha were at par and proved superior to no-nitrogen. Interaction showed that fluchloralin with hand weeding and hoeing in the absence of nitrogen gave about three times more seed-cotton yield over unweeded control with 80 kg N /ha.

SEED COTTON YIELD AND NUTRIENT UPTAKE BETWEEN COTTON AND WEEDS

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A Field experiment was conducted during *Kharif* 1979-80 to compare the nutrients uptake by cotton and weeds. Mechanical weeding by implement did not give a perfect weed control. Diuron 0.75 kg/ha pre + post emergence gave the highest yield of seed cotton (763.1 kg/ha) and highest uptake of NPK by cotton crop (33.86 :22.40 : 24.20 kg). The yield under weedy check was the lowest (149 7 kg/ha) and NPK uptake by crop was also lowest (23.41 : 5.68 : 10 90 kg/ha). The NPK uptake by weeds was more under weedy check (45.31 : 15.63 : 22.62 kg/ha) while under diuron pre + post was the lowest (7 06 : 2.41 : 4.94 kg/ha).

PERFORMANCE OF HERBICIDES WITH AND WITHOUT HOEING IN CONTROLLING WEEDS IN JUTE

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In field experiment conducted in jute (*Corchorus olitorius* L.) the highest weed control efficiency (WCE) was found in treatment with two hand weeding treatments (86%).

The treatment of fluazifop-butyl 0.188 kg/ha post (21 DAS), fluchloralin 1.0 kg/ha ppi (2 DBS) and pendimethalin 0.75 kg/ha ppi, (2 DBS) all followed by two hoeings (25 and 35 DAS) gave 56.7%, 49% and 37% weed control efficiency, respectively. The plots treated with fluchloralin 1.0 kg/ha ppi followed by two hoeings gave high fibre yield of 39.47 and 35.23q/ha in 1986and1987. respectively The plots treated with pendimethalin 0 75 kg/ha ppi followed by hoeings gave 33.86 q/ha and 36.95 q/ha of fibre while fluazifop-butyl post 0.188 kg/ha followed by hoeings gave 33 87 q/ha, 34.05 q/ha of fibre in 1986 and 1987, respectively Among herbicides, fluchloralin followed by pendimethalin (as ppi) and fluazifop-butyl were promising, giving comparable yield with the conventional methed in one of two years of studies. Fibre yield of jute was reduced to the tune of 19.68 q/ha and 12.27 q/ha due to weed competition in unweeded check.

WEED MANAGEMENT STUDIES IN BHALIA *(Moghania macrophylla)* NURSERY

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A field experiment was conducted during 1985 and 1986 to evaluate the efficacy of some herbicides and hand weeding for weed control in *Moghania macrophylla* (willd.) O. Ktze. (*bhalia*) nursery. Grassy weeds constituted 90% of the total weed population. The weed competition study revealed that weed free condition through weeding at 21 days increased dry matter accumulation of *bhalia* seedlings by 66.94 and 69.25 per cent at 80 and 100 DAS (days after sowing), respectively in 1985 and 94.48 per cent at 80 DAS in 1986, over unweeded control. Hand weeding twice (35 and 60 DAS) and pendimethalin 1.5 kg/ha, oxadiazon 0.5 kg/ha were superior to other herbicides and reduced the weeds significantly over unweeded check, consequently healthy seedlings were produced.

WEED CONTROL IN INTERCROPPING AND CROPPING SYSTEM

EFFECT OF PLANT POPULATION AND WEED MANAGEMENT PRACTICES ON WEED GROWTH IN RAINFED GROUNDNUT+PIGEONPEA INTERCROPPING SYSTEM

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Field experiments were conducted during *Kharif* 1987 and 1988 on sandy loam soils of medium fertility to study the different weed control practices for groundnut+ pigeonpea intercropping system. The treatments comprised of four levels of plant population of pigeonpea (100%, 75%, 50% and 25% of sole optimum) and four levels of weed management (control, handweeding at 25 and 40 DAS, fluchloralin 1 kg/ha and pendimethalin 1 kg/ha). Recommended population of 3.33 lakh/ha was maintained in groundnut.

Weed density and weed dry matter was not influenced by different plant population of pigeonpea during both the years. Application of pendimethalin and fluchloralin recorded lowest weed density and weed dry matter as compared to hand-weeding. During 1987 weeds were minimum in handweeding, whereas fluchloralin and pendimethaln recorded lower weed density during 1988 at harvest of groundnut and pigeonpea. Weed dry matter was lower with hand weeding during 1987 and with fluchloralin and pendimethalin at all stages of sampling in 1988. There was no significant difference in weed growth between fluchloralin and pendtmethalin.

INFLUENCE OF WEED MANAGEMENT PRACTICES ON YIELD COMPONENTS IN RAINFED GROUNDNUT+PIGEONPEA INTERCROPPING SYSTEM

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Field experiments were conducted during *Kharif* 1987 and 1988 on sandy loam soils to know the effect of weed management practices on yield and yield components in groundnut+pigeonpea intercropping system. Handweeding 25 and 40 days after sowing, fluchloralin and pendimethalin both at 1 kg/ha ppi were compared with unweeded control.

The number of total pods, filled pods per plant, 100 pod weight and pod yield were higher in handweeding. This was on par with fluchloralin during both the years.

The yield components of pigeonpea (pods per plant and 1000-seed weight) and seed yield were highest with hand weeding during both the years of experimentation. There was no significant difference between fluchloralin and pendimethalin hence, both will work for intercropping system of groundnut+pigeonpea.

INTEGRATED WEED MANAGEMENT STUDIES IN GROUNDNUT PIGEONPEA INTERCROPPING

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In an experiment conducted on a sandy loam soil, for two years during *Kharif*, 1987 and 1988, groundnut (K_3) was intercropped with pigeonpea (ICPL-6) in 5 : 1 planting pattern. The effect of pre-emergence application of herbicides viz, Oxyfluorfen

0.25kg/ha Pendimethalin 1.5 kg/ha metolachlor 1.5 kg/ha fluchloralin 1.5 kg/ha, alachlor1·5 kg/ha and oxadiazon 1·0 kg/ha was compared with hand weeding twice. All the herbicide treated plots were followed by one hand weeding at 40 DAS. The results indicated that the pre-emergence application of metolachlor 1.5 kg/ha + HW or fluchloralin 1.5 kg/ha + HW was helpful in reducing the weed competition, increasing the yields of both the component crops and increasing the net monetary returns for the farmers.

HERBICIDAL CONTROL OF WINTER WEEDS IN AUTUMN CANE INDIAN MUSTARD INTERCROPPING SYSTEM

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Field studies carried out at the Regional Research station Kheri, during 1986-87 and 1987-88 to find out the effective weed control for autumn planted sugarcane intercropped with Indian mustard. Study revealed that isoproturon 0.75 kg and 1.0 kg/ha post was quite effective against winter annual broadleaf weeds and *Phalaria minor*. It was also selective to the sugarcane + Indian mustard intercropping system. This treatment gave 65.11 to 90.63 % and 44.82 to 45.28 % increase in yield of sugarcane and intercrop Indian mustard (raya) , respectively Isoproturon as pre emergance was comparatively less selective to intercrop of Indian mustard than post emergence treatment. fluazifop-butyl 0.25 kg/ha post was toxic to the sugarcane and failed to control broadleaf weeds. Pendimethalin 0.75 kg/ha pre was slightiy phytotoxic to the intercrop but gave excellent control of *P. minor*.

CHEMICAL WEED CONTROL IN SOYBEAN+MAIZE MIXTURE IN GUINEA SAVANA IN NIGERIA

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Field experiments were conducted during 1986 and 1987 at Yandev Experimental Station located in Southern Guinea Savana in Nigeria in order to study the efficiency of various herbicide mixtures and combination with cultural methods to control weeds in soybean+maize mixture. The weed control treatments included mixture of herbicides like metolachlor+metabromuron, metolachlor+terbutryn, metolachlor+prometryne, pendimethalin+chloramben either applied alone or followed by one shallow hoeing at three weeks after sowing.

The results showed that *Digitaria ciliaris* (48%) and *Commelina benghalensis* (32%) constituted about 80% of the total weed flora based on weed dry matter accumulation in weedy plots. The competition with weeds during entire crop season resulted in soybean yield reduction to the extent of 74 per cent. When soybean was kept free from weeds for first 60 days after sowing, the yield of soybean was almost similar to that of complete weed-free treatment.

Pre emergence application of pendimethalin + chloramben constantly controlled the weeds effectively and produced highest yield of 844 kg/ha soybean and 2852 kg/ha maize whereas unweeded control yielded only 208 kg/ha soybean and 1287 kg/ha maize.

EFFECT OF PHOSPHATE LEVELS AND PLANTING GEOMETRY NI SORGHUM-LEGUME INTERCROPPING

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The forage sorghum P-288 (*Sorghum sudanensis*) was grown at 25, 50 and 75 cm row spacing as sole crop and as an intercrop with cowpea (*Vigna ungiculata*), soybean (*Glycine max*) and ricebean (*Phseolus calcaratus*) at row distances of 50 and 75 cm and sole legumes at 25 cm row spacings and at 0, 30 and 60 kg P2 O5/ha in a split plot design. The crops were harvested component wise (66 DAS) for forage. The dry forage of each component crop, combined yield (CY), weed count and weed dry matter (DM) were recorded and nitrogen, phosphorus and potassium uptake by weeds was estimated in *Kharif*, 1983 and 1984. The soil of experimental site was sandy clay to clay.

Intercrops (during both the years) and sole legumes during, 83 and in pooled reduced the weed DM accumlation as compared to sole sorghums. The sorghums at 25 cm, accumulated maximum (5.96 q/ha) and soybean as intercrop with sorghum planted at 50 cm apart rows had least (2.17 q/ha) weed DM. At harvest less weeds were noted in intercrops as compared to sole crops while sole legumes and sorghums were at par. Sole sorghum at 25 cm had maximum of 311 2 and cowpea as an inter crop with sorghum at 75 cm apart rows had least (167.9/0.5 m^{-2}) weeds. The uptake of NPK was more by the weeds in sole crops in contrast to weeds of intercrops. The weeds of sole legumes took more N and P (in 84) and less K (in 83) as compared to weeds of sole sorghums. Weeds in association with ricebeen took more N and P as compared to cowpea. Weeds of soybean intercropped with sorghum at 75 cm rows took more P in comparision to 50 cm rows, in 1984. Weed DM accumulation, N and K uptake by weeds was not influenced by P application. The uptake of P by weeds was more under untreated plots than the plots treated with 30 and 60 kg $P_2 O^5$ /ha.

LOSSES CAUSED BY WEEDS IN COTTON BASED INTERCROPPING

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Field experiments were conducted during the *Kharif*, 1986 and 1987. The results showed that the uptake of nitrogen and phosphorus by weeds was significantly reduced due to intercropping. All the weed control measures significantly reduced the uptake of nitrogen and phosphorus by weeds over unweeded 'check' and loss of nutrients through weeds was maximum in unweeded check due to maxtmum weed dry weight. Uptake of nitrogen and phosphorus by weeds was low under weed-free condition, but weed-free treatment was equal to fluchloralin 1.5 kg/ha-+one weeding and fluchloralin 2.0 kg/ha-+ one weeding treatment.

The yield of seed cotton due to unchecked weeds was reduced by about 72.42 and 80.60 per cent in the first and second season, respectively over weed-free treatment. Unweeded control reduced yield of cotton stalks to the extent of 60 to 69 per cent over weed free treatment. Lack of weed control in cotton besed intercropping resulted in more than 73 per cent on an average reduction in seed cotton equivalent yield. Weed-free environment enhanced the yield of seed cotton. In case of intercrops, unchecked weeds reduced the grain yield by about 61 to 72 per cent in greengram, 64 to 68 per cent in blackgram, 74 to 81 per cent in soybean and dry pod yield by about 35 to 55 per cent in groundnut as compared to weed-free treatment. The corresponding decrease in fodder yield was about 68 to 69 per-cent in greengram, 49 to 82 per cent in blackgram, 67 to 79 per cent in soybean and 57 per cent in groundnut, respe ctively.

EFFECT OF CHEMICAL AND CULTURAL METHODS OF WEED CONTROL ON WEEDS AND SEED COTTON EQUIVALENT YIELD IN COTTON BASED INTERCROPPING UNDER DRY LAND CONDITION

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Fleld experiments were conducted during *Kharif*, 1986-87 and 1987-88 with five main plot treatments and eight sub-plot treatments. The proportion of narrow-leaf weeds was numerically more than that of broad-leaf weeds. Perennial weeds like *Cyperus rotundus* and *Cynodon dactylon* were dominant. Blackgram and greengram were the most compitable intercrops in cotton for suppressing the weeds at most of the stages, thereby reducing the dry matter production of weeds. Soybean and groundnut as interecrops in cotton also substantially reduced the dry matter of weeds. The weed index was the highest in cotton sole and was decreased due to intercropping under weedy condition. Soybean or groundnut as an intercrop depressed the yield of seed cotton, but significantly enhanced the seed cotton equivalent yield over other treatments and thus had a compensatory effect.

Weed-free condition achieved through repeated weedings and hoeings provided an excellent control of broad-leaf weeds as well as narrow-leaf weeds during both the seasons thus, reducing total weed population as well as dry matter of weeds but in turn increased the seed cotton equivalent yield. Pre-plant soil incorporation of fluchloralin 0.675 kg/ha or 0.900kg/ha in combination with one weeding at 35days after sowing was next to weed-free treatment in reducting the weed flora, dry matter of weeds as well as seed cotton equivalent yield. Weed-free or fluchloralin + one weeding was better in reducing weed index. On the contrary, weed control efficiency was highest in weed-free followed by fluchloralin 0.675 kg/ha + one weeding and fluchloralin 0.900 kg/ha + one weeding. Fluchloralin 0.675 kg/ha and 0.900 kg/ha were at par but both the levels reduced the dry matter of weeds significantly over unweeeded check.

WEED MANAGEMENT IN MAIZE + BLACKGRAM INTERCROPPING SYSTEMS IN MID-HILLS SUB-HUMID ZONE OF HIMACHAL PRADESH

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Field studies on herbicidal weed control in maize+blackgram intercropping system were conducted during *Kharif*, 1986-88. The pre emergence herbicidal treatments comprised of metolachlor, pendimethalin and benthiocarb each at 0.5, 1.0, 1.5 and 2 kg/ha, oxadiazon at 0.25, 0.5, 0.75, 1.0 and 1.25 kg/ha. These treatments were compared with handweeding, hoeing at 20 days after sowing, hand weeding, hoeing 30 days after sowing, complete weed free and weedy check.

The major weed flora included mainly grassy weeds-*Dactyloctenium aegyptium* (L.) P. Beauv, *Digitaria sanguinalis* (L.) Scop. *Eleusine indica* (L.) Gaertn, and *Cynodon dactylon* (L) Pers. *Cyperus rotundus* L. and *Commelina benghalensis* L. were also present.

Application of herbicides reduced weed dry matter significantly as compared to weedy check. Amongst various herbicides, application of metolachlor and pendimethalin each at 1.0, 1.5 and 2 kg/ha, benthiocarb at 1.5 and 2.0 kg/ha and oxadiazon gave excellent control of weeds. However, oxadiazon at higher rates proved phytotoxic to both maize and blackgram.

Maize equivalent yield based on three years data revealed that application of metolachlor 1 kg/ha, pendimethalin 1 kg/ha, benthiocarb 1.5 kg/ha and oxadiazon 0.5 kg/ha were best alternatives to most commonly used method of handweeding and hoeing in maize+blackgram intercropping stystem.

TIME AND DURATION OF WEED INFESTATION RELATION TO WEED-CROP COMPETITION IN MAIZE + BLACKGRAM AND MAIZE + HORSEGRAM INTERCROPPING SYSTEM

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Two parallel field experiments were conducted to study the weed-cropcompetition in maize+blackgram and maize + horsegram intercropping system during *Kharif* 1986 and 1987 under mid-hills sub-humid conditions of Himachal Pradesh. In two sets of treatments (i) weeds were allowed to grow for different periods after sowing and (ii) the crop was handweeded at different times and then no further weeding was done. These treatments were compared with weedy check.

Uninterrupted weed growth throughout the crop growth period reduced maize equivalent yield by 58.6 and 50.3 per cent in maize + blackgram and maize + horsegram intercropping systems, respectively as compared to complete weed free check. Further it was noted that in maize + blackgram intercropping, hand weeding done at 6 weeks after sowing recorded 27.2 per cent reduction in yield as compared to hand weeding done at 5 weeks after sowing, whereas in maize + horsegram intercropping it was 15.5 per cent.

Horsegram proved more effective in smothering the weeds than blackgram. However, maize yield was comparatively lower in maize + horsegram intercropping as compared to maize+blackgram intercropping system. Thus, in both the systems weeding should be done latest by 5 weeks after sowing.

COMPARATIVE EFFICACY OF SOME WEED CONTROL METHODS IN SORGHUM+PIGEONPEA INTERCROPPING

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An experiment on sorghum + pigeonpea intercropping was conducted during *Kharif*, 1987 and 1988. The experiment involved three conventional methods of weed control and two herbicides (fluchloralin and metolachlor) separately each at two levels with and without in ercultivation operations. The highest grain and straw yield and sorghum equivalent ratio was obtained with preemergence application of metolachlor 1.5 kg / ha followed by one intercultivation at 35 DAS as compared to other treatments. The yield achieved in sorghum+pigeonpea intercropping using metolachlor 1.5 kg / ha pre+one inter cultivation to kill weeds, was comparable with the conventional methods. The net profit was noted in the order of Rs. 7777 to 5809 in metolachlor treatment as compared to weedy check in respective years

SOIL MOISTURE AND HERBICIDE INTERACTION STUDIES FOR WEED CONTROL IN RAINFED SORGHUM INTERCROPPED WITH COWPEA

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Field experiments were conducted during monsoon 1987 and 1988 under rainfed condition to study the soil moisture and herbicide interaction in relation to weed control in sorghum + cowpea intercropping system with 2 : 1 ratio. The treatments included

three applications of herbicides (pre sowing application during 1st spell and second spell of rainfall), two herbicides namely isoproturon 0.50 kg/ha and pendimethalin 1.0 kg/ha and two methods of application viz; spraying and sand mied broadcasting.

The results showed that as pre sowing application, isoproturon 0.50 kg/ha gave good control of weeds with higher selectivity to both the crops, while pendimethalin 1.0 kg/ha adversely affected the germination of sorghum. Pendimethalin 1.0 kg/ha applied after 1st spell of rainfall gave good crop selectivity than isoproturon, which affected the germination and establishment of cowpea. With the herbicide application during second spell of rainfall, isoproturon 0.50 kg/ha caused severe injury to cowpea. There was no significant difference in weed control efficiency between methods of sowing and two herbicides. Among the treatments studied preemergence application of pendimethalin 1.0 kg/ha as spray recorded higher yield and net profit. The residue study showed rapid degradation of isoproturon than pendimethalin. At harvest the soil contained no residues of isoproturon and 0.03 ppm of pendimethalin residues was far below the permissible limit.

INTEGRATED WEED MANAGEMENT FOR RICE-RICE-GREEN GRAM CROPPING SEQUENCE OF WET LAND

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Field experiment was conducted during 1988-89 to study the integrated weed management system in wetland cropping system involving Rice-Rice-Greengram. For both the rice crops thiobencarb 1.25 kg/ha and anilophos 0.4kg/ha pre followed by one hand weeding and thiobencarb 2.0 kg/ha and anilophos 0.6 kg/ha pre followed by 2,4-D N salt 1.0 kg/ha post were tried with hand weeding twice as check. For summer pulse crop fluchloralin 1.0 kg/ha pre and hand weeded check were compared.

The results showed that for both the rice crop anilophos 0.4 kg/ha pre followed by one hand weeding gave higher weed control efficiency and higher grain yield. This was comparable with thiobencarb 1.25 kg/ha + HW, thiobencarb 2.0 kg pre+2,4-D 1.0 kg/ha post and anilophos 0.6 kg/ha pre, 2,4-D 1.0 kg/ha post. However, anil p .os 0 6 kg/ha showed early set back to the seedling establishment. For pulse crop hand weeding twice gave higher pulse grain yield than fluchloralin 1.0 kg/ha. The economics of weed control methods for rice showed higher benefit cost ratio with integrated methods of weed control than pure chemical method of weed control.

STUDIES ON INTEGRATED WEED MANAGEMENT IN TRANSPLANTED RICE FALLOW COTTON

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A field experiment was conducted during March to October, 1987. Eleveu treatments comprising of an unweeded control, twice hand weeding, pre-plant herbicides diuron, fluchloralin and oxadiazon applied alone and in combination with hand weeding or paraquat directed spray on 40 DAT were compared. Diuron + hand weeding gave the highest weed control index (93.56%), weed control efficiency (94%), seed cotton yield (15.11 q/ha) and net return per rupee invested (Rs. 2.72) Handweeding alone, proved inferior to pre-plant herbicide+handweeding but was superior to pre-plant herbicide + paraquat post emergence.

WEED MANAGEMENT IN RICE BASED CROPPING SEQUENCE

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A Field experiment was conducted during the *Kharif* and *Rabi* seasons of 1988 and 1989 to study the effect of weed control methods on rice and rice based cropping sequence (wheat, gram and mustard). Pre-emergence application of thiobencarb 1.5 kg/ha produced maximum rice grain yield, which was closely followed by combined application of thiobencarb 1.0 kg/ha + 2,4-D 0.5 kg/ha. Wheat followed after rice, application of 2.4-D post was most effective in minimising weed growth and increased the grain yield of wheat as compared to other treatments. In gram, application of pendimethalin 1.0 kg/ha pre was most eff ctive in reducing the weed population and dry weight which in turn increased the grain yield. In mustard, mechanical weeding at 20 and 40 days after sowing showed maximum effectivity in reducing the weed growth and the resulting grain yield was very high. However, none of the weed control methods was as effective as weed free treatment which registered maximum grain yield in all the crops besides wheat, where 2,4-D 1.0 kg/ha was on par with weed free treatment.

In residual studies, application of thiobencarb 1.5 kg/ha and 2,4-D 1.0 kg/ha in rice had significantly higher grain yield of gram over unweeded control, while no such effect was observed in wheat and mustard.

Grain yield of wheat, gram and mustard were also influenced by cumulative effects of weed control methods. The maximum cumulative effects were observed in mechanical treatment in wheat and mustard and 2,4-D pendimethalin in gram. The minimum cumulative effect was observed in weedy check. However, none of the treatments had as much as high cumulative effect as weed free treatment, which had maximum grain yield in all the three crops followed after rice.

RESIDUAL AND DIRECT EFFECTS OF HERBICIDES ON EMERGENCE AND SURVIVAL OF WHEAT SEEDLINGS UNDER RICE--WHEAT CROPPING SYSTEM

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The residual effects of herbicides viz., thiobencarb 3.0 kg/ha, butachlor 2.5 kg/ha and oxadiazon 1.0 kg/ha pre and all superimposed by 2,4-D at 20 DAS in rice crop and direct effect of isoproturon 1.0 kg pre and oxadiazon 1.0 kg pre applied to wheat under rice-wheat cropping system, were studied on germination of wheat seed (Var. WH-147).

The residual effect of herbicides applied to rice was not found on wheat germination and seedling emergence. The direct effect of herbicides applied to wheat revealed that oxadiazon 1.0 kg/ha had reduced the seedling emergency by 10 to 13 per cent as compared to untreated and isoproturon treated plots The initial vigour of the seedlings was also poor under oxadiazon treated plots. Later on, the growth and tillering was more with dark green leaves under oxadiazon treated plots.

HERBICIDE ROTATION IN RICE-WHEAT CROPPING SYSTEM WEED CONTROL IN WHEAT

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Influence of continuous application of herbicides in rice – wheat cropping system was studied on sandy-clay soils of rice-wheat zone of Madhya Pradesh. Six weed control treatments viz,. Oxadiazon 1.0 kg/ha pre, thiobencarb 3.0 kg/ha pre

Butachlor 2.0 kg/ha pre, hoeing once, all superimposed with 2,4-D 1.0 kg/ha post 20 days after sowing, HW twice and weedy cheeck as main plot treatments for rice and four sub-plot treatments viz.,isoproturon 1.0 kg/ha pre, oxadiazon 1.0kg/ha pre, HW once and a weedy check to wheat were tested for three years on the same land.

The effects on wheat revealed that the main treatments i. e. the herbicide applied to rice had no residual effeot on weed control. in wheat except oxadiazon which reduced the total weed population significantly as compared to other treatments. All the herbicidal treated and hand weeded plots during *Kharif* had significantly lower weed population in *Rabi* as compared to control plots during *Kharif*

The direct effect of herbicides was significant and both the herbicides reduced the weed population as compared to control *Cyperus rotundus*, *Paspalum distichum* and *Cynodon dactylon* were not controlled by both the herbicides. Amongst annuals, *Anagallis arvensis* was not controlled by isoproturon 1.0 kg/ha pre and *Medicago denticulata* was comparatively less controlled than oxadiazon. The significantly lower weed biomass was noted under all the treatments as compared to control. Significantly lower weed biomass was noted under hand weeding (200 kg/ha), followed by isoproturon 1.0 kg pre (474.8 kg/ha) and oxadiazon (593 kg/ha), control plots had the maximum (2080 kg/ha). The main treatments did not cause significant effect on weed biomass reduction. The biomass contribution was mainly due to *Cynodon dactylon* and *Paspalum distichum* under isoproturon and oxadiazon while due to *P. minor* under weedy check.

The effects of various treatments on crop growth and yield parameters were favourable. The total crop biomass seedyield significantly increased due to direct herbiciadl,hand weeding treatments as compared to weedy check. The indirect residual effect was not significant on growth as well as seed yield. The significantly higher yield was noted under isoproturon 1.0kg/ha pre (4558kg/ha) at par to hand weeding (4471kg/ha and superior to oxadiazon (4094 kg/ha) Significantly the lowest yield was noted under weedy check (3101) kg/ha.

HERBICIDE ROTATION IN SOYBEAN-WHEAT CROPPING SYSTEM EFFECT ON WHEAT

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Effects of continuous use of herbicides viz, oxadiazon 1.0 kg/ha. oxyfluorfen 0.2 kg/ha, butachlor 2.5 kg/ha as pre-emergence, fluchloralin 1.0 kg/ha ppi, HW 1 and control as main treatments in soybean and sub-plot treatments viz, isoproturon 1.0 kg/ha and oxadiazon 1.0 kg/ha pre, HW 1 and control to wheat were evaluated on heavy clay soils under soybean-wheat cropping systems for three years. The experimental field was infested with *Anagallis arvensis*, *Melilotus alba*, *Trifolium flagiferum*, *Indigofera* spp., *Chenopodium album*, *Cichorium intybus* and *Cyperus rotundus*. The population of *phalaris minor* was meagre. The herbicides applied to soybean did not show any residual effects on weeds in wheat where as the direct effect of herbicides applied to wheat was significant on weed control. Oxadiazon was most effective for reducing the weeds and was significantly better than isoproturon. The weed shoot biomass was also significantly lower under oxadiazon (108 kg) than isoproturon (174 kg). However, both of these herbicides were at par to HW (126 kg/ha). Lower efficacy of isoproturon was due to its ineffectiveness on *Anagllis arvensis*.

Effect on crop revealed no residual effects of herbicides on wheat crop as the crop growth and yield did not vary due to indirect effects or direct effects of herbicides or HW. It was owing to less weed competition efficiency with wheat crop.

NUTRIENT UPTAKE BY WEEDS AND WHEAT UNDER RICE-WHEAT CROPPING SYSTEM

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The residual effects of herbicides viz; oxadiazon 1.0 kg/ha, thiobencarb 3.0 kg/ha, butachlor 2.5 kg/ha all as preemergence, hoeing 1 all superimposed with 2,4-D 1.0 kg/ha post (20 DAS), HW and control applied to rice and direct effects of isoproturon 1.0 kg/ha, oxadiazon 1.0 kg/ha both as pre emergence and control were studied for wheat as sub-plot treatments. The herbicidal and other treatments applied for rice did not reveal residual effects on subsequent wheat crop for NPK uptake by weeds except the greater NPK uptake by weeds under weedy check of rice due to increased weed population in wheat.

The NPK uptake varied greatly due to direct effect of herbicides applied to wheat. The highest NPK uptake by weed was 48.8, 3.8, 34.9 kg/ha under weedy check. Both herbicides viz; isoproturon 1.0 kg/ha and oxadiazon 1.0 kg/ha were at par to HW with regard to NPK uptake by weeds and all these had significantly lower uptake than the weedy check. The NPK uptake in wheat grains did not vary due to residual effects of herbicides or weedy check. The direct effects were significant and the lowest NPK uptake was under weedy check (78.1 : 6.4 : 11.3 kg/ ha) as compared to other treatments. Under manual weeding it was 112.7 : 9.2 : 16.3 kg/ha and at par to herbicides.

EFFECT OF WEED MANAGEMENT PRACTICES ADOPTED FOR SORGHUM ON SUCCEEDING CROP OF CHICKPEA

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PARBHANI-431 403

Field studies were conducted during 1982-83 to study the residual effect of

different weed control methods applied to *Kharif* sorghum on succeeding chickpea. Herbicides viz; atrazine 0 25 and 0.50 kg/ha pre, sionazine 0.25 kg/ha pre, Fluchloralin 0.50 kg/ha ppi and 2,4–D 2 kg/ha post were applied to *Kharif* sorghum and recommended cultural practices were adopated. Weedy and weed free check were also kept for comparision. The results indicated that, there was no differences in grain yields of chickpea due to different weed management practices adopated in *Kharif* sorghum. It was therefore concluded that the applied herbicide to sorghum had no residual effect on succeeding crop of the chickpea.

INTEGRATED WEED AND NUTRIENT MANAGEMENT ON WEED DYNAMICS IN RICE BASED CROPPING SYSTEM

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Field experiments were conducted during 1987-89 to study the influence of integrated weed management on weed dynamics in rice based crop sequence. The components included weed con rol methods, azolla, N levels and neemcake.

Preemergence application of anilofos (0,30 kg/ha) + 2,4-D EE (0 5 kg/ha) and thiobencarb (1.00 kg/ha) + 2,4–D EE (0.51 kg /ha) were effetive against annual *Echinochlo spp*. Perennials viz, *Paspalum distichum* and *Marsilea minuta* were best controlled by hand weeding twice. Continuous use of herbicides resulted in weed shift from annuals to perennials. Hand weeding twice favoured the growth of *Manochorla vaginalis Eclipta prostrata* and *Ammania baccifera*. Dual culture of azolla effectively suppressed *M. minuta* Response of weeds to N levels was indirect. Better canopy development at higher N level suppressed *M. minuta* and *Cyperus difformis*, Response to neem cake was

not well pronounced. Better control of weeds in rice reduced weed infestation in greengram. Azolla inoculation to rice promoted the incidence of *Echinochloa* in greengram. Growth characters, yield attributes and yield were improved by better control of weeds. Weed control combined with higher N application was advantageous. However, under unweeded check higher N level depressed the rice yield. Preemergence application of anilofos + 2,4-D EE to rice enhanced grain yield of greengram, besides leaving no residue in soil after application for three seasons.

STUDIES ON CROP WEED ASSOCIATION UNDER DIFFERENT CROP ROTATIONS

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Studies on crop-weed association under different crop rotations were conducted for two years from *Rabi*, 1986 to study the weed spectrum and its density under different crop rotations. The experiment was laid out with three crops in *Kharif* i. e. maize, castor, cowpea, and three crops in *Rabi* i. e. Wheat, Chickpea and safflower. These were raised using different rotations. All the rotations had hand weeding and no weeding treatments. The results indicated that *Trichodesma indicum*, *Digera arvensis*, *Cyperus rotundus* and *Euphobia hirta* were the common weeds seen irrespective of the season. Further, the yield reduction due to weeds was lowest in cowpea among the different crops studied. The crop rotations like chickpea /maize/wheat/cowpea/chickpea/cowpea/chickpea cowpea& chickpea/cowpea/safflower/castor which gave higher percent decrease in yield due to weeds could by grown as rotational crops. It was found beneficial to grow smothering crops, like cowpea in rotation to reduce losses due to weeds and to get maximum yield of crops. The losses could be reduced to the extent of 25-30 per cent.

INTEGRATED WEED MANAGEMENT IN SORGHUM-SAFFLOWER CROPPING SEQUENCE

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Field studies conducted during the year 1987-88 on integrated weed management in sorghum-safflower cropping sequence indicated that atrazine 0.75 kg/ha pendimethalin 0.50 kg/ha and butachlor 0.50 kg/ha supplemented with hand weeding and hoeing at six weeks after sowing to *Kharif* sorghum did not differ significantly to two hand weedings and hoeings at three and six weeks after sowing in influencing the grain yield of *Kharif* sorghum and seed yield of succeeding safflower crop. However, atrazine 1 kg/ha pre proved harmful to *Kharif* sorghum and even succeeding safflower crop during *Rabi*. These studies revealed that atrazine 0.75 kg/ha pre or pendimethalin or butachlor 0.50 kg/ha pre supplemented with handweeding and hoeing at six weeks after sowing proved safe and effective in controlling weeds in *Kharif* sosghum and succeeding safflower crop.

INTEGRATED WEED MANAGEMENT FOR RAGI+SUNFLOWER-COTTON+ONION--SORGHUM+COWPEA CROPPING SEQUENCE OF GARDEN LAND

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Field experiments were conducted during 1987--88 and 1988-89 to study the

Integrated weed managment system in irrigated high intensity (sequential and intercropping) cropping-system finger millet+sunflower-cotton+onion-sorghum+cowpea and the nature of weed problem for the whole cropping system. Ragi crop with different weed control treatments viz; butachlor 0.75 kg/ha, fluchloralin 0.9 kg/ha, isoproturon 0.75 kg/ha pre emergence, 2,4-D Na salt 1.0 kg/ha post and hand weeding twice formed the main plot, weed control treatments for cotton+onion following the finger millet formed the subplot with pre em. fluchloralin 0.9, pendimethalin 0.9, oxyfluorfen 0.125, butachlor 1.25 kg/ha and hand weeded twice. This subplot was converted into subplot by raising, sorghum+cowpea and imposing isoproturon 0.5 kg/ha and hand weeding.

In *ragi* crop, dicot weeds (*Trianthema portulacastrum*) was the dominant weed while in cotton and sorghum dominance of sedges (*Cyperus rotundus*) and dicots was recorded. At the end of the two years trial, definite shift in the weed community from annual broadleaved weeds to perennial grasses and sedges was observed. For the entire cropping sequence application of fluchloralin 0.9 kg or butachlor 0.75 kg/ha followed by one hand weeding (for finger-millet border cropped with sunflower), pendimethalin 0.9 kg/ha followed by one earthing (for cotton intercropped with onion) and hand weeding twice (for sorghum intercropped with cowpea) was the most effective and economical weed management system, without any phytotoxic residual effect on any of the crops, while isoproturon 0.75 kg/ha for fingermillet and 0.5 kg/ha for cowpea intercropped in sorghum was phytotoxic.

EFFECT OF WEED MANAGEMENT PRACTICES ON YIELD OF LOW LAND TRANSPLANTED RICE AND SUCCEDING CROPS OF WHEAT, LENTIL AND LINSEED

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Field experiment was carried out during 1984 to 1987 to study the effect of weed

management practices on low land transplanted rice and the succeeding crops of wheat, lentil and linseed. All weed management practices were significantly superior to weedy check in case of rice. In succeeding lentil and linseed, significantly lower weed dry matter was recorded with maunual weeding than the herbicides treated plots and the weedy check. In rice, post planting application of butachlor or thiobencarb 1.5 kg/ha was most effective in controlling both narrow and broadleaf weeds and gave comparable grain yield to hand weeded plots in all the three years. However, butachlor or thiobencarb gave higher net returns and benefit cost ratio than manual weeding. In case of *Rabi* crops, isoproturon 1.0 kg/ha post or pendimethalin 1.0 kg/ha pre for wheat, oxadiazon 0.75 kg/ha pre for linseed and bifenox or fluchloralin 1.0 kg/ha pre for lentil were much effective in controlling the weeds. which gave almost equal seed yield to that under manual weeding. Higher weed control efficiency was recorded with hand weeding which was followed by isoproturon, oxadiazon and bifenox in wheat, linseed and lentil in respective years.

DIRECT AND RESIDUAL EFFECT OF VARYING LEVELS OF HERBICIDES FOR CONTROLLING THE WEEDS IN POTATO-BLACKGRAM CROP SEQUENCE

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Field experiments were conducted during 1981-82 and 1982-83 to standardise the doses of promising herbicides for controlling the weeds in potato (*Solanum tuberosum* (L.) and to test residual effect on succeeding blsckgram (*Vigna mungo* (L,) Hepper) . The major weeds in experimental plots were *Chenopodium album*, *Cyperus rotundus*, *Trianthema monogyna*, *Spergula arvensis*, *Anagallis*, *Pos* spp. and *Oxalis* spp. Three herbicides viz, oxyfluorfen 0.10, 0.15, and 0.20 kg/ha, metribuzin 0.50, 0.75 and 1.00 kg/ha and

methabenzthiazuron 1.00, 1.25, and 1.50 kg/ha were evaluated along with normal practice of weed control (weeding + earthing) and weedy check. All the herbicides at varying levels significantly reduced the weed growth during both the years and increased the tuber yield as compared with control. The lowest levels of different herbicides tested were sufficient for weed control. However, the maximum weed control efficiency in potato and the residual effect of different herbicides for weed control on succeeding blackgram were in favour of higher levels of herbicides. Metribuzin was the most effective herbicide for controlling the weeds through direct as well as residual effect followed by methabenzthiazuron in potato-blackgram crop sequence.

STUDIES ON CHEMICAL V/S MANUAL METHODS OF WEED MANAGEMENT IN SOYBEAN-WHEAT CROPPING SYSTEM

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Application of fluchloralin 1 kg/ha pre plant incorporation to soybean crop and 2, 4-D Na salt 1 kg / ha post to wheat or two hand weedings to soybean and application of 2, 4-D Na salt 1 kg/ha post to wheat crop were quite promising and produced about 40 per cent higher seed yield in soybean and 20 per cent higher yield in wheat than no weeding.

WEED MANAGEMENT STUDIES IN RICE-WINTER MAIZE CROPPING SYSTEMS

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Field investigations were carried out during *Kharif* and *Rabi* 1984-85 to 1986-87. The study aimed to evolve appropriate chemical weed management practices in rice-winter maize cropping sequence. Treatments under study were butachlor 1.5 kg/ha oxadiazon 0.75 kg/ha and thiobencarb 1.5 kg/ha pre in rice and atrazine 1 5 kg/ha, simiazine 0.75 kg/ha and atrazine 1.5 kg/ha as pre emergence+2,4-D 0.8 kg/ha as post-emergence in case of winter maize along with one hand weeding and a weedy 'cneck' in both the cases. In rice, unweeded control recorded maximum weed dry matter (248 to 356 kg/ha). Weed dry matter was significantly lower where weeds were controlled either manually (43 to 89 kg/ha) or with herbicides (32 to 89 kg/ha) in different years. WCE for weed control treatments varied from 75 to 87 per cent in different years. In case of winter maize, hand weeded plots recorded the lowest weed dry matter yield and gave the highest weed control efficiency in three years. Pre-emergence application of simazine or atrazine and post-emergence application of 2, 4-D were at par in weed dry matter yields. The unweeded control recorded significantly higher weed dry matter of 1260, 1185 and 1358 kg/ha in the three, respective years. In rice, although the highest grain yields in respective years were recorded in hand weeded treatment, all the herbicides yielded at par with it and all these were significantly superior to weedy 'check'. Thiobencarb gave the highest additional net return. The net return under herbicides were almost comparable to hand weeding. However, higher benefit cost-ratio in case of herbicides proved superiority over hand weeding. In case of succeding winter maize, the highest net returns due to herbicides were obtained with atrazine (pre)+2,4-D (post). However, the net return in maize were slightly lower than one weeding but the benefit-cost ratio was higher with the herbicides.

EFFECTS OF WEED MANAGEMENT PRACTICES FOR SORGHUM ON SUCCEEDING CROP OF CHICKPEA

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Field studies were conducted during 1982 to 1983 to study the residual effect of different weed control methods applied to *Kharif* sorghum on succeeding chickpea crop. Herbicides viz, atrazine 0.25 & 0.50 kg/ha pre, simazine 0.25 kg/ha pre, fluchloralin 0.50 kg ppi and 2, 4-D 2.00 kg/ha post were applied to *Kharif* sorghum and recommended cultural practices were adopted. Weedy and weed free check were also kept for comparison. The data indicated that, there was no difference in grain yields of chickpea due to different weed management practices adopted in *Kharif* sorghum. It was therefore, concluded that the applied herbicide to sorghum had no residual effect on succeeding crop of chickpea.

WEED MANAGEMENT IN VEGETABLES, SPICES AND PLANTATION CROPS

EFFECT OF HERBICIDES ON OKRA *(Abelmoschus esculentus* L.*)* AND ASSOCIATED WEEDS

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Effects of butachlor, thiobencarb, pendimethalin and alachlor at different rates of application alongwith weed-free and weedy treatments were tested on weeds and green

fruit yield of okra. *Cyperus rotundus, Cynodon dactylon, Amaranthus viridis, Ageratum conyzoides Solanum nigrum* and *Echinocloa colonum* were the dominant weeds.Density as well as dry matter produced by weeds were significantly reduced in herbicide treated plots. Pre-emergence application of thiobencarb 1.5 and 2.0 kg/ha, alachlor 2.5 kg/ha and butachlor 2.0 kg/ha proved more effective in controlling weeds than other treatments. More than 70 per cent reduction in yield of green fruits of *okra* was recorded due to uncontrolled weeds. Thiobencarb 1.5 and 2.0 kg/ha yielded at par with weed-free plot.

CHEMICAL CONTROL OF WEEDS IN OKRA (*Abelmoschus esculentus* (L.) Monch.) FOR SEED

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Efficacy of fluchloralin 0.75 and 1.5 kg/ha ppi, pendimethalin 0.75 and 1.5 kg/ha pre and fluazifop-butyl 0.25 and 0.50 kg/ha post for weed control in *Okra* for seed was studied during *Kharif*, 1984 and 1985. The results revealed that herbicides significantly reduced the dry weight of weeds as compared to unweeded control. Fluchloralin 0.75 kg/ha, pendimethalin o ·75 kg/ha, and fluazifop butyl 0.25 and 0.50 kg/ha supplemented with one hand weeding (6WAS) resulted in complete control of weeds. All the herbicides at the doses tested were safe to crop. Pendimethalin and fluchloralin treatments yielded at par with two hand weeding. Fluazifop butyl alone did not control broadleaf weeds and yielded at par with unweeded control. Herbicide treatments supplemented with one hand weeding yielded higher than herbicide alone treatments but the differences were non-significant.

EFFECT OF PENDIMETHALIN AND ISOPROTURON ON POTATO

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Pendimethalin and isoproturon each at 0.5,1.0 and 1.5kg/ha alongwith linuron 1.0kg/ha, paragua 0.5kg/ha weed-free and weedy treatments were evaluated for weed control in potato. *Chenopodium album, Cyperus rotundus, Fumaria parviflora* and *Vicia sativa* were the major weeds constituting more than 69 % of the total weed population. Pre-emergence application of pendimethalin and isproturon as well as post-emergence application of isoproturon, irrespective of application rates, caused significant reduction in the total weed density and weed dry matter production. The weed control efficacy of both the herbicides increased with increasing rates. The weed control efficiency of pendimethalin and isoproturon 1.0 and 1.5 kg/ha was at par and much higher than 0.5 kg/ha. There was not much variation in the weed control efficacy of isoproturon due to application time.

Uncontrolled weeds in weedy plots caused more than 40% reduction in potato tuber yield and all the treatments were significantly higher. Pendimethalin and isoproturon each at 1.0 and 1.5 kg/ha being at par with weed-free, produced significantly more yields than at 0.5 kg/ha. Linuron and paraquat were also comparable with isoproturon and pendimethalin at higher rates.

PERFORMANCE OF DIFFERENT HERBICIDES IN CONTROLLING WEEDS IN POTATO

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Studies were carried out during *Rabi* 1988 to find out the effect of different herbicides and their combinations on weed control in potato. Treatments comprised of

alachlor 1.5, 2.0 kg/ha, pendimethalin 1.0 and 1.25 kg/ha and oxadiazon 0.5 and 0.75 kg/ha each applied as pre-emergence alone and in combination with simazine 1.125 kg/ha. The highest dry matter of weeds (82.5 g m2) was accumulated in weedy treatment which was significantly higher than other treatments. Weed free treatment recorded maximum tuber yield (337.4 q/ha) which was at par with other treatments, however, presence of weeds throughout the growing season reduced the yield by 45%. Among herbicides, alachlor+simazine (1.25+0.125 kg/ha) gave maximum bulb yield (336.1 q/ha).

COMPARATIVE EFFICACY OF PROMISING HERBICIDES IN POTATO

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Field experiments were conducted from 1971 to 1988 to evaluate sixteen herbicides to control weeds in potato crop. All the herbicides gave more tuber yield than control. The average increase was of the order of 2.8 to 31.4% with different herbicides. Oxyfluorfen 0.09–0.141 kg/ha, metribuzin 0.36 kg/ha pre were most effective and increased the tuber yield over control by 31.4 and 25.3%, respectively. The inerease in tuber yield by paraquat 1.2 kg/ha as early post emergence (5–10% emergence ot potato) was 17.4%.

STUDIES ON THE EFFICACY OF DIFFERENT WEEDICIDES IN CONTROLLING WEED FLORA IN POTATO

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The experiment was conducted with weedicides and interculture operations during *Rabi*, 1986-87. The results revealed that one hand weeding+one earthing up recorded

the highest yield of 260.59 q/ha followed by fluchloralin 1.0 kg/ha pre-emergence which gave 260.25 q/ha tubers. Post emergence application to weeds, propanil 0.74 kg/ha produced 257.61 q/ha and paraquat 1.2 kg/ha gave 248.52 kg/ha tubers which were significantly superior to weedy check (no weeding and no second earthing)but these were at par with each other.

In case of weed population lowest weeds of 10.25 were recorded in one hand weeding+one earthing up and highest weeds of 33.25 were in weedy check (0.25 m^2 quadrat). Fluchloralin gave highest net return of Rs. 25655/- and the lowest of Rs. 20013/- was obtained in weedy check.

STUDIES ON WEED CONTROL IN TOMATO

(Lycopersicon esculentum **Mill.***)*

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NEW DELHI-110012

A series of trials were laid out to identify the most suitable herbicides for the control of weeds in tomato at Hissar. Ludhiana and Durgapura, during 1985-86 to 1988-89. Eleven treatments with four herbicides viz. Pendimethalin, fluchloralin alachlor and oxyfluorfen were included. Pendimethalin pre emergence followed by one hand weeding 45 days after transplanting was the most effective in controlling the weeds in tomato and increasing the yield of marketable fruits at Hissar and Durgapura. A net income of Rs. 8,960 with a cost benefit ratio 1 : 1.63 was obtained at Hissar in pendimethalin 1.0 kg/ha followed by one hand weeding (45 DAT) . Fluchloralin 1.87 kg/ha ppi followed by one hoeing (45 DAT) was the most suitable for controlling weeds under Ludhiana conditions.

EFFECT OF HERBICIDES ON NUTRIENT UPTAKE BY WEEDS IN BRINJAL *(Solanum melongena* L.)

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Efficacy of three herbicides viz, fluchloralin (0.75, 1.0 and 1.25 kg/ha), oxadiazon (0.75, 1.00 and 1.25 kg/ha), pendimethalin (1.00, 2.00 and 3.00 kg/ha) was compared with one and two hand weeding, weed free and control in brinjal (CV. BR-112). All the weed control treatments reduced the weed dry matter and this increased the fruit yield over weedy check. Fluchloralin and oxadiazon each at 1.25 kg/ha and pendimethalin 3.00 kg/ha yielded higher than hand weedings and were at par with the weed free treatment. Nitrogen uptake by weeds was lower in all the weed control treatments as compared with the weedy check. Also the nitrogen uptake by weeds reduced with the increase in dose of herbicides. In case of P & K uptake, it was recorded maximum in hand weeding at 70 days during both the years but K uptake in the second year (1984) followed the trend of N in 1983.

EFFECT OF HERBICIDES ON NUTRIENTS REMOVAL BY WEEDS IN BRINJAL (*Solanum melongena* L.)

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The investigations on chemical weed control in brinjal were carried out during *Kharif*, 1983 and 1984. The experiment consisted of fluchloralin (0.75. 1.00 and 1.25 kg/ha) oxadiazon (0.75, 1.00 and 1.25 kg/ha), pendimethalin (1.00, 2.00 and 3.00 kg/ha) alongwith manual weeding treatments at 45, 70, 45 + 70 days, weed free and

weedy check All the weed control treatments reduced the weed dry matter and increased the fruit yield over weedy 'check'. However, fluchloralin and oxadiazon, each 1.25 kg/ha and pendimethalin 3.00 kg/ha yielded higher than hand weedings and were significantly at par with weed free treatment Nutrient uptake by weeds at harvest was directly proportional to the dry matter production at harvest. Maximum uptake of nutrients was in weedy check. However, the uptake of nutrients by the weeds reduced with the increase in the dose of herbicides.

INTEGRATED WEED MANAGEMENT IN CABBAGE

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A field experiment was conducted during *Rabi*, 1988-89 to find out integrated weed management in cabbage var. Golden acre. Pendimethalin 1.0 and 1.5 kg/ha, oxyfluorfen 0.2 and 0.3 kg/ha and fluchloralin 0.9 and 1.35 kg/ha,lower level of herbicides+ weeding at 40 DAT, weeding only at 20, 40 and 20+40 DAT along with weedfree and unweeded control were included in treatments. *Echinochloa colonum* (L.) Link. and *Melilotus* spp. were the dominant weeds. All the weed control treatments caused marked reduction in the density and dry weight of weeds and brought about significant improvement in mean head diameter.Trimmed head yield of cabbage was reduced by71.0per cent due to uncontrolled weeds. Weeding at 20+40 DAT and application of fluchloralin 0.9 kg/ha+ weeding at 40 DAT produced head yield at par with weedfree treatment.

CHEMICAL WEED CONTROL IN PEAS *(Pisum sativum L.)*

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Effect of alachlor 1.0 and 2.0 kg/ha pre, nitrofen 2 0 and 2.5 kg/ha pre, fluchloralin 1.0 kg/ha ppi alone and the lower rates with one hand weeding were compared with hand

weeding three and weedy check. The most predominant weed species were *Chenopodium album* L., *Daucus carrota* L., *Cyperus rotundus* L., *Portulaca oleracea* L. and *Convolvulus arvensis*.

The results revealed that the weed dry weight was the lowest under alachlor 2.0 kg/ha followed by alachlor 1.5 kg/ha. The highest green pod yield was obtained under nitrofen 2.0 kg/ha (64.86 q/ha) followed by alachlor 1.5 kg super-imposed with one HW at three weeks after sowing (63.70 q/ha). Net profit was more under alachlor 1.5 kg/ha (Rs. 7726.00) followed by nitrofen 2.0 kg/ha (Rs. 7708.00) while hand weeding gave the net income of Rs. 6689·50 per hectare.

CHEMICAL WEED CONTROL IN ONION

(Allium cepa L.)

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The weed control efficacy of alachlor 2.0 kg/ha pre, nitrofen 1.0 kg/ha pre, nitrofen 1.0 kg/ha pre, fluchloralin 1.0 kg/ha ppi, oxadiazon 1 0 kg/ha pre, alone and each superimposed with one HW at 45 days after transplanting was studied for four years. The most pre-dominant weed species were *Chenopodium album* L., *Daucus carrota* L., *Cyperus rotundus* L. and *Eragrostis diarrhena* (Sch.) Steud. Oxadiazon 1.0 kg/ha resulted in significantly higher yield (214.87 q/ha) followed by alachlor 2.0 kg/ha (187.96 qlha) and fluchloralin 1.0 kg/ha (176 77 q/ha). The bulb yields under control and hand weeding were 87.56 and 156.06 q/ha, respectively. The herbicidal treatments with hand weeding were not economical.

STUDY OF THE EFFICACY OF CERTAIN HERBICIDES IN ONION *(Allium cepa* L.)

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Effects of pendimethalin, isoproturon and oxadiazon, each at 0.5, 1.0 and 1.5 kg/ha and manual weeding (30, 60 and 90 day stage) on transplanted onion and associated weeds were evaluated. Weedy and weed-free treatments were also included for comparison. Weed flora consisted of *Chenopodium album, Fumaria parviflora, Medicago denticulata, Cyperus rotundus, Digitaria sanquinalis, Eleusine indica, Gnaphalium indicum, Sorghum halepense* and *Cynodon dactylon* as the major weeds.

All the treatments caused significant reduction in the density and dry weight of weeds and gave more bulb yield.Oxadiazon and isoproturon at 1.0 and 1.5 kg/ha resulted in complete control of *C. album* and *G. indicum* at all the stages. Pendimethalin 1.0 and 0.5 kg / ha was more effective against these weeds than 0.5 kg / ha In general, oxadiazon at all the rates was more effective in reducing weed density and dry weight. Weedy condition caused more than 80% reduction in onion bulb yield. Manual weeding produced more bulb yield than all the rates of pendimethalin, isoproturon and oxadiazon. Bulb yield increased with the increase in the rates of pendi methalin and oxadiazon. However, there was reduction in the bulb yields with increasing rates of isoproturon due to the phytotoxicity on onion.

EFFECT OF HERBICIDES ON WEEDS AND BULB YIELD OF ONION

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Field studies were conducted during 1987-88 and 1988-89 with sixteen weed

control treatments to evaluate their efficiency in controlling weeds and influence on the productivity and profitability in onion cultivation. Highest weed population (83 and 94m) and dry matter (185 and 205 g/m) were recorded under weedy check, whereas the values were lower under weed free check.

All the weed control treatments recorded higher bulb yield than weedy check. Weed free (HW-4) gave the maximum bulb yield and was significantly superior to weedy 'check',fluchloralin 1.0 kg/ha and pendimethalin 1.0 kg/ha. All other treatments were at par. Among herbicides, oxyfluorfen 0.25 kg/ha gave maximum bulb yield and highest weed control efficiency

HERBICIDAL WEED CONTROL IN ONION

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Efficiency of fluchloralin 1.0 kg/ha ppi, thiobencarb 2.0 kg/ha, butachlor 2 0 kg/ha, oxadiazon 1.0 kg/ha, methabenzthiazuron 1.0 kg/ha and isoproturon 1.0 kg/ha all as pre plant was studied to control weeds in onion. The dominant weed flora consisted of *Cynodon dactylon*, *Cyperus rotundus*, *Parthenium hysterophorus*, *Ageratum conyzoides*, *Euphorbia geniculata*, *Echinochloa crusgalli* and *Lagascea mollis* with IVI of 75.68, 53 3, 52.2, 30.36, 26.65, 24.63 and 19.09, respectively.

The perennial weeds viz; *Cynodon dactylon* and *Cyperus rotundus* were not controlled by any herbicide. The effective control of annual weeds and higher yields were noted under fluchloralin (112.31 q/ha), butachlor (112 q/ha) and Methabenzthiazuron (111.31 q/ha). All other herbicides gave the yield at par to hand weeding (105 q/ha) and significantly higher than control (59.06 q/ha). Correlation analysis revealed a significant negative association of weed dry weight with leaf length, number of leaves, bulb diameter, bulb weight and bulb yield. The weed population also had significant negative correlation with bulb diameter and yield.

HERBICIDAL CONTROL OF WEEDS IN KHARIF ONION (*Allium cepa* L.)

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Trifluralin 1.5 kg, butachlor 2.5 and 3.0 kg, fluchloralin 1.5 kg, ethalfluralin, (Sonalin) 1.5 kg and isoproturon 1.0, 1.5 kg/ha as pre planting were evaluated to control the weeds of onion during *Kharif*, 1988. The dominant weeds were identified as *Chloris barbata, Cynodon dactylon, Dactyloctentium, ezypiacum, Digitaria adscendens* and *Echinochloa crusgalli* amongst grasses and *Cyperus rotundus* among sedges. The broad leaf weeds were *Sida carpinifolia, Parthenium hysterophorus, Ageratum conyzoides, Melilotus* spp., *Amaranthus viridis, vicia sativa, Anagallis arvensis* and *Euphorbia geniculata*. None of the herbicides controlled the perennial weeds.

The greater reduction in weed population was noted under butachlor 3.0 kg/ha and it gave the highest bulb yield (432.5 q/ha) followed by hand weeding (428,57 q/ha). The bulb yield under control was 368.88 q/ha while other herbicidal treatments could not increase it significantly as compared with control.

COMPARATIVE STUDIES ON METHODS OF WEED CONTROL IN GARLIC (*Allium sativum* L.) Var. G-41

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An experiment was conducted during *Rabi* 1988–89 to study the methods of weed control in garlic by using fluchioralin and pendimethalin each at 1.0, 1.5 and 2.0 kg/ha at pre planting and hand weeding 2, 3 and 4 times as per treatment.

The most dominant weeds were *Cynodon dactylon*, *Lagascea mollis*, *Sonchus arvensis*, *Euphorbia* spp. *Cyperus rotundus*, *Digera alternifolia*, *Portulaca oleracea* *Phyllanthus medagascerensis* etc.Results revealed that the significant higher yield(75.56q/ha) was obtained when fluchloralin was applied at 1.5 kg/ha followed by pendimethalin 1.5 kg/ha (71.57 q/ha), hand weeding four 71.48 q/ha and hand weeding for 3 times (70.56 q/ha). Significantly lower yield(60.0q/ha) was recorded in unweeded check followed by fluchloralin 1.0kg/ha(63.33q/ha)and fluchloralin 2.0 kg/ha (63 52q/ha) Subsequently,lower weed biomass (20.98 q/ha) was recorded in hand weeding 4,fluchloralin 1.5kg/ha (27.60q/ha) and pendimethalin 1.5 kg/ha (28.64 q/ha). It was highest in weedy check (52.68 q/ha). In herbicidal treatments, weed control efficiency was maximum (47.60%) in fluchloralin 1.5 kg/ha followed by pendimethalin 1.5 kg/ha (45.63%), but it was maximum (60.17%) in 4 hand weeding. Fluchloralin 1.5 kg/ha gave the maximum net profit of Rs. 3.212.80/ha followed by pendimethalin 1.5 kg/ha which gave Rs. (2,018.15) over control. Hand weeding 2, 3 or 4 times resulted in a loss of Rs. 743.55, 150.00 and Rs. 222.25lha, respectively as compared to control.

EFFECT OF VARIOUS HERBICIDES ON CORIANDER AND ASSOCIATED WEEDS

Govindra Singh and S. S. Tripathi

Department of Agronomy

G. B. pant University of Agriculture & Technology

PANTNAGAR (NAINITAL) 263 145

Effects of isoproturon, pendimethalin and fluchloralin at different rates alongwith weed-free and weedy treatments were tested on coriander and weeds. The major weed species were *Chenopodium album*, *Fumaria parviflora* and *Cyperus rotundus*. Fluchloralin 1.0 and 1.5 kg/ha ppi, pre-emergence application of pendimethalin and isoproturon each

at 1.5 kg/ha proved more effective in controlling weeds than other herbicides. Weeds reduced coriander yield by 74.3 per cent. Pendimethalin 1.0 and 1.5 kg/ha pre and fluchloralin 1.0 and 1.5 kg/ha ppi produced coriander yields at par with weed-free treatment. Density as well as dry matter production of weeds were significantly reduced in herbicide treated plots.

CROP-WEED COMPETITION STUDIES IN CORIANDER

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Department of Agronomy

G. B Pant University of Agriculture & Technology

PANTNAGAR (NAINITAL) 263 145

Crop-weed competition studies in coriander were carried out to determine critical duration of weed control. Treatments consisted of weed competition during first 30, 60,90, 120, 150 days after sowing, till harvest and weed competition after first 30, 60, 90, 120, 150 days after sowing and no competition till harvest.

The major weed species were *Chenopodium album, Fumaria Parviflora* and *Cyperus rotundus* with total density of 698 weeds/m^2 and weed dry weight of 576 q/m^2 recorded at 150 days after sowing. Weed competition during entire crop season resulted in yield reduction of 48%. Weedy condition even during the first 30 days caused significant reduction in yield. Significant increase in yield was noted under initial weed-free condition upto 60 days and beyond. Weeds emerging after 30 days of sowing were high in density and competed with the crop. Increase in the duration of initial weed-free condition beyond 60 days of sowing had no additional effect on yield.

EFFECTS OF HERBICIDES UNDER DIFFERENT SOIL REGIMES ON WEED CONTROL, YIELD AND QUALITY OF CHILLIES (*Capsicum annum* L.)

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An experiment entitled effects of herbicides under different soil moisture regimes on Weed Control, yield and quality of chillies (*Capsicum annum* L.)" was conducted during *Rabi* 1983-84 and 1984-85. The experiment was laid out in split plot design with soil moisture regimes of 25,50 and75% DASM as main plot treatments,pre and post-planting applications of oxyfluorfen at 0 37 kg/ha and fluchloralin at 1.25 kg/ha, hand weeding and uuweeded control as sub-plots.

Monocot weeds such as *Cyperus rotundus*, *Digitaria sanguinalis* and *Eragrostis major* were siguaificantly suppressed at lower moisture regimes. Oxyfluorfin controlled major dicot weeds like *Trianthema Portulacastrum*, *Cleome gynandra*, *Amarauthus virids* etc., more effectively than fluchloralin. Dry matter production, yield and yield components of chilli crop were significantly improved by two hand weedings as well as by herbicide application.

Hand weeding twice recorded maximum green pod yield of 170.65 q/ha,, an increase of 81.45 per cent over unweeded control. Pre-planting application of oxyfluorfen at 0.37 kg/ha was found to record significantly higher yield (159.18 q/ha.) than fluchloralin at 1.25 kg/ha. which recorded green pod yield of 146.52 q/ha. Pre-planting application of oxyfluorfen also significantly increased ascorbic acid content of chillies (216.78 mg/100 g). Maximum capsaicin content of 0.31 per cent was obtained in hand weeding and pre-plantiug application of fluchloralin.

Yield and yield components were significantly influenced when the crop was irrigated at 50% DASM, thereby resulted in mean maximum green pod yield of 156.08 q/ha. Irrigation had little effect on capsaicin content in chillies, while ascorbic acid content was significantly influenced by higher moisture regimes. Maximum net profit of Rs 14, 536 per hectare (mean of two years) was obtained with hand weeding twice followed by pre-planting application of fluchloralin (Rs. 10, 024 per hectare) with cost benefit ratios of 3.04, 3.19 for hand weeding and 2.58, 2.78 for fluohloralin in the two years, respectively.

CONTROL OF WEEDS WITH HERBICIDES IN TURMERIC

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Field trial for the control of weeds in turmeric was conducted for two seasons, i. e. 87-88 and 88-89 at the Agril. Research Station. Kovvur, on clay loam soils with alachlor, butachlor, fluchloralin and atrazine in combination with inter-cultivation at 30 and 60 DAS and split application of herbicides applied at sowing and at 30 DAS. The results indicated that all the herbicide treatments reduced the weed density and dry weight of weeds as compared to unweeded control. The application of atrazine alone at 2.0 kg/ha or atrazine at 1.5 kg+alachlor at 1.5 kg in two split applications though reduced the weed density, dry weight of weeds, exhibited sublethal toxic effects on orop growth.

Mean maximum fresh rhizome yield of 568.7 q/ha was recorded with butachlor at 3 0 kg/ha (2.0 kg+1.0 kg) followed by fluchloralin 1.5 kg/ha (1.0+0.50 kg/ha),

(562.1 q/ha) and butachlor at 3.0 kg+IC. The lowest rhizome yield of 377.8 q/ha was recorded in unweeded control, while the herbicide atrazine at 2.0 kg/ha and atrazine+ alachlor combination was toxic to crop growth and resulted in reduced yields. From the results it was concluded that the application of butachlor at 3.0 kg or fluchloralin at 1.5 kg either as single dose or in two split applications combined with intercultivation was found to be as effective as that of intercultivation+hand weeding twice.

CHEMICAL WEED CONTROL IN POMOGRANATE, CUSTARD APPLE AND GUAJAVA

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The tolerance of seven herbicides viz., diuron, atrazine,alachlor, butachlor, metolachlor and metribuzin at 2. 0 and 3.0 kg/ha and oxyfluorfen 1 0 and 2.0 kg/ha and their weed control efficiency were studied in one month old nurseries of pomogranate,custard apple and guajava. Pomogranate was susceptible to metolachlor and metribuzin while custardapple was susceptible to atrazine at both the concentrations of herbicide used. Rest of the chemicals proved to be good and did not produce any toxic symptoms on plant parts. Guajava was found to tolerate all the herbicides though higher concentrations of atrazine alachlor, butachlor showed initial set back in the growth, later the seedlings recovered. Leaf chlorophyll assay of the seedlings supported the findings. Weed control was very effective in herbicides like diuron, atrazine and oxyfluorfen.

EFFECT OF DIURON, ATRAZINE AND DIFFERENT NPK DOSES ON BANANA

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A Field trial to compare the effect of herbicide and different NPK levels on growth and yield of banana cultivars Rasthali (Silk) (*Ayiranka rasthali*), Monthan (*Motta poovan*) and illakibale (*poovan*) was conducted under alfisoles condition. It was observed that diuron and atrazine 2.5 kg/ha may be sprayed first, after planting suckers. One spray of glyphasate 3.0 kg/ha after five months of diuron and atragine spray was sufficient to control weeds for an year. There was no significant difference in the plant height, stem girth, leaf number of diuron/atrazine + 100 percent NPK optimum dose with that of handweeded plots. Diuron/atrazine + 75 percent NPK treated plots indicated luxurient growth of the plant. Leaf chlorophyll assay also supported the findings. The bunches were robust with 10–12 hands varying from variety to variety. Howsoever, when the herbicide treated plots were given only 50 percent of NPK optima, indicated poor growth, delayed flowering and slender fingers in the hand.

RELATIVE EFFICIENCY OF HERBICIDES FOR WEED CONTROL IN TAPIOCA

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Field experiment was conducted during *Kharif*, 1988 to find out the effective herbicide and economical dose for weed control in tapioca,. The treatments comprised of

the pre emergence application of atrazine 0.5 kg, oxyfluorfen 0.125 kg. pendimethalin 1.0 kg, fluchloralin 1. 0 kg, oxadiazon 0.75 kg imazethapyr 0.1 kg and post emergence 2.4-D 1.0 kg and paraquat 1.0 kg, 2,4-D 1.0 kg/ha For all the alone treatments two hand weedings were given on 30 and 60 DAP. The same herbicides were tried at double the dose followed by on. hand weeding at 60 days after planting.

Among the herbicides tried, atrazine and imazethapyr at all doses showed phytotoxic effect to tapioca. Oxadiazon 0.75 kg/ha pre + two hand weeding on 30 and 60 DAP gave higher weed control efficiency and highest tuber yield. It was comparable with hand weding 4 times, oxyfluorfen 0.125 kg/ha, pendimethalin 1.0 kg + two hand weeding and oxadiazon 1.5 kg, oxyfluorfen 0.250 kg/ha + one hand weeding alone at 60 DAP. Economics of weed control methods showed highest benefit cost ratio of 3.2 from oxadiazon 1.5 kg/ha pre followed by one hand weeding of 60 DAP.

WEED MANAGEMENT IN COCONUT GARDEN

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Field experiments were conducted to evaluate the possibility of herbicidal control of weeds in underplanted coconut garden during 1986-1989. The treatments consisted of manual as well as chemical methods of weed control. The data on weed count and weed drymatter production for the three years showed that herbicides were more efficient in reducing weed population and weed dry matter production as compared to manual methods like digging or cutlassing. Among the herbicide treatments, paraquat 0.4 kg/ha sprayed thrice at monthly interval, glyphosate 0.8kg/ha or dalapon 3.0 kg/ha followed by paraquat 0.4 kg/ha two weeks after were effective treatments in reducing the weed population and weed drymatter production. Among the manual methods of weed control, digging was found to be better than sickle weeding.

Uncontrolled weed growth lead to a decline in the productivity of coconut palms, whereas regular weed control by chemical / mechanical methods resulted in increased productivity, The herbicide treatments did not show any adverse effects on the young coconut palms, under planted in between the older palms.

WEED MANAGEMENT IN COCONUT-BANANA INTERCROPPING SYSTEM

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Intercropping banana with coconut is a cropping system prevalent in Kerala. Inorder to find out a suitable method of weed control under such situation, an experiment was conducted during 1986-1989 in a young coconut garden. The treatment comprised of manual, cultural and chemical methods of weed control. All weed control treatments reduced the drymatter production of weeds, without any phytotoxic effects on coconut or banaua. Pre - emergence application of diuron 1.5 kg/ha, oxyfluorfen 0.2 kg/ha or raising cowpea as an intercrop could check the weed growth upto about two months. Subsequent weed growth could be effectively controlled by the application of paraquat 0.4 kg/ha or glyphosate 0.4 kg/ha. Digging twice (June-July & Sept-Oct)was better than sickle weeding twice (June-July & Sep-Oct.). Intercropping banana in coconut itself reduced the weed growth as compared to sole crop of coconut.

All weed control treatment favourably influenced the girth and number of fronds of coconut. The continuous weed competition in unweeded control plots resulted in the death of the young palms by 1989. Weed control had a positive influence on the growth, earliness in flowering and yteld of banana, both the plants and the ratoon crop,

EFFECT OF PREEMERGENT HERBICIDES ON YIELD AND QUALITY OF CHINA ASTER

(*Callistephus chinensis* (L.) Ness)

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Pre emergence herbicides were effective in control of weeds at early stages. Dicot weeds were effectively controlled than monocot and sedges. Maximum yield was recorded with diuron 1.00 kg/ha and the least was with metolachlor 1.0 kg/ha.

Total dry weight of weeds differ significantly at all stages of growth. Number of branches per plant and days taken for fifty percent flower difered significantly due to herbicdes. Number of flowers per plant and yield/ha enhanced due to diuron 1.0 kg/ha.

Flower quality attributes such as peduncle length flower, diameter and dry weight significantly increased with diuron. Highest net return was realised with diuron 1.00 kg/ha. (Rs. 16, 941.62/ha).

CROP-WEED COMPETITION AND WEED FLORA

STUDIES ON RICE-WEED COMPETITION FOR NUTRIENTS AS INFLUENCED BY SEEDING AND WEED CONTROL TREATMENTS

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Field experiments were conducted during monsoon, 1985 to 1986 to study the crop-weed competition for major nutrients in direct sown rice, Amongst the monocot,

the most domiant species was *Echinochlca* spp. contributing about 40 per cent. The dicot weeds contributing only about 12 per cent. Amongst different rice seeding methods broadcasting produced maximum weed biomass over drilling and line sowing. Handweeding treatment recorded lowest weed biomass thereby indicating higher WCE. As regards to chemical weed control, butachlor 2 kg/ha had higher WCE due to lower weed biomass as compared to lower dose. Depending upon the weed dry matter, the total accumulation of N. P. and K ranged from 20.10, 2.94 and 28.71 kg/ha in the weed control treatments to 86. 54, 12.41 and 134.52 kg/ha in the weedy check, respectively. The extent of nitrogen losses from no-weeding treatments ranged from 98.73 kg/ha in broadcasting to 78.53 and 82.35 kg/ha in the case of drilling and line sowing, respectively. Butachlor could minimize nutrient loss and added to the fertilizer use efficiency of rice. Drilling and line-sowing recorded 17 and 13 per cent higher grain yield over broadcast seeding. Two weedings given at 30 and 50 DAS produced 82 per cent higher grain yield over weedy check and was at par with butachlor 2 kg/ha.

CROP WEED COMPETITION IN UPLAND RICE

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In upland rice Var. Rasi, the highest grain yield (26.75 q/ha) was recorded in season long weed free which was at par with weed free upto 45 DAS the lowest grain yield (13.42 q/ha) under season long weedy was at par with weedy upto 45 DAS. And weed free upto 15 DAS. It indicated that critical period of crop-weed competition in upland rice ranged from 15to45 DAS. The total reduction in grain yield due to unchecked weed growth was 49.8 per cent.

EFFECT OF WEED COMPETITION IN RAINFED GROUNDNUT (*Arachis hypogeae* L.) ANDSOYBEAN (*GIycine max* L.) *MerriII)* IN MALWA REGION

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The two years (1984 and 1985) field study revealed that under control, weed infestation reduced the yield of groundnut (10.91 q/ha) and soybean (9.09 q/ha) due to reduction in pod number and yield per plant. The production was declined by 55 per cent in groundnut and about 48 percent in soybean as compared to hand weeding (19.36 and 17.73 q/ha) , pendimethalin 1.5 kg/ha pre and fluchloralin 1.2 kg/ha ppi gave season long control of weeds in groundnut and yielded 17.34 and 13.77 q/ha, respectively. Whereas, in soybean only pendimethalin 1.0 kg/ha pre successfully controlled the weeds and favorably influenced the seed yield (14.89 q/ha).

COMPARATIVE YIELD LOSSES IN DIFFERENT *KHARIF* CROPS DUE TO WEED INFESTATION UNDER RAINFED CONDITIONS

[Prem Singh, Kamta Prasad and Ved Prakash
Vivekananda Parvatiya Krishi Anusandhan Shala
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A field trial was conducted during two consecutive *Kharif,* season of 1988 and 1989 to assess the comprative losses in yield of different crops due to weed infestation. Five *Kharif* crops (rice, soybean, fingermillet, barnyard millet and maize) were grown under complete weedy and weed free environment of rainfed condition. Under un-

weeded situations weed dry weight accumulation was 510, 380, 369, 249 and 212 g m^{-2} in rice, barnyard millet, fingermillet, maize and soybean, respectively, indicating good smothering effect of soybean on millet, maize and soybean weeds. The losses in grain yields of rice, barnyard millet, finger millet, maize and soybean as compared to weed free crops were 90.6, 77.6, 80.7, 57.8 and 50.1 per cent, respectiveiy,

CROP-WEED COMPETITION STUDIES IN SOME *KHARIF* CROPS

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A field experiment was conducted during *Kharif*, 1989 under irrigated conditions to study the responses of some *Kharif* crops to weed competition. Treatments comprised of six crops viz; bajra (BK-650), sorghum (CHS-9). soybean (PK-327), groundnut (Kaderi-3), cowpea (PUSA-779) and greengram (PS-16) as the main plot treatments and three sub-plot treatments viz; unweeded control, one hand weeding at 3 weeks after sowing (WAS) and weed free check,

Yield reduction due to uninhibited growth of weeds as compared to weed free 'check' varied from 56 to 89%. The lowest reduction was in the order of sorghum followed by soybean, bajra, groundnut, mung and cowpea. However, one handweeding given at 3 WAS brought down the competition by weeds with an average reduction in yield of 35% as compared to 74% in unweeded control. Yield reduction due to one hand weeding given at 3 WAS as compared to weed free check varied from 13 - 52%. The lowest reduction being in bajra and the highest in cowpea The weed dry weight at harvest in unweeded treatment was higher in groundnut, cowpea and mung as compared to bajra and soybean. It was lowest in bajra and highest in mung with one hand weeding at 3 WAS.

WEED CROP COMPETITION IN PEARLMILLET WITH RELATION TO N APPLICATION

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The experiments conducted during *Kharif*, 1985 and 1986 showed that the growth and grain yield of pearlmillet increased significantly with every additional dose of nitrogen from 0 to 120 kg N/ha. Keeping plots weed free for the initial 45 DAS produced growth and yield of pearlmillet similar to that obtained under keeping weed free for the full season. Allowing weeds only for initial 15 days also, produced growth and yield similar to that obtained under weed free upto 45 DAS, but allowing weeds further resulted in significantly lower yields. 15 to 30 DAS is the most critical period of weed-crop competition.

The effect of N on the growth of weeds was more than the population of weeds. Higher nitrogen application in pearlmillet allowed the competition in favour of crop against carpet weed (*Digara arvensis*). However, in the presence of *Echinochloa* depending upon the population, the competition went in favour of weeds or crop. Initial weed free for 15 or 30 DAS and then allowing the weeds to grow resulted in significantly less population and dry weight of weeds in comparison to the weedy check. These weeds did not emerge in the plots kept weed free for initial 45 DAS. On the contrary, keeping weedy environment upto initial 15 or 30 DAS produced almost identical population and dry weight of weeds as compared to unweeded plots for longer periods.

COMPETING ABILITY OF WHEAT VARIETIES WITH WILD OATS (*Avena Iudoviciana* (L.) UNDER LATE SOWN CONDITION

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Field experiments were conducted to evaluate competitve abilities of wheat (*Triticum aestivum* L.) varieties to wild oats (*A, Iudoviciana*) durlng winter, 1988-89. Wild oats significantly reduced the wheat grain yield of all varieties by 10 to 36% depending upon varieties. The competing ability of WH 291 and HD 2285 was more than HD 2009 and S 308. Wheat variety HD 2009 was least competitive among all varieties. HD 2285 was the most competitive which registered only 16.5% reduction in yield due to season long wild oats competition. Based on observations, wheat height and dry matter accumulation per unit area during early crop growth stages were better characters for governing the competitive ability of wheat varieties to wild oat than the number of tillers.

COMPETITING ABILITY OF WHEAT VARIETIES WITH WILD OATS (*Avena Iudoviciana*) L. UNDER NORMAL SOWN CONDITION

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Fields trials were conducted to test the competiting ability of different wheat varieties under timeiy sown wheat during 1988-89. Wild oats reduced wheat grain yield

from 37 to 67% depending upon varieties. Wheat vnrieties WH 147 followed by WH 283 were better competitive to wild oats than rest of the varieties. WH 2009 variety was least competitive. Significantly low dry matter accumulation of wild oats was registered, under WH 147 followed by WH 283. As a non cash input varietal selection against the competitive weed like wild oats may form an integral part of weed management.

INFLUENCE OF NITROGEN ON THE COMPETITION OF WILD PEA *(Lathyrus aphaca* L.) IN WHEAT

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Two years field experiments indicated that nitrogen at higher rates allowed the competition in favour of wheat. Nitrogen applications significantly decreased the population and dry weight of wild pea at 90 DAS. Wild peas at population of 200 plants /m2 reduced the potential yield of wheat upto 970 kg/ha. The loss in the potential yield of wheat was more in the unfertili sed plots than in the fertilized plots.

CROP WEED COMPETITION STUDIES IN PEA *(Pisnm sativum)*

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Field experiments were conducted during winter 1987-88 and 1988-89, to study

effect of time of weed free periods on the yield of pea. Keeping Plots weed free for the intial 45, 60 and 75 days of crop growth led to significantly higher seed yield of pea than unweeded check and similar to season long weed free plots. Maximum seed yields were obtained under season long weed free conditions. While minimum yield was recorded under unweeded conditions in both years.

WEED FLORA OF *KHARIF* CROPS IN THE NORTH-EAST ALLUVIAL PLAIN ZONE OF NORTH-BIHAR

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Ecological survey of the weed flora of important *Kharif* crops (rice and maize) in North-West alluvial plain regions of North Bihar (sub-zone of Agro-climatic zone IV B) of India was carried out during *Kharif*. 1987 . 47 weed species belonging to 33 genera and 16 families were found in rice (direct sown as well as transplanted) fields. The major weed species were contributed by *Poaceae, Cyperaceae* and *Amaranthaceae*. Monocot weeds were predominant over the dicots in rice fields, and *Poaceae* and *Cyperaceae* contributed the bulk. *Amaranthaceae* constituted the majority of dicot weeds. The broad leaf weeds were less. *Cynodon dactylon* recorded the highest IVI (2792. 16) in rice fields.

In *Kharif* maize, 33 species belonging to 30 genera and 12 families were noted. *Poaceae* contributed the most (8 species) followed by *Amaranthaceae* (7 spp.), *Asteraceae* (5. spp.) *Euphorbiaceae* (3 spp), *Solanaceae* (2 spp.) and *Cyperaceae* (2 spp.). In the maize fields, the most dominant weed species was *Cyperus rotundus* (L.) having the highest IVI of 5058.86. Among the grasses, sedges and broad-leaf weeds, the latter was the most dominant. The weed spectrum in maize fields consisted chiefly of *Poaceae, Amaranthaceae* and *Asteraceae* families.

SURVEY OF WEEDS IN RICE FIELDS OF CAUVERY DELTA OF TAMIL NUDU

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A study was undertaken during *Kharif* 1987 to survey the weedflora in the intensive rice growing cauvery delta comprising Tanjore and South Arcot Districts of Tamil Nadu. Sixty eight randomly selected fields were surveyed, of which 54 fields were transplanted and 14 were direct sceded rice fields. The survey recorded 27 species of weeds comprising 6 grass species, 5 sedges and 16 broadleaved weeds. The transplanted rice fields were predominently infested with *Echinochloa crusgalli* to the extent of 18 % *Sphenocba zeylanica* and *Cyperus difformis* 12 % each. In case of direct seeded rice, the major weeds were *Echinochloa colonum* (16 %) followed by *Cyperus rotundus*, *Marselia quadrifolia* (14%each) and *Cynodon dactylon* (13%).

WEED FLORA OF MEDZIPHEMA ON ECOLOGICAL SURVEY OF RICE FIELDS

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MEDZIPHEMA-797 106

In four localities Medziphema area of Nagaland, *Borresia hispida*, *Ageratum Conyzoides*, *Cyperus rotundus*, *Axonompus compressus*, *Dactyloctenium aegyptium* and *Echinochloa Colonum* were the most dominant weed species in rice field. The restricted distribution of *Solanum khasianum*, *Cleome gynandra* and *Euphorbia hirta* was also found.

WEED SEED CONTAMINATION IN RICE SEED IN MAHABOOB NAGAR DISTRICT, ANDHRA PRADESH

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PALEM–509 215

A study was conducted in Palem and Kottalgadda Villages of Mahaboobnagar District, Andhra Pradesh to quantify the extent of weed seed contamination in rice seed due to the practice of harvesting and threshing of weeds with rice. The number of weed seeds ranged from 157 to 11587 per kg rice seed. The number of weed seeds was 4157/kg rice seed. Seeds of *Echinochloa crusgalli* (L.) Beau., *Echinochloa oryzoides* (Ard.) Fritsch, *Echinochloa glabrescens* Munro ex Hook, f., *Echinochloa colonum* (L) and *Cyperus rotundus* L, predominated Variation was recorded in the predominance in type and numder of weed seeds.

WEED FLORA OF SOYBEAN FIELD IN MADHYA PRADESH

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In Madhya Pradesh. the weed flora in soybean fields belonged to 17 families and 88 species with the major contribution from graminae. The dominant grassy weeds were *Echinochloa crusgalli* (6.05m-2), *Cynodon dactylon* (4.13), *Digitaria adscendens* (3.17). *Eragrostis pilosa* (3,13), *Oplismenus burmanii* (1.28) and *Setaria glauca* (1.9). The major sedges were *Fimbristylis* spp. (7.98), *Cyperus*

rotundus (3.8), *Cyperus microiria* (1.93) and *Cyperus iria* (1,05). while among *dicotyledonous, Ageratum conyzoides* (3.5), *Physalis minima* (3.3) *Commelina bengalensis* (1.27), *Commelina commnnis* (3.05), *Phyllanthus niruri* (2.52). *Cyanotis axillaris* (1.98), *Phyllanthus simplex* (1,81), *Portulaca oleracea* (1.5) and *Eclipta alba* (1.17) were dominant.

The common weed control methods adopted in soybean growing divisions consists of hand weeding with *Khurpi,* hand pulling, cutting by sickles, bullock drawn harrows (*Kolpa*) or (*Dora*) under low rainfall areas and stale seed bed technique under high raiufall area.

SURVEY OF *KHARIF* WEEDS IN REWA DIVISION OF MADHYA PRADESH (INDIA)

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A survey on weed flora was conducted during *Khrif,* 1987 in Rewa Division, 46 weed species were recorded, *Echinochloa* spp., *Cyperus* spp., *Cynodon dactylon* and *Eclipta alba* were most dominant, The major weeds under paddy fields consisted of *Echinochloa* spp., *Cypeurs* spp., *Eclipt alba, Cynodon dactylon, Aeschynomene indica, Sehima nurvosum, Fimbristylis miliaceae* and *Indigofera linifolia.* In sorghum and maize fields *Cyperus* spp., *Echinochloa* spp., *Commelina bengnalensis, Corchorus* spp, *Panicum* spp., *Eclipta alba* and *Phyllanthus simplex* were dominant weeds. In pulses, weed flora was almost similar to sorghum and maize crops.

WEEDS OF WHEAT AND GRAM CROPS AT INDORE AND DHAR DISTRICTS OF MADHYA PRADESH

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Thirty five weed species were recorded in wheat crop. On the basis of IVI. the most dominant weeds among dicotyledonous were *Anagallis arvensis* (37.5), *Melilotus alba* (27.2), *Cichorium intybus* (24.3), *Chenopodium album* (22.4), *Brassica sinensis* (18.0), *Parthenium hysterophorus* (15.3), *Convolvulus arvensis* (13.0), *Launia asplenifolia* (11.2) and *Euphorbia geniculata* (11.1) The predominant monocotyledonous weeds comprised of *Cynodon dactylon* (17.3), *Cyperus rotundus* (8.0) and *Avena fatua* (5.5),

In gram crop, the dominant weeds were almost similar to wheat crop but total weed species were about 50 % less as compared to wheat. The dicotyledonous weeds having maximum IVI were *Euphorbia geniculata* (42.9), *Launia asplenifolia* (34.4) *Brassica sinensis* (28.6), *Cichorium intybus* (28.4), *Chenopodium album* (22.3) and *Melilotus alba* (21.5) while in monocotyledonous weeds, *Cynodon dactylon* (16.1), *Cyperus rotundus* (10.1), and *Avena fatua* (8.6) were dominant.

MAJOR *RABI* WEEDS IN KHANDWA AND KHARGONE DISTRICTS OF M. P.

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The present communication is an account of major *Rabi* weeds in Khandwa and Khargone districts of Madhya Pradesh. Total 32 and 23 weed species were recorded in wheat and pulse crops, respectively.

The dominant weeds in wheat crop consisted of *Chenopodium album* L., *Anagallis arvensis* L., *Argemone mexicana* L., *Solanum nigrum* L., *Sanchus* spp., and *Vicia* spp. Almost similar weeds were recorded in pulses. The monocotyledonous weeds were almost similar in both crops which comprised of *Cyperus rotundus* L., *Cynodon dactylon* (L.) pers. and *Dinebra arabica* Jacp.

A NOTE ON THE WEED FLORA OF POTATO CROP IN SATPURA PLATEAU OF M. P.

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Potato constitutes as one of the major vegetable crops in Satpura Plateau of M. P. Weed survey was carried out on farmers fields of district Chhindwara during *Rabi* 1988-89. The major weeds recorded were *Chenopodium album*. *Convolvulus arvensis*, *Amaranthus viridis*, *A. spinosa*, *Solanum nigrum*, *Argemone mexicana*, *Cynodon dactylon* and *Cyperus rotundus* etc.

Chenopodium album was the predominating and serious weed in most of the potato fields of farmers. Over 30 species of weeds were noticed in the fields surveyed.

WEED FLORA OF WHEAT OF MARATHWADA REGION OF MAHARASHTRA STATE

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PARBHANI-431 402

A survey of weed flora of wheat (*Triticum aestivum*) fields was conducted during *Rabi*, 1983 to 1986 in all the seven districts of Marathwada region. In all. 31 weed species were recorded, out of which 6 belonged to grasses, 1 sedge and remaininq were broad leaved weeds. Amongst the grasses 5 species from *Poaceae* family and 1 from *Commelinaceae*, and amongst the broad leaved weeds *Euphorbiaceae* contributed 5 species followed by *Amaranthaceae* (4), *Asteraceae* (3), *Convolvulaceae* (2), *Leguminosae* (2), *Chenopodiaceae, Primulaceae, portulaceae, orobanchaceae, Boraginaceae, Papavaraceae* and *Cyperaceae* (1 each). Per cent contribution was more from *Poaceae* (16 te 32%), *Commelinaceae* (8%), *Euphorbiaceae* (7 to 20%), *Amaranthaceae* (0.5 to 25) and *Convolvulaceae* (4 to 23). Dominant grasses infesting wheat crop were *Brachiaria eruciformis* and *Cynodon dactylon* while pre-dominant broad leaved weeds were *Convolvulus arvensis, Sonchus arvensis* and *Euphorbia dracnculoides. Achyranthus aspera, Amaranthus spinosus Argemone mexicana* were dominant during 1983.

SOME FAST GROWING WEEDS OF KARNATAKA

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The three weeds namely, *Eupatorium odoratum* L, *Alternanthera sessilis* (L.) DC., *Nicandra physaloides Gaerten* belonging to *Asteraceae, Amaranthaceae*

and *solanaceae* respectively have been observed in the regions of Karnataka. *Eupatorium odoratum* in plantation and forest area, *Alternanthera sessiis* in garden and wet land and *Nicandra physaloidcs* on the bunds of cultivated black soil are problem.

The rate of seed production in *Eupatorium* and *Nicandra* is very high. The seeds are small, very light and presence of crown of pappers in *Eupatorium* is suitable for wind dispersal. The growth of *Alternanthera sessilis* is gragarious due to the production of roots at the nodes inducing fast vegetative propogation.

WEED FLORA OF DHARWAD AGRICULTURE UNIVERSITY CAMPUS

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The weeds associated with different field crops, orchards and waste lands of Agriculture University campus of Dharwad were surveyed. The distribution of *Tridex procumbens*, *Euphorbia geniculata*, *Alternanthera sessilis*, *Lagascea mollis*, *Gomphrena decumbens*, *Portulaca quadrifida*, *Merrimia gangetica* and grasses were noted in garden and waste lands. In wet lands, *Cyperus* spp., *Echinochloa* spp., *Panicum*, *isachne*, *Commelina benjalensis*, *Cynodon dactylon* were predominant. In dry lands, dicot weeds were dominant (*Oldenlandia* spp. *Tridex procumbens*, *Nicandra physaloides* *Lagascea mollis*, *Euphorbia* spp. *Celosia argentia*, *Tribulus terrestris*, *Leucas* spp., *Desmodium* spp.). Among crops, maize and sorghum were noticed to be affected more by weeds than paddy. In wheat, Groundnut and cotton the weed problem was moderate. As many as 153 weed species belonging to 106 genera and 32 families of flowering plants were recorded to grow in the fields, orchards and waste lands of the campus area.

FLORISTIC STUDY OF *Parthenium Hysterophorus* L. IN CULTIVATED AND NONCULTIVATED LANDS

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HYDERABAD - 30

With a view to study the distribution pattern, floristic study of *Parthenium hysterophorus* was carried out in cultivated and noncultivated lands around Hyderabad city during both *Kharif* 1988 and *Rabi* 1988-89. Among the twenty six weed species *Parthenium* was found to be most predominant weed species. In *Kharif Parthenium* was widely distributed on cultivated lands (castor, groundnut, maize and sorghum) with relative density of 33.5 per cent and relative frequency of 15.9 per cent as compared to *Rabi* cultivated lands (chickpea, safflower and wheat) with the relative density and relative frequency of 19.9 and 14.4 per cent, respectively. Among the noncultivated lands relative density and relative frequency was high by 6.1 and 3.8 per cent, respectively in *Rabi* compared to *Kharif* However, *parthenium* plants found during the *Kharif* on cultivated and non-cultivated lands did not show much variation compared to *Rabi*.

INFLUENCE OF POLYETHYLANE MULCHING IN CONTROLLING WEEDS IN HOT ARID REGION

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Effect of soil solarization achieved through mulching the soil with transparent polyethylene sheet during hot summer months revealed that polyethylene mulching raised

the soil surface temperatures from 51°C to 58°C under wet and 55°C to 62°C under dry conditions. These higher temperatures affected the weed population, root parasite and diseases incidences in clusterbean and cumin crops. Reduction in weed number, their fresh and dry weight due to mulching was of the order of 75 90 and 69% in clusterbean and 68.81 and 75% in cumin crops, respectively as compared to non mulched plots. Clusterbean crop raised in mulched plots remained disease free till harvest. Whereas, there was 19 to 23% mortality due to dry root rot under wet and dry non mulched plots, respectively. Reduction in cumin wilt incidence was upto 28.5%. Influence of soil solarization was also conspicuous in controlling broom-rape in tomato crop. Solarization could reduce emergence of more than 91% broom-rape seeds. Reduction in weed population, disease and broom-rape incidence resulted in higher yields of these crops. Comparing the efficiency of mulch under dry and wet conditions showed that wet mulch proved better than dry mulch.

PHYTOSOCIOLOGY OF WEEDS IN FIELD CROPS AT ANNAMALAINAGAR

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A quantitative analysis of community characteristics of weeds associated with five field crops was done during April, 1988. Based on relative abundance, relative density and relative frequency, the importance value index (expressed in percentage) was worked out. *Sphenoclea zeylonica* (28.84%) and *Cyperus difformis* (23.98%) in transplanted rice, *Cyperus rotundus* (49.6%) in ragi, *Axanopus compressus* (48.4%) in maize, *Trienthema portulacastrum* (28.2%) and *cyperus rotundus* (23.9%) in sugarcane and *Trienthema portulacastrum* (37.8%) in cotton were found to be the dominant weeds by virtue of their higher importance values.

SURVEY OF *Eupatorium odoratum* L. IN SOME PARTS OF WESTERN GHAT REGIONS OF KARNATAKA

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Survey of *Eupatorium adoratum* L., abnoxious weed was made in the Western ghat regions of Karnatka, to assess the extent of infestation and the damage. The survey revealed that the weed was seen invaded almost all the forest areas, plantation fields and field crops also. The degree of infestation was more in newly afforested areas, open fields and all along the *nala* area, while it was found less in thick evergreen forests and at higher elevations. The weed was completely absent all along the coastal line for about two kilometers from sea waters. The direction of its spread was from west to east, in general.

Due to its high regenerative capacity combined with prolific seed production, has led to fast spreading of this noxious weed. Among different area the Sagar division of Shimoga district was maximum affected (about 58.05 sq.km.) and Mysore district the least (about 21 sq. km)

WEED MENACE IN TEA PLANTATIONS OF HIMACHAL

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Himachal Pradesh has 1660 tea holdings covering 2063 ha area in Kangra Valley. Weed menace in tea plantations is still not considered a serious problem and weed control is often neglected. Survey of weed flora in tea plantations of Kangra Valley revealed that

about 234 weed species, comprising of 189 annuals and 45 perennials, belonging to 161 genera from 48 families, of which 39 dicotyledonous, 5 monocotyledonous and 4 pteridophytes. Of the monocotyledonous weeds, grasses (Poaceae 56 spp.) contributed maximum species and predominant the flora Amongst the dicotyledonous weeds, Asteraceae (34 spp.) was predominant. Weed competition commences from May, though June to October (rainy season) is the critical period. About 163 annual species appear during summer and rainy season and 26 species during winter.

Imperata, Saccharum, Cynodon, Paspalum, Setaria, Erigeron, Ageratum, Polygonum Bidens, Verbena. Seigesbeckia, Galium etc. are major herbaceous weeds. Shrub like *Lantana, Berberis Rubus* are abundant in abandoned gardens.

Wide spacing, considerable vacancies, and multistemmed architecture of the existing china hybrid tea bushes in Kangra tea plantations are conductive to serious weed problems in mature tea, In tea plots neglected for long, persistent weeds like brushes and grasses become established within the bush frames which makes it difficult to control them.

BIOLOGY AND MANAGEMENT OF PROBLEM WEEDS

HERBICIDAL CONTROL OF CONGRESS GRASS

(Parthenium hysterophorus)

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Two sets of experiments were conducted in the developing residencial colonies and uncultivated area of the campus of Punjab Agricultural University from 1987 to 1989 to find out herbicidal control of rainy season flush of *Parthenium*. Treatments of 25 to 50 cm tall *Parthenium* with 2,4-D 1.6 and 2.4 kg, atrazine 1.0 and 1.5 kg, diuron 1.6 and 2.4 kg/ha and tank mixed application of atrazine 1.0kg and diuron 1.6kg with 2,4-D 1.6 kg/ha significantly reduced the number of *Parthenium* plants /m2 and dry matter as compared to unsprayed spot. Paraquat 0.5 or 1.0 kg/ha was ineffective,

In another set, spraying was done at the plant height of 0.5 to 1.0 m. Number of *Parthenium* plants and dry matter yield one month after spraying were significantly reduced with the application of atrazine 1.25 kg/ha, 1.5 kg/ha and diuron 2.0, 3.0 kg, tank mix application of atrazine 1.25 kg or 1.5 kg and diuron 2.0 or 3.0 kg/ha with 2,4-D 1.0 kg/ha as compared to unsprayed spot. Tank mixed application treatments were proved more effective.

CONTROL OF *Parthenium hysterophorus* L. AND ASSOCIATED WEEDS IN LATE SOWN WHEAT

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An experiment was conducted to study the effects of 2,4-D and sodium chloride alone and in combinations on late sown wheat and associated weeds particularly on *Parthenium hysterophorus* L. during 1988-89. Weed control treatments consisted of sodium chloride 10 20 and 30% solution, 2,4-D Na 0.5 kg/ha, sodium chlorides 10, 20 and 30% solution each followed by 2.4-D Na 0.5 kg/ha, hand weeding and untreated control. The treatments, 30% sodium chloride solution spray followed by 2,4-D Na salt 0.5 kg/ha showed maximum toxicity to wheat and *Parthenium* spp. than other treatments. The lowest grain yield was obtained in plots treated with 30% sodium chloride solution spray followed by 2,4-D Na salt application. Highest grain yield was recorded in plots treated with 10% sodium chloride spray followed by 2,4-D Na salt.

EFFICIENCY OF FARM CHEMICALS POR CONTROL OF *Parthenium hysterophorus*

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Efficiency of nine herbicides was studied on control of *Parthenium*, during 1981-82. Application of atrazine 2 kg/ha, oxadiazon 1.25 kg/ha, dalapon 5.8 kg/ha and simazine 2 kg/ha gave the control of *Parthenium* to the extent of 100, 98.6, 98.2 and 96.7% over fluchloralin, chlortoluron and control, respeetively. While herbicides, fenuron 1.0 kg/ha, monuron 1.20 kg/ha and methabenzthiazuron 3.50 kg/ha gave more than 88% control of *Parthenium* as regards fresh weight. In terms of dry weight reduction, atrazine, oxadiazon, dalapon, simazine and monuron were at par and gave more than 89·/. control.

MANURIAL VALUE OF *PARTHENIUM* WEED

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Studies on utilization of phytomass of *Parthenium hysterophorus* (L.) as organic recycling in cropped soils were taken up. The phytomass was highest during August which ranged in different locations from 0.76—6.63 t/ha (mean 2 85 t/ha). The major plant nutrients were in the order of K (2.75—2.8%) Ca (1.79--1.88%) N (1.50—1.75%) P (0.52—0.58%) S (0.48—0.50%) Mg (1.50—1.75%) and micronutrient content were Fe (690—720 ppm); Mn (105—122 ppm); Zn (35–41 ppm); Cu (20–20 ppm).

The recycling of weed mass can be done directly as green manure or as compost. When incorporated into soil at 5 t/ha as green manure it supplied 25 to 30 kg N, 8 to 10 kg P and 45 to 50 kg K. In soil the residue decomposed fast (C/N ratio ; 30 - 40) resulting in increased availability of N, P and K which reached peak by 45 days. The weed was useful for direct incorporation with quick release of nutrients to crops.

The weed compost was ready in 75 days and with N : P : K content of 1.07, 1.87 and 0.41% and C/N ratio of 14.6.

EFFECT OF TRALKOXYDIM ON THE CONTROL OF WILD OATS *(Avena Ludoviciana)*

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A pot experiment was conducted in the screen house during 1988-89 to test the combination effect of tralkoxydim with fluroxypyr or 2,4–D or isoproturon on wild oats (*Avena ludovicina*). Spraying was done at two leaf stage. Percent control of weed and root-shoot dry weight were recorded.

The combination of tralkoxydim with fluroxypyr had no significant effect though more reduction in root-shoot dry weight was observed as compared to tralkoxydim alone. When 2,4–D was combined with tralkoxydim, the activity of tralkoxydim was less than tralkoxydim appled alone. The potency of isoproturon + tralkoxydim was more than tralkoxydim alone.

BIOLOGY AND CONTROL OF *Imperata cylindrica* (L.) P.Beauv. IN LAWN WITH GLYPHOSATE

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Imperata cylindrica is a perennial problem weed in lawns, forming a tussock of rhizomes up to a depth of 10 cm. It reproduces both through rhizomes and seeds. Seeds collected during May–June manifested complete dormancy whereas the one collected during September and December had 35 and 12% germination, respectively at 28° C. Exposure of rhizomes at room temperature for even one day caused complete mortality.

The pot culture and field experiments conducted for three years revealed that glyphosate 1 to 1.5 kg/ha applied in August–September caused killing of rhizomes and gave a season long control. The lawn grass showed initial phytotoxicity but recovered. Mixing of 2 per cent ammonium sulphate with glyphosate improved the efficacy. Near complete killing of *Imperata* rhizomes was obtained with 2 kg/ha of glyphosate but its toxic effect on lawn grass persisted longer. The area treated with different doses of glyphosate remained free from the weed for subsequent two to three seasons.

BIOLOGY AND CONTROL OF *Sorghum halepense* (L.) PERS

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Studies on biology of *Sorghum halepense* revealed that its seed had both seed coat and embryonal dormancy. Mechanical scarification improved germination up to

19 per cent at 32°C. Storage for one year improved germination up to 49 per cent. On equal number of nodes (40) per pot basis, rhizome segments having more number of nodes produced higher above and below ground biomass than smaller fragments with less number of nodes which produced greater number of shoots. Studies on effect of moisture stress revealed that rhizome could withstand desiccation at room temperature (Max. 34–35 C) and sprouted even 86 per cent moisture loss. Rhizomes failed to sprout beyond this loss in moisture. Initial desiccation for two days inceased the above ground dry matter production. Pot culture and field experiments revealed that glyphosate gave better control of this weed than dichloropropionic acid (dalapon). Glyphosate applied at 1 to 2 kg/ha gave good control of top growth and caused considerable killing of rhizomes. Mixing 5 per cent ammonium sulphate or 3 per cent urea with glyphosate increased its efficacy.

INTEGRATED WEED MANAGEMENT FOR CONTROLLING *Imperata cylindrica* AND OTHER WEEDS IN ESTABLISHED TEA GARDENS

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To find out the effective metod of controlling *Imperata cylindrica* and other weeds in established tea garden, field experiments were conducted during 1987 and 1988 at the Tea Research Station of Himachal Pradesh. Results of the experiment revealed that glyphosate 1.0 kg/ha, one hoeing followed by glyphosate 0.5 kg/ha, cheegling followed by diuron 1.6 kg/ha and gallant-453, 0.5 kg/ha + 1% selwet were effective in controlling *Imperata cylindrica* and other weeds in tea gardens.

STUDY ON THE CONTROL OF *Ageratum conyzoides* (L.)

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In Himachal Pradesh *A. Conyzoides* weed is known as *Phulnu* or *Neela Phulnu* and commonly found in maize, mash, soybean and almost in all the uncultivated lands like road sides, field bunds, sides of water channels, pastures and grazing lands and orchards. Nine herbicides were tested in pot experiments and seven of them were used in field trials during 1987-88. Glyphosate 1.0 and 0.5 kg/ha, diuron 1.50 kg and 0.75 kg/ha, atrazine 1.0, 2.00 kg/ha and common salt 20% and 10% solution were effective in controlling this weed under non-cropped situation. Dowco 433 liquid 0.2 kg/ha, 2, 4-D ester 1.0 kg/ha and dalapon 4.8 kg/ha followed by 2,4-D Na salt 1.50 kg/ha were also effective in killing this weed to a significant level as compared to untreated control. Regeneration studies showed that the herbicides found effective in complete mortality of *A. conyzoides* had no regeneration even after 75 days after application.

STUDY ON THE CONTROL OF *Oxalis latfolia*

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Oxalis latifolia H. B. & K., a member of family *Oxalisaceae* and called as *Khati-buti* or *phiphru* in the Himachal Pradesh. This problematic weed invades vegetable fields, maize crop, orchards and garden lands through outhill regions. Most affected

crops are the vegetables that require frequent hoeing resulting in multiplication of *Oxalis bulbs*. To find out effecteive herbicides and rates vis-a-vis regeneration from bulbs, experiments were conducted in pots and field during 1987–88 under non cropped situations. Out of nine herbicides tested in pot experiment four were effective. In field experiment glyphosate 1.0 kg/ha, oxadiazon 0.75 kg/ha and Dowco-433 liquid 0.2 kg/ha were highly effective in controlling *O. latifolia* to significant level as compared to weedy 'check'. The herbicides that were effective in controlling *O. latifolia* also inihibited its regeneration.

COLONISING CAPACITY OF A WEEDY LEMON GRASS *(cymbopogon coloratus)*

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GUNTUR (A. P.)

A perennial tussock forming grass *Cymbopogon coloratus*. Nees stapf, has become a scourge in the local area during 1984 to 1989 and still fast and vast spreading. Observations for over four years showed several growth characters of weediness such as vigorous vegetative reproduction together with seed set and occasionally apomixis, high regenerative ability; invasion and domination in disturbed areas; wind pollination, shorter vegetative and longer reproductive phase; balance of r & k strategies; amplitude of phonoplasticity (to cite Ehrendorfer, 1965); Polyploidy (2n=20, 40); lesser susceptability to disease, predation and parasitism, and prevalence of all favourable factors in regulation of the weed population size. The paper discusses these features with evidence.

EFFECT OF DIFFERENT HERBICIDES ON CONTROL OF *Cyperus rotundus* IN GROUNDNUT

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In a field study conducted during *Kharif* 1988 and summer 1988-89 with fluchloralin, pendimethalin, alachlor applied as ppi and preemergence applied on soil as carrier, while alachlor also as early post emergence and 2, 4-D EC as pre-emergence and also as early post emergence directed spray in groundnut and the effects were studied on control of *Cyperus rotundus* All the herbicides were applied ot 1.0 kg / ha.

The results indicated that pre emergence application of fluchloralin applied with soil considerably reduced the number and dry matter of sedges, alachlor effectively checked the number as well as dry matter productions of nutsedge, its ppi and early post emergence were more effective and resulted in higher pod yield of groundnut.

GROWTH PERFORMANCE OF WHITE HORSENETTLE

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In pots under glass house conditions, the growth efficiency of 15, 30, 40 and 55 days old weed plant was assessed interms of height, dry matter produced and its distribution to different organs viz; root, stem and leaf, leaf number and leaf area per plant by drawing samples before the application of dicamba herbicide.

The results revealed no significant increase in production of dry matter, leaf area and leaf number in 15 days old plant, but there was difference in total plant height. In case of 30 days old plant a maximum leaf weight of 940 mg with a range of 827 to 940 mg and leaf area of 61.0 cm^2 with a range of 46.0 to 61.0 cm^2 and a root length of 14.1 cm^2 per plant were recorded, respectively. Considering 40 days old plant, the dry weight of stem increased enormously and it had an advantage of increasing the total biomass production followed by leaf and root, respectively. A two fold increase in DMP of root (0.81 to 0.98 g/plant), stem (1.62 to 2.41 g/plant), leaf (2.13 to 2.44 g/plant) and total (4.88 to 5.63 g/plant) was noticed in 55 days old weed plant. The higher production of leaf (29.2) per plant is an indication of the weed plant efficiency in increasing its competition capaciy with crop plant for atomospheric Co_2 , light and land area.

EFFECT OF TIME OF APPLICATION ON EFFICACY OF GLYPHOSATE IN CONTROLLING *Lantana camara* Var. Aculeata

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Field experiments were conducted for two years to study the influence of time of application on the efficacy of glyphosate in controlling *Lantana Camara* var. aculeata, a obnoxious weed of the state. *Lantana* bushes were cut 1–1.5 above the ground at monthly interval round the year. Different concentrations of glyphosate with and without surfactants were sprayed on regenerated foliage. The temperature and relative humidity data were recorded for different months. Results revealed that cutting of bushes in August, September or October and application of glyphosate 0.75–1% without surfactant

and 0.50 with surfactant on regenerated foliage in September, October and November controlled the weed effectively. The killed plants did not regenerate. Spray of glyphosate in January to August did not control the weed even at highest concentration. A relative humidity of more than 40 per cent appeared to be an essential factor for effective functioning of glyphosate (Glycel-41 SI).

STUDIES ON THE CONTROL OF WATER HYACINTH USING ATRAZINE

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Atrazine was tried against *Eichhornia crassipes* which is a menace to water bodies and irrigation systems. Laboratory trials were conducted using different concentrations of 50% atrazine ranging from 0.0 to 0·8 ppm. Chlorophyll content recorded a loss, as the herbicide is a strong photosynthetic barrier. Metabolic changes revealed decrease in sugar content, whereas proteins and phenolic contents increased. Observation of histochemical changes in starch, lipids and proteins supported the estimated changes of metabolites in treated and untreated plants. The herbicidal dose of 0.8 ppm proved to be toxic causing death after 11th day of treatment. Field trials were conducted using 0.8 p.m. dosage. Chlorophyll content showed a decline recording a loos of 90 per cent on 12th day of the treatment.

REMOVAL OF WATER HYACINTH-A COST EFFECTIVE APPROACH UNDER BIO-ENVIRONMENTAL CONTROL OF MALARIA IN KHEDA DISTT. GUJARAT

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Under Bio-environment control of malaria manually removal of water hyacinth was carried out in four experimental ponds (18.18 ha) of Kheda district (Gujarat). The expenditure of Rs. 30,828/- was incurred on removal and subsequent maintenance of the ponds. After the removal of water hyacinth a sum of Rs. 17,466/- was invested in fish culture. In one year, after deduction of all expenditure. a total profit of Rs. 14,683/- was recorded from the four experimental ponds. This study revealed that the manual removal of water hyacinth from water bodies can be commercially exploited for fish culture and a good source of income for village panchayats. It become as beneficial approach to control mosquito breeding and the diseases.

WEED PHYSIOLOGY

CHLOROPHYLL CONTENTS IN FRESH LEAVES OF CHICKPEA AS INFLUENCED BY SEED RATES AND WEED MANAGEMENT PRACTICES

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Experiment was conducted to study the effect of seed rates and weed management practices on the chlorophyll content in fresh leaves of chickpea during *Rabi* 1987-88.

Chlorophyll content was determined at 60th, 90th and 120th day stages of crop. Results revealed that the lowest seed rate of 75 kg/ha resulted the highest chlorophyll content at all the stages of crop but the differences in chlorophyll content at 60th day stage of crop due to varying seed rates were not perceptible. HW 25 and 45 DAS enhanced the chlorophyll content almost at all the stages of crop as compared with other weed management practices. The interaction of seed rates and weed managament practices was not pronounced.

EFFECT OF WEED MANAGEMENT PRACTICES ON CHLOROPHYLL CONTENT OF DIRECT SEEDED RICE

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The effect of 14 weed management treatments on chlorophyll content in, fresh leaves of direct seeded rice was studied during rainy season, 1989. Results revealed that in general, the chlorophyll content in fresh leaves of crop plant was more at 30th and 60th day stages than 90th day stage. The lowest chlorophyll content was recorded under pendimethalin 2.0 kg/ha pre emergence at 30th day stage while at 60th and 90th daystages, it was lowest under unweeded check.

EFFICACY OF HERBICIDES ON SUGARCANE-STRIGA RELATIONSHIP

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An experiment was carried out in farmer's field to find out the efficacy of herbicide

on crop-weed relationship and its effect on cane yield and quality. The variety Mandya was used as the test crop. The treatments included both pre-emergence (atrazine 1.0 kg/ha), and post-emergence herbicides such as paraquat (0.75 kg/ha), 2,4-D sodium salt (2.0 kg/ha), ammonium sulphate (10%) and urea (10%) were applied three times on 45, 75 and 105 days after planting besides farmers practice of weeding and unweeded check were maintained.

The experimental data showed that the herbicide application did not affect the germination of buds (61.6%)in ammonium sulphate vs control (58.3%) and tiller production. The height of the cane was also not affected by the herbicide and the height varied between 61.6 cm and 97 1 cm on 65 th day and 327.6 to 359·6 cm on 310 th day old cane. There was not much difference in leaf production. The ammonium sulphate spray resulted maximum dry weight of 300.3 g/plant in 310 days old cane.

The quality characters such as sucrose content of juice, brix (total soluble solid were also higher in sulphate treatment (21.5 and 32.0 per cent) as against the control (19.3 and 27.3). There was not much difference regarding the purity co-efficient. Application of ammonium sulphate recorded the maximum yield of 115.3 t/ha as against the unweeded check (66.0 t/ha).

INFLUENCE OF HERBICIDES ON PHYSIOLOGICAL PARAMETERS OF SOYBEAN UNDER DIFFERENT ROW SPACINGS AND SEEDINGS RATES

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Six herbicidal treatments viz, fluchloralin 1.0 kg/ha ppi, oxyfluorfen 0.2 kg,

metribuzin 0.5 kg and oxadiazon 1.0 kg/ha all as pre em , hand weeding–2 and weedy check were evaluated under six cultural treatments viz, three row spacings (20, 30 and 40 cm) xtwo seeding rates (100 and 125 kg/ha) against weeds in soybean.

The significant reduction in crop population emergence was found in herbicidal treatments as compared to untreated plots. Greater mortality due to weed stress was occurred under weedy check. Oxyfluorfen and oxadiazon resulted delayed seedling emergence by one day, abnormal seedling growth, increased epicotyler region with characteristic bending and slight leaf chlorosis but acquired normal growth within two weeks. Later on all the herbicides produced dark green leaves and resulted better growth. Oxadiazon reduced the stem length and leaf size but increased the root dry weight, number of branches, plant dry weight, number of pods, seed yield per plant and HI.

The LAI increased with age (1.41, 4.92, 6.16) and at 75 day stage maximum LAI was noted under fluchloralin (6.97) followed by metribuzin (6.81), oxyfluorfen (6.19), hand weeding (6.81) and oxadiazon (5.63).

The CGR increased with age upto 75 day stage and declined afterward. The maximum CGR was under oxadiazon (19.60 gm^{-2} day^{-1}) followed by oxyfluorfen (19.19) while it was the lowest in weedy check (12.74) at 75 day stage. Almost similar trend was noted for RGR.

NAR declined due to increased age and leaf area with slight increase at pod filling stage (0.62, 0.12, 0.14, 0.05 mg dm -2 day -1). It was maximum under oxadiazon (0.18) during pod filling. At 75 day stage, significantly greater LAI (7.18), CGR (20.06 g m 2 day –1) and RGR (19.68 mg g –1 day –1) were at 20 cm row spacing than 40 cm. Planting in 30 cm row spacing resulted significantly higher RGR and NAR.

Seeding at 125 kg/ha resulted in significantly higher plant population at initial stage, increased mortality percentage, plant heignt, leaf area per plant at 50 day stage, LAI, CGR, RGR, NAR at 75 day stage, seed yield per plant and crop biomass/ha.

PATH CO-EFFICIENT ANALYSIS OF SOYBEAN YIELD IN SOYBEAN-WEED-ECOSYSTEM

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The cause effect relationships in crop-weed ecosystem revealed that the weed biomass (kg/ha), total weed population (m^2), number of *Echinochloa crusgalli*, *Digitaria adscendens*, *Phyllanthus* spp. and *Cyperus rotundus* had negative correlations with seed yield. The coefficient values were-0.8494, -0.8892, -0,8991, -0.8983, -0.7133 and -0.3709, respectively. The reductron in yield could be predicted by 0.552, 2.461, 3.722, 44.698, 7.858, 12.509 kg/ha, respectively with increase in one plant of above weed components.

The strong positive correlation of seed yield, with crop biomass (r=0.9069), filled pods per plant (0.6409), branches per plant (0.6113), CGR at 75 day stage (0.4568) and 1000 seed weight (0.3772) was obtained. The regression equation (y=a+bX) predicted the increase in yield by 0.525, 1007.39, 883.67, 68.16 and 48.76 kg/ha with increase of one unit in crop biomass (kg), branches per plant, 1000 seed weight (g), filled pods per plant and CGR g m^2 day^{1}.

Path co-efficient analysis revealed that crop biomass had strong direct positive effect on seed yield (0.4255) followed by branches per plant (0.1477). While the weed biomass had greater negative direct effect on seed yield (0.7189). Total weed population and number of *Digitaria adscendens* also had direct negative effect. *Echinochloa crusgalli* had indirect negative effect on yield via branches per plant and NAR. *Echinochloa crusgalli* had the strong direct positive effect on weed biomass followed by *Digitaria adscendens* hence, considered as important weeds of soybean crop.

LATENT EFFECTS OF HERBICIDES APPLIED IN RICE-WHEAT SEQUENCE ON SEEDLING GROWTH OF WHEAT

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The information on latent effects of herbicides in the harvested seeds obtained from the treated crops are very meagre. Hence, wheat seeds were obtained from a herbicidal field trial conducted under rice-wheat cropping-system in which six herbicidal treatments to rice viz, oxadiazon 1.0 kg, thiobencarb 3.0 kg, butachlor 2.5 kg/ha pre hoeing I all super imposed with 2,4-D 1.0 kg/ha post 20 DAS, HW and control as main treatments and four sub-plot treatments viz, isoproturon 1.0 kg pre, oxadiazon 1.0 kg/ha pre, HW and control for wheat were tested. After crop harvest, the seeds were collected treatmentwise and tested for germination and seedling growth in pots to determine the latent affect of herbicides.

The results revealed that the herbicides applied to rice did not affect the seed germination and seedling growth of harvested wheat seed. However, the coleoptile length was increased due to thiobencarb and oxadiazon. The direct application of isoproturon and oxadiazon as pre emergence also had no latent effect on harvested seed, except oxadiazon which increased the leaf length of subsequent seedlings.

STUDIES ON SEED COAT STRUCTURE AND FLOATING BEHAVIOUR OF WEEDS

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Study on seed coat structure and floating of weed seed has greater significance on

weed seed dispersal and cleaning the crop seeds through dipping in water or saline solution. Therefore, weed seeds of sixty species of *Kharif* and fifteen species of *Rabi* seasons were collected and the seed-coat structure was studied The sinking and floating was noted by dipping in tap water, 5 % NaCl and 5 % clay solution in water.

Among fifty *Kharif* weed species, the seeds of 25 species were floated in all conditions and in case of ten species some seeds sinked and others floated. Seeds of fifteen species sinked in all media. In general seeds of compositae family floated due to persistant pappus or other appendages like corky spines. The common species of this family having floating type seeds were *Acanthospermum hispidum, Ageratum conyzoides, Caesulia axillaris, Xanthium strumarium, Blumea* spp , *Parthenium hysterophorus* and *Tridax procumbens*. Most of the graminaceous weed species viz; *Bothroichloa pertusa, Echinochloa colonum, Eragrostis* spp., *Saccharum spontaneum* and *Setaria intermedia* also had floaling type of seeds.

Amongst fifteen *Rabi* weed species, five species viz, *Chenopodium album, Chrozophora parvifolia, Medicago denticulata* (with fruit) and *Rumex dentatus* (with husk) had floating type seeds. The seeds of *Cichorium intybus* and *Portulaca oleracea* albeit, very minute but sinked in all media.

STUDIES OF WEED SEED LONGIVITY

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Seeds of sixty two weed species were collected, dried and stored in glass bottle to study the longivity. The germination test was conducted after 10 years of storage as per ISTA using the germination paper. The results revealed that out of 62 weed species only four species could germinate after 10 years of storage. The highest germination was noted in *Phaseolus trilobus* (55%) followed by *Merimia emerginata* (45%), *Cassia tora* (35%) and *Ipomoea pestigrides* (5%). The seeds of other species were nonviable or still dormant which need further study.

APPARENT PHOTOSYNTHETIC AND TRANSPIRATIONAL EFFICIENCY OF MAJOR WEEDS OF WHEAT

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Apparent photosynthetic efficiency and transpirational rates of major weeds of wheat crop under irrigated high fertility conditions were determined by computurised portable pl otosynthesis systems (LI-COR, LI 600). The field study on well illuminated top leaves (par ranged from 1317 to 1618 U E S^{-1} m^{-2}) revealed that *Medicago denticulata* had the highest apparent photosysthetic rate (17.92 mg CO_2 S^{-1} m^{-2} LA) followed by *Phalaris minor* (16.10 mg), *Melilotus alba* (13.56 mg), *Rumex dentatus* (12.62 mg) and *Cichorium intybus* (8.13 mg). The lowest rate was in *Chenopodium album* (5.41 mg). The transpirational rate was also the highest in *Medicago denticulata* (27.83 m mole H_2 O m^{-2} S^{-1}) followed by *phalaris minor* (21.08 m moles), and *Melilotus alba* (19.91 m moles). The rates were lower in *Chenopodium album* and *Cichorium intybus* (6.76, 7.15 m moles). The leaf temperature was higher in *Melilotus alba* (34.49°C) followed by *Medicago denticulata* (34.10) and *Chenopodium album* (33.65) which was higher by 2 to 3 °C than ambient temperature. In other weeds, it ranged from 31 to 32°C which was about 1°C higher than the ambient temperature. Stomatal resistance (Sr) was the highest in *Chenopodium album* (2 453 cm S^{-1}) and lower in *Medicago denticulata* (0.133) and wheat (0.201) which could be an important factor responsible for photosynthetic rates.

The wheat had the greater apparant pl otosynthetic rate (27.07 m g CO_2 m^{-2} S^{-1}) than all other weeds investigated. Based on photosynthesising leaf area, wheat was considered most efficient which had higher net dry weight accumulation followed by *Phalaris minor, Medicago denticulata, Cichorium intybus, Melilotus alba* and *Chenopodium album*. Hence, wheat was considered as efficient competitor with weeds.

PERIODICITY OF GERMINATION OF DIFFERENT *KHARIF* WEEDS UNDER KUMARGANJ CONDITION

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Studies carried out to investigate the chronological sequences of germination of *Kharif* weeds under field conditions revealed that all the weed species germinated from 16th June to Ist September. Most of the weed species completed their emergence in 3 to 4 flushes.

Amongst total weeds emerged, *Echinochloa colonum*, *Anelima nodiflora*, *Phyllanthus niruri*, *P. Simplex*, *Corchorus acutangulus*, *Eleusine indica* and *Digera arvensis* germinated from 16th June, *Ecliota alba*, *Caesulia axillaris* and *Alotropsis cimicina* from Ist July, *Fimbristylis* spp. from 16th July, *Ammania baccifera*, *Mollugo stricta*, *Lindernia ciliata L. bractiata* from Ist August, *Ammania multiflora* and *Euphorbia hirta* from 16th August and *Oldenlandia dichotoma* and *Eragrostis* from Ist September.

EFFECT OF HERBICIDES ON GERMINATION AND GERMINATION INDICES OF *Eupatorium odoratum* L. SEEDS

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Eupatorium odoratum L. plants produced large amounts of viable seeds. The seeds being small, winged and lighter in weight, disseminate tremendously and invade new areas very quickly. Thus it becomes essential to check the weed establishment by reducing the seed germinability by means of herbicide spray.

Seeds collected from plants treated with 2,4-D, paraquat and glyphosate, showed no germination at all the concentrations. However, seeds obtained from plants treated with atrazine and diuron showed germination which was on par with the control indicating the ineffectiveness of the said herbicides in inhibiting the seed germination. Further, the seeds treated directly with the solutions of 2,4-D, paraquat and ammonium sulphamate, recorded no germination at all the concentrations. Glyphosate and bromacil had little effect on seed germination, whereas atrazine and diuron treatments did not affect the seed germination.

EFFECT OF QUALITY OF WATER ON PHYSICO-CHEMICAL PROPERTIES OF PENDIMETHALIN SPRAY FLUID

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Laboratory experiments were conducted with water of different salt concetrations (EC) dominated by cations viz, calcium, magnesium and sodium. The treatments constituted distilled water, standard hard water, farm water collected from TNAU and water with EC 1,2 and 4 m mhos/cm with respective salt dominations as Ca, Mg and Na. Pendimethalin 1.0 kg/ha was used and calculated quantities of the formulation (s omp 30 EC) were mixed with different water and the different physio-chemical properties were estimated at different periods. The results revealed that Na dominated water showed creaming up (below the ISI limit) with pendimethalin. The viscosity of the spray fluid prepared in distilled water was maintained at the same level upto 12 hours, while with different quality water and with elapse of time, the viscosity was reduced. The surface tension of spray fluid was reduced in Na dominated water. Reduction in active ingredient content with increasing salt concentrations and time was observed.

ALLELOPATHY OF PLANT EXTRACTS ON *Parthenium hysterophorus* L.

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Relative efficacy of six plant species extracts obtained by three methods of extraction was studied to control *Parthenium* by allelopathy. Extracts of *Cassia sericea* significantly reduce the plant height, root length, number of leaves and branches of *Parthenium* at all the stages of study. The extracts of *Cassia sericea* were also superior in reducing the density of *Parthenium* at 60 DAS, while, extracts of *Parthenium hysterophorus* were effective at 30, 90 and 120 DAS showing the autotoxicity. Further, extracts of *Flaveria australasica* also reduced the dry matter production of *Parthenium* by 27 and 15 percent as compared to control at 90 and 120 DAS, respectively while, at 30 DAS extracts of *Parthenium hysterorus* and at 60 DAS extracts of *Parthenium hystero phorus* reduced the dry matter production of *Parthenium* Maximum weed control efficiency was recorded with the extracts of *Flaveria australasica* (72%), *Cassia scricea* (46%) and *Helianthus annus* (39%) at 30, 60, 90 and 120 DAS, respectively.

Hot methanolic extraction was better in reducing the density at all the stages of study. Though at 30 and 60 DAS hot methanolic extraction recorded lower dry matter production, but at 90 and 120 DAS aqueous extraction method resulted in lower dry matrer. However, aqueous extract was found to record maximum weed control efficiency at all the stages of study.

ALLELOPATHIC EFFECT OF DIFFERENT PLANT SPECIES ON *Parthenium hysterophorus* L.

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RAJENDRANAGAR-30

An experiment was carried out during 1988 on allelopathic control of *Parthenium hystcrophorus* by growing six plant species viz; *Cassia sericea* L., *Helianthus annus* L., *Flavere australasica* Hook *Tephrosia purpurea* Pers., *Celosia argentea* L. and *Parthenium hysterophorus* L. in *Parthenium* infested fields. *Cassia sericea* significanlly reduced the density and dry matter production of *parthenium* and also proved its superiority by resulting in 100 and 99.43 per cent of weed control efficiency at 30 and 60 DAS, respectively. However, *Parthenium hysterophorus* grown in *Parthenium* infested fields resulted in negative control efficiency i. e. -10.53 and -5.63 per cent at 30 and 60 DAS, respectively.

EFFECT OF *Cassia sericea* ON *Parthenium hysterophorus*

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A field experiment was conducted to find out the effect of *Cassia sericea* weed on *Parthenium* Five strips of *Parthenium* plant alone and five strips of *Parthenium* and *Cassia sericea* plants were maintained by uniform sowing of both seeds in a alternate rows in a combined plot. The plants wsre maintained for a period of 120 days with periodical irrigations. The growth performance of *Parthenum* plants both in terms of population/m^2 and DMP per plant were assessed at different stages.

The growth of *Cassia sericea* plant considerably suppressed the population of *Parthenium* weed. The percentage of reduction was more with vigorous growth of *Cassia* plants and a maximum reduction of 36.4 per cent was obtained at 60 th day after sowing. A significant reduction occurred in DMP of *Parthenium* and a maximum reduction of 18.1 per cent was recorded in 30 days old plant and beyond which the range of per cent reduction was declined.

INVESTIGATION ON ALLELOPATHIC EFFECTS OF *Cassia tora* ON *Parthenium hysterophorus*

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JABALPUR-482 004

Parthenium hysterophorus is spreading in noncropped and crop lands at faster rate. Under non-cropped lands, it has been observed that the *Cassia tora* communities suppressed the growth of *P. hysterophorus*. Hence, allelopathic effect of *C. tora* was suspected. With this view, the effect of the root, leaf, seed and whole plant extracts and seed of *C. tora* were studied on *P. hysterophorus* in two conditions viz; petridishes and germination paper under laboratory conditions. The effects of root, leaf, seed and whole plant powder and seed of *C. tora* were also investigated on *P. hysterophorus* under field condition during winter.

The laboratory tests revealed significant reduction in seed germination of *P. hysterophorus* under leaf and whole plant extracts as compared to control indicating allelopathic effects. It was also confirmed by field tests where addition of leaf or whole plant powder of *C. tora* to soil reduced the germination of *P. hysterophorus* significantly. However, complete inhibition was not found. The field test indicated that the *P. hysterophorus* could not be controlled by *C.tora*. Its intensity can only be reduced under non-cropped lands as during winter the germina ion of *C. tora* was very meagre but *P. hysterophorus* germinated profusely.

ALLELOPATHIC EFFECTS OF *Launea splaniifolia* ON *Rabi* CROPS AND WEEDS

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Allelopathic effect of *Launea splaniifolia* a common weed of *Rabi* crops, was studied on wheat, gram, lentil, peas, linseed and mustard and on weeds viz, *Vicia sativa* and *Lathyrus aphaca*. The seeds of each crop and weed were germinated in germination paper soaked with extracts (water) of roots, leaves, stems, whole plant and distilled water. The same set of treatments was repeated on soil filled in aluminium pots. The germination percentage and seedling vigour were determined under each extract and compared with control.

The germination was reduced under root and leaf extracts of *Launea splaniifolia* The root length was reduced in wheat and pulses but in linseed and mustard hypocotyl length was reduced. The greater growth reduction was noted in *lentil* and gram. The reduction in germination was also noted in *Lathyrus aphaca* and *Vicia sativa* Thus it indicated toxic effects of *Launea splaniifolia* on these crops and weeds. The allelopathic effects of this weed was also confirmed under field condition while making observation on crop growth under communities of *Launea splaniifolia*. Lentil crop was highly affected and crop mortality was observed apart from reduction in growth.

RESPONSE OF *Boerhaavia diffusa* TO *Trianthema portulacastrum*

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An experiment was carried out to find out the response of *Boerhaavia diffusa* to the *Trianthema portulacastrum* weed extracts. Ten percent aqueous extracts of

different parts of 24 hours soaked in water and they were applied to the *Boerhaavia* seeds at the rate of 250 ml per plot, besides maintained with a control for a check. Both germination percentage and growth performance of seedlings were assessed on 7th, 30th and 60th day after sowing.

The analysis of results indicated that the horsepurslane weed considerably reduced the germination of *Boerhaavia diffusa* with the exception in stem extract. Significant differences were observed in growth of root and shoot. The root extract caused much reduction followed by whole plant extract. The vigour index of seven days old seedling was much affected by the root and whole plant extracts of horse purslane. The total phenolies content of *Boerhaavia diffusa* plant was very much affected, when the weed was treated with root extract of horsepurslane. In general, the root and whole plant extract had a significant effect on *Boerhaavia diffusa* weed plant.

ALLELOPATHIC EFFECT OF HORSEPURSLANE *(Trianthema portulacastrum* ON JUNGLE RICE *Echinochloa colonum)*

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A pot culture experiment was carried out to find out the allelopathic effect of horsepurslane on jungle rice. Ten percent extract solution of different parts of horse-purslane weed namely root, stem, leaf and whole plant were prepared by soaking in water for 24 hours and they were applied to the pots sown with jungle rice weed seeds at the rate of 250 ml per pot besides maintained with distilled water for a check. The germination of weeds seeds on seventh day and growth performance of seedlings on seventh, 30th and 60th day were assessed.

The results revealed no reduction in germination and growth of jungle rice when it was treated with different parts of horsepurslane weed extracts. However, the leaf extract reduced the dry weight/plot at 60th day stage (142.7 mg) as against control (204 mg). But at the intitial stage (7th day) the same treatment recorded more dry weight. The total phenolies content of parts of weed plant (jungle rice) was not affected by the horsepurslane weed extracts, and hence there was not much harmful effect on jungle rice. (*Echinochloa colonum*)

ALLELOPATHY IN *Croton bonplandianum* Baill

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The aqueous leaf leachate of *Croton bonplandianum* at the highest concentration tested (i. e. 1 ml = 0.1 g dry wt. of leaf) brought about total inhibition of germination in plack gram, clusterbeans and mustard and redueed the germination. in french beans, green gram, finger millet and wheat. The root length in all the crop species was reduced. The aqueous leaf leachates obtained from soils containing 80 and 100 g dry weight of leaves of *C. bonplandianum* also brought about significant reductions in germination and seedling growth in cluster bean, radish and finger millet. Seeds of this weed also exhibited allelopathy and reduced the germination and seedling growth of finger millet (bioassay used) to varying degrees depending upon the seed rates (20, 40, 60 and 100 seeds/petridish). When air dried leaves of this weed were added to the soil, they reduced the germination of finger millet to the extent of 30-87 % at 0.5 to 10.0 g dry wt. as compared to control. A similar trend was observed with regard to root length also.

The inhibitory compounds were extracted and identified in *C. bonplandianum* p-hydroxy benzoic acid and p-coumaric acid were present in the leaf and only p-phydroxy benzoic acid in the root.

STUDIES ON ALLELOPATHIC EFFECTS OF *Eupatorium odoratum*

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DHARWAD-580005

Laboratory studies were conducted to know the allelopathic effect of siam weed (*Eupatorium odoratum*) on seed germination and subsequent growth of selected varieties of cereals, pulses and oil seed crops. Pronounced effect on seed germination by 5% leaf extract was observed in wheat cv. UP-301 (50.00%) and sunhemp (46.67%) when compared to their respective controls (80% and 93.33%). Reduction in root and shoot length was observed in all other crop varieties viz, CC-464, DWR-16 and UP-301 of wheat, cowpea (C-152), sabower, soybean, lucerne and sunhemp. Both 2% and 4% (w/v) concentrations of capitula extract were effective in suppressing shoot growth whereas reduction in germination did not show significant differences. In general, the study indicated greater growth inhibition by leaf extraction than seed extract.

EFFECT OF PHYTOTOXINS FROM WILD OATS *(Avena ludoviciana)* ON GERMINATION OF RICE CULTIVARS

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HISAR-125 004

Wild oats(*Avena ludoviciana*) is common weed of *Rabi* in rice-wheat rotation. Its residue was assayed for the phytotoxic effect on some rice cultivars.

In rice cv. Jaya, aqueous extract (10%) obtained by soaking of the above ground plant parts in water for 24 hours inhibited the elongation of hypocotyl and decreased the accumulation of dry matter in roots and shoots. The effect of plant litter

(2 g/petridish) obtained from root, shoot and husk revealed that the root litter had a promotary effect but shoot litter (stem+leaves) decreased the germination, inhibited the radical and hypocotyl length and dry matter accumulation by roots and shoots. The husk increased the radical length. Shoot litter also inhibited the germination of other rice cultivars viz, HKR - 126, HKR - 120, N - 22, ARC, WC - 1240, COBM 120 and IR 56.

EFFECT OF QUALITY OF WATER ON THE BIOEFFICACY OF PENDIMETHALIN IN SOYBEAN

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Field experiment was conducted with soybean var. Co. 1 during 1989. The treatments constituted pendimethalin (1. 0 kg/ha) spray mixtures in different quality water viz, distilled water standard hard water. Ca, Mg, and Na dominated waters with EC 4 m mhos/cm with spraying treatments immediately and 12 hours after mixing the herbicides. Phytotoxicity was more in Na dominated water of EC 4 mmhos/cm. applied immediately after mixing which decreased over the elapse of time upto 12 hours, probably due to the reduction in active ingredient content with time. No phytotaxic symptoms are observed in nonherbicidal plots. The lowest weed population (20 DAS) was recorded in hand weeded plot followed by pendimethalin with distilled water sprayed immediately and with Na dominated water sprayed 12 hours after mixing. The weed dry matter also followed similar trends. The highest grain yield was recorded in hand weeding twice as there is no phytotoxicity and fairly good weed control. The yield reduction under pendimethalin might be due to the phytotoxicity and/or due to production of toxic metabolites. The standard hard water and distiled water kept 12 hours after mixing was effective in reducing weed population and enhancing grain and stover yield.

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE ACTIVITY OF ISOPROTURON AGAINST *PHALARIS MINOR*

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The effect of different environmental factors like temperature, relative humidity, light, soil moisture and method of water application on the toxicity of isoproturon against *Phalaris minor* Retz. was studied under controlled environmental conditions at the Weed Research Organization, Oxford, England.

Warmer temperature (26/16 °C day/night) reduced the activity of isoproturon as compared to cooler temperatures (16/10 or 10/6 °C day/night). This trend in response was identical whether the plants were grown in a temperature either before and after or only after treatment implying that temperature after treatment was far more important. In general, the activity of herbicide through foliage was less or negligible.

Relative humidity (50/75 or 95/90% day night) had little effect on the activity of isoproturon. Soil moisture content at or following spraying had greater influence, wetter soil moisture regime (80 or 120% FC) resulting in greater toxicity than dry one (40 % FC). At 100% FC sub-surface watering had negligible effect on plant growth which was in direct contrast to surface watering. There was very little difference in the herbicide activity when the treated plants were subjected to different intensities of light (38 to 156 W/m²).

TRANSLOCATION OF DICAMBA IN *Solanum elaeagnifolium*

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Three experiments were conducted in pots under glass house conditions to find out the effect of damage caused and translocation of foliar applied systemic herbicide dicamba in *Solanum elaeagnifolium*. The herbicide at different concentration viz, 0.36, 0.48, 0.96 and 1.92 kg/ha mixed with C^{-14} were applied on 30 40 and days 55 days after planting. The herbicide applied plants were maintained separately for each stage and it consituted a single experiment. The plants showed phytotoxic symptoms within 24 hours of application and completely dried on third day after spraying. The analysis of C^{-14}activity and per cent distribution of applied herbicide revealed that, the leaf had more activity (38.66 to 46.61 10^{-4} uCi) followed by stem (15.13 to 30.51 to 10^{-4} uCi) and root (3.76 to 8.82 10^{-4} uCi) The herbicide had moved even to the lower most part of the root zone and the per cent distribution of herbicide was high in the increasing order of root, stem and leaf. The increase in the dose of herbicide applied, the activity and distribution were high in all parts of the weed plant.

GROWTH OF WEEDS AT VARIOUS FERTILITY LEVELS UNDER IRRIGATED WHEAT ECOSYSTEM

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The influence of three levels of N (40, 80, 120 kg/ha) and P (0, 40, 80 kg/ha), two levels of K (0, 40 kg/ha) in all possible combination and an absolute control

(No Po Ko) has studies on growth of various weeds in association with irrigated wheat under heavy clay soils. The major broadleaf weeds were *Melilotus alba*, *Trifolium flagiferum*, *Lathyrus aphaca*, *Chenopodium album* and *Angalis arvensis*. The dominant grasses were *Phalaris minor*, *Eragrostis dianthena*, *Cynodon dactylon* and *Paspalum distichum* while sedge was only *Cyperus rotundus*.

The growth of all the weeds except *Phalaris minor* was higher under NPK treatments. As the fertility levels increased the growth in terms of dry weight was decreased. In case of *Phalaris minor* the growth was poor at lower fertility and increased with increasing levels of added NPK. Under well managed wheat weed ecosystem, wheat crop responded more to NPK than *Phalaris minor* or other weeds. At N120 P80 K40 kg/ha most of the weeds viz, *Chenopodium album*, *Anagallis arvensis*, *Trifolium flagiferum* and *Vicia sativa* were suppressed almost completely due to greater crop growth. The wheat growth and yield were lower under control and increased with increasing fertility upto N 120 P80 K 40 level.

EFFECT OF DIFFERENT AGRO-CHEMICALS ON THE YIELD AND QUALITY OF WHEAT

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The experiment involving five treatments viz, control (water spray). Atonik spray (1000 : 1000). Atonik (1500 : 1500), Mixtalol (100 : 100) and Mixtalol (150 : 150) was carried out in two consecutive *Rabi* (winter) 1982 and 1983 on sandy loam soils of medium fertility under irrigated conditions. The chemicals were sprayed at tillering and at before heading stage.

The results revealed that both the agro-chemicals at both the concentrations proved better than water spray and further more, agro-chemical mixtalol at its both the concentrations proved better than both the concentrations of Atonik in increasing the grain yield and also proved equally good to atonik in protein content.

LIMITATIONS IN TRANSLOCATION OF FOLIAR APPLIED HERBICIDE AND ITS SIGNIFICANCE IN HERBICIDE RESISTANCE IN *Oxalis latifolia H. B. & K.*

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2,4-D and glyphosate spray were effective in killing the shoots of *Oxalis latifolia* but did not prevent the sprouting of the bulbs. For understanding the possible reasons for herbicide resistance, experiments were conducted to assess the entry and translocation of foliar applied labelled 2,4-D to the under ground bulbs in intact *Oxalis latifolia* under field/pot conditions. The translocation of labelled 2,4-D was compared to labelled sucrose in the same weed. Translocation pattern of labelled 2,4-D showed that, much of the 2,4-D remained in the foliage and did not translocate to the bulb. Least activity was observed in newly formed bulbs. Whereas, sucrose translocated was much to newly developing bulbs and least to the roots. Lack of 2,4-D translocation to the underground parts was attributed to enhanced callose aocumulation in 2,4-D sprayed plants.

Ethephon pretreatment, 24 h prior to 2,4-D or sucrose spray enhanced the entry and translocation of both the compounds but did not altered the translocation pattern. The possible role of ethephon in enhancing the effectiveness of foliar applied herbicide and lack of herbicide mobility through phloem owing to callose accumulation leading to herbicide resistance are discussed.

RELATIONSHIP OF MICRO FLORA AND FUNA WITH WEEDS AND HERBICIDES PATHOGENIC POTENTIALITY OF SOME FUNGI TO CONTROL *Parthenium hysterophorus*

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Pathogenicity of twenty fungi isolated earlier from living and diseased parts of *Parthenium hysterophorus* L. and their potentiality as biocontrol agent has been discussed in this paper. *Alternaria alternata*, *A. dianthi*, *A. macrospora Myrothecium roridum*, *Collectotricum gloesosporioides*, *Drechslora indica*, *Bipolaris* sp. *Fusarium equiseti* and *F. oxysporum* caused considerable damage to the weed and may be exploited as bio-control agent after critical evaluations.

FUNGI ASSOCIATED WITH CONGRESS WEED (*Parthenium hyterophorus* L.)

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Parthenium hysterophorus L. is an obnoxious weed, occupying vast areas of cultivated land causing serious environmental concerns as human and animal health hazards in most of the states of India. Twenty five fungi, associated with the weed, ar reportedin this paper. It is important that a catalogue of organism be presented to from the foundations of further research, The pathogenicity of these fungi is yet to be terted and they may have notential for biolgical of the weed.

INFLUENCE OF HERBICIDES ON NODULATION UNDER DIFFERENT ROW SPACINGS AND SEEDING RATES IN SOYBEAN

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Influence of six herbicidal treatments viz, fluchloralin 1.0 kg/ha ppi, oxyfluorfen 0.2 kg, metribuzin 0.5 kg and oxadiazon 1.0 kg/ha all as pre em, hand weeding 2 and weedy check was investigated on nodulation in soybean for two years under six cultural treatments viz, three row spacings (20, 30 and 40 cm) x two seedling rates (100 and 125 kg/ha),

At initial stage, the number of nodules and nodule dry weight per plant were significantly reduced under herbicidal treatments but at 50 and 75 day-stages, greater nodulation was under oxadiazon and oxyfluorten. None of the herbicides had inhibitory effects on nodulation vis-a-vis rhizobiae activity in soybean.

At 75 day stage, planting in 30 cm row spacing resulted significantly higher nodule number. At 100 kg/ha seeding rate nodule dry weight per plant was significantly greater than higher seeding rate of 125 kg/ha.

EFFECT OF PRE-EMERGENCE HERBICIDES ON THE GROWTH AND NODULATION IN GROUNDNUT *(Arachis hypogaea* L.)

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Groundnut (var. MH-2) plant were raised in earthan pots filled with mixture of field soil and FYM (6 : 1) under open air net house conditions and treated with

perdimethalin 0.25, 1.0 and 1.25 kg/ha pre, fluchloralin 1.0 and 1.5 kg/ha ppi and water sprayed control. Plants were sampled at 30,45 and 60 days after sowing by washing the soil under running tap water. Length of shoot and root and their dry weights, number of nodules per plant and their leghaemoglobin content and leaf pigments were estimated.

Total chlorophyll content was increased with the application of fluchloralin and pendimethalin in the beginaing but decreased at later stages. Whereas the carotenoid content was increased at later stages, but decreased or at par with control in the beginning. Shoot and root length of the plants were increased with application of lower doses of both herbicides but the higher doses decreased the length. The number of nodules per plant were increased after 45 days of application at lower doses of both the herbicides. Fluchloralin 1.0 kg/ha increased the number of pods, pods and seed weight and number of seeds per plant. Pendimethalin deereased the yield at tributes in groundnut.

EFFECT OF HERBICIDES APPLICATION ON SOIL MICROBIAL POPULATION OF PADDY SOIL

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A experiment consisting of granular and liquid for nulation of herbicide application in rice to control weeds anp their effects hn soil microbial population was carried out. The microbial population was enumerated by standard plate technique using selective media at interval of 10 days after application of herbicides. The results indicated that all the herbicides applied (paraquat. thiobencarb. butachlor, propanil and bentazon) post, adversely affected, followed by fungi and actynomycetes in decending order. The adverse influence of herbicides gradually reduced with the passage of time. There was practically no effect of paraquat, butachlor and propanil on soil microbial population.

EFFECT OF HERBICIDES ON RICE ROOT NEMATODE *(Hirschmanniella mucronata)* WEEDS AND PLANT GROWTH OF RICE

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An investigation was carried out to assess the effect of eight herbicides such as bensulfuron methyl, butachlor, quinchlorac, thiobencarb, pretilachlor, pendimethalin, piperphos and 2,4-D including a handweeded and unweeded check against the rice root nematode *Hirschmanniella mucronata* and some low land weeds. Results indicated tnat butachlor 1 kg/ha and pretilachlor 0.45 kg/ha were highly effective in supressing nematode population as well as weed growth. Consequently use of these herbicides stimulated also the plant growth and yield.

EFFECT OF PARAQUAT ON THE INCIDENCE OF VIRAL DISEASES IN POTATO CROP

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It is a recommendation to use paraquat (gramoxone) 2.5 kg/ha (comm.) after 5% germination of potato crop in the field to control the population of the weeds. Since, viral diseases are very important in potato which caused severe reduction in yield. The observation were recored the incidence of virus in sprayed and non-sprayed potato fields, on the basis of five years data (1984-1988). It is concluded that the incidences of virus infection were less in sprayed fields in comparision to non-sprayed fields.

WEED HOSTS OF SINGHARA PESTS

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Singhara (*Trapa bispinosa*) is an important aquatic crop grown in tanks and ponds in Madhya Pradesh. The several insect pests infest this crop during growing season (July-December). During nongrowing season, these pests svrvive on aquatic weeds which act as alternate hosts. Hence, the insect pests of *Trapa* crop were recognised and alternate weed hosts were identified by making regular visit to tanks and ponds around Jabalpur and remote areas where tribals are cultivating this crop The weed hosts identified for major pests are *Eichhornia crassipes, Ipomoea aguatica* and *Jussiaea* sp. Former two are the hosts of Singhara blood-worm (*Stenochironomous* sp.) and later is the host of blue beetle (*Haltica cynea*). Azolla spp., a very detrimental weed of *Trapa* crop acts as a strong desseminator of *Singhara* beetle (*Galerucella birmanica* Jacoby.) and provide shelter.

The aquatic vegetation which act as weed pests were also identified which consisted of *Azolla* spp. *Salvinia* spp., *Lemna* spp. *Spirodella* spp., *Pistia stratiotics* and *Eichhornia crassipes* amongst floating types; *Caratophyllum demersum, Potamogeton* spp., *Utricularia* spp., and *Vallisneria* spp. amongst submerged weeds and *Ipomoea aquatica* and *Jussiaea* spp. under emerged rooted types.

WEED FLORA OF POTATO SERVING AS ALTERNATE HOSTS FOR *Myzus Persicae* IN SATPURA PLATEAU

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A survey to identify the weeds of potato as alternate hosts of *Myzus persicae* was conducted dnring 1987-89. *Chenopodium album* was the most dominant weed herbouring

maximum aphid population. As much as 20 aphids/plant were recorded on this plant during the last week of Januarp, 1988. *C. album* was found to serve as alternate host for *M. persicae* during December to March Considerable aphid population was recorded on *Solanum nigrum*, *Amaranthus viridis*, *Euphorbia hilta* *E. geniculata* and wild mustard. Some other weeds serving as alternate hosts of *Myzus Persicas* have also been recoried.

SUICIDAL DEATH OF WEEDS WITH PRESOWING IRRIGATION IN PALMAROSA NURSERY

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In present studies an attempt was made to monitor the effect of presowing irrigation in stimulating the germination of weeds and their suicidal death on weed comptition in palmarosa (*Cymbopogon martinil*) nursery during 1987 and 1988. Nursery beds were given 1, 2 and 3 pre sowing irrigations to keep them moist for different length of time (3—10 days) Second and third irrigation were applied at about 60-80% available soil moisture. In another set of treatments one manual weeding was super imposed on presowing irrigation treatments. These were compared with one hand weeding 10 DAS (days after sowing), two hand weeding 10 & 25 DAS, weedy check and weed free check.

The results revealed that prosowing irrigation and its frequencies were highly effective in stimulating the germination/sprouting of weeds Weed population recorded at 40 DAS (at the time of uprouting of seedlings) indicated that presowing stimulation of germination and suicidal death of weeds resulted in 32.7, 59.3 and 70.1% reduction in weed population with 1, 2 and 3 irrigations, respectively as compared to the population in weedy check, the corresponding decrease in weed dry weight was 22.7, 47.9 and 77.4% respectively. Manual weeding superimposed on presowing irrigation brought further reduction in weed dry matter. The reduction in weed competition (in terms of weed dry matter) with 1, 2 and 3 pre sowing irrigation superimposed with one manual

weeding, was 87.5, 93.9 and 94.9%, respectively when compared to weedy check plots. The effect of reduced weed competition was clearly visible on growth and dry matter of seedlings. The weeding efficiency of manual labour was several fold more in plots with presowing irrigation than without irrigation. Thus, the results of present investigation led to the conclusion that weed competition in Palmarosa nursery can be minimised to a significant level by keeping nursery beds moist for 6-10 days using 2-3 presowing irrigations.

EFFECT OF PARAQUAT ON THE INCIDENCE OF VIRAL DISEASES IN POTATO CROP

R. B. Sangar, M. S. Parihar and R. P. Pandey
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AMBIKAPUR-497 001

It is a recommendation to use paraquat (gramoxone) 2.5 litres/ha after 5% germination of potato crop in the field to control the population of the weeds. Since viral diseases are very important in potato which causes degeneration in the yield. The observations were recorded on the incidence of virus in sprayed and non-sprayed potato fields it is concluded after five years of experimentation (1984-1988) that the incidence of virus infection were less in sprayed fields than non-sprayed fields.

PERSISTANCE OF FLUAZIFOP-P-BUTYL IN SOIL UNDER LABORATORY CONDITIONS

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Investigations were conducted on persistance of fluazifop-butyl in IARI (alluvial) soil under laboratory conditions by incubating the treated (10 & 20 ug^{-1}) moist soil at

28 +/1 °C and monitering herblcide as 'total fluazifop residues by HPLC technique at regular intervals. Influence of temperature on the persistance of the herbicide was studied by incubating the treated soil (10, ug g^{-1}) at 3 temperatures viz,28+/1 °C,35+/1°C and 40 + 1 °C.

The degradation of fluzifop-p butyl in soil followed a pseudo-first order reaction kinetics with half-life ranging between 19 8 to 29.8 days. The persistence of the herbicide was higher with higher rate of application. Degradation was highest at 40 (half-life, 14.8 days) followed by 35 °C (half-life,17 5 days) and 28 + 1 °C (half-life, 19.8 days). At the end of 90 days 15.36, 11.87 and 9.38 percent herbicide residues persisted in soil at 28 , 35 and 40 °C, respectively, from normal rate of application.

STUDIES ON MANAGEMENT OF ATRAZINE RESIDUES IN SOIL USING CERTAIN AMENDMENTS

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Experiments were conducted under green house conditions with soybean var. Co 26 and without crop. Organic manures viz, farm yard manure 12.5 t/ha, compost 12.5t/ha poultry manure 2.5 t/ha and amendments viz, oxalic acid, citric acid, succinic acid, phosphoric acid, urea and ammonium sulphate (each at 50 ppm concentration) were tried. Atrazine was applieat 0 5 ppm to all the pots 3 days after sowing. Periodical analysis of atrazine content in soil was taken up in uncropped pots Repeated sowings of soybean at regular intervals were takenup. The results revealed that the atrazine content in soil reducted considerably with time. The reduction was specetacular in treatments with farm yard manure, phosphoric acid and compost, which is evidenced from the increaseo dry matter of soybean and sorghum crops taken 30 days after sowing. The grain and stalk yield of sorghum also showed similar trends indicating the superiority of farm yard manure (12.5 t/ha), phosphoric acid (50ppm) and compost (12.5 t/ha) in reducing the atrazine residues in soil.

INFLUENCE OF ORGANIC MANURES ON HERBICIDE RESIDUE IN SOIL

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Cucumber growth bioassay was used to detect the residue of butachlor, applied at three different doses viz, 1,0, 1.5 and 2.0 kg/ha to rice soil, along with different sources of organic manures like FYM, pressmud, *Glyricida maculata* and *Pressmud+Glyricida maculata*. All the organic manures slightly increased the growth parameters of cucumber (germinati n percentage, plant height and dry matter) over no organic manuring. But even at 2.0 kg/ha, butachlor residue in soil was untraceable (less than 0.05 ppm) regardless of organic manure addition.

PERSISTANCE OF ATRAZINE RESIDUES IN SOIL

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LUDHIANA-141 004

Residue of atrazine (0.625 kg/ha) applied to *Kharif* maize was studied in 0–5 cm and 5–10 cm soil depth over a period. The results revealed that in 0-5 cm soil depth there was a progressive decrease in herbicide concentration from zero to 90 days after application. In case of 5–10 cm soil depth there was no change in concentration for first 10 days. The concentration of atrazine increased after 20 days and there-after, started decreasing. At 90 days after application the soil contained 0.030 ppm atrazine in both 0-5 and 5-10 cm soil depth.

STUDIES ON METOXURON PERSISTANCE IN SOIL

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Persistance of metoxuron applied postemergence (30 days after sowing) for weed control in wheat at 1·0 and 1.5 kg/ha in a loamy sand soil (0–5 cm) was studied. At 5, 10, 15, 20, 30, 40, 50 & 60 days after application the concentration of metoxuron in soil was 0.021, 0.014, 0 012, 0.010, 0.009, 0.007, 0 007 and 0.005, ppm at 1.0 kg/ha and 0 022, 0.017, 0.014, 0.01, 0.008, 0.007, 0.007 and 0.007 at 1.5 kg/ha, respectively. At 80 days after application metoxuron was degraded to non-detectable limits.

BIOASSAY FOR HERBICIDE RESIDUE STUDY IN SOIL UNDER RICE-WHEAT CROPPING SYSTEM

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The herbicides residue in soil was studied under rice-wheat cropping system after two years of continuous application. Oxadiazon 1 0 kg/ha, thiobencarb 3.0 kg/ha and butachlor 2.5 kg/ha all aspreem were applied to rice maintaining a control (HW). Subsequently isoproturon 1.0 kg pre emergence and oxadiazon 1.0 kg pre emergence and control were assigned in subplots for wheat. After two years of continuous application the soil was collected and filled in pots. The indicator species viz, finger millet, cucumber and black gram were grown and germination and growth parameters were compared with control and the known concentration of herbicides.

The results revealed no residue of butachlor, thiobencarb and isoproturon in soil as there was no reduction in germination and growth of test crops. The residual effect of oxadiazon applied to rice was not evident but its application to wheat showed residue after harvest of wheat crop as evidenced by reduction in leaf length and dry weight of finger millet.

STUDIES ON RESIDUAL EFFECT OF HERBICIDES APPLIED IN RICE ON SUCCEEDING WHEAT CROP

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A field trail was carried out during *Rabi*, 1986-87 to study the residual effect of herbicides applied in rice on succeeding wheat crop. The herbicides, applied to rice were thiobencarb (2.0 kg/ha), butachlor (1.5 kg/ha), fluchloralin (1.0 kg/ha) and pritilachlor (0.75 kg/ha) all applied 3 days after transplantation. The results revealed that the different herbicides applied to transplanted rice did not show residual effect on weed density, dry weight of weeds and grain yield of wheat.

STUDIES ON RESIDUAL TOXICITY OF THE HERBICIDES SPRAYED TO RICE ON SUCCEEDING *RABI* CROPS

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A field study on weed contral in drilled paddy (IET-1444) using propanil, butachlor, bentazon, fluchloralin and oxyflurofen was condueted during 1980-81. The results indicated that oxflurofen was quite effective in controlling the weeds of all

kind. It also effectively controlled the weeds like *Echinochloa crusgalli* and checked the growth of *Cyperus* at 0.4 kg/ha. The grain yield of paddy was highest (22.75 q/ha) in oxyflurofen which was closely followed by weed free check (22.25 q/ha). Studies on residual toxicity on *Rabi* crops with these herbicides revealed that Bengal gram and field bean were sensitive to residues of bentazon 1.5 kg/ha. Little retardation of growth of field bean was observed with ox flurofen 0.4 kg/ha but the *Cyperus iria* was controlled even during *Rabi* rainfed conditions.

HERBICIDES RESIDUE IN SOIL AFTER SUMMER MOONGBEAN

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A field trial was carried out during summer 1987. Post harvest soil samples were taken from the experimental field and bioassy studies were done in the laboratory. The herbicides were fluchloralin 1.0 kg/ha ppi and haloxyfopmethyl 0.12, 0.24 and 0.36 kg/ha at 20-day stage. The reseults showed that the herbicides applied in summer moongbean did not leave any adverse level of residue in soil after harvest of crop.

RELATIVE EFFICACY OF VARIOUS HERBICIDES IN CONTROLLING WEEDS IN POTATO AND THEIR RESIDUAL EFFECT ON WHEAT

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Studies were made with potato variety Chandramukhi to assess the relative bio-efficay of metribuzin, pendimethalin and oxadiazon with recommended herbicides viz, fluchloralin and alachlor. The residual toxic effect was studied on wheat sown in standing

crop of potato. All the herbicides had an excellent control of weeds and reduced the dry matter production as compared to weedy check. The highest tuber yield was obtained under oxadiazon but it was not significantly different from the tuber yields produced uuder metribuzon, pendimethalin, fluchloralin and hand weeding. Alachlor and lower concentration of metribuzin, oxadiazon and pendimetalin produced significantly lower tuber yield as compared to higher rates. None of the herbicides left any toxic residues in the soil which was evidenced from non-significant difference in the wheat yield obtained under various herbicides and in untreated control.

EFFECT OF HERBICIDES ON WEEDS AND YIELD OF MAIZE AND THEIR RESIDUAL EFFECT ON SWEET POTATO AND TORI

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Field experiments were conducted for three years from 1984–85 to 1986-87 to study the effect of herbicides on weeds and yield of maize and their residual effects on succeeding crops of sweet potato and *Tori*. The treatments comprised of different rates of atrazine with 2,4-D as post emergence alongwith HW and weedy check. In maize, unweeded control recorded the highest dry matter yield of weeds (22.5, 12.3 and 14.56 q/ha) All the weed control treatments resulted in significantly lower weed dry matter than unweeded control and were statistically at par. Hand weeding was at par with herbicides and recorded the grain yield of maize in the range of 28.5 to 35.6 q/ha.

Reemergence of weeds in *Tori* and sweet potato immediately following the maize crop was greater problem resulting in significantly higher weed dry matter in control plots in all the years. All the maize applied herbicides, significantly brought down weed dry matter accumulation per unit area in succeeding *Tori* and sweet potato crops. Weedy check recorded the lowest *Tori* and sweet potato yields. Highest *Tori* and sweet potato yields were obtained from maize applied atrazine+2,4-D plots. *Tori* and sweet potato crops were not affected due to residual effect of herbicides applied in preceeding maize crop".

DEGRADATION AND PERSISTENCE OF FLUCHLORALIN IN DIFFERENT SOIL TYPES

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Laboratory experiments were conducted in different soils viz; alluvial, black and red soils to study the degradation and persistence of fluchloralin. Fluchloralin was applied at 1.0 kg/ha to all the soils. Fluchloralin in the soil samples were analysed at periodic intervals using Gas chromatography equipped with electron capture detector. Fluchloralin persisted upto 90 days in black soil with a calculated half life of 38.8 days while in alluvial and red soils it persisted upto 80 and 70 days respectively.

PERSISTENCE OF POST PLANTING APPLICATION OF PENDIMETHALIN AND FLUCHLORALIN IN SOIL AND RESIDUES IN ONION

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A field study was carried out with onion (Cv. Pusa red) at Anand on loamy sand soil during 1987-88. Ftuchloralin was applied at 1.0 kg/ha while pendimethalin at

0.75, 1.0, 1.25, 1.5 and 2.0 kg/ha in 500 l/ha as post-planting (5 DATP). Both herbicides controlled weeds comparable with handweeding. After harvest, it was indicated that residues of pendimethalin and fluchloralin were below the tolerance limit i. e upto 0.056 ppm for pendimethalin 1.0 kg/ha and 0.126 ppm for fluchloralin in onion bulb while in soil for the same dose were 0.076 and 0.040 kg/ha for pendimethalin and fluchloralin respectively.

HERBICIDE RESIDUE

STUDIES ON RESIDUAL EFFECT OF HERBICIDES APPLIED IN WHEAT ON SUCEEDING CROP OF RICE

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A field trial was conducted during *Kharif*, 1987 to study the residual effect of herbicides applied in wheat on rice. The results revealed that the herbicides namely 2,4-D Na salt 0.5 kg/ha, isoproturon 1 kg/ha and methabenzthiazuron 1.4 kg/ha all applied 30 DAS in wheat did not show residual effect on weed density, dry weight of weed and grain yield of rice.

EFFECT OF INCORPORATION OF WEEDS ON THE AVAILABLE NUTRIENT STATUS IN SOIL

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Nutrient recycling in crop weed ecosystem was studied by incorporating the weeds in *situ* in the field on a sandy clay loam soil. Seventeen dominent weed species were

collected at pre-flowering stage and the calculated quantity of each weed species was added to soil 0.5 percent (W/W). The soil was irrigated periodically for effective decomposition of weeds and to maintain soil moisture approximately at 50% FC. The soil samples were drawn 0-15 cm depth of each treatment at 15, 30, 45, 60, 75, 90 and 105 days after incorporation and analysed for available N. P. and K status. Incorporation of weeds significantly increased the available N, P, and K status of soil upto 30-45 days. Incorporation of *Digera arvensis, Xanthium strumarium, Tridax procumbans* increased the available 'N' status upto 20 to 25% as compared to paddy straw. Incorporation of *Euphorbia geniculata. Parthenium hysterophorus, Sida glutinosa* increased the available P upto 20-25% while the incorporation of *Digera arvensis, Xanthium strumarium Almania nodiflora* resulted in 13-15% increase in available K status as compared to paddy straw. The effect of weed species on available nutrient status was also studied.

PESTICIDE RESIDUES AND HUMAN HAZARDS–A REVIEW

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Pesticides have become mainstay of modern farming in India in order to control pests and weeds in farming and in storage systems. Besides use in agriculture, a considerable portion is used in public health protection-cum-eradication programmes. These chemicals aimed at controlling pre and post emergence weeds and pests in crop production and in grain storage are transformed inside biological system whether plant or animal into other compounds termed residues which sometimes are more toxic than the parent pesticidal molecule itself persist in feeds and foods, so that the environment becomes polluted terminally to cause hazard to human health. Tolerance limit in feeds and foods have been reviewed.

NEW HERBICIDES

WEED CONTROL STUDIES IN TRANSPLANTED RICE WITH CINMETHYLIN

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Field experiments were conducted on transplanted rice to study the efficacy of cinmethylin 40, 60, 80, 100, 160 g/ha, butachlor 1.25 kg/ha and cinmethylin 80 + 2, 4-D EE 400 g/ha comparing with unweeded control during *Kharif*, 88-89 and 89-90. The results on weed susceptibility at various doses of cinmethylin indicated that the weed species, *Cyperus iria*, *Cyperus difformis*, *Fimbristylis miliacea*, *Seirpus spp.*, *Echinochloa crusgalli*, *Echinochloa colonum*, *Leersia hexandra*, *Dinebra retroflexa*, *Monochoria vaginalis*, among sedges and grasses, *Ludwigia perennis*, *Eclipta alba*, *Ammannia baceifera*, *Cardanthera uliginosa*, *Bergia ammanioides*, among dicots were highly susceptible, while the weeds like *Cyperus rotundus*, *Bergia capensis*, *Spheonclea zeylanica*, were resistant.

The results indicated that the application of cinmethylin 160 g/ha recorded the lowest weed density and dry weight of weeds followed by its lower dose of 100 g/ha and the combination of cinmethylin 80 g + 2, 4-D EE 400 g/ha. Mean maximum grain yield of 62.12 q/ha was recorded with cinmethylin 100 g/ha followed by the combination of cinmethylin 80 q/ha (59.62 a/ha). Significantly lowest yield was recorded in unweeded control.

Results revealed that the application of cinmethylin 80 to 100 g/ha and the combination of cinmethylin 80 g + 2, 4-D EE 400 g/ha were useful in controlling weeds and to increase the grain yield of rice.

EVALUATION OF FLUAZIFOP-P-BUTYL FOR WEED CONTROL IN SOYBEAN

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The weed survey in soybean fields revealed that the grassy weeds constitute more than 60% of total weed flora in M. P. Hence, efficacy of fluazifop-p-butyl 0.125, 0.25, 0.50 kg/ha post at 15 and 21 DAS and 0.125, 0.25, 0.50 kg/ha at 15 DAS superimposed with hand weeding 20 DAS was evaluated for grassy weed control in soybean. It was compared with haloxyfop-methyl 0.125, 0.25 and 0.50 kg/ha post 15 and 21 DAS. The major grassy weeds were *Echinocchloa crusgalli* var. *oryzichola*, *Digitaria adscendens* and *Cynodon dactylon*. Other associated *weeds were Commelina communis*, *Alysicarpus rugosus*, *Eclipta alba*, *Corchorus* spp., *Phyllanthus niruri*, *P. simplex*, *Rotala indica* amongst broad leaf weeds and sedges were *Cyperus rotundus*, *Cyperus* spp. and *Fimbristylis* spp.

All the weed control treatments reduced the weeds significantly than weedy check. Fluazifop-p-butyl and haloxyfopmethyl were effective against grassy weeds only. The effects were noted 4 to 5 days after spraying. Fluazifoppbutly 0.5 kg/ha was more effective at both intervals having 57% WCE based on weed dry weight at harvest. At 0.125 and 0.250 kg/ha, older grassy weeds particularly *E. crusgalli* var. *oryzichola* regenerated. Haloxyfop-methyl 0.5 kg/ha 21 DAS was better amongst all the herbicidal treatments having 60-65% WCE and at par to HW. Fluazifoppbutyl or haloxyfop-methyl did not show any phytotoxic effects on soybean at any rate and stage. All the weed control treatments gave significantly higher yields than weedy check (9.48 q/ha) and at par to HW (21.22 q/ha) except fluazifoppbutly 0.125 kg at 15 DAS and hand hoeing. Among herbicides, greater yields were obtained with higher rates of 0.5 kg at 21 DAS under both fluazifop-p-butyl (21.01 q/ha) and haloxyfopmethyl (22.28 q/ha). Superimposing HW on fluazifop-p-butyl was not beneficial.

INFLUENCE OF FLUROXYPYR ON WEEDS IN WHEAT

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Two years field studies were conducted for the control of broad leaf weeds in wheat. Fluroxypyr was very effective against wild pea (*Lathyrus aphaca* L.) and common vetch (*Vicia sativa* L.) However, fluroxypyr was less effective on *Chenopodium album* L. than 2,4-D and isoproturon. Combiuation of isoproturon 1.00 kg/ha + fluroxypyr 0,20 kg/ha or isoproturon 1.00 kg/ha + 2,4-D 0 25 kg/ha or isoproturon 0.75 kg/ha + 2,4-D 0.50 kg/ha as tank mixture improved the spectrum of weed kill and gave greater yields than 2,4-D alone at 0.25 kg, 0.50 kg/ha, methabenzthiazuron 1.4 kg/ha and the weedy check.

EVALUATION OF FLUROXYPYR AND TRALKOXYDIM FOR BROAD SPECTRUM WEED CONTROL IN WHEAT

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Fluroxypyr and tralkoxydim were evaluated for the control of grassy and broad leaf weeds in two field experiments. Fluroxypyr controlled broad lenf weeds but not grassy weeds. Tralkoxydim at 0.30 kg/ha controlled wild oats (*Avena ludoviciana* L) and wild canary grass (*Phalaris minor* Retz) but did not affect the broad leaf weeds. Isoproturon 1.0 kg/ha + 2,4-D 0.50 kg/ha controlled both grassy and broad leaf weeds. Wheat plants treated with fluroxypyr 0.30 kg/ha + 2,4-D 0.25 kg/ha or fluroxypyr 0.30 kg/ha + Isoproturon 0.50 kg/ha produced similar number and length of heads and grain yield of wheat as that of weed free check. Isoproturon 1.0 kg/ha + 2,4-D 0.50 kg/ha or isoproturon 0 50 kg/ha + fluroxypyr 0.30 kg/ha were potential broad spectrum weed control treatments.

EFFICIENCY OF 2,4--D AND FLUROXYPYR IN WHEAT

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An experiment was conducted during *Rabi*, 1988-89 with fluroxypyr (0.10, 0.15 and 0.20 kg/ha), 2,4-D (0.25 and 0.50 kg/ha) applied at 30 days after sowing alone and in all possible combintions as tank mixture, weedy and weed free check.

Phalaris minor, followed by *Malilotus indica* and *Anagallis arvensis* were the predominant weeds. The total dry matter of weeds remained high because of the presence of *P. minor* which was not controlled by either of the herbicides. Maximum grain yield (44.08 q/ha) was recorded from 2,4-D at 0.5 kg+fluroxypyr at 0.2 kg/ha which was significantly higher than the weedy check (34.63 q/ha). All the combinations of 2,4-D and fluroxypyr produced almost similar grain yields which were significantly higher than the weedy plots.

CONTROL OF WEEDS IN WHEAT THROUGH HERBICIDES

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Experiments on bio-efficacy of tralkoxydim and fluroxypyr alone and in combination with other herbicides revealed that the higher rate (0.35 kg/ha) of tralkoxydim applied 30 days after sowing was effective in controlling *Phalaris minor* but it could not control broadleaf weeds. Mixture of tralkoxydim and 2,4-D (0.250+0.4 kg/ha) effectively controlled *Phalaris minor* as well as brodleaf weeds. Application of fluroxypyr was as effective as 2,4-D on dicot weeds.

The control of *Phalaris minor* with tralkoxydim was as good as with isoproturon. Combination of tralkoxydim with 2,4-D produced the grain yield of wheat at par with isoproturon either alone or in combination with fluroxypyr.

ACTIVITY OF SOME SUBSTITUTED PHENYL ACRYLAMIDES FOR WEED CONTROL IN WHEAT

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A number of substituted phenyl acrylamides were studied for control of wild canary grass (*Phalaris minor* Retz.) wild oat (*Avena ludovicana* L.) and wild onino (*Asphodelus tenuifolius*). Laboratory experiments were performed using concentrations ranging from 0—1000 ppm.

Compound-I was effective for control of wild onion which checked the germination and root lenght at 500 and 1000 ppm. The order of herbicidal activity was wild onion, wild canary grass and wild oat. Compound-II could control wild canary grass more effectively than wild onion. The order af herbicidal activity of compound-III was wild onion, wild canary grass and wild oat. Compound-IV controlled all the weeds but more efficiently wild onion and wild canary grass. Wild onion was controlled by all the four compounds more effectively.

NEW HERBICIDES FOR CONTROLLING WILD OATS (*Avena ludoviciana* Dur.) FROM WHEAT (*Triticum aestivum*)

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Field investigation revealed that tralkoxydim (grasp) 0.25 kg/ha applient before first irrigation and at 0.25 and 0.35 kg/ha afrer first irrigation to the crop were compared very well with Avadex-BW and isoproturon treatments (standard). Another

new herbicide SCO 574 applied at 1.5 kg/ha after first irrigation also performed at par with standard treatments. Both these new herbicides provided good control of wild oats and significantiy increased the grain yield of wheat when compared with conventional method i. e. of two hand hoeings.

EVALUATION OF TRALKOXYDIM FOR WEED CONTROL IN WHEAT

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Four rates of tralkoxydim (0.25, 030, 0.35, 0.40 kg/ha) applied alone and incombination with 2,4-D 0.5 kg/ha, 2,4-D alone, isoproturon 1.0 kg/ha, pendimethalin 1.0 kg/ha and weedy check were studied for weed control in wheat.

Tralkoxydim was highly effective against *Phalaris minor* and *Avena ludoviciana* and reduced the density and dry weight of these weeds. Tank mixing of 2,4-D 0.5 kg/ha with tralkoxydim resulted into reduced efficacy of tralkoxydim on *p. minor* and *A. ludoviciana*. Efficacy of 2,4-D in tank mixing with tralkoxydim remained almost similar to its application alone with respect to non - grassy weed control. Weed control efficacy of tralkoxydim at 0.25 and 0·30 kg/ha was low as compard to its higher rates. There was no toxicity of tralkoxydim on wheat crop at any rate, applied alone or tank mixed with 2,4-D. When compared with isoproturon and pendimethalin, tralkoxydim o.35 and 0.40 kg/ha alone or tank mixed with 2,4-D 0.5 kg/ha produced grain yields on par. Residues of tralkoxydim in grain, straw of wheat and soil at harvest were not detectable.