*Indian Journal of Weed Science* 41(3&4) : 201-203, 2009 **Short communication**

# Effect of fertilizer and manure on weed incidence, depletion of nutrients by weeds and yield of soybean

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**ABSTRACT**

**A field experiment was conducted during rainy season of 2008 to study the effect of fertilizer and manure on weed incidence and depletion of nutrients by weeds in soybean. The relative density (RD) of broad leaved weeds were found dominant (33.63%) among all other weeds. *Commelina communis* was 14.68%, *Echinochloa colona* 11.97%, *Cyperus rotundus* 10.14%, *Cynodon dactylon* 6.70% and other weeds 22.86%. Among the different fertility levels, 100% NPK (20:80:20) + 15 t FYM/ha gave significantly lowest weed biomass, highest WCE (61.51%), zero percent weed index, significantly highest grain yield (8.13 q/ha), highest NPKS nutrient contents in weeds and lowest depletion of NPKS nutrient by weeds.**

**Key words :** Fertility levels, POE herbicide

Weeds pose a serious threat to soybean cultivation during early phase till two months after sowing. Weeds in soybean fields reduce production efficiency by competing with crop plants for space, water, nutrients and light interception. Many perennial grasses and broad leaved weeds interfere in soybean cultivation because this crop is very sensitive to early weed infestation. Weed infestation in soybean fields may reduce yields by 54 to 65% depending on the intensity, nature and the duration of weed competition (Chandel 1989). Thus, weeds deplete the applied plant nutrients at the faster rate than crop plants. Looking to the increased cost of chemical fertilizers and other problems in soil properties and soil pollution, the addition of nutrients through organic sources like FYM including sulphur and zinc is being seriously recognized aspects, hence the present research was taken up.

A field experiment was conducted during rainy season of 2008 at the research farm of JNKVV, Jabalpur, (Madhya Pradesh). The soil of the experimental field was medium black (Vertisol). It is a part of long term fertilizer experiment initiated in 1972 where soybean-wheat cropping system is being followed. The experiment was done in four replications with 10 treatments in a randomized block design. The recommended (100%) fertilizer dose was 20 : 80 : 20 NPK/ha, their sources being urea, single super phosphate (SSP) and muriate of potash, respectively. In sulphur free treatments, instead of SSP, diammonium phosphate was used. FYM 15t/ha was applied as basal. Soybean var. *JS 93- 05* was sown at 80 kg/ha on 9$^{th}$ July, 2008. Imazethpyr was applied 0.5 kg/ha as post emergence at 20 DAS in all the treatments except $T_4$ and $T_{10}$. In 100 % NPK + HW, manual weeding was done at 20 and 40 DAS. The grain and straw samples were chemically analyzed for N, P, K and S contents in percentage. The respective nutrient content (%) was multiplied with the grain or straw yield (q/ha) to obtain nutrient uptake in kg/ha. The plot-wise soil samples were drawn from surface 0-20 cm soil layer before sowing and after harvest of soybean. These composite soil samples were used for determining the nutrient status of the soil i.e. chemical properties of the soil.

**Table 1. Weed population and relative density**

| Weed species | Weed population (plants/ha) | | | Relative density (%) |
|---|---|---|---|---|
| | 20 DAS | 40 DAS | Mean | |
| **Broad leaved** | 109162 | 70915 | 90038 | 33.63 |
| *Commelina communis* (L.) | 49345 | 39272 | 39308 | 14.68 |
| *Cynodon dactylon* (L.) | 18702 | 17187 | 17944 | 6.70 |
| *Cyperus rotundus* (L.) | 32357 | 21960 | 27158 | 10.14 |
| *Echinochloa colona* (L.) | 49247 | 14852 | 32049 | 11.97 |
| **Others** | 74210 | 48225 | 61217 | 22.86 |
| **Total weeds** | 3,33,023 | 2,12,411 | 2,67,714 | |

DAS - Days after sowing

**Weeds and their dominance**

The experimental field was mainly infested with *Echinochloa colona, Cyperus rotundus*, *Cynodon dactylon* and *Commalina communis* (Table 1). Similar weed flora associated with soybean crop was reported by Kurchania *et al.* (2001)

Among the weeds, higher relative density of broad leaved weeds (33.63%) may be due to the higher seed production capacity of the weeds and the weed seeds might have continued to remain in the field from the previous season also. The lowest relative density was found in *Cynodon dactylon* (6.70%). The density of all the weeds decreased at 40 DAS, which may be due to smothering effect of the crop, resulting in death of weed plants.

**Weed- biomass, weed control efficiency (WCE) and weed index (WI)**

Weed biomass was minimum (270 kg/ha) in $T_8$ as compared to control and other treatments (420 to 647 kg/ha) (Table 2). Consequently, the weed control efficiency (WCE) was maximum (61.51%) under $T_8$ in which 100% NPK was applied with FYM and imazethapyr. The WCE was minimum in $T_7$ (9.71%). The minimum weed biomass and maximum weed control efficiency (WCE) under $T_8$ might be due to the application of imazethapyr with smothering of weeds which reduced the intensity of grassy as well as broad leaved weeds considerably resulting in lesser weed biomass and higher WCE. These results are in conformity with the findings of Kurchania *et al.* (2001), Vega *et al.* (2001) and Singh *et al.* (2002)

**Table 2. Weed biomass, weed control efficiency (WCE) weed index (WI) and yield of soybean an influenced by different treatments**

| Treatments | Weed biomass at 40 DAS (kg/ha) | WCE (%) | Weed index (%) | Grain yield (kg/ha) |
|---|---|---|---|---|
| $T_1$ 50 % NPK (10:40:10) | 540.0 | 12.76 | 32.34 | 550 |
| $T_2$ 100 % NPK (20:80:20) | 430.0 | 23.38 | 9.22 | 738 |
| $T_3$ 150% NPK (30:120:30) | 420.0 | 24.82 | 3.93 | 781 |
| $T_4$ 100 % NPK + HW (40 DAS) | 470.0 | 20.50 | 13.16 | 706 |
| $T_5$ 100 % NPK + Zn | 490.0 | 25.89 | 14.63 | 694 |
| $T_6$ 100 % NP | 535.0 | 14.82 | 23.86 | 619 |
| $T_7$ 100 % N | 560.0 | 9.71 | 35.42 | 525 |
| $T_8$ 100 % NPK + FYM (15 t/ha) | 270.0 | 61.51 | 0.00 | 813 |
| $T_9$ 100 % NPK + S | 505.0 | 16.36 | 15.37 | 688 |
| $T_{10}$ Control | 647.5 | 0.00 | 49.20 | 413 |
| LSD (P=0.05) | - | - | - | 105 |

Imazethapyre was applied 0.5 kg/ha in all the treatments except $T_4$ and $T_{10}$; FYM - Farm Yard imanure; DAS - Days after sowing.

**Ta b l e e 3 en Eat ft t fm r ee u c nt t r os i fe o dn it m fs a fc j e o o r n r t**

| Tre a t m e | N o i g t e P n h o s P p o h t o a S r s u u s l | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2 n 0 4 S 0 D 2 | | | A0D4 S A0 | | | D 2S | | | A0D4 S A0 | | | D 2S | | | A0D4 S A0 | | |
| $T_1$ 50 % NPK (10:40:10) | 1 | 1 | . 0 1 | . 06 | | . 7 0 2 | . 6 01 | | | .6 0 4 | . 1 02 | | | .3 0 1 | . | |
| $T_2$ 100 % NPK (20:80:20) | 1 | | . 0 4 | . 5 08 | | . 7 0 3 | . 2 01 | | | .7 0 8 | . 2 03 | | | .2 0 2 | . | |
| $T_3$ 150% NPK (30:120:30) | 1 | | . 0 5 | . 3 08 | | . 7 0 3 | . 3 01 | | | .8 0 8 | . 8 03 | | | .2 0 2 | . | |
| $T_4$ 100 % NPK + HW (40 DAS) | 1 | | . 0 3 | . 3 08 | | . 1 0 3 | . 2 01 | | | .7 0 6 | . 4 03 | | | .2 0 2 | . | |
| $T_5$ 100 % NPK + Zn | 1 | | . 0 2 | . 7 08 | | . 0 0 3 | . 1 01 | | | .6 0 6 | . 2 03 | | | .2 0 2 | . | |
| $T_6$ 100 % NP | 1 | | . 0 1 | . 7 06 | | . 9 0 3 | . 0 01 | | | .6 0 6 | . 2 03 | | | .0 0 2 | . | |
| $T_7$ 100 % N | 1 | | . 0 1 | . 2 06 | | . 9 0 2 | . 6 01 | | | .6 0 5 | . 4 02 | | | .7 0 1 | . | |
| $T_8$ 100 % NPK + FYM (15 t/ha) | 1 | | . 1 5 | . 6 01 | | . 6 0 3 | . 4 11 | | | .8 0 0 | . 0 03 | | | .3 0 2 | . | |
| $T_9$ 100 % NPK + S | 1 | | . 0 1 | . 6 06 | | . 9 0 2 | . 8 01 | | | .6 0 5 | . 6 02 | | | .8 0 1 | . | |
| $T_{10}$ Control | 0 | | . 0 9 | . 4 02 | | . 5 0 2 | . 4 01 | | | .5 0 2 | . 8 02 | | | .3 0 1 | . | |
| LSD (P=0.05) | 0 | | . 0 2 | . 0 00 | | . 8 0 0 | . 5 00 | | | .2 0 1 | . 0 00 | | | .5 0 0 | . | |

I : 2 0 D A S - D a y s a f t e r s o w

**Table 4. Effect of different treatments on depletion of major nutrients by weeds in soybean**

| Treatments | Nitrogen (kg/ha) | | Phosphorus (kg/ha) | | Potassium (kg/ha) | | Sulphur (kg/ha) | |
|---|---|---|---|---|---|---|---|---|
| | 20 DAS | 40 DAS | 20 DAS | 40 DAS | 20 DAS | 40 DAS | 20 DAS | 40 DAS |
| $T_1$ 50 % NPK (10:40:10) | 7.43 | 3.63 | 1.77 | 0.88 | 2.72 | 1.25 | 1.13 | 0.69 |
| $T_2$ 100 % NPK (20:80:20) | 9.21 | 3.72 | 2.05 | 0.71 | 5.20 | 1.36 | 1.46 | 1.53 |
| $T_3$ 150% NPK (30:120:30) | 9.48 | 3.65 | 2.10 | 0.76 | 5.48 | 1.37 | 1.44 | 1.69 |
| $T_4$ 100 % NPK + HW (40 DAS) | 8.47 | 3.77 | 2.04 | 0.79 | 4.09 | 1.50 | 1.39 | 1.66 |
| $T_5$ 100 % NPK + Zn | 8.01 | 3.92 | 1.96 | 0.77 | 3.99 | 1.60 | 1.28 | 1.55 |
| $T_6$ 100 % NP | 7.60 | 3.66 | 1.96 | 0.84 | 4.02 | 1.58 | 1.31 | 1.41 |
| $T_7$ 100 % N | 7.75 | 3.86 | 1.82 | 0.94 | 3.73 | 1.57 | 1.26 | 0.87 |
| $T_8$ 100 % NPK + FYM (15 t/ha) | 4.16 | 3.14 | 0.92 | 0.48 | 2.65 | 0.90 | 0.63 | 1.54 |
| $T_9$ 100 % NPK + S | 7.53 | 3.51 | 1.87 | 0.82 | 3.67 | 1.48 | 1.28 | 0.86 |
| $T_{10}$ Control | 6.98 | 3.35 | 1.80 | 0.99 | 2.04 | 1.50 | 1.30 | 0.79 |
| LSD (P=0.05) | 1.72 | 1.00 | 0.47 | 0.23 | 0.88 | 0.39 | 0.31 | 0.35 |

DAS - Days after sowing

Weed index varied in proportion to the seed yield obtained in a particular treatment as against the control treatment. The yield loss in $T_3$ treatment was relatively low (3.93%) and the reduction in yield under $T_8$ (100% NPK + FYM + imazethapyre) was nil due to less reduction in seed yield in the treatments. The values of weed index in $T_2$, $T_4$, $T_5$ and $T_9$ treatments were in accordance with the WCE of the treatment with herbicide combination, consequently the yield obtain under these treatments was higher compared to $T_7$ (100% N alone) and $T_{10}$ (control). The high yield loss to the extent of 49.20% was noted in control.

**Nutrient content and depletion by weeds**

The content of N, P, K and S nutrients was lowest under control and highest with $T_8$ i.e. application of 100% NPK+ FYM + imazethapyr (Table 3). The lowest content of all the nutrients under control was owing to more competition of weeds and crop plants for the nutrients. On the contrary the highest content of nutrients under $T_8$ was attributed to more availability of the nutrients and reduction in weed biomass as compared to control.

The depletion of nitrogen and phosphorus by weeds was minimum under $T_8$ (Table 4). This was attributed to the application of 100% NPK with FYM and imazethapper which resulted in reduction in weed biomass and enhanced WCE. These findings are in agreement with those of Singh and Kolar (1994). As regard the depletion of potassium and sulphur by weeds, various treatments exhibited variable response.

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