

Weed Management in Groundnut (*Arachis hypogaea* L.) under Varying Crop Geometry

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In India out of total production of edible oil, 67% is contributed by groundnut. The demand for edible oil in the country is rising by 6% per year. Therefore, concerted efforts are now being made for increasing and stabilizing oilseed production (Vasudevan, 1990). More important but often not recognized factor responsible for poor yield is improper row to row and plant to plant spacing as well as weed control especially during the early period of crop. During this period less crop canopy cover favours heavy competition with weeds causing considerable reduction in yield of crop. Keeping this in view, the study was undertaken to find out the optimum crop geometry and effective weed management practices for increased yield in groundnut.

A field experiment was conducted during **kharif** 2007 at Instructional Farm, College of Technology and Engineering, Maharana Pratap University of Agriculture and Technology, Udaipur. The soil was sandy loam and alkaline in reaction, medium in available nitrogen (292.13 kg/ha) and phosphorus (18.10 kg/ha) and high in available potassium (308.40 kg/ha). The treatments consisted three crop geometries viz., 30 x 10 cm, 25 x 12 cm and 20 x 15 cm and weed management practices viz., weedy check, hand weeding (twice) 20 and 40 DAS, pendimethalin 1.0 kg/ha PE, pendimethalin 1.0 kg/ha PE + one hand weeding 30 DAS, oxyfluorfen 0.1 kg/ha PE and oxyfluorfen 0.1 kg/ha PE + one hand weeding 30 DAS. Groundnut variety TAG-24 was sown on 17 July 2007. The treatments were laid out in factorial RBD and replicated four times. The crop was raised under rainfed condition with one life saving irrigation.

It was observed that various crop geometries viz., 20 x 15 cm, 25 x 12 cm and 30 x 10 cm did not bring any significant response in the various growth, yield and quality parameters of groundnut (Table 1). All these crop geometries provided uniform plant population. Therefore, it seemed that variation in the row to row distance (20 to 30 cm) and plant to plant distance (10 to 15 cm) was not sufficient to cause variable competition among the plants and hence significant improvement was not observed in any of the parameters taken for present

study. The results obtained by Pandya *et al.* (2005) in soybean and Subrahmaniyam *et al.* (2008) in groundnut also support the present findings.

Dominant weed flora of the experimental field was *Cynodon dactylon*, *Cyperus rotundus*, *Digera arvensis*, *Echinochloa crus-galli*, *Echinochloa colona*, *Eclipta alba* and *Phyllanthus niruri*. The effect of various weed management practices resulted in control of number of weeds. Among the various treatments, oxyfluorfen and pendimethalin along with one hand weeding 30 DAS were more effective in controlling all the monocot and dicot weeds at all the stages of crop growth (20, 30 and 40 DAS) than the remaining treatments. Dry matter accumulation of weeds was found to be lower in plots treated with pendimethalin and oxyfluorfen + one hand weeding 30 DAS at all the stages of crop growth (20, 30 and 40 DAS). Reduced weed population and weed dry matter by integrated weed management with PE application of oxyfluorfen 0.1 to 0.5 kg/ha followed by one hand weeding 30 DAS compared to pendimethalin and one hand weeding was also reported by Rajendran and Lourduraj (1999).

In general, the aforesaid improvement seems to be on account of their direct impact through least crop-weed competition, while indirect effect might be on account of least competition for below and above ground plant growth inputs viz., light, space, water, nutrients, etc. This is also evident from least uptake of nutrients by crop plants in weedy check and higher uptake by crop plants under influence of these treatments (Table 1). Further, in legumes crop nodulation plays a pivotal role in fixation of atmospheric nitrogen which is utilized by plants for various enzymatic processes resulting in enhanced carbohydrate and protein contents which are of prime importance for plant growth. Less weed population provides ample space for root growth and nodulation. Similarly, under reduced density and dry matter of weeds, plant gets sufficient space for optimum expansion of leaves and branches as early as possible. Thus, under least crop-weed competition, adequate availability of light, optimum temperature, adequate space

Table 1. Effect of crop geometry and weed management on weed density, weed dry matter accumulation 40 DAS, plant dry matter accumulation, plant height, pod yield, total N and P uptake and B : C ratio of groundnut

Treatments	Weed density (number of weeds/0.25 m ²) 40 DAS	Dry matter accumulation of weeds (g/0.25 m ²) 40 DAS	Dry matter accumulation by weeds (g/plant) at harvest	Plant height at harvest (cm)	Pod yield (kg/ha)	Total N uptake (kg/ha)	Total P uptake (kg/ha)	B : C ratio
Crop geometry								
20 × 15 cm	4.42 (26.08)	5.54	25.07	27.96	1223	82.5	12.613	2.61
25 × 12 cm	4.46 (26.37)	5.59	25.24	28.12	1227	83.9	12.735	2.55
30 × 10 cm	4.43 (26.35)	5.58	25.51	28.50	1233	84.3	12.945	2.49
S. Em±	0.053	0.052	0.42	0.49	24	1.6	0.270	0.05
LSD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS
Weed management practices								
Weedy check	9.68 (93.44)	15.79	18.69	22.94	729	46.1	7.456	1.63
Hand weeding (twice) 20 and 40 DAS	0.71 (0.00)	0.00	23.73	26.49	1142	75.3	11.828	2.36
Pendimethalin 1.0 kg/ha PE	4.32 (18.17)	5.01	26.29	28.64	1261	85.1	12.985	2.63
Pendimethalin 1.0 kg/ha PE+one hand weeding 30 DAS	3.86 (14.42)	3.81	28.43	30.67	1476	103.7	15.548	2.98
Oxyfluorfen 0.1 kg/ha PE	4.29 (17.89)	4.93	25.65	28.88	1262	85.9	12.946	2.63
Oxyfluorfen 0.1 kg/ha PE+one hand weeding 30 DAS	3.76 (13.69)	3.86	28.84	31.54	1496	105.3	15.823	3.06
S. Em±	0.074	0.074	0.59	0.69	34	2.266	0.381	0.07
LSD (P=0.05)	0.211	0.210	1.67	1.97	95	6.432	1.083	0.20

DAS—Days after sowing, PE—Pre-emergence. Figures in parentheses are original values. NS—Not Significant.

along with improvement in physiological and morphological characters of the plant can be responsible for greater photosynthetic rate for more accumulation of plant dry matter (Duncan, 1971) and increased plant height. Thus, congenial nutritional environment might have increased metabolic processes in plants resulting in greater meristematic activity and apical growth thereby improving branch formation and retention of higher number of leaves/plant which resulted in enhanced dry matter production and plant height. Data (Table 1) indicated that both cultural and herbicidal methods brought about significant improvement in pod yield over weedy check. Moreover, herbicides viz., pendimethalin and oxyfluorfen in combination with one hand weeding 30 DAS had more prominent influence on pod yield. The maximum pod yield of 1496 kg/ha was obtained with PE application of oxyfluorfen + one hand weeding (30 DAS). However, it was at par with PE application of pendimethalin + one hand weeding 30 DAS (1476 kg/ha)

The protein content was significantly improved by all the weed management practices as compared to weedy check (Table 1). This may be attributed to increased concentration of N in kernel since protein content is mainly governed by it. Further, weed management practices also stimulated the nitrogen and phosphorus concentrations in plant and their uptake over weedy check. Moreover, pendimethalin and oxyfluorfen in integration with one hand weeding were the most effective in enhancing nutrient uptake except weed free check. These results are in accordance with the findings of Madhu *et al.* (2006) who reported that highest nitrogen and phosphorus uptake of groundnut was observed in hand weeding and herbicide treated plots compared with those in untreated plot.

Pendimethalin 1.0 kg/ha + hand weeding 30 DAS and oxyfluorfen 0.1 kg/ha + hand weeding 30 DAS

recorded significantly higher crop dry matter accumulation by 52.11 and 54.31% at harvest, respectively, over weedy check. Plant height at harvest was also significantly influenced by weed management practices. The herbicides pendimethalin and oxyfluorfen combined with hand weeding 30 DAS recorded the higher nitrogen content in kernel and haulm and phosphorus content in kernel and total N and P uptake by crop, whereas lower uptake of N (46.1 kg/ha) and P (7.5 kg/ha) was obtained in weedy check. The highest B : C ratio of 3.06 was observed with oxyfluorfen in combination with one hand weeding followed by 2.98 with pendimethalin + one hand weeding (30 DAS).

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