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RESEARCH PAPER

Effect of integrated weed management on groundnut (*Arachis hypogea*)

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Abstract : An experiment on integrated weed management in groundnut (*Arachis hypogea*) was conducted at Department of Agronomy during 2009-10. Ten treatments which included three herbicides *viz.,* Pendimethalin, Quizolofop ethyl, Imazethapyr with mechanical weeding were studied in Randomized Block Design. Complete weed free condition recorded highest dry pod yield (1786 kgha^{-1}). Pre-emergence application of Pendimethalin 1.0 kg a.i./ha followed by one hand weeding at 15 days after sowing, recorded 10.8 pods/plant as against 4.97 pods/plant and 60.0 nodule per plant as against 37.5 in unweeded control. Pre-emergence application of Pendimethalin @ 1.0 kg a.i./ha followed by post-emergence Imazethapyr @ 75 g a.i./ha at 15 days after sowing increased pod yield (1255 kgha^{-1}), shelling % and 100 kernal weight. Application of Pendimethalin recorded increased soil fungal count 16.0X10^4 cfu g^{-1}, soil actinomycetes count 15.67X10^6 cfu g^{-1} and soil bacterial count 20.33X10 cfu g^{-1} compared to unweeded control.

Key Words : Pre-emergence pendimethalin, Fungal count, Actinomycetes, Bacterial count, Pod yield, Hand weeding

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INTRODUCTION

Groundnut (*Arachis hypogea*) is valuable oilseeds, which accounts 33% area and 45% production in India globally. India ranks first among groundnut growing countries in the world sharing 6.74 M.ha. area and 7.99 MT production. Integrated weed management in groundnut has great importance as groundnut suffer heavily due to weed competition in early stage because of its short structure and initial slow growth. The reduction in groundnut yield to the extent of 70% is being reported by Dev Kumar and Giri (1998). Weeds compete with crop for soil moisture, nutrients and light and reduced the yield. They also harbour pest and diseases and serve as alternative host during off season. Critical period of crop weed competition in groundnut crop was observed to be 4 to 8 weeks after sowing (Santelmann and Hill, 1969), being groundnut is dwarf in nature with slow seedling emergence and slow initial growth. The loss in yield of groundnut pods due to competition by weed ranged from 30-40% (Chandra Singh and Gupta, 1973). Nutrient losses due to crop weed competition were 38.8,

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9.2 and 23.3 N, P and K kgha^{-1}, respectively (Naidu *et al.,* 1982).

Mechanical weeding and cultural weeding though economical under Indian condition, but the time of application is more important. The field situation like continuous rains does not permit mechanical operations in time. The herbicide gives timely and effective control of weeds and traditional methods give better aeration and soil condition along with weed control. Therefore, use of herbicide alone or in combination with cultural method to control weeds effectively has become necessity. With this view, an investigation entitled Integrated Weed Management in Groundnut was conducted in view to study the relative efficacy of herbicides, to control weeds and to study the nutrient uptake of weeds.

MATERIAL AND METHODS

An experiment on "Integrated Weed Management in Groundnut was conducted at Agronomy farm, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (M.S.), India during 2009-10. The treatments comprising three herbicides, cultural method of weed control and integration of these were replicated three times in Randomized Block Design. The herbicide pre-emergence application of Pendimethalin @ 1.0 kg a.i./ha + one hand weeding at 15 DAS, post emergence Emazethapyr @ 75 g a.i./ha at 15 DAS, post emergence of Quizolphop ethyl @ 50 g a.i./ha at 15 DAS and the three cultural treatments with two control were tried on groundnut during rainy season. The details of treatments are given in Table 1. The plot size was 3.6mX4.0m and 2.7mX3.0m for gross and net respectively. The crop was sown at 30X10 cm spacing with 100 kg seed rate and fertilizer dose of 25:50:0 NPK kg/ha. The weed control efficiency was calculated as

$$WCI = \frac{wpc - wpt}{wpc}$$

where,

wpc = Weed population in unweeded plot

wpt = Weed population in treated plot

The weed index was derived as $w1 = \frac{x - y}{x} x100$

where,

x = yield from weed free treatment

y = yield from weed treatment for which w1 is to be calculated.

The microbial count *viz.*, bacterial count, actynomycetes and fungal counts were recorded from one gram of soil before and after spray of herbicides. The nutrient uptake was calculated from the dry matter produced by the plant and weeds.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Weed studies:

Crop was infested with monocot and dicot weeds. In monocot weeds *Cynodon dactylon, Ischaemum pilosum* and *Digitaria sanguinalis* were dominant while in dicot *Parthenium hysterophorus, Convolvulus arvensis, Achyranthes aspera, Phyllanthus niruri, Euphorbia hirta, Digera arvensis* and *Tridax procumbens* were dominant weeds in groundnut. Pre-

Table 1 : Effect of treatrments on weed index and weed control efficiency

Treatments	Weed index (%)	Weed control efficiency (%)	
		Monocot	Dicot
T_1-Unweeded (Control)	62.09	Control	Control
T_2-Weed free (Check)	---	100	100
T_3-PE Pendimethalin @ 1.0 kg a.i./ha + one hand weeding at 15 DAS	7.17	55.80	52.64
T_4-PoE Quizolofop ethyl @ 50 g a.i./ha at 15 DAS	30.96	52.32	44.75
T_5- PoE Emazethapyr @ 75 g a.i./ha at 15 DAS	29.73	51.17	42.15
T_6- PE Pendimethalin @ 1.0 kg a.i./ha + T_4	25.36	51.17	52.64
T_7- PE Pendimethalin @ 1.0 kg a.i./ha + T_5	14.72	52.32	42.15
T_8- Two weeding at 15 DAS and 30 DAS	2.52	62.78	73.72
T_9- Two hoeing at 15 DAS and 30 DAS	9.46	59.29	55.25
T_{10}-One weeding at 15 DAS and one hoeing at 30 DAS	7.58	60.48	57.93

emergence application of Pendimethalin followed by hand weeding was effective to control weeds at early stage of crop growth and the dicot weeds were 13.67 per sq.m. as against 19.00 in unweeded control. While the monocot weeds recorded were 17.33 as against 25.67 per sq.m. Pendimethalin @ 1.0 kg a.i./ha as pre-emergence followed by Imazethapyr @ 75 g a.i./ha has recorded 14.72 weed index and 52.32 % weed control efficiency (Table1).

Pod yields :

Pod yield of groundnut was influenced significantly due to various treatments The absolute weed free condition produced maximum pod yield (1786 kgha^{-1}) followed by hand weeding twice at 15 and 30 DAS (1741 kgha^{-1}) than weedy check (677 kgha^{-1}). Pre- emergence application of Pendimethalin @1.0 kg a.i./ha produced pod yield of 16.58 kgha^{-1} which was comparable to complete weed free condition and on par with cultural method of weed control. Post emergence application of Quizolofop ethyl @ 50 g a.i./ha at 15 DAS recorded 1233 kgha^{-1} of dry pod yield which was comparable to other weed control methods of herbicides and also comparable to cultural practice. Haulm yield, shelling % and 100 kernal weight were improved in herbicide spray which were comparable to cultural method of weed control (Table 2).

Nutrient uptake:

Maximum uptake of nutrient (NPK) was observed

Table 2 : Pod yield, haulm yield and shelling percentage as influenced by various treatments

Treatments	Pod yield (kgha^{-1})	Haulm (kgha^{-1})	Shelling percentage
T_1-Unweeded (Control)	677	2272	68.66
T_2-Weed free (Check)	1786	2314	73.45
T_3-PE Pendimethalin @ 1.0 kg a.i./ha + one hand weeding at 15 DAS	1658	2281	71.71
T_4-PoE Quizolofop ethyl @ 50 g a.i./ha at 15 DAS	1233	2283	72.04
T_5- PoE Emazethapyr @ 75 g a.i./ha at 15 DAS	1255	2252	72.60
T_6- PE Pendimethalin @ 1.0 kg a.i./ha + T_4	1333	2305	70.53
T_7- PE Pendimethalin @ 1.0 kg a.i./ha + T_5	1523	2319	71.34
T_8- Two weeding at 15 DAS and 30 DAS	1741	2281	73.65
T_9- Two hoeing at 15 DAS and 30 DAS	1617	2301	71.99
T_{10}-One weeding at 15 DAS and one hoeing at 30 DAS	1651	2294	72.81
S.E.±	0.51	0.19	0.60
C.D. (P=0.05)	1.50	NS	1.79

NS= Non-significant

Table 3 : Total nutrient uptake as influenced by various treatments

Treatments	Total nutrient uptake by plant	
	N (kgha^{-1})	P_2O (kgha^{-1})
T_1-Unweeded (Control)	45.79	2.83
T_2-Weed free (Check)	85.37	9.35
T_3-PE Pendimethalin @ 1.0 kg a.i./ha + one hand weeding at 15 DAS	77.42	8.41
T_4-PoE Quizolofop ethyl @ 50 g a.i./ha at 15 DAS	55.24	4.58
T_5- PoE Emazethapyr @ 75 g a.i./ha at 15 DAS	59.02	5.93
T_6- PE Pendimethalin @ 1.0 kg a.i./ha + T_4	61.44	6.49
T_7- PE Pendimethalin @ 1.0 kg a.i./ha + T_5	65.44	7.13
T_8- Two weeding at 15 DAS and 30 DAS	84.59	8.77
T_9- Two hoeing at 15 DAS and 30 DAS	66.31	6.41
T_{10}-One weeding at 15 DAS and one hoeing at 30 DAS	73.09	7.79
S.E.±	0.10	0.04
C.D.(P=0.05)	0.29	0.11

with weed free condition followed by cultural method of weed control. Pre-emergence application of Pendimethalin followed by hand weeding recorded nutrient uptake (77.42 N : 8.41 P_2O kg ha^{-1}) which was significantly more than other herbicides used (Table 3).

Microbial studies :

Cultural method of weed control and complete weed free condition recorded more bacterial, actinomycetes and fungal counts. Pendimethalin 1.0 kg a.i./ha followed by handweeding improved the fungal count ($16X10^4$ cfu g^{-1}), actinomycetes count ($15.67X10^6$ cfu g^{-1}) and bacterial count ($20.33X10^7$ cfu g^{-1}) per gram of soil which was comparable to other herbicides. The least contents of these colonies were observed under weedy check (Table 4).

Groundnut (*Arachis hypogea*) an important legume crop is most sensitive to weed infestation. The flowering on groundnut initiated at 21 days after sowing and this stage is most sensitive to moisture and nutrient stress. Weed compete for these resources and thus reduce growth and yield of groundnut. Cultural method of weed control is most effective in the sense that it pulverise soil and thus provide better aeration for root proliferation, nodulation and pod development. As evidenced in Table 1 the weed counts were reduced in weedings at 15 and 30 DAS. Similar results were reported by Sukhadia *et al.* (1998). The pod yield was increased due to cultural method of weed control. Pre-emergence application of Pendimethalin 1.0 kg a.i./ha reduced monocot and dicot populations in early stage of crop growth which has permitted better growth of crop, pod bearing and thus finally improved pod yield. Similar observations were reported by Rathi *et al.* (1986) and further stated that Pandimethalin @ 1.5 kg a.i./ha was as effective as two hand weeding.

Integrated weed management:

Pendimethalin 1.0 kg a.i./ha followed by one hand weeding at 15 DAS was more effective to control weeds at early crop growth stage. Hand weeding allows pulverisation of soil, better aeration, root proliferation, better nodulation and more pod formations ultimately increased pod yield (1658 kg/ha). Itnal *et al*. (1993) also revealed that pre-emergence application of Pendimethalin 1.0 kg a.i./ha followed by one hand weeding was most effective not only to control weeds but also in obtaining higher pod yield of groundnut. Better crop growth due to early and effective weed control absorbed more nutrient from soil and thus the nutrient uptake was N 77 $kgha^{-1}$ and P_2O 8.40 $kgha^{-1}$ to the nutrient uptake by weed control through cultural methods as well as other weedicides used either as pre-emergence or post emergence spray. The microbial population was increased in Pendimethalin @ 1.0 kg a.i./ha followed by one hand weeding and it was $16X10^4$ cfu g^{-1} for fungal counts and $15.67X10^6$ cfu g^{-1} for actinomycetes per gram of soil. This indicates that herbicides application has no adverse effect on microbial population.

Conclusion :

Integrated nutrient management through

Table 4 : Microbial count as influenced by different treatments

Treatments	Fungal count ($X10^4$ cfu g^{-1})	Actinomycetes count ($X10^6$ cfu g^{-1})	Bacterial count ($X10^7$ cfu g^{-1})
	After spraying	After spraying	After spraying
T_1-Unweeded (Control)	8.33	10.00	14.33
T_2-Weed free (Check)	21.00	19.33	25.33
T_3-PE Pendimethalin @ 1.0 kg a.i./ha + one hand weeding at 15 DAS	16.00	15.67	20.33
T_4-PoE Quizolofop ethyl @ 50 g a.i./ha at 15 DAS	13.67	14.67	18.33
T_5- PoE Emazethapyr @ 75 g a.i./ha at 15 DAS	13.67	14.67	18.67
T_6- PE Pendimethalin @ 1.0 kg a.i./ha + T_4	14.67	15.33	19.67
T_7- PE Pendimethalin @ 1.0 kg a.i./ha + T_5	15.33	15.67	19.33
T_8- Two weeding at 15 DAS and 30 DAS	19.67	17.67	24.33
T_9- Two hoeing at 15 DAS and 30 DAS	18.67	16.67	21.33
T_{10}-One weeding at 15 DAS and one hoeing at 30 DAS	19.33	16.67	22.33
S.E.±	0.39	0.36	0.34
C.D. (P=0.05)	1.16	1.08	1.01

Pendimethalin 1.0 kg a.i./ha followed by one hand weeding 15 DAS was most effective to control weeds and increased yield of groundnut.

REFERENCES

Chandrasingh, D.J. and Gupta, K.M. (1973). Weed control for groundnut with herbicides. *Farmer & Parliament*, **8**(7): 15-16.

Devkumar, M. and Giri, Gajendra (1998). Influence of weed control and doses and time of gypsum application on yield attributes, pod and oil yield of groundnut. *Indian J. Agron.,* **43** (3) : 453-458.

Itnal, C.J., Lingaraju, B.S. and Kurdukeri, C.B. (1993). Effect of herbicides and cultural methods on weed control in irrigated groundnut. *Indian J. Weed Sci.,* **25**(3 and 4): 27-31.

Naidu, L.G.K., Reddy, G.H.S. and Rajan, M.S.S. (1982). Nutrient uptake as influenced by crop weed competition in groundnut. *Indian J. Weed Sci.*, **14**(2): 137-140.

Rathi G.S., Sharma, R.S. and Dubey, M.P. (1986). Studies on integrated weed control in rainfed groundnut. *Indian J. Weed Sci.,* **18**(4): 220-225.

Santelman, P.W. and Hill, L.H. (1969). Competitive effect of annual weeds on Spanish peanut. *Weed Sci.,* **17**: 1-2.

Sukhadia, N.M., Ramani, B.B., Asodaria K.B. and Modhwadia, M.M. (1998). Comparative efficacy of pre and post emergence herbicide application in spreading groundnut. *Indian J. Weed Sci.,* **30** (3 and 4): 163-167.