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Weed Management in *Kharif* Groundnut

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A B S T R A C T

A field experiment was conducted on medium black soil to study the effect of different treatments of weed control on groundnut (*Arachis hypogaea*) yield at Dry Farming Research Station, Junagadh Agricultural University, Jamkhambhalia, Gujarat during *kharif*-2013 to 2018. The experiment comprising of 12 treatments with three replications laid out in randomized block design. The pooled results revealed that weed free (HW and IC at 15,30,45 and 60 DAS) treatment recorded significantly higher pod yield (2115 kg/ha), haulm yield (4919 kg/ha), maximum weed control efficiency (74.21%) and lowest dry weight of weed (492 kg/ha) with maximum net return (78857 Rs/ha)and BCR (2.93). However, integrated weed management practices*i.e.*post emergence application of Quizalofop-ethyl @ 40 g/ha at 20 days after sowing followed by one hand weeding and one interculturing and pre- emergence application of Oxyfluorfen @ 0.24 kg/ha followed by one hand weeding and one interculturing at 40 days after sowing also recorded higher weed control efficiency, yield attributes, pod yield and haulm yield compared to other treatments.

Introduction

Groundnut (*Arachis hypogea* L.) is one of the most important oilseed crop, cultivated for edible oil, protein and confectionery purpose. *Kharif* groundnut cultivation required frequent weed control practices for higher seed production, because groundnut is highly susceptible to weed infestation due to its slow growth rate at initial stage and its physiological characteristics like short plant height and underground pod bearing habit. Uncontrolled weed reduces the yield of *Kharif* groundnut by 54 to 71% especially during early period of crop growth (Agasimani *et al.*, 2010). Unlike the other crops in groundnut weed surges difficulties in pegging, growing, pod developing and harvesting and also

competing with crops for essential resources like nutrients, sunlight, water, air *etc.* The critical period of weed competition was found to be 4 to 8 weeks after sowing (Hamada, 1988).

Therefore, weeding should be completed before the pegging stage in groundnut. In present situation manual weeding is costlier and increase the production cost.

To avoid such experience one should require the most effective weedicide under rain fed condition. Pre-emergence (PE) herbicides *viz.* pendimethalin (Patel *et al.,* 2013) and oxyfluorfen (Ramalingam *et al.,* 2013) and post-emergence (POE) herbicides, *viz.* imazethapyr (Kalhapure 2013) and quizal of op-ethyl (Samant *et al.,* 2014) were found very effective in controlling weeds, higher crop yield and increased income in different parts of the country. Thus, this experiment was planned to know the feasibility of weedicides in groundnut under rainfed condition.

Materials and Methods

The experiment was conducted on medium black soil of dry farming research station, of Junagadh Agricultural University, Jamkhambhalia (Gujarat) during six consecutive *kharif* seasons of 2013-14 to 2018-19. The year wise total rainfall received during the crop growth seasons2013 to 2018 were1263.6, 324.7, 241, 688, 731 and 523 mm, with 33, 19, 12, 17, 21 and 10 rainy days, respectively.

The soil of the experimental field was medium black having good drainage and high moisture retentive capacity. Some important characteristics of the soil were p^H8.30, EC 0.35dS/m, Organic carbon 0.41 %, available N, P, K and S were 230.3, 28.6, and 336kg/ha and 17.8ppm, respectivelyand micronutrient Fe, Mn and Zn were 10.19, 12.84and o.66ppm, respectively. Total twelve treatments, comprising seven treatments of pre-emergence or post emergence herbicides (pendimethalin 30% and 37.5 %, oxyflourfen, Quizalofop ethyl, Imazethapyr Oxadiargyl, Propaquizafop) combined with one hand weeding and one interculturing at 40 days after sowing, one treatment comprising only cultural practices like hand weeding and interculturing at 20 and 40 days after sowing, two treatments comprising both pre and post emergence herbicides, one treatment as weed free (HW and IC at 15,30,45 and 60 DAS) and one treatment as weedy check.

The experiment was laid out in randomized block design with three replications and individual plot size of 5.0 m X 3.6 m (gross) and 4.0 mX 2.4 m (net). Groundnut seeds of cv.*GG -20* were sown at 60 cm row to row and 15 cm plant to plant distance with bullock drawn seed drill. The crop was fertilized with 12.5- 25-00 NPK kg/ha. Pre emergence application of herbicides was applied as per the treatment immediately after the sowing. All other recommended agricultural practices were done throughout the crop seasons. Yield and yield attributes, dry weight of weeds per net plot were recorded at the time of crop harvest.

Economics of all the treatments was worked out. The weed control efficiency (WCE) and weed index (WI) was calculated by using following formula.

$$\text{WCE (\%)} = \frac{\text{Weed dry weight (kg) in Unweeded plot} - \text{Weed dry weight (kg) in treated plot}}{\text{Weed dry weight (kg) in unweeded plot}} \times 100$$

$$\textit{WI (\%)} = \frac{\text{Yield from weed free plot} - \text{Yield from treated plot}}{\text{Yield from weed free plot}} \times 100$$

Results and Discussion

Effect on dry weight of weed, WCE, WI and Yield attribute

The results indicated (Table 1) that the significantly the highest dry weight of weed (1910 kg/ha) was observed under the weedy check as compared to all other treatments.

The significantly lower dry weight of weed was recorded under weed free treatment (HW and IC at 15,30,45 and 60 DAS), which was at par with treatments Pendimethalin 30% EC @ 0.90 kg/ha PE + 1 HW and 1 IC at 40 DAS, Pendimethalin 38.7% CS @ 0.75 kg/ha PPI + 1 HW and 1 IC at 40 DAS and Oxyfluorfen @ 0.24 kg/ha PE + 1 HW and 1 IC at 40 DAS.

The highest weed control efficiency (74.2 %) and the lowest weed index (0.0 %) were recorded under weed free treatment (HW and IC at 15,30,45 and 60 DAS). Similarly, pre-emergence application of Pendimethalin 38.7% CS @ 0.75 kg/ha PPI + 1 HW and 1 IC at 40 DAS, Pendimethalin 30% EC @ 0.90 kg/ha PE + 1 HW and 1 IC at 40 DAS and Oxyfluorfen @ 0.24 kg/ha PE + 1 HW and 1 IC at 40 DAS recorded remarkably higher weed control efficiency 73.5, 72.6 and 72.1 %, followed by weed free treatment, respectively.

The post-emergence application of herbicides coupled with 1 hand weeding and interculturing at 40 DAS sowing recorded lower weed control efficiency as compared to pre-emergence application of weedicide coupled with 1 hand weeding and interculturing at 40 DAS. It is also noted that the only pre-emergence application of herbicide coupled with post-emergence herbicide at 30 DAS also recorded lower weed control efficiency as compared to weed free and pre-emergence application of herbicide coupled with 1 HW and 1 IC at 40 DAS (Dutta *et al.*, 2005, Solanki *et al.*, 2005 and Kalhapure *et al.*, 2013).

Effect on yield attributes

The data in table 1 showed that significantly the highest number of pods (19.5) and shellling % (75%) were recorded under weed free treatment, which was followed by post-emergence application of Quizalofop-ethyl @ 40 g/ha at 20 DAS coupled with one hand weeding and one interculturing at 40 DAS (17.5& 72.7 %) and pre-emergence application of Oxyfluorfen @ 0.24 g/ha coupled with one hand weeding and one interculturing at 40 DAS (16.6 and 72.9 %). (Dutta *et al.*, 2005 and Bhatt *et al.*, 2010).

Effect on yield

Among different weed control treatments (Table 2) the significantly the highest pod yield of groundnut was recoded under weed free check (2115 kg/ha), which was followed by post-emergence application of Quizalofop-ethyl @ 40 g/ha at 20 DAS coupled with one hand weeding and one interculturing at 40 DAS (1690 kg/ha) and pre-emergence application of Oxyfluorfen @ 0.24 g/ha coupled with one hand weeding and one interculturing at 40 DAS (1679 kg/ha). In case of haulm yield the significantly the highest haulm yield of groundnut was recoded under weed free check (4919 kg/ha), which was followed by pre-emergence application of Oxyfluorfen @ 0.24 g/ha coupled with one hand weeding and one interculturing at 40 DAS (3950 kg/ha) and post-emergence application of Quizalofop-ethyl @ 40 g/ha at 20 DAS coupled with one hand weeding and one interculturing at 40 DAS (3938 kg/ha). The unweeded control treatment recorded significantly the lowest pod (865 kg/ha) and haulm (1878 kg/ha) yield. (Bhatt *et al.*, 2010, Swetha *et al.*, 2016 and Solanki *et al.*, 2005)

Table.1 Effect of different treatments on dry weight of weed, WCE, WI and yield attributes of groundnut (pooled- six years)

Treatment	No. of pods/ plant	Shelling %	Weed dry weight (kg/ha)	WCE (%)	WI (%)
Pendimethalin 30% EC @ 0.90 kg/ha PE + 1 HW and 1 IC at 40 DAS	15.1	72.7	524.0	72.6	26.4
Pendimethalin 38.7% CS @ 0.75 kg/ha PPI + 1 HW and 1 IC at 40 DAS	15.1	72.0	506.0	73.5	28.2
Oxyfluorfen @ 0.24 kg/ha PE + 1 HW and 1 IC at 40 DAS	16.6	72.9	532.0	72.1	20.6
Quizalofop-ethyl @ 40 g/ha POE at 20 DAS + 1HW and 1 IC at 40 DAS	17.5	72.7	787.0	58.8	20.1
Imazethapyr @ 75 g/ha POE at 20 DAS + 1 HW and 1 IC at 40 DAS	13.6	72.3	744.0	61.1	39.1
Oxadiargyl @ 90 g/ha POE at 20 DAS + 1 HW& 1 IC at 40 DAS	13.7	71.6	1172.0	38.6	41.6
Propaquizafop @ 90 g/ha POE at 20 DAS + 1 HW and 1 IC at 40 DAS	14.7	72.4	894.0	53.2	25.3
HW and IC at 20 and 40 DAS	14.1	71.4	1134.0	40.6	37.7
Pendimethalin 30% EC @ 0.90 kg/ha PE+Imazethapyr @ 75 g/ha POE at 30 DAS	15.1	72.5	770.0	59.7	37.3
Pendimethalin 30% EC @ 0.90 kg/ha PE +Oxadiargyl @ 90 g/ha POE at 30 DAS	14.6	72.6	961.0	49.7	40.4
Weed free (HW and IC at 15,30,45 &60 DAS)	19.5	75.0	492.0	74.2	0.0
Unweeded control	11.2	67.6	1910.0	0.0	26.4
S.Em. ±	0.59	0	86		
C.D. at 5%	1.67	1	244		
C.V.%	5.62	11.7	16		

Table.2 Effect of different treatments on crop yield and economics (pooled-six years)

Treatment	Pod yield (kg/ha)	Haulm yield (kg/ha)	Gross Returns (Rs. /ha)	Cost of cultivation (Rs./ha)	Net returns (Rs./ha)	B:C
Pendimethalin 30% EC @ 0.90 kg/ha PE + 1 HW and 1 IC at 40 DAS	1557	3675	88426	28755	59671	3.08
Pendimethalin 38.7% CS @ 0.75 kg/ha PPI + 1 HW and 1 IC at 40 DAS	1520	3553	86152	28670	57482	3.00
Oxyfluorfen @ 0.24 kg/ha PE + 1 HW and 1 IC at 40 DAS	1679	3950	95295	29970	65325	3.18
Quizalofop-ethyl @ 40 g/ha POE at 20 DAS + 1HW and 1 IC at 40 DAS	1690	3938	95732	29106	66626	3.29
Imazethapyr @ 75 g/ha POE at 20 DAS + 1 HW and 1 IC at 40 DAS	1288	3076	73348	28883	44465	2.54
Oxadiargyl @ 90 g/ha POE at 20 DAS + 1 HW& 1 IC at 40 DAS	1236	2908	70139	28965	41174	2.42
Propaquizafop @ 90 g/ha POE at 20 DAS + 1 HW and 1 IC at 40 DAS	1581	3712	89708	28830	60878	3.11
HW and IC at 20 and 40 DAS	1317	3232	75431	32020	43411	2.36
Pendimethalin 30% EC @ 0.90 kg/ha PE+ Imazethapyr @ 75 g/ha POE at 30 DAS	1326	3160	75460	25618	49842	2.95
Pendimethalin 30% EC @ 0.90 kg/ha PE + Oxadiargyl @ 90 g/ha POE at 30 DAS	1262	2992	71730	25700	46030	2.79
Weed free (HW and IC at 15,30,45 and 60 DAS)	2115	4919	119777	40920	78857	2.93
Unweeded control	865	1878	48322	23120	25202	2.09
S.Em. ±	67.3	151.8				
C.D.at5%	190.8	430.5				
C.V.%	11.7	9.2				

Economics

The maximum net return (78857 Rs./ha) and BCR (2.93) was recorded under weed free treatments. However, the weed management practices involving post-emergence application of Quizal of op-ethyl @ 40 g/ha at 20 DAS coupled with one hand weeding and one interculturing at 40 DAS recorded higher net return 66626 Rs./ha over other weed control treatment with 3.29 BCR.(Samant and Mishra 2014 and Bhatt *et al.*, 2010).

Under paucity of labour, farmers are advised to carry out post-emergence application of Quizal of op-ethyl @ 40 g/ha at 20 DAS coupled with one hand weeding and one interculturing at 40 DAS for economical weed control in groundnut.

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