

Effect of pre and postemergence herbicides on pod yield and economics of groundnut, *Arachis hypogaea*

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ABSTRACT

It is imperative to develop cheaper methods of weed control with effective herbicides alone or mixed with other herbicides compared to integrated weed management that helps in reducing the weed population without much adverse effect on the crop productivity in groundnut. The experiment was conducted at research farm of Zonal Agricultural Research Station, Khargone, JNKVV, Jabalpur during 2009 and 2010. Crop was sown during first week of July with 30 x 10 cm spacing and seed rate was 100 kg/ha. Gross plot size of experiment was 5 x 3 m and the variety used was JGN-3. Results of the experiment showed that application of pre-emergence pendimethalin 1 kg ai/ha + post emergence application of imazathypyr @ 75g ai/ha (750 ml/ha) at 20 DAS gave comparable pod yield (1207 kg/ha) and maximum net return on invested rupee (B:C ratio 2.2). The results showed that use of herbicides to weed control was a cheaper and economical method of weed control.

Keywords: Herbicides; pod yield; net return; B:C ratio

INTRODUCTION

Groundnut or peanut, *Arachis hypogaea* L is known as the King of oilseeds. It is one of the most important food and cash crops of our country. In India groundnut was grown on 6.22 million ha during 2008-09 with a total production of 7.34 MT and an average productivity of 1180 kg/ha. There are greater opportunities for achieving higher yield in groundnut through proper agronomic management practices. Among several factors limiting its yield, weeds are considered to be one of

the major yield limiting factors. In Kharif season weeds cause great losses than either insect pests or plant diseases because of favorable climatic conditions. Reduction in yield due to weed alone is estimated to be 16-42 per cent depending on crop and location (Rangasamy et al 1993). Depending on weed intensity the yield reduction in groundnut ranges between 40-50 per cent (Mishra 1997). Weeds compete with crop plants for nutrients and remove 30 to 40 per cent of applied nutrients resulting in significant yield reduction (Dryden and Krishnamurthy

1977). It is therefore necessary to control weeds so as to reduce competition for nutrients, moisture and radiant energy and to obtain maximum fertilizer and water use efficiency.

Weeding and hoeing are common cultural and manual weed management methods for groundnut but with considering the scarcity of labour these methods are very costly and tedious. Manual weeding requires huge labour force and accounts for about 25 per cent of total labour requirement (900-1200 man hours/ha) (Nag and Dutt 1979). It is imperative to develop cheaper methods of weed control with effective herbicides alone or mixed with other herbicides which compared to integrated weed management help in reducing the weed population without much adverse effect on the crop productivity. In this view the experiment was conducted to evaluate suitable herbicides and herbicide combinations in Kharif groundnut crop.

MATERIAL and METHODS

The experiment was conducted at research farm of Zonal Agricultural Research Station, Khargone, JNKVV, Jabalpur during 2009 and 2010. The soil of the experimental field was clay loam having pH 7.7 and available N, P and K 258, 14.2, 375 kg/ha respectively. The experiment consisting of total seven treatments viz T₁ (un-weeded control), T₂ (weed free check), T₃ (pendimethalin (PE)

1 kg ai/ha + one hand weeding at 30 DAS), T₄ (PoE quizalofop ethyle 50 g ai/ha (750 ml/ha) at 20 DAS), T₅ (PoE imazathypyr 75g ai/ha (750 ml/ha) at 20 DAS), T₆ (PE pendimethalin @1 kg ai/ha + T₄) and T₇ (PE pendimethalin 1 kg ai/ha + T₅) was laid out in randomized block design with three replications. Crop was sown during first week of July with 30 cm row to row and 10 cm plant to plant distance and seed rate of 100 kg/ha. Gross plot size for experiment was 5 x 3 m and the variety used was JGN-3. Agronomic practices other than treatments were performed common to all the plots as per recommended. Different observations made during the course of investigation were plant population, dry haulms yield and pod yield. The economic parameters, net return and B:C ratio were computed on the basis of cost of cultivation and pod yield at prevailing market prices.

RESULTS and DISCUSSION

Effect on haulm and pod yield of groundnut

The results presented in Table 1 show that total plant population at harvest was not significantly different among various weed control treatments. Maximum plant population was observed in T₆ (289/m²) followed by T₂ (283/m²) and lowest in T₁ (264/m²). Dry haulm yield was observed significantly higher in all the treatments compared with un-weeded check (T₁, 1155 kg/ha). Maximum dry haulm yield was recorded in T₇ (2400 kg/ha) followed by

Table 1. Growth parameters and economics of groundnut under weed management practices (2007-08 and 2008-09)

Treatment	Final plant population /m ²	Dry haulum yield (kg/ha)	Dry pod yield (kg/ha)	Cost of cultivation (Rs/ha)	Net income (Rs/ha)	B:C ratio
T1- Unweeded check	264	1155	607	10520	4502	1.4
T2- Weed-free check	283	2355	1522	19520	16712	1.8
T3- Preemergence pendimethalin 1 kg ai/ha + one hand weeding at 30 DAS	259	1780	1100	14020	10430	1.7
T4- Postemergence quizalofop ethyl 50 g ai/ha (750 ml/ha) at 20 DAS	279	1886	900	12020	10702	1.9
T5- Postemergence imazathapyr 75 g ai/ha (750 ml/ha) at 20 DAS	283	2086	1111	12500	14962	2.1
T6- Preemergence pendimethalin 1 kg ai/ha + T4	289	1645	1149	12520	10530	1.8
T7- Pre-emergence pendimethalin 1 kg ai/ha + T5	277	2400	1207	13870	16270	2.2
CD _{0.05}	NS	270	401	-	-	-
CV%	7.52	8.00	22.11	-	-	-

T₂ (2355 kg/ha) and T₅ (2086 kg/ha). T₇, T₂ and T₅ were at par to each other and significantly higher than other treatments in reference to dry haulm yield. Pre-emergence application of pendimethalin at 1.0 kg/ha recorded lower weed population and higher pod and haulm yield due to control of weeds at early stage was reported by Bhatt et al (2008).

In groundnut nodule formation, weed control index and pod yield were maximum with pre-emergence application of pendimethalin at 1.0 kg ai/ha (Deshmuk and Dev 1995). Jain et al (2000) confirmed that pre-emergence application of pendimethalin at 1.5 kg/ha reduced the weed density, weed biomass and increased the weed control efficiency as well as number of pods/plant and weight of pods. Nayak et al (2000) reported that the higher weed control efficiency was found in pendimethalin at 1.0 kg/ha which was on par with two hand weedings on 25 and 40 DAS.

Dry pod yield was recorded maximum in treatment T₂ (1522 kg/ha) followed by T₇ (1207 kg/ha) and minimum in T₁ (607 kg/ha) un-weeded check. This might be due to minimizing the competition of weeds with main crop for resources viz space, light, nutrients and moisture with adaption of effective weed control methods. Singh and Giri (2001) have also concluded that proper weed control was responsible for increase in plant height and dry matter

production in groundnut. Weed free environment in crop also facilitated better peg initiation and development at the critical growth stages of groundnut which tended to increase number of pods/plant and pod yield/hectare. Higher profitable pod yield of summer groundnut was also reported by Raj et al (2008) by keeping the crop in weed free condition.

All the treatments produced significantly higher dry pod yield in comparison to un-weeded control while yields of T₇, T₅ and T₆ were at par. These results in general are in agreement with those obtained by Kumar et al (2003a), Kumar et al (2003b). Gnanamurthy and Balasubramaniyan (1998) stated that the uncontrolled weeds reduced peanut yield up to 75 per cent.

Effect on economics of groundnut

Economic evaluation of different weed control treatments showed maximum net return in T₂ (weed free check) of Rs 16712/ha followed by T₇ (pendimethalin 1 kg ai/ha (PE) + T₅) of Rs 16270/ha (Table 1). Maximum B:C ratio was observed in T₇ (2.2) followed by T₅ (2.1) and T₄ (1.9). This might be due to the reason that cost of cultivation of groundnut crop was increased in treatment weed-free check due to the higher human labour requirement and their higher wages. This cost was reduced in treatment pendimethalin 1 kg/ha as PE + imazethapyr 0.150 kg/ha as PoE by using herbicides to effective control of weeds with

minimizing human labour. Sasikala et al (2004), Tomar et al (2009) and Rao et al (2011) have also reported higher net return and B:C ratio with integration of pre and postemergence application of herbicides with hand weeding in groundnut.

CONCLUSION

Based on these findings it may be concluded that application of preemergence pendimethalin 1 kg ai/ha + postemergence application of imazathypyr 75 g ai/ha (750 ml/ha) at 20 DAS gave maximum net return on invested rupee. The results confirm that use of herbicides to weed control was a cheaper and economical method of weed control. It is also a best option to reduce the constraints of labour scarcity in Indian agriculture.

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