

Integrated weed management in kharif groundnut (*Arachis hypogaea* L.)

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ABSTRACT

A field experiment was conducted during the rainy (*kharif*) season of 2000-01 on integrated weed management in groundnut (*Arachis hypogaea* L.) on clay loam soils of Rahuri, Maharashtra. Weed density and weed dry matter was significantly less in weed free check. Pre-emergence application of oxyfluorfen @ 0.125 kg a. i. ha⁻¹ with hand weeding 30 DAS or glyphosate (POE) @ 1.5 kg a. i. ha⁻¹, soil solarization for 30 days and oxyfluorfen (PE) @ 0.25 kg a. i. ha⁻¹ effectively controlled dry matter accumulation in weed. Maximum values of shelling per cent, 100 kernel weight and yield were recorded in weed free check followed by two hand weedings, oxyfluorfen (PE) @ 0.125 kg a. i. ha⁻¹ + glyphosate (POE) @ 1.5 kg a. i. ha⁻¹ and oxyfluorfen (PE) @ 0.125 kg a. i. ha⁻¹ + 1 HW 30 DAS, maximum net returns and B:C ratio were observed under weed free treatment (Rs. 14,766/- ha⁻¹ & 2.8 respectively followed by two hand weedings, oxyfluorfen (PE) @ 0.125 kg a. i. ha⁻¹ + HW 30 DAS and oxyfluorfen (PE) @ 0.125 kg a. i. ha⁻¹ + Glyphosate (POE) @ 1.5 kg ha⁻¹.

Key words : Groundnut, Weed biomass, Herbicide, Weed management, Yield, Economics.

INTRODUCTION

Groundnut is extensively grown in India during the *kharif* season. Initial slow growth combined with prostrate nature of its growth and hot humid climate prevailing during the *kharif* season permit early and severe crop weed competition resulting in loss of yield to the tune of 75 per cent (Gnanamurthy and Balsubramanian, 1998). Chemical control of weeds form an excellent alternative to manual weeding. However, pre-emergence application of herbicides may allow the emergence of weeds after some time. Under such situation integration of pre-emergence herbicidal treatments with hand weeding or post-emergence herbicides may help in reducing the losses caused by weeds. Weed control can also be achieved by mulching moistened soil with transparent polyethylene sheet during hot season. This technique of soil solarization in India was reviewed by Yaduraju (1993). The present study was, therefore, initiated to find out an effective and economical weed control method in groundnut.

MATERIALS AND METHODS

A field experiment was conducted in clay loam soil during *kharif* 2000 at Post Graduate Institute Research Farm, Rahuri, Maharashtra. The soil was slightly alkaline in reaction (pH 7.8), containing 113.82, 15.18 and 421.70 kg ha⁻¹ available nitrogen, phosphorus and potassium, respectively. The experiment comprised 10 treatments, the details of which are furnished in Table 1. The experiment was laid out in randomized block design and replicated three times. The groundnut variety SB-XI was sown as 30 x 10 cm apart during first week of July. A basal dose of 25 kg N and 50 kg P O ha⁻¹ was applied through urea and single super phosphate, respectively. All the recommended package of practices were followed to raise the crops.

For soil solarization, in summer months, the plots were covered with transparent polyethylene sheet (0.014 mm) for 30 days following the procedure of Chauhan *et al.* (1988). All such plots were uniformly irrigated to field capacity, one

day prior to imposing the treatments. Fifteen days prior to sowing of groundnut, the finally prepared plot was uniformly irrigated to field capacity. A flush of young weed seedlings appeared was removed by harrowing in state bed technique.

Weed samples were collected 1 m² quadrat at harvest for weed dry matter. The weed index (WI) and weed control efficiency (WCE) were computed as per Somani (1992).

RESULTS AND DISCUSSION

Weed density and weed dry matter

The predominant weed species observed were *Cyperus rotundus*, *Panicum ischmi*, *Cyanotis auxillaris*, *Cynodon dactylon*, *Commelina benghalensis* among monocots and *Digera arvensis*, *Parthenium hysterophorus*, *Acalypha indica* L., *Phyllanthus niruri*, *Lactuca runcinata*, *Euphorbia geniculata*, *Portulaca oleracea*, *Tridax procumbens* among the dicot weeds.

All the weed control treatments effectively controlled the weeds. Significantly lower weed density and weed dry matter and significantly more weed control efficiency was observed in all weed control treatments over the unweeded control. The weed density was significantly lowest in weed free treatment and was at par with 2 hand weedings and pre-emergence application of oxyfluorfen @ 0.125 kg a. i. ha⁻¹ + glyphosate (POE) @ 1.5 kg a. i. ha⁻¹. The highest weed weight (17.13 q ha⁻¹) was recorded in unweeded control (T₁). Weed free check recorded significantly lowest weed weight. It was followed by pre-emergence application of oxyfluorfen @ 0.125 kg a. i. ha⁻¹ + glyphosate (POE) @ 1.5 kg a. i. ha⁻¹, oxyfluorfen (PE) @ 0.125 kg a. i. ha⁻¹ + 1 HW at 30 DAS, soil solarization for 30 days and early post application of oxyfluorfen @ 0.25 kg a. i. ha⁻¹ which were at par with each other. The results are in conformity with the reports of Patel *et al.* (1996) and Biradar *et al.* (1997). The weed index was the maximum with unweeded control compared with other treatments (Table 1). Under the present investigation, effectiveness of herbicidal application in reducing weed competition upto early crop-growth stage

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Table 1 : Effect of weed control methods on weed intensity, weed control efficiency, weed index and weed dry weight in groundnut.

| Treatment | Weed intensity (m ²) | Weed control efficiency (%) | Weed index (%) | Weed dry weight (q ha ⁻¹) |
|--|----------------------------------|-----------------------------|----------------|---------------------------------------|
| T ₁ : Oxyfluorfen 23.5 % EC (PE) @ 0.25 kg a. i. ha ⁻¹ | 7.00 | 89.12 | 20.39 | 3.17 |
| T ₂ : Oxyfluorfen 23.5 % EC (POE) @ 0.125 kg a. i. ha ⁻¹ | 21.33 | 66.84 | 33.66 | 4.44 |
| T ₃ : Oxyfluorfen 23.5 % EC (PE) @ 0.125 kg a. i. ha ⁻¹ + 1 HW 30 DAS | 5.33 | 91.71 | 7.66 | 2.79 |
| T ₄ : Glyphosate 41 % EC (POE) @ 1.5 kg a. i. ha ⁻¹ | 17.00 | 73.57 | 28.28 | 4.29 |
| T ₅ : Oxyfluorfen 23.5 % EC (PE) @ 0.125 kg a. i. ha ⁻¹ + Glyphosate 41 % EC (POE) @ 1.5 kg a. i. ha ⁻¹ | 3.67 | 94.30 | 6.36 | 2.16 |
| T ₆ : Soil solarization for 30 days | 6.00 | 90.67 | 12.26 | 3.02 |
| T ₇ : Stale bed technique (Irrigated plot 15 days before sowing then harrowing) | 56.67 | 11.90 | 45.06 | 12.06 |
| T ₈ : Two hand weedings (20 and 40 DAS) | 2.33 | 96.38 | 4.67 | 3.94 |
| T ₉ : Weed free | 1.33 | 97.93 | - | 0.77 |
| T ₁₀ : Unweeded control | 64.33 | - | 47.05 | 17.13 |
| CD (P = 0.05) | 3.77- | - | - | 1.05 |

PE = Pre-emergence; POE = Post emergence, DAS = Days after sowing; HW = Hand weeding.

Table 2 : Effect of weed control methods on yield attributes, net return and benefit:cost ratio of groundnut

| Treatment | Shelling (%) | 100 kernel weight (g) | Yield (q ha ⁻¹) | | | Additional income over control (Rs ha ⁻¹) | Benefit : cost ratio |
|--|--------------|-----------------------|-----------------------------|-------|--------|---|----------------------|
| | | | Pod | Haulm | Kernel | | |
| T ₁ : Oxyfluorfen 23.5 % EC (PE) @ 0.25 kg a. i. ha ⁻¹ | 70.79 | 49.04 | 10.39 | 13.41 | 7.26 | 3884 | 2.34 |
| T ₂ : Oxyfluorfen 23.5 % EC (POE) @ 0.125 kg a. i. ha ⁻¹ | 69.94 | 48.02 | 8.63 | 11.11 | 5.98 | 1766 | 2.22 |
| T ₃ : Oxyfluorfen 23.5 % EC (PE) @ 0.125 kg a. i. ha ⁻¹ + 1 HW 30 DAS | 70.92 | 50.32 | 12.05 | 15.81 | 8.42 | 7016 | 2.78 |
| T ₄ : Glyphosate 41 % EC (POE) @ 1.5 kg a. i. ha ⁻¹ | 70.37 | 48.71 | 9.37 | 12.76 | 6.54 | 2541 | 2.27 |
| T ₅ : Oxyfluorfen 23.5 % EC (PE) @ 0.125 kg a. i. ha ⁻¹ + Glyphosate 41 % EC (POE) @ 1.5 kg a. i. ha ⁻¹ | 70.97 | 50.87 | 12.22 | 16.24 | 8.50 | 6538 | 2.55 |
| T ₆ : Soil solarization for 30 days | 70.78 | 49.07 | 11.45 | 14.35 | 7.98 | 4733 | 2.30 |
| T ₇ : Stale bed technique (Irrigated plot 15 days before sowing then harrowing) | 69.52 | 47.23 | 7.18 | 10.08 | 5.26 | 31 | 2.07 |
| T ₈ : Two hand weedings (20 and 40 DAS) | 71.01 | 50.55 | 12.45 | 16.18 | 8.68 | 7926 | 2.96 |
| T ₉ : Weed free | 71.35 | 51.11 | 13.05 | 16.99 | 9.24 | 8183 | 2.80 |
| T ₁₀ : Unweeded control | 69.48 | 47.15 | 6.92 | 9.83 | 4.80 | - | 2.14 |
| CD (P = 0.05) | 0.57 | 1.66 | 1.25 | 1.73 | 0.89 | - | - |

PE = Pre-emergence; POE = Post emergence; DAS = Days after sowing.

seem to be due to their adverse effects on physiology of weed growth and development.

Yield attributes

Weed free check, two hand weedings at 20 and 40 DAS, oxyfluorfen (PE) @ 0.125 kg a. i. ha⁻¹ + glyphosate (POE) @ 1.5 kg a. i. ha⁻¹ and oxyfluorfen (PE) @ 0.125 kg a. i. ha⁻¹ + 1 HW 30 DAS recorded higher shelling (%) and 100 kernel weight compared with unweeded (Table 2). Soil solarization for 30 days and oxyfluorfen (PE) @ 0.25 kg a. i. ha⁻¹ were at par with these treatments in respect of shelling (%). Bhagat (1997) also reported the beneficial effect of herbicides in control of weeds in groundnut crop.

Crop yield and economics

Significantly higher dry pod, haulm and kernel yields were obtained with weed free treatment which was at par with that observed with two hand weedings (20 and 40 DAS), pre-emergence application of oxyfluorfen @ 0.125 kg a. i. ha⁻¹ + glyphosate (POE) @ 1.5 kg a. i. ha⁻¹ and oxyfluorfen @ 0.125 kg a. i. ha⁻¹ + 1 HW 30 DAS. Bhagat (1997) observed that highest yield in 2 hand weedings (13.8 q ha⁻¹) followed by oxyfluorfen (PE) @ 0.1 kg a. i. ha⁻¹ + HW (12.5 q ha⁻¹). This might be due to the combined action of pre-emergence application of herbicides which suppressed the initial weed growth and 1 HW 30 DAS or post emergence herbicidal application resulted in removal/killing of weeds which emerged later. Further, the high yield with these treatments might also be utilization of available nutrients by the crop otherwise due to utilised by the weeds. This was supported by the lower dry weight of weeds and higher yield attributing character under these treatments resulting in higher pod yields.

Weed free check, 2 hand weeding (20 and 40 DAS) and pre-emergence application of oxyfluorfen @ 0.125 kg a. i. ha⁻¹ with 1 HW 30 DAS or post emergence application of glyphosate @ 1.5 kg a. i. ha⁻¹ gave higher net returns and benefit : cost ratio.

Thus, weed control with either two hand weedings (20 and 40 DAS) or pre-emergence application of oxyfluorfen @ 0.125 kg a. i. ha⁻¹ + 1 HW 30 DAS or oxyfluorfen (PE) @ 0.125 kg a. i. ha⁻¹ + glyphosate (POE) @ 1.5 kg a. i. ha⁻¹ is economically viable in groundnut fields.

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