



# Weed Management Strategies for Enhanced Productivity in Groundnut

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## **Author's contribution**

*The sole author designed, analysed, interpreted and prepared the manuscript.*

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## **ABSTRACT**

A field investigation was carried out at Regional Research Station, Tamil Nadu Agricultural University, Vridhachalam to evaluate suitable weed management strategies for enhanced productivity groundnut. The experiment was laid out in randomized complete block design with three replications and nine treatments. The treatments included were Pendimethalin @ 1.0 kg/ha as PE, Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha as PE, Pendimethalin @ 1.0 kg/ha as PE fb Quizalofop-p-ethyl @ 50 g/ha at 15-20 DAS, Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha as PE fb Quizalofop-p-ethyl @ 50 g/ha at 15-20 DAS, Pendimethalin @ 1.0 kg/ha as PE fb Imazethapyr @ 75 g/ha at 15-20 DAS, Pendimethalin @ 1.0 kg/ha as PE fb Hand Weeding (HW) at 25-30 DAS, Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha as PE fb HW at 25-30 DAS, Two hand weeding at 20 and 40 DAS and Weedy check. Application of Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha on 3<sup>rd</sup> day after sowing followed by one manual weeding at 25-30 DAS recorded lower weed density of 33.3 No/m<sup>2</sup>, weed dry weight of 113 g/m<sup>2</sup> with higher pod yield of 2400 kg/ha, net return of Rs. 62851/- per ha with BCR of 1.91. Among the herbicide combinations, application of pendimethalin @ 1.0 kg/ha on 3 DAS followed by Imazethapyr @ 75 g/ha at 15-20 DAS recorded pod yield of 1600 kg/ha with Benefit Cost Ratio of 1.38. From this study, it was concluded that application of

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Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg a.i./ha on 3 DAS as pre-emergence followed by one hand weeding at 25-30 DAS was identified as efficient and economical weed management practice for groundnut.

*Keywords: Groundnut; herbicide; hand weeding; weed density; weed dry weight.*

## 1. INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop of India which is cultivated in nearly 4.91 million ha area with the production of 8.22 million tonnes and average productivity of 1674 kg/ha [1]. Among the several constraints for low productivity in groundnut such as cultivation of groundnut as rain-fed crop, lack of technical knowledge among the farmers, unawareness on improved varieties and technologies etc., the major cause of minimizing productivity is severe weed infestation [2]. Unlike other crops, weeds interfere with pegging, pod development and harvesting of groundnut at different crop growth stages besides competing for essential resources. Yield losses due to weeds have been estimated in groundnut as high as 24 to 70 percent [3] and upto 57% [4] in India.

Critically viewing, the manual method of hoeing is costly and time consuming. But, the major problem in agriculture is acute scarcity of labour during the peak period of key operations like sowing, weeding and harvesting. Mechanically operated power weeder cannot be used due to closer spacing and also it may affect peg initiation in groundnut. In this context, chemical weed control is a better supplement to conventional methods and thus created a scope for using herbicides for weed control in groundnut crop. Therefore, an experiment was carried out at Regional Research Station, Tamil Nadu Agricultural University, Vridhachalam to find out the effective and economically feasible weed management strategies for yield enhancement in groundnut.

## 2. MATERIALS AND METHODS

A field experiment was conducted during *kharif* 2018 at Regional Research Station, Vridhachalam to evaluate the suitable weed management strategies for yield enhancement in groundnut (var. VRI 8). The soil of the experimental site was red sandy loam in texture and slightly acidic in reaction (pH 6.8 and EC 0.20 dSm<sup>-1</sup>) as well as low in available nitrogen (222 kg ha<sup>-1</sup>), medium in available phosphorus

(12 kg ha<sup>-1</sup>) and high in available potash (323 kg ha<sup>-1</sup>). The experiment comprising of 9 treatments viz., Pendimethalin @ 1.0 kg/ha as PE, Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha as PE, Pendimethalin @ 1.0 kg/ha as PE fb Quizalofop-p-ethyl @ 50 g/ha at 15-20 DAS, Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha as PE fb Quizalofop-p-ethyl @ 50 g/ha at 15-20 DAS, Pendimethalin @ 1.0 kg/ha as PE fb Imazethapyr @ 75 g/ha at 15-20 DAS, Pendimethalin @ 1.0 kg/ha as PE fb Hand Weeding (HW) at 25-30 DAS, Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha as PE fb HW at 25-30 DAS, Two hand weeding at 20 and 40 DAS and Weedy check were laid out in randomized block design with three replications.

The groundnut variety VRI 8 was sown in beds and channels method of land configuration at 30 x 10 cm spacing with seed rate of 125 kg kernel ha<sup>-1</sup> under irrigated ecosystem. The maximum and minimum temperature recorded was 37.6°C and 24.9°C with the rainfall of 399.4 mm in 21 rainy days during the cropping season of *kharif* 2018. The crop was fertilized with 25-50-75 kg N-P2O5-K2O ha<sup>-1</sup>. The pre-emergence herbicide was applied to soil on third day after sowing, while post-emergence herbicides were applied to foliage of weeds on 20 DAS. The Spray fluid was used at the rate of 500 litres per hectare. The knapsack sprayer fitted with flat fan nozzle was used for the herbicide spray.

Total weed density and weed biomass were recorded using 0.25 m<sup>2</sup> quadrant and converted to per square meter area for interpretation of results. Weed density of major weed species was expressed as number of weeds per meter square area and weed biomass as gram per square meter area. At the end of cropping season, yield was recorded from net plot area and computed to kilogram per hectare. Cost of cultivation, gross return and net return were calculated based on the prevailing price of inputs and outputs. Benefit cost ratio was calculated on the basis of gross return divided by the cost of cultivation.

### 3. RESULTS AND DISCUSSION

#### 3.1 Weeds Flora

The experimental field was infested with *Amaranthus viridis*, *Trianthema portulacastrum*, *Cyperus rotundus*, *Cynodon dactylon*, *Cleome viscosa*, *Boerhaavia diffusa*, *Eclipta alba*, *Dactyloctenium aegyptium*, *Vernonia cinerea*, *Tridax procumbens*, *Phyllanthus niruri*, *Commelina benghalensis*, *Chenopodium album* and *Echinochloa spp.* Singh et al. [5] also observed similar weed flora in groundnut.

#### 3.2 Effect on Weeds

The results on weed density (Table 1) reflected that significant difference was found among the weed control treatments. In the present study, pre-emergence application of Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha on 3 days after sowing followed by one hand weeding at 25-30 DAS recorded lower weed density of 33.3 No/m<sup>2</sup> as compared to pre-emergence application of Pendimethalin @ 1.0 kg/ha followed by one hand weeding at 25-30 DAS (71.3 No/m<sup>2</sup>) and Pendimethalin @ 1.0 kg/ha as pre-emergence followed by Imazethapyr @ 75 g/ha as post emergence at 15-20 DAS (72.7 No/m<sup>2</sup>) and weedy check (356 No/m<sup>2</sup>). Similar trend was also observed with weed biomass. Lower weed dry weight of 113 g/m<sup>2</sup> was recorded with application of

Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha as pre-emergence herbicide on 3 DAS followed by one hand weeding at 25-30 DAS as compared to pre-emergence application of pendimethalin @ 1.0 kg/ha followed by one hand weeding at 25-30 DAS (139.07 g/m<sup>2</sup>), application of pendimethalin @ 1.0 kg/ha as PE followed by Imazethapyr @ 75 g/ha at 15-20 DAS as POE (164.80 g/m<sup>2</sup>) and weedy check (349.87 g/m<sup>2</sup>).

Regarding to weed control efficiency, application of Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha as pre-emergence followed by one hand weeding at 25-30 DAS resulted in higher weed control efficiency (67.37%) as compared to application of existing recommendation of pendimethalin @ 1.0 kg/ha as pre-emergence followed by one hand weeding at 25-30 DAS (60.31%) and pendimethalin @ 1.0 kg/ha as PE fb Imazethapyr @ 75 g/ha at 15-20 DAS as POE (52.43%) (Table 1). The probable reasons for obtaining highest weed control efficiency under the treatment T<sub>7</sub> might be due to lesser weed competition faced by groundnut crop, as pre-emergence application of ready mix herbicide viz., pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha resulted in better weed control during early stages of the crop growth and later the weed growth was checked by one hand weeding at 25-30 DAS. Similar findings were also reported by Rao et al. [6] and Jadhav et al. [7].

**Table 1. Influence of weed management practices on Weed Dry Weight (WDW), Weed Density (WD) and Weed Control Efficiency (WCE) in groundnut**

| Treatments   | WDW (g/m <sup>2</sup> ) | WD (No./m <sup>2</sup> ) | WCE (%) |
|--|-------------------------|--------------------------|---------|
| T1 Pendimethalin @ 1.0 kg/ha PE  | 245.20                  | 186.7                    | 29.88   |
| T2 Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg/ha PE (ready mix)   | 202.60                  | 96.0                     | 41.38   |
| T3 Pendimethalin @ 1.0 kg/ha PE + Quizalofop-p-ethyl @ 50 g/ha at 15-20DAS                                       | 230.00                  | 157.3                    | 34.09   |
| T4 Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg/ha PE (ready mix) + Quizalofop-p-ethyl @ 50 g/ha at 15-20 DAS | 206.13                  | 93.3                     | 41.00   |
| T5 Pendimethalin @ 1.0 kg/ha PE + Imazethapyr @ 75 g/ha at 15-20 DAS   | 164.80                  | 72.7                     | 52.43   |
| T6 Pendimethalin @ 1.0 kg/ha PE + Manual weeding at 25-30 DAS  | 139.07                  | 71.3                     | 60.31   |
| T7 Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg/ha PE (ready mix) + Manual weeding at 25-30 DAS               | 113.00                  | 33.3                     | 67.37   |
| T8 Two manual weeding at 20 and 40 DAS   | 134.00                  | 53.3                     | 61.37   |
| T9 Weedy check.  | 349.87                  | 356.0                    | 0       |
| S.Ed   | 18.61                   | 13.20                    | -       |
| CD (P=0.05)  | 39.45                   | 27.99                    | -       |

**Table 2. Influence of weed management practices on yield and economics in groundnut**

| Treatments   | Dry pod yield (kg/ha) | Gross return (Rs/ha) | Net return (Rs/ha) | BCR  |
|--|-----------------------|----------------------|--------------------|------|
| T1 Pendimethalin @ 1.0 kg/ha PE  | 950                   | 52250                | -10219             | 0.84 |
| T2 Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg/ha PE (ready mix)   | 1300                  | 71500                | 7226               | 1.11 |
| T3 Pendimethalin @ 1.0 kg/ha PE + Quizalofop-p-ethyl @ 50 g/ha at 15-20 DAS                                      | 1267                  | 69667                | 7033               | 1.11 |
| T4 Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg/ha PE (ready mix) + Quizalofop-p-ethyl @ 50 g/ha at 15-20 DAS | 1400                  | 77000                | 11571              | 1.18 |
| T5 Pendimethalin @ 1.0 kg/ha PE + Imazethapyr @ 75 g/ha at 15-20 DAS   | 1600                  | 88000                | 24376              | 1.38 |
| T6 Pendimethalin @ 1.0 kg/ha PE + Manual weeding at 25-30 DAS  | 2067                  | 113667               | 46323              | 1.69 |
| T7 Pendimethalin 30 EC + Imazethapyr 2 EC @ 1.0 kg/ha PE (ready mix) + Manual weeding at 25-30 DAS               | 2400                  | 132000               | 62851              | 1.91 |
| T8 Two manual weeding at 20 and 40 DAS   | 1967                  | 108167               | 35643              | 1.49 |
| T9 Weedy check.  | 383                   | 21083                | -35191             | 0.37 |
| S.Ed   | 130.8                 | -                    | -                  | -    |
| CD (P=0.05)  | 277.3                 | -                    | -                  | -    |

### 3.3 Effect on Groundnut

The results (Table 2) revealed that pre-emergence application of Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg/ha as on 3<sup>rd</sup> day after sowing fb one hand weeding at 25-30 DAS recorded higher pod yield of 2400 kg/ha, net return of Rs. 62851/- per ha and BCR of 1.91 against the existing practice of pendimethalin @ 1.0 kg/ha as pre-emergence followed by one hand weeding at 25-30 DAS which recorded the pod yield of 2067 kg/ha, net return of Rs. 46323/- per ha and benefit cost ratio of 1.69 as compared to two hand weeding at 20 and 40 DAS which recorded 1967 kg/ha., net return of Rs. 35643/- per ha and benefit cost ratio of 1.49. Mathukia et al. [8] also reported that pre-emergence application of pendimethalin 0.9 kg ha<sup>-1</sup> supplemented with IC & HW at 40 DAS was found with higher yield and economics. These results are in close agreement with the findings of Pawar et al. [4]. Weed control by two hand weeding registered lower net return and benefit cost ratio due to increased cost of cultivation under manual weeding.

### 4. CONCLUSION

From the present study, it was concluded that pre-emergence application of Pendimethalin 30 EC + Imazethapyr 2 EC (ready mix) @ 1.0 kg a.i./ha on 3 DAS followed by one hand weeding

at 25-30 DAS was identified as efficient and economical weed management practice for groundnut by considering the scarcity and cost of labourers for agricultural operations.

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### COMPETING INTERESTS

Author has declared that no competing interests exist.

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