



A CASE STUDY

Weed management in groundnut through farmers participatory approach

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Abstract : To popularize herbicides usage in groundnut cultivation 15 on-farm demonstrations were conducted in farmers fields with an area of 12.0 hectares under supervision of DAATT Centre (Extension unit of Acharya N.G. Ranga Agricultural University, Andhra Pradesh), Anantapuram during *Rabi* season over a period of 3 years from 2011-12, 2012-13 and 2013-14. The treatments consisted of T₁: Herbicide application (Pendimethalin @ 3.75 lit/ha as pre-emergence + quizalopop ethyl @ 1.0 lit/ha as post-emergence at 20 days after sowing + one hand weeding at 40 days after sowing) T₂: farmers practice (Manual weeding with Danthulu twice at 20 and 40 days after sowing) with an objective to obtain higher productivity, to reduce the cost of cultivation of groundnut and subsequently improve the returns from unit area in farmers' fields. Demonstrations revealed that application of pendimethalin @ 3.75 lit/ha immediately after sowing + quizalopop ethyl @ 1.0 lit/ha at 20 days after sowing + manual weeding at 40 days after sowing has recorded higher pod yield (2252 kg ha⁻¹) which was 15.2 per cent higher over farmers practice (1955 kg ha⁻¹). A saving of Rs. 4000/- (Rupees four thousand only) on cost of cultivation per hectare was realized with herbicide application besides increasing groundnut yield. Higher gross returns (Rs. 1,05,844/-) and net returns (Rs. 83,094/-) per hectare were with herbicide application compared to farmers practice (Rs. 91,885/- gross returns and Rs. 65,135/- net returns). Due to herbicide application cost of cultivation was reduced by 15.3 per cent whereas, gross returns and net returns were improved by 20.1 and 43.1 per cent, respectively over farmers practice.

Key Words : Groundnut, Weed management, Farmers fields

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INTRODUCTION

Groundnut is an important oilseed crop of India which is cultivated in nearly 6 million ha area with the production of 7.5 million tonnes and average productivity of 1.27 t/ha. Though India ranks first in the world under groundnut area, there is need to import 8.03 million tons of edible oil. In Anantapuram district of Andhra Pradesh

groundnut is the major oilseed crop cultivated in an area of 7.06 lakh hectares during *Kharif* and 25,690 hectares during *Rabi* season. Groundnut productivity in Anantapuram district is very low, because of many problems in its cultivation. Cultivation of groundnut as rain fed crop, lack of knowledge among the farmers about cultivation of groundnut with modern technology, unawareness of improved varieties and improper

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fertilization *etc.* are some causes of lower productivity of groundnut in Anantapuram district. Along with these, the major cause of minimizing production is severe weed infestation in crop. Weed management in groundnut due to weed infestation is reported by Devkumar and Giri (1998). In India, yield losses of has great importance as groundnut suffers heavily due to weed competition in the early stage because of its short structure and initial slow growth. Upto 70 per cent reduction in groundnut yield groundnut due to weeds ranged from 13-80 per cent (Ghosh *et al.*, 2000). Weeds compete with crop for soil moisture, nutrients and light and reduce the yield. They also harbour and serve as alternative host for pest and diseases. The critical period of crop weed competition in groundnut was observed to be 4 to 8 weeks after sowing as groundnut is naturally short with slow seedling emergence and initial growth. Nutrient losses due to crop weed competition were 38.8, 9.2 and 23.3 N, P and K kg ha⁻¹, respectively (Naidu *et al.*, 1982). Weeding and hoeing are common cultural and manual weed management methods for groundnut, but with considering the scarcity of labours, these methods are very costly and tedious. Mechanically operated power weeder cannot be used after peg initiation of groundnut. 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 weeding and hoeing has become a necessity to control weeds.

Hence, considering the above points on farm demonstrations were conducted in farmers fields to popularize herbicide application on *Rabi* groundnut among farmers under supervision of DAATT Centre (Extension unit of Acharya N.G. Ranga Agricultural University, Andhra Pradesh), Anantapuram for three years during *Rabi*, 2011-12, 2012-13 and 2013-14. The comparison was made between groundnut with herbicide application +one hand weeding and farmers practice without herbicide application with an objective to obtain effective weed control and higher groundnut productivity in farmers' fields.

MATERIAL AND METHODS

Fifteen on-farm demonstrations were conducted to popularize benefits of herbicide application on yield components, pod yield and economics of groundnut in five villages of Anantapuram district with an area of 12.0 hectares during *Rabi* season over a period of 3 years

from 2011-12, 2012-13 and 2013-14 (Table 1). The treatments consisted of T₁: Herbicide application (pendimethalin 30 % EC @ 3.75 lit/ha as pre-emergence + quizalopop ethyl 5 % EC @ 1.0 lit/ha as post-emergence at 20 days after sowing +one hand weeding at 40 days after sowing) T₂: farmers practice (Manual weeding with Danthulu twice at 20 and 40 days after sowing). Plot size for each treatment of on-farm demonstration was 4000 m². In each year of on-farm demonstration soil samples were collected from farmer's fields and analyzed at Krishi Vigyan Kendra, Reddipalli (Anantapuram district). The soil analysis revealed that pH varied from 6.1 to 8.3, EC ranged from 0.05 to 0.49 ds m⁻¹, organic carbon was 0.05 to 0.38 per cent, available nitrogen was low in all the samples, available phosphorus was medium to high (36.2 to 67.2 kg ha⁻¹) and available potassium was low to medium (71 to 285 kg ha⁻¹). Groundnut variety K-6 of 110-115 days duration was sown in first fortnight of November during three years of demonstration with spacing of 22.5 cm × 10 cm on flat beds. The seeds of groundnut were treated with imidachloprid @ 2ml and mancozeb @ 3 g/ kg seeds before sowing. In both treatments fertilizers were applied according to soil test results. The recommended dose of fertilizer 30-40-50 kg N, P and K/ha was applied as half of N and full P and K at the time of sowing and remaining N was applied one month after sowing the crop. During entire period of demonstration nitrogen was low in all soil samples, hence full recommended dose of nitrogen was applied. If the phosphorus and potassium nutrient status were medium, half of the recommended dose of fertilizers were applied. No fertilizers were applied if their status was high. In farmers practice 150 kg DAP per ha⁻¹ was applied. Protective irrigations were applied whenever it was necessary during the crop growth. Pendimethalin was applied one day after sowing as pre-emergence, whereas quizalopop ethyl was applied 20 days after sowing as post-emergence with knapsack sprayer. In farmers practice weed control was achieved by manual weeding with danthulu twice at 20 and 40 DAS. The crop was harvested at 125 days after sowing (DAS). Weed density (no./m²) was recorded by putting a quadrat of 0.25m² at two random spots in each plot. At harvest ten plants were randomly selected from each treatment for recording growth parameters such as plant height (cm), number of pods/ plant, 100 pod weight and 100 seed weight. At harvest in each treatment pod and haulm yield from the net plot (5 m × 5 m) was recorded.

Both treatments received uniform plant protection and cultural management practices throughout the period of crop growth. Labour charges, cost of inputs were worked out to compute the cost of cultivation. Gross returns were calculated based on local market prices of groundnut and net returns by subtracting the total cost of cultivation from gross returns. Benefit: cost ratio was computed by dividing gross returns with cost of cultivation.

RESULTS AND DISCUSSION

The results of the on-farm demonstrations on weed management in groundnut in comparison with farmers practice are given in Table 2.

Weed density :

Predominant weeds in demonstration groundnut field were *Parthenium hysterophorus*, *Portulaca oleracea*, *Argemone mexicana*, *Echinochloa colonum*, *Cyperus rotundus* and *Cynodon dactylon*. Lower weed density of 12.2 per m² was recorded with herbicide application compared to farmers practice (18.1 per m²). This might be due to pre-emergence application of pendimethalin which prevented emergence of monocot weeds by inhibiting root and shoot growth, while quizalopop ethyl was responsible for destruction of grassy weeds at 3-4 leaf stage. Remaining monocot weeds were controlled by hand weeding at 40 DAS. Integration of

pre and post-emergence herbicides with hand weeding resulted significant reduction in weed density (Walia *et al.*, 2007).

Growth and yield attributes :

Higher plant height of 36.4 cm was recorded with herbicide application compared to farmers practice (33.6 cm). There were more number of filled pods per plant (18.8) in herbicide application as compared to 14.3 pods in farmers practice. Higher 100 pod weight of 75.8 g was recorded with herbicide application compared to farmers practice (71.3 g). Similarly higher 100 seed weight of 44.3 g was recorded herbicide application compared to farmers practice (39.6 g). 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) has also concluded that proper weed control was responsible for increase in plant height of groundnut. Weed free environment in crop also facilitated better peg initiation and development at the critical growth stages of groundnut which tends to increase in number of filled pods/plant and pod yield/hectare. Higher profitable pod yield of summer groundnut was also reported by Raj *et al.* (2008) with keeping the crop in weed free condition. Due to herbicide application plant height, number of filled pods per plant, 100 pod weight

Table 1 : Details of on-farm demonstrations

Sr. No.	Year	Number of villages	Number of locations	Area (ha)
1.	2011-12	5	5	4.0
2.	2012-13	5	5	4.0
3.	2013-14	5	5	4.0
	Total	15	15	12.0

Table 2 : Yield of groundnut as influenced by herbicide application

(Mean of 3 years data)

Sr. No.	Particulars	Herbicide application	Farmers practice	% increase or decrease over farmers practice
1.	Weed density (no./m ²)	12.2	18.1	-32.6
2.	Plant height (cm)	36.4	33.6	8.3
3.	Number of filled pods per plant	18.8	14.3	31.5
4.	100 pod weight (g)	75.8	71.3	6.3
5.	100 seed weight (g)	44.3	39.6	11.9
6.	Shelling (%)	73.7	69.4	6.2
7.	Pod yield (kg ha ⁻¹)	2252	1955	15.2
8.	Haulm yield (kg ha ⁻¹)	2899	2655	9.2
9.	Cost of cultivation (Rs. ha ⁻¹)	22750	26750	-15.0
10.	Gross returns (Rs. ha ⁻¹)	105844	91885	15.2
11.	Net returns (Rs. ha ⁻¹)	83094	65135	27.6
12.	C:B ratio	4.7	3.4	35.4

and 100 seed weight were increased by 8.3, 31.5, 6.3 and 11.9 per cent, respectively over farmers practice.

Pod yield :

Herbicide application recorded higher pod yield (2252 kg ha⁻¹) which was 15.2 per cent higher over farmers practice (1955 kg ha⁻¹). Higher number of pods per plant, 100 pod weight and 100 seed weight might be the reason behind the yield increase in herbicide application treatment as reported by Bhale *et al.* (2012). Pendimethalin @ 3.75 lit/ha as pre-emergence + quizalopop ethyl @ 1.0 lit/ha as post-emergence at 20 days after sowing + one hand weeding at 40 days after sowing was more effective to control weeds at the early crop growth stage. Pre-emergence application of pendimethalin reduced monocot and dicot populations in the early stage of crop growth which permitted better growth of crop, pod bearing and thus, finally improved pod yield. Hand weeding allows pulverisation of soil, better aeration, root proliferation, better nodulation and more pod formations, ultimately increasing pod yield (2252 kg ha⁻¹) as reported by Bhale *et al.* (2012).

Kalhature *et al.* (2013) also showed that pendimethalin @ 3.75 lit/ha as pre-emergence + quizalopop ethyl @ 1.0 lit/ha as post-emergence at 20 days after sowing +one hand weeding at 40 days after sowing 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 through herbicide application + hand weeding allowed absorption of more nutrients from soil compared to weed control through manual weeding alone.

Economics :

Gross returns (Rs. 1,05,844/-) and net returns (Rs. 83,094/-) per hectare were more with herbicide application compared to farmers practice (Rs. 91,885/- gross returns and Rs. 65,135/- net returns). This was due to higher pod yield with herbicide application. Higher gross returns of Rs. 13,959/- per hectare was obtained with herbicide application due to higher pod yield compared to farmers practice. The cost of cultivation was comparatively high in farmers practice compared to herbicide application. This might be due to the higher need of human labours and their higher wages. This cost was reduced in treatment pendimethalin @ 3.75 lit/ha as pre-emergence + quizalopop ethyl @ 1.0 lit/ha as post-emergence at 20 days after sowing +one hand weeding

at 40 days after sowing by using herbicides to effective control of weeds with minimizing human labours. Simultaneously cost benefit ratio was higher with herbicide application (1:4.7) compared to farmers practice (1:3.4) because of lower cost of cultivation and improved yield with herbicide application. In herbicide application cost of cultivation was reduced by 15.3 per cent where as, gross returns and net returns were improved by 15.2 and 27.6 per cent, respectively over farmers practice. Sasikala *et al.* (2004) and Rao *et al.* (2011) have also reported higher net return and C:B ratio with integration of pre - and postemergence application of herbicides with one hand weeding in groundnut.

Considering the present condition of scarcity and high cost of labours, quality of weed control, yield and B:C ratio of cultivation of groundnut, pendimethalin @ 3.75 lit/ha as pre-emergence + quizalopop ethyl @ 1.0 lit/ha as post-emergence at 20 days after sowing +one hand weeding at 40 days after sowing proved practically more convenient and economically best feasible weed management practice for groundnut.

REFERENCES

- Bhale, Vilas, M., Karmore, Jayashri, V., Patil and Yuvraj, R. (2012).** Integrated weed management in groundnut. *Pak. J. Weed Sci. Res.*, **18** : 733-739.
- 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.
- Ghosh, P.K., Mandal, K.G. and Kuntal, M.H. (2000).** Allelopathic effects of weeds on groundnut (*Arachis hypogaea*) in India - A Review. *Agric. Rev.*, **21** (1) : 66-69.
- Kalhature, A.H., Shete, B.T. and Bodake, P.S. (2013).** Integration of chemical and cultural methods for weed management in groundnut. *Indian J. Weed Sci.*, **45** (2) : 116-119.
- 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.
- Raj, V.C., Damame, H.S., Patel, A.M. and Arvadia, M.K. (2008).** Integrated weed management in summer groundnut (*Arachis hypogaea* L.), 127pp. In: Biennial Conference on Weed Management in Modern Agriculture: Emerging Challenges and Opportunities, at Patna, Bihar during 27-28 February 2008.
- Rao, S.S., Madhavi, M. and Reddy, C.R. (2011).** Integrated approach for weed control in Rabi groundnut (*Arachis hypogaea* L.). *J. Res. ANGRAU*, **39** (1) : 60-63.

Sasikala, B., Reddy, Y. and Raghava Reddy, C. (2004). Pre- and postemergence herbicides on weed control and yield of groundnut (*Arachis hypogaea*). *Indian. J. Dry. Agric. Res. & Dev.*, **19** (1) : 78-80.

Singh, V.B. and Giri, G. (2001). Influence of intercropping and weed control measures on dry matter accumulation and

nutrient uptake by sunflower and groundnut and their effect on succeeding maize. *Indian J. Agron.*, **46** (1) : 50-55.

Walia, U.S., Singh, Surjit and Singh, Buta (2007). Integrated approach for the control of hardy weeds in groundnut (*Arachis hypogaea* L.). *Indian J. Weed Sci.*, **39** (1&2) : 112-115.

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