www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(6): 2970-2973

www.thepharmajournal.com
Received: 12-04-2022
Accepted: 16-05-2022

Pastula Bhavani
M.Sc. (Ag), Department of Agronomy, S.V. Agricultural College, Tirupati, Acharya N. G. Ranga Agricultural University, Andhra Pradesh, India

V Chandrika
Principal Scientist (Agronomy) and Head, Agricultural Research Station, Utukur, Kadapa, Andhra Pradesh, India

P Maheswara Reddy
Senior Scientist (Agronomy) Regional Agricultural Research Station, Tirupati, Andhra Pradesh, India

MVS Naidu
Professor and Head, Department of Soil Science and Agricultural Chemistry, S.V. Agricultural College, Tirupati, Andhra Pradesh, India

Corresponding Author
Pastula Bhavani
M.Sc. (Ag), Department of Agronomy, S.V. Agricultural College, Tirupati, Acharya N. G. Ranga Agricultural University, Andhra Pradesh, India

Pod yield and economics of rabi groundnut as influenced by sequential application of herbicides

Pastula Bhavani, V Chandrika, P Maheswara Reddy and MVS Naidu

Abstract
The current investigation was done to evaluate the sequential application of herbicides on yield and economics of groundnut during *rabi* season, 2020-2021 at S. V. Agricultural College, Tirupati, Andhra Pradesh. Pendimethalin + Imazethapyr (Valor), Diclosulam, Alachlor, Bentazone, Imazethapyr, Quizalofop-p-ethyl were tested alone as well as in sequential application in comparison with hand weeding twice at 20 and 40 DAS and weedy check in randomized block design with three replications. This study revealed that among chemical treatments higher pod yield, net returns and BC ratio of *rabi* groundnut recorded with sequential application of diclosulam 20 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1}at 20 DAS (T_8) and alachlor 1250 g ha^{-1} as pre-emergence *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1}, (T_5) both were comparable with hand weeding twice which realised higher pod yield and gross returns.

Keywords: Groundnut, pre-emergence, quizalofop-p-ethyl, bentazone and pod yield

Introduction
In field conditions weeds pose a heavy competition to groundnut crop as well as major trouble to farmer in its elimination by hand weeding. Groundnut is an important oilseed crop of India with an total area of 4.83 million ha, production of 9.95 million tonnes and productivity of 2063 kg ha^{-1} during both seasons in 2019-2020 (www.indiastat.com). Luxurious weed growth in groundnut led to 45.5 per cent less pod yield over weed free situation reported by Poonia *et al.* (2016) [7]. Further, Geethika (2018) [2] reported yield loss of 52 per cent due to heavy weed infestation in *rabi* groundnut on sandy loam soils of Tirupati. Groundnut suffers from heavy competition from weeds especially in the initial stages of crop growth period. According to Sahoo *et al*. (2017) [8] the critical period of crop weed competition is upto 45 DAS, where weed free environment aids in increased productivity.
Herbicides look better than any other method of weed control because of their performance in decreasing weed competition, easy usage and economically low cost and less work force is engaged. However farmers continue to practice the hand weeding which is proved to be better in controlling the weeds but results in poor net returns. Further hand weeding is characterized by high labour force and wage. The main aim of this research therefore was to determine most suitable combination of pre- and post emergence herbicides that enhance efficient control of weeds with low cost of cultivation and higher net returns to groundnut farmer.

Materials and Methods
A field experiment was conducted at Wetland farm of S. V. Agricultural College, Tirupati, Andhra Pradesh during *kharif* season of 2020-2021. The soil of experimental plot was sandy loam in texture, neutral in reaction, low in organic carbon and available nitrogen, medium in available phosphorus and available potassium. Ten treatments were imposed in three replications they were Pre-emergence (PE) application of pendimethalin+imazethapyr (pre-mix) 1000 g ha^{-1} (T_1), PE application of diclosulam 20 g ha^{-1} (T_2), PE application of alachlor 1250 g ha^{-1} *fb* imazethapyr 75 g ha^{-1} at 20 DAS (T_3), PE application of alachlor 1250 g ha^{-1} *fb* bentazone 960 g ha^{-1} at 20 DAS (T_4), PE application of alachlor 1250 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_5), PE application of diclosulam 20 g ha^{-1} *fb* imazethapyr 75 g ha^{-1} at 20 DAS (T_6), PE application of diclosulam 20 g ha^{-1} *fb* bentazone 960 g ha^{-1} at 20 DAS (T_7), PE application of diclosulam 20 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_8), Hand weeding at 20 and 40 DAS (T_9) and Weedy check (T_{10}), were laid out in randomized block design. Groundnut variety Dharani was sown on 1st December, 2020 keeping spacing of 22.5 x 10 cm by using seed rate of 120 kg ha^{-1}.

Fertilizer dose of 30-40-50 N-P-K kg ha^{-1} was applied. Pre- and post-emergence herbicides were applied by using battery operated sprayer fitted with flat fan nozzle by mixing in 500 litre of water ha^{-1} as per treatments. Pre-emergence herbicides Pendimethalin + Imazethapyr (Valor), Diclosulam and Alachlor were sprayed on the day of sowing whereas post emergence herbicides Bentazone, Imazethapyr, Quizalofop-p-ethyl were applied at 20 DAS. Suitable plant protection chemicals were sprayed in all plots to check the incidence of pests and diseases. In the plots ear marked for hand weeding, the operation was done at 20 and 40 DAS as per the treatments. Statistical data was taken as per the schedule and the collected data was statistically analyzed following the analysis of variance for RBD as given by Panse and Sukhatme (1985) [6]. The yield reduction (%) owing to the presence of weeds was estimated by using the formula suggested by Kumar and Gill (1969) [3] which is expressed as weed index (WI).

$$WI = \frac{X - Y}{X} \times 100$$

WI = Weed index (%)
X =Yield obtained from minimum weed competition plot,
Y =Yield obtained from treated plot

The total cost of cultivation was calculated for individual treatments on the basis of cost of inputs used. Gross returns were computed by multiplying economic yield with prevailing market price of the output. Net returns were arrived by deducting the cost of cultivation from gross monetary returns for each treatment. Benefit-cost ratio was computed by using the following formula.

$$\text{Benefit-cost ratio} = \frac{\text{Gross returns (₹ ha}^{-1})}{\text{Cost of cultivation (₹ ha}^{-1})}$$

Results and Discussion

Pod yield

Hand weeding at 20 and 40 DAS (T_9), recorded higher pod yield of *rabi* groundnut and it was statistically similar to sequential application of diclosulam 20 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_8) and alachlor 1250 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_5). Quizalofop-p-ethyl was found to be effective in suppression of grassy weed growth through inhibition of lipid synthesis and bentazone affects PS II process decreasing the ratio of photo assimilates production and translocation in broad leaved weeds. These results were in accordance with those of Kalaichelvi *et al.* (2015) [5] and Chetan *et al*. (2015) [1]. This depicts that use of tank mix quizalofop-p-ethyl and bentazone at 20 DAS provided wider control of grassy and broad leaved weeds respectively in *rabi* groundnut. The next best treatments in recording significantly higher yield was PE application of pendimethalin + imazethapyr (pre mix) 1000 g ha^{-1} (T_1), diclosulam 20 g ha^{-1} *fb* imazethapyr 75 g ha^{-1} at 20 DAS (T_6) and alachlor 1250 g ha^{-1} *fb* imazethapyr 75 g ha^{-1} (T_3), which were comparable with each other. Significantly lower yield was recorded with weedy check (T_{10}) than rest of the weed management practices.

Weed index

Weed index recorded minimum with pre-emergence application of diclosulam 20 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_8) and alachlor 1250 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_5). Use of pre followed by post emergence herbicides reduced the weed intensity and increased the crop growth intensity there by uptake of nutrients by weeds was reduced ultimately weeds registered lower weed biomass this might be the reason for lower weed index in the above treatments. The yield loss due to presence of weeds in unweeded check (T_{10}) was higher owing to higher weed growth during the entire crop growth period which led to higher value of weed index (44.47 %). Whereas pre-emergence application of application of alachlor 1250 g ha^{-1} *fb* bentazone 960 g ha^{-1} at 20 DAS (T_4), diclosulam 20 g ha^{-1} *fb* bentazone 960 g ha^{-1} (T_7) and PE application of diclosulam 20 g ha^{-1} (T_2) also recorded higher weed index because of use of broad leaved weed controllers *viz.*, diclosulam and bentazone, lead to dominance of grassy weeds in these plots owing to lower pod yields. These results were in line with Grichar *et al.* (2006) [4]. The pod yield and weed index values of different weed management practices are presented in Table 1 and graphically depicted in Figure 1.

Economics

Higher gross returns were realised with PE application of diclosulam 20 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_8) and alachlor 1250 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_5), which were on par with hand weeding at 20 and 40 DAS (T_9). The next higher gross returns were observed with pre emergence application of pendimethalin + imazethapyr (pre mix) 1000 g ha^{-1} (T_1), diclosulam 20 g ha^{-1} *fb* imazethapyr 75 g ha^{-1} at 20 DAS (T_6) and alachlor 1250 g ha^{-1} *fb* imazethapyr 75 g ha^{-1} (T_3), which were in parity with each other. These results were in agreement with earlier findings of Vijay *et al*. (2018) [9].

Higher net returns and benefit-cost ratio were recorded with the PE application of diclosulam 20 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_8) and alachlor 1250 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_5), because of lower cost of chemicals and higher realisation of yields nearly equivalent to hand weeding twice. Although hand weeding at 20 and 40 DAS recorded higher gross returns but failed to realise higher net returns and benefit-cost ratio because of higher cost of cultivation associated in the form of manual labour. The gross returns, net returns and BC ratio values are presented in Table 2.

Table 1: Pod yield (Kg ha^{-1}) and weed index (%) of *rabi* groundnut as influenced by different weed management practices

	Treatments	Pod yield	Weed index
T_1	Pre-emergence (PE) application of pendimethalin + imazethapyr (pre-mix) 1000 g ha^{-1}	3068	13.79
T_2	PE application of diclosulam 20 g ha^{-1}	2401	32.55
T_3	PE application of alachlor 1250 g ha^{-1} *fb* imazethapyr 75 g ha^{-1} at 20 DAS	2948	17.17
T_4	PE application of alachlor 1250 g ha^{-1} *fb* bentazone 960 g ha^{-1} at 20 DAS	2500	29.76
T_5	PE application of alachlor 1250 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS	3480	2.22
T_6	PE application of diclosulam 20 g ha^{-1} *fb* imazethapyr 75 g ha^{-1} at 20 DAS	2970	16.55
T_7	PE application of diclosulam 20 g ha^{-1} *fb* bentazone 960 g ha^{-1} at 20 DAS	2450	31.16
T_8	PE application of diclosulam 20 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS	3510	1.39
T_9	Hand weeding at 20 and 40 DAS	3559	0.00
T_{10}	Weedy check	1976	44.47
SEm ±		135.4	-
CD (P = 0.05)		402	-

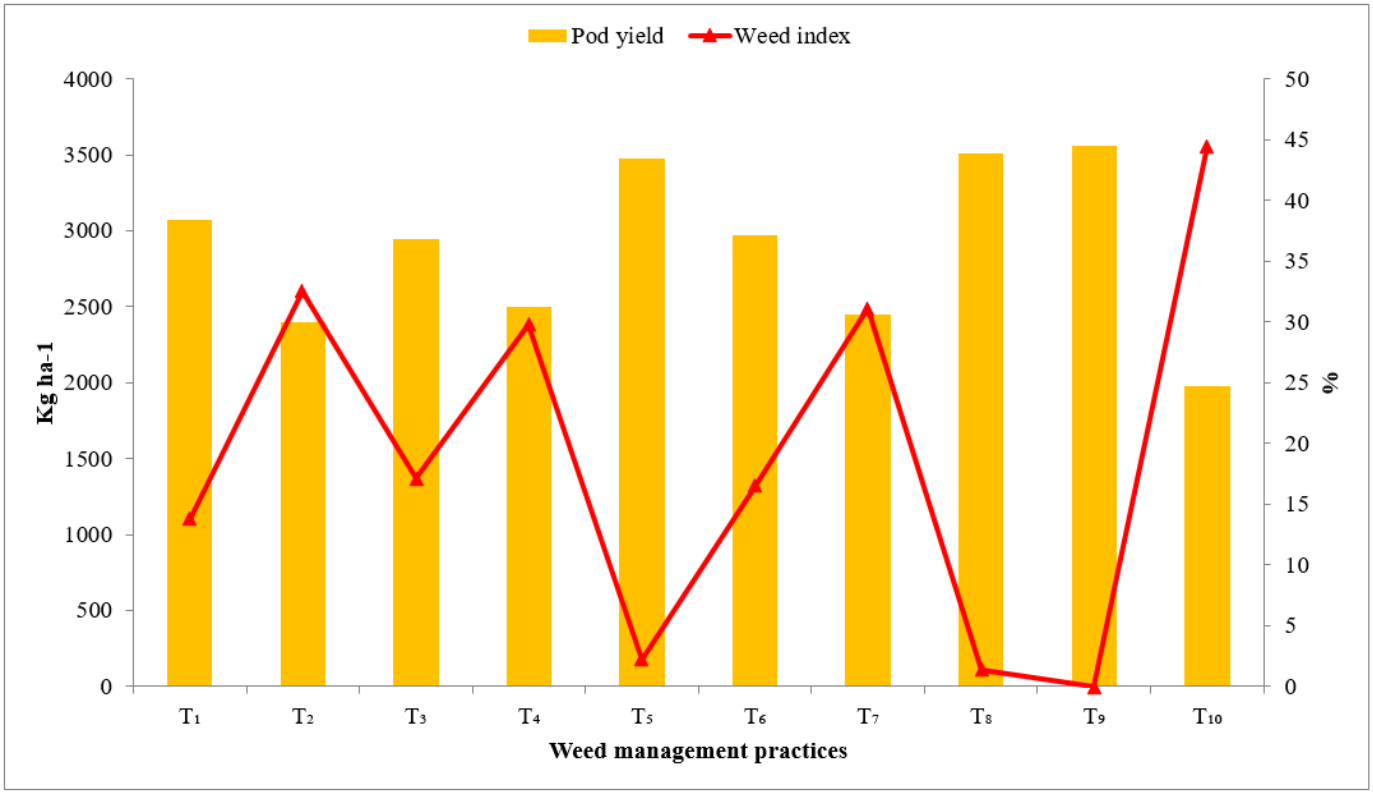

Fig 1: Graphical representation of pod yield (Kg ha^{-1}) and weed index (%) of *rabi* groundnut under different weed management practices.

Table 2: Gross returns (₹ ha^{-1}), Net returns (₹ ha^{-1}) and benefit cost ratio of *rabi* groundnut as influenced by different weed management practices

	Treatments	Gross returns	Net returns	B:C ratio
T_1	Pre-emergence (PE) application of pendimethalin + imazethapyr (pre-mix) 1000 g ha^{-1}	127456	76095	2.48
T_2	PE application of diclosulam 20 g ha^{-1}	100116	50304	2.01
T_3	PE application of alachlor 1250 g ha^{-1} *fb* imazethapyr 75 g ha^{-1} at 20 DAS	122593	70730	2.36
T_4	PE application of alachlor 1250 g ha^{-1} *fb* bentazone 960 g ha^{-1} at 20 DAS	104218	51914	1.99
T_5	PE application of alachlor 1250 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS	144385	899816	2.65
T_6	PE application of diclosulam 20 g ha^{-1} *fb* imazethapyr 75 g ha^{-1} at 20 DAS	123477	72366	2.42
T_7	PE application of diclosulam 20 g ha^{-1} *fb* bentazone 960 g ha^{-1} at 20 DAS	102180	50628	1.98
T_8	PE application of diclosulam 20 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS	145580	91928	2.71
T_9	Hand weeding at 20 and 40 DAS	147633	84369	2.33
T_{10}	Weedy check	82683	34419	1.71
	SEm ±	5470.1	1886.4	0.095
	CD (P = 0.05)	16253	5610	0.28

Conclusion

From the above findings, it can be concluded that sequential application of diclosulam 20 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_8) and sequential application of alachlor 1250 g ha^{-1} *fb* quizalofop-p-ethyl 50 g ha^{-1} + bentazone 960 g ha^{-1} at 20 DAS (T_5) are the most

effective broad spectrum weed management practices to increase the economic yield and monetary returns in *rabi* groundnut at the times of labour shortcomes.

References

1. Chetan F, Cornel C, Rusu T, Simon A. Determining influence on the cultivation technology on weeds and soybean production. Production Environment. 2015;8(15):211-215.
2. Geethika NS. Plant water extracts for weed management in groundnut (*Arachis hypogaea* L.). M.Sc. (Agri.) Thesis, Acharya N.G. Ranga Agricultural University, Guntur, 2018.
3. Gill GS, Kumar VK. Weed Index a new method for reporting weed control traits. Indian Journal of Agronomy. 1969;14:96-98.
4. Grichar WJ, Dotray PA, Besler AB, Langston BV. Weed control programs in peanut (*Arachis hypogaea* L.) with diclosulam and ethalfluralin combinations. The Texas Journal of Agriculture and Natural Resource. 2006;19:62-71.
5. Kalaichelvi K, Sakthivel S, Balakrishnan A. Integrated weed management in groundnut. Indian Journal of Weed Science. 2015;47(2):174-177.
6. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi, 1985, 100-174.
7. Poonia TC, Karwasara PK, Mathukia RK, Ajay S. Productivity and economics of rainy season groundnut as influenced by weed management practices. Indian Journal of Weed Science. 2016;48(4):400-403.
8. Sahoo SK, Pradhan J, Kuruwanshi VB, Guhey A, Rout GR, Dash R. Phytotoxic effect of pre emergence herbicides on oil content and yield components of groundnut (*Arachis hypogaea*). International Journal of Current Microbiology and Applied Sciences. 2017;6(9):1738-1748.
9. Vijay J, Mallareddy M, Shekar KC, Padmaja B. Effect of sequential application of pre and post-emergence herbicides on growth, yield attributes and yield of soybean (*Glycine max*). International Journal Pure and Applied Bioscience. 2018;6(2):238-241.
10. www.indiastat.com