ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 9, Issue, 01, pp.44605-44608, January, 2017

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

EFFECT OF INTEGRATED WEED MANAGEMENT PRACTICES ON WEED DYNAMICS, YIELD AND ECONOMICS OF RABI GROUNDNUT(*ARACHIS HYPOGAEA*) IN SANDY LOAM SOILS OF ANDHRAPRADESH

***Geetha Devi, S., Venkateswarulu, B. and Chandrasekar, K.**

Acharya N.G. Ranga Agricultural University, Guntur – 522509, Andhra Pradesh, India

ARTICLE INFO

Article History:
Received 18th October, 2016
Received in revised form
23rd November, 2016
Accepted 07th December, 2016
Published online 31st January, 2017

Key words:

Groundnut,cultural methods,
Economics, Weed management, Yield.

ABSTRACT

A field experiment was conducted during Rabi season of 2002-03 on sandy loam soils at Bapatla, Andhra Pradesh to study the effects of pre and post-emergence herbicides, alone or integrated with manual/mechanical weeding on weed pressure, productivity and economic returns of Rabi groundnut (*Arachis hypogaea*). Pendimethalin @ 0.75kg/ha as pre-emergence(PE)+imazethapyr@75 g/ha as post-emergence(PoE) herbicides at 21 days after sowing (DAS) resulted in significantly higher growth attributes, yield attributes, yield and net returns over the unweeded control and was found at par withT1: Hand-weeding at 20 and 40 DAS,T7:Pendimethalin @ 0.75kg a.i./ha(PE)+Intercultivation with wheel-hoeing fallowed by hand weeding and T5:Pendimethalin@0.75kg a.i./ha(PE)+imazethapyr @ 50 g a.i./ha(PoE).

Citation: Geetha Devi, S., Venkateswarulu, B. and Chandrasekar, K., 2017. "Effect of Integrated Weed Management Practices on Weed dynamics, Yield and Economics of Rabi groundnut (*Arachis hypogaea*) in sandy loam soils of Andhrapradesh", *International Journal of Current Research*, 9, (01), 44605-44608.

INTRODUCTION

Groundnut is an impartant oil seed crop of India which is cultivated in India during Rabi nearly 6.41million ha. Area with the production of 9.18 million ton nes and average productivity of 1.43 tonnes/ha (Srinivasarao *et al.,* 2011).In Andhra Pradesh, Groundnut (Arachis hypogaea) is an important oil seed crop which occupies an area of 2.64M.ha., production of 5.07 MT and productivity of 1.921kg/ha respectively (Department of Agriculture, Andhra Pradesh, 2008-2009). Weed infestation is considered as one of the major factor in groundnut production. Weed interference resulted in yield loss ranging from 74 to 92% (Agostinho *et al.,* 2006). Critical period of crop-weed competition for groundnut crop was reported to be up to 45 DAS and weed free environment during this period registered higher pod yield (Rao, 2000). Hand weeding and hoeing are common cultural and manual weed management methods for groundnut, but with scarcity of labours these methods are very costly and tedious. Use of pre and post emergence herbicides is best alternative for weed control at critical periods. Combination of physical and chemical methods by use of post-emergence herbicides is the best alternative for weed control at critical periods. Combination of physical and chemical methods by use of post-emergence herbicides like imazethapyr or quizalofop-p-ethyl (Bhatt *et al.,* 2008) were suggested for controlling weeds effectively at later stages of crop growth and maintenance of weed free environment at critical stages of crop growth (Sailaja *et al.,* 2002). Therefore field experiment was initiated to find out an effective and economical integrated weed management practice in *Rabi* groundnut.

**Corresponding author: Geetha Devi, S.,*
Acharya N.G. Ranga Agricultural University, Guntur – 522509, Andhra Pradesh, India.

MATERIALS AND METHODS

Field experiment was conducted during *Rabi* season 2002-03 at Agricultural College Farm, Bapatla, India to find out the response of integrated weed management practices on growth and yield of groundnut. The soil of the experimental site was sandy loam in texture with soil pH was neutral in reaction (7.0) and an electrical conductivity of 0.14 dSm^{-1}. The soil organic carbon carbon content was low (0.50%). The soil was low in available nitrogen(185 kg/ha) and phosphorus (18 kg/ha) but rich in available potassium (320kg/ha).The experimental site was located at an 5.0mt above mean sea level, 15^{o} 41N latitude, 80^{0} 30E longitude and the experiment was laid out in randomized block design with three replications. Groundnut variety "TMV-2" was sown at spacing of 30X10cm.A basal dose of 20 kg N, 40 kg P_2O_5 and 50 kg k_2o/ha was applied through urea, single super phosphate and muriate of potash respectively. Herbicides were applied through using manually operated knapsack sprayer fitted with flat fan nozzle using

spray volume of 500L/ha. The details of the treatments T_1: Hand weeding at 20 and 40 DAS;T_2 :Wheel-hoeing at 20 and 40 DAS; T_3: Pendimethalin @1.0kg a.i./ha as pre-emergence(PE); T_4:Imazethapyr @ 62.5 g a.i./ha post-emergence(PoE) at 21 days after sowing; T_5:Pendimethalin @ 0.75 kg/ha(PE)+imazethapyr @ 50 g a.i./ha (PoE);T_6: Pendimethalin @ 0.75 kg a.i./ha(PE)+ imazethapyr @50 g a.i./ha (PoE) + Intercultivation with wheel-hoeing fallowed by handweeding; T_7: Pendimethalin @ 0.75 kg/ha (PE) + Intercultivation with wheel-hoeing fallowed by handweeding; T_8: Unweeded check; T_9:Weed free check(weekly hand weeding). Pre emergence herbicide pendimethalin was applied on first day after sowing where as post-emergence herbicide was applied at 21 days after sowing. Weed free check was achieved by weekly interval of hand weeding was done throughout the crop period. Regarding five plants were selected from each plot and regular biometric observations of crop and weed parameters were recorded from 30 days after sowing upto harvest. However, observation data recorded at 30 DAS and at harvest is given in tables for study the results and discussion. Weed density (no/m^2) was recorded by putting a quadrate of 0.25m^2at two random spots in each plot. Weed control efficiency and weed index was calculated by standard formulae. Plant Height and plant dry matter at 30DAS and 60 DAS were recorded for randomly selected five plants. Data on Pod yield (kg/ha) and yield components viz., number of pods/plant. Grass 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 ration was computed by dividing gross returns with cost of cultivation.

RESULTS AND DISCUSSION

Effect on Weeds

Predominant weeds identified in the experimental groundnut fields were *Cyanodan dactylon, Echinochloa colonum, Digitaria sanguinalis, Dactyloctenium aegyptium,Panicum repens, Cyperus rotundus, Trianthema Portulacastrum, Commelinabenghalensis, Tridax procumbens, Trichodesma indicum, Partheniumhysterophorus, Acanthospermum hispidum, Eclipta alba, Phyllanthus niruri, Amaranthus viridis,Cleome viscose,Celotia argentia and Acalypha indica.* All the treatments were found to reduce significantly population densities of grasses, sedges and dicot weeds at 30 days after sowing and harvesting as compared to unweeded control. After weed free control, treatment of pendimethalin 30%EC @ 0.75 kg/ha as (PE) + imazethapyr 50% EC @ 50 g/ha as PoE + Intercultivation with wheel hoeing fallowed by hand weeding was found to have significantly lowest weed densities of grasses, sedges and broad leaved weeds as compared to unweeded control and at par with Pendimethalin 30% EC @ 1.0 kg/ha (PE) + Intercultivation with wheel hoeing fallowed by handweeding,pendimethalin 30% EC @ 0.75 kg/ha PE + imazethapyr 50% EC @ 50 g/ha PoE at 21 DAS and Handweeding at 20 and 40 DAS at 30 DAS and harvest for Grasses, Sedges and Broad leaved weeds. Table 1. Our results support the findings of Kalhapure *et al.* (2013),who reported that pendimethalin 1.5 kg/ha PE + Imazethapyr 0.15 kg/ha as PoE +1 hand weeding at 40 DAS was at par with weed free control in controlling the weed density in groundnut. Thus, pre-emergence application of pendimethalin prevents emergence of monocot and grassy weeds by inhibiting root and shoot growth while imazethapyr was responsible for inhibition of Aceto Lactate Synthase (ALS) or ace to hydroxyl acid synthase (AHAS) in broadleaved weeds which caused destruction of these weeds at 3-4 leaf stage. Remaining monocot weeds were controlled by intercultivation with wheel-hoeing fallowed by handweeding. Pendimethalin 30% EC @ 0.75 kg/ha PE + Imazethapyr 50% EC @ 50 g /ha PoE at 21 DAS + Intercultivation with wheel-hoeing fallowed by handweeding recorded highest WCE(Weed Control Efficiency) fallowed by Handweeding at 20 and 40 DAS, Pendimethalin 30% EC @ 1.0 kg/ha (PE) + Intercultivation with wheel hoeing fallowed by handweeding and Pendimethalin 30% EC @ 0.75 kg/ha (PE) + Imazethapyr 50% EC @ 50 g a.i./ha (PoE) at 30DAS and at harvest. However, Pendimethalin 30% EC @ 0.75 kg/ha PE + imazethapyr 50%EC @50 g a.i./ha PoE at 21 DAS + Intercultivation with wheel-hoeing fallowed by handweeding fallowed by handweeding at 20 and 40 DAS, Pendimethalin 30% EC @ 1.0 kg/ha (PE) + Intercultivation with wheel hoeing fallowed by handweeding and pendimethalin 30% EC 0.75 kg/ha PE +Imazethapyr 50% EC 50 g a.i./ha PoE resulted in the lowest Weed Index.Kalhapure etal.(2013), reported higher WCE and lower Weed Index with Pendimethalin 1.5 kg/has PE + Imazethpyr 0.15 kg/ha as PoE + handweeding at 40 DAS.

Effect on Crop

Weed free recorded significantly taller plants and plant drymatter production, at 30 DAS and 60 DAS fallowed by pendimethalin 30%EC 0.75 kg/ha PE + Imazethapyr 50% EC 50 g a.i./ ha PoE + Intercultivation with wheel hoeing fallowed by handweeding which were on a par with each other but were significantly superior over all other treatments. Among Integrated Weed Management practices the maximum plant height and drymatter production at 30 DAS and 60 DAS were recorded with T_6 fallowed by T_7 and T_5 which were on a par with one another and found significantly superior over herbicides alone and wheel hoeing. This might be due to the minimizing the competition of weeds with main crop for resources viz., space, light, nutrients and moisture with adoption of effective weed control menthods. Singh and Giri (2001) has also concluded that proper weed control was responsible for increase in plant height and dry matter production in groundnut. Significantly lower values of plant height and dry matter production were recorded in treatment unweeded check.

Yield attributes and Yield

Yield attributes and yield was significantly affected by weed control measures (Table-2). Among the weed control measures, weed-free check recorded significantly highest number of pods/plant and pod yield fallowed by Pendimethalin 30% EC @ 0.75 kg/ha (PE)+Imazethapyr @ 50% EC @ 50 g a.i./ha + Intercultivation with wheel-hoeing fallowed by handweeding. These two treatments were significantly superior over rest of the treatments and were statistically on a par with each other. Among the integrated weed management practices Pendimethalin 30%EC @ 0.75 kg/ha (PE) + imazethapyr 50% EC @ 75 g /ha (PoE) + Intercultivation with wheel hoeing fallowed by handweeding recorded higher number of pods/plant and pod yield fallowed by Pendimethalin 30%EC 1.0kg/ha (PE)+ Intercultivation with wheel hoeing fallowed by handweeding and Handweeding at 20 and 40 DAS which were significantly superior over herbicide alone and wheel hoeing. Those results are in confirmity with the findings of Sharma *et al.* (2015), also reported that Pendimethalin 30 %EC @0.9 kg/ha as PE + imazethapyr @ 75 g /ha as PoE at 20 DAS and

Table 1. Effect of different weed-management practices on weed count at 30 DAS and at harvest, Total weed density, weed control efficiency at 30 DAS and at harvest and weed index

Treatments	Grassy weeds / m^2		Sedge weeds /m^2		Dicot weeds / m^2		Weed Control Efficiency (%)		Weed Index (%)
	30 DAS	At harvest	30DAS	At harvest	30 DAS	At harvest	30 DAS	At harvest	
T_1-Hand Weeding at 20 and 40 DAS	7.42 (55.98)	7.87 (62.32)	2.47 (5.60)	3.73 (13.41)	6.38 (40.20)	7.52 (56.05)	6.33	70.3	7.9
T_2- Wheel – Hoeing at 20 and 40 DAS	9.15 (83.22)	9.46 (89.00)	3.37 (10.85)	5.12 (25.72)	7.99 (63.34)	9.01 (80.68)	43.2	56.0	29.4
T_3- Pendimethalin 30%EC @1.0kg/ha PE	7.98 (63.19)	8.96 (79.07)	2.82 (7.48)	4.89 (23.45)	6.89 (46.97)	8.86 (78.00)	57.5	59.4	22.5
T_4- Imazethapyr50%EC@62.5ga.i./haPoE at 21DAS	8.21 (66.91)	9.24 (84.88)	2.86 (7.67)	4.98 (24.30)	7.15 (50.62)	8.95 (79.60)	54.8	57.5	24.8
T_5-Pendimethalin30%EC @ 0.75 kg/ha PE + Imazethapyr 50%EC 50ga.i./ha PoE	7.11 (50.20)	8.12 (65.44)	1.96 (3.37)	4.02 (15.66)	5.89 (34.19)	7.90 (63.50)	68.3	67.5	13.5
T_6-Pendimethalin 30%EC @ 0.75kg/ha PE + Imazethapyr 50 g a.i./ha PoE+Intercultivation with wheel-hoeing fallowed by handweeding	6.63 (43.46)	7.14 (50.49)	1.77 (2.63)	3.42 (11.20)	5.60 (30.86)	7.48 (54.26)	72.2	73.9	5.7
T_7-Pendimethalin 30%EC@ 0.75 kg/ha PE + IC with wheel hoeing fallowed by handweeding	6.89 (46.98)	7.99 (63.35)	1.89 (3.20)	3.92 (14.87)	5.72 (32.22)	7.73 (59.26)	70.3	69.1	11.1
T_8- Unweeded control	11.64 (135.0)	16.99 (288.17)	6.59 (43.06)	7.10 (49.91)	9.93 (98.10)	10.33 (106.21)	0.0	0.0	52.1
T_9 – Weed Free	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	0.71 (0.00)	100.0	100.0	0.0
SEm ±	0.29	0.33	0.26	0.27	0.12	0.33			
CD (P=0.05)	0.85	0.83	0.85	0.83	0.40	0.94			

PE,Pre-emergence;PoE,post-emergence;HW,hand-weeding;IC,interculturing,DAS,days after sowing;WH-wheel-hoeing;EC,emulsifiable concentration
√ X+0.5 transformation, Figure in parentheses are original values

Table 2. Effect of different weed-management practices on growth attributes, yield attributes, yield and economics of groundnut

Treatments	Plant height (cm)		Plant dry matter Accumulation(g)		Total number of pods/plant	Pod Yield (kg/ha)	Net Returns ($\times 10^3$Rs/ha)	B:C Ratio
	30 DAS	60 DAS	30DAS	60DAS				
T_1-Hand Weeding at 20 and 40 DAS	11.8	38.3	76.5	394.9	21.8	2280	23.43 (23430)	2.62
T_2- Wheel – Hoeing at 20 and 40 DAS	11.0	32.6	68.5	310.0	16.7	1751	16.46 (16459)	1.95
T_3- Pendimethalin 30%EC @1.0kg/ha PE	11.3	34.8	69.9	338.4	18.5	1922	18.96 (18959)	2.27
T_4- Imazethapyr50%EC@62.5ga.i./haPoE at 21DAS	11.2	34.7	69.0	322.8	17.9	1864	18.61 (18611)	2.36
T_5-Pendimethalin30%EC @ 0.75 kg/ha PE + Imazethapyr 50%EC 50ga.i./ha PoE	12.9	38.0	78.8	378.3	20.5	2145	21.61 (21614)	2.44
T_6-Pendimethalin 30%EC @ 0.75kg/ha PE + Imazethapyr 50 g a.i./ha PoE+Intercultivation with wheel-hoeing fallowed by handweeding	13.0	40.1	84.5	408.3	22.3	2338	24.22 (24217)	2.72
T_7-Pendimethalin 30%EC@ 0.75 kg/ha PE + IC with wheel hoeing fallowed by handweeding	12.1	38.1	79.9	386.2	21.2	2205	22.59 (22585)	2.60
T_8- Unweeded control	8.3	29.0	41.1	230.6	14.0	1189	9.86 (9857)	1.38
T_9 – Weed Free	14.4	42.0	88.3	438.7	23.8	2480	20.67 (20674)	1.44
SEm ±	0.5	1.1	2.7	10.8	0.43	66.53		
CD (P=0.05)	1.5	3.2	8.1	32.3	1.29	199		

PE, Pre-emergence; PoE, post-emergence; HW, hand-weeding; IC, interculturing, DAS,days after sowing; WH-wheel-hoeing; EC, emulsifiable concentration
√ X+0.5 transformation, Figure in parentheses are original values

Pendimethalin 30 % EC @ 0.9 kg/ha as PE + Handweeding and IC at 40 DAS resulted in 94.3 and 92.69 % higher pod yield respectively. Pendimethalin 30 %EC @ 0.75 kg/ha as PE + Imazethapyr 50% EC @ 50 g/ha as (PoE) + IC with wheel hoeing fallowed by handweeding was most effective not only to control weeds but also in obtaining higher pod yields in groundnut. Thus, weed free environment created with the help of application of pre-emergence and post-emergence herbicides at early and later stages of crop growth facilitates better growth and development of plants, flowering, peg initiation and entry in to the soil + handweeding allows pulverization and more pod formation ultimately increasing pod yield/ha compared to weed control through manual weeding alone.

Economics

Pendimethalin 30 % EC @ 0.75 kg/ha as PE + Imazethapyr 50 % EC @ 50 g/ha(PoE) + Intercultivation with wheel hoeing

fallowed by hand weeding recorded significantly highest net returns Rs.24,217/- and Benefit: Cost ratio 2.72 fallowed by hand weeding at 20 and 40 DAS, Pendimethalin 30%EC @ 1.0kg/ha + Intercultivation with wheel hoeing fallowed by hand weeding and Pendimethalin 30 % EC @ 0.75 kg/ha (PE) + Imazethapyr 50 % EC 50 g a.i./ha (PoE). Whereas weed free check recorded lower net returns (Rs.20,674/-) and low B:C ratio 1.44 this might be due to the cost of cultivation of groundnut was increased in treatment weed free check due to higher need of human labours and their wages. The cost was reduced in treatment (T_6),using herbicides to effective control of weeds with minimizing human labours Kalhapure (2013) also reported that highest net returns and Benefit :Cost ratio with Pendimethalin @ 1.5 kg/ha as PE + imazethapyr @ 0.15 kg/ha as PoE + Hand weeding at 40 DAS .Weedy check recorded lowest net returns (Rs.9857) and B:C ratio (1.38). Thus, Treatment Pendimethalin 30 % EC 0.75 kg/ha (PE) + Imazethapyr 50% EC @ 50 g a.i./ha was proved practically more convenient and economically best feasible integrated weed management practice for groundnut considering the present condition of scarcity and high cost of labours, quality of weed control ,yield and B:C ratio of cultivation of Groundnnt.

REFERENCES

Agostinho, F.H., Gravena, R., Alves, P.L.C.A., Salgado, T.P and Mattos, E.D. 2006. The Effect of Cultivar on Critical Periods of Weed control in Peanut Science, 33(1):29-35.

Annual Reports of Department of Agriculture,Andhra Pradesh, 2008-2009.

Bhatt, R.K., Patel, B.J., Bhatt, V.K. and Patel, P.P. 2008. Weed Management through Soil Solarization in *Kharif* Groundnut (*Arachis hypogaea*). *Crop Research,* 36(1,2&3):115-119.

Kalhapure, A.H., Shete, B.T. and Bodake, P.S. 2013. Integration of Chemical and Cultural Methods for Weed Management in Groundnut. *Indian Journal of Weed Science,* 45(2):116-119.

Rao, V.S. 2000. Principles of Weed Science, Second Edition, Oxford and IBH Publish Co.Pvt.Ltd., New Delhi

Sailaja, K., Buchu Reddy, B. and Davender Reddy, M. 2002. Effect of Seed Bed Preparation and Weed control Practices on Growth and Yield of Groundnut after *Kharif* Rice. *Indian Journal of Dryland Agricultural Research and Development*, 17(2):152-157.

Sharma Satyakumari, Ram, A.JAT. and Sagarka, B.K. 2015. Effect of Weed Management Practices on Weed Dynamics, Yield and Economics of Groundnut in black calcareous Soil. *Indian Journal of Agronomy,* 60(2):312-317.

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 Journal of Agronomy.,* 46(1):50-55.

Srinivasarao, S., Madhavi, M. and Reddy, C.R. 2011. Integrated Approach for Weed Control in *Rab*i Groundnut (*Arachis hypogaea*)

****