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INFLUENCE OF WEED MANAGEMENT PRACTICES ON CROP GROWTH, NUTRIENT UPTAKE AND YIELD OF GROUNDNUT UNDER IRRIGATION CONDITION

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ABSTRACT
An agronomic investigation was conducted at Main Research Station, Hebbal, Bengaluru during *Kharif* 2011, with eight treatments [fluazifop-p-butyl 13.4 EC at 100, 134 and 167 g a.i./ha, imazethapyr 10 SL at 100 g a.i./ha,quizalofop-p-ethyl 5 EC at 50 g a.i./ha , pendimethalin 30 EC at 750 g a.i./ha, hand weeding and unweeded control] were replicated four times in RCBD.All herbicide treatments and hand weeding recorded the significantly higher growth parameters, yield attributesand nutrient uptake in groundnut as compared to unweeded control, whereas, unweeded control lowered the nutrient uptake of groundnut by 44% as compared to hand weeding.Fluazifop-p-butyl 167 g ai/ha @ 20 DAS gave higher pod yield (1681 kg/ha) similar to that of hand weeding (1655 kg/ha) and was on par with imazethapyr 100 g ai/ha @ 20 DAS (1577 kg/ha), Fluazifop-p-butyl 134 g ai/ha (1542 kg/ha) @ 20 DAS, pendimethalin 750 g ai/ha @ 3 DAS (1528 kg/ha) and quizalofop-p-ethyl 50 g ai/ha (1485 kg/ha) due to lower weed competition. Unweeded control lowered the pod yield by 56% (720 kg/ha) as compared to hand weeding. Thus, adoption of suitable weed management through hand weeding or use of herbicides improved the yield and growth components.

INTRODUCTION

Groundnut is an important oilseed cum leguminous crop in India, but its yield is unpredictable (Bhan and Sing 1993) and it has indeterminate growth habit, hence growth and development of reproductive and vegetative organs overlap, this causes low fruiting efficiency due to inter-organ competition for photo-assimilation and other metabolites (Pushp Sharma and Virender Sardana, 2012). One of the major factors responsible for low productivity of groundnut is the improper management of weeds. Groundnut is grown extensively during *Kharif* season under rainfed condition, where it encounters severe weed infestation especially in the early stages. Weeds the essential component of agro-ecosystems, interfere with crops and lead to enormous crop losses (vaid *et al.*, 2010).The critical period of weed competition is found to be the first four to eight weeks after sowing (Subbaiah *et al.*, 1997, Jat *et al.*, 2011). Groundnut crop is highly susceptible to weed infestation because of its slow growth in the initial stages up to 40 days (Senthil Kumar, 2004), short plant height and underground pod bearing habit. Uncontrolled weed growth reduce groundnut yield to the tune of 76% (Gnanamurthy and Balasubramaniyan, 1998). Less weed population and dry weight provided ample space for root growth, nodulation, optimum expansion of leaves and branches of plant as early as possible in groundnut (Jayarama Reddy, 1995) and weed management practices results in better growth attributes such as plant height, number of nodules per plant aided better total dry matter production, nutrient accumulation and yield components and consequently higher seed yield in groundnut (Chaitanya, 2009 and Bandiwaddar *et al.*, 1999). Thus, adoption of suitable weed management through hand weeding or use of herbicides improved the yield and growth components. At present, many farmers demand good herbicides for managing weeds, and to get better crop establishment and yield. Hence, the present study was, initiated during *Kharif* 2011 at Hebbal, Bengaluru to evaluate the performance of different herbicides on crop growth, yield and nutrient uptake pattern of groundnut.

MATERIALS AND METHODS

A field study was conducted during *Kharif* 2011, on red sandy loam soil of Hebbal, Bengaluru coming under Eastern Dry Zone of University of Agricultural Sciences, Bengaluru. The soil type was sandy loam with pH of 6.60, average fertility status of 0.65% OC, available N of 228.0 kg/ha, available P_2O_5 of 24.3 kg/ha and K_2O of 170.0 kg/ha. The experiment was laid out with eight treatments replicated four times in a randomized block design. The weed management practices evaluated were fluazifop-p-butyl 13.4 EC 100 to 167 g ai/ha, imazethapyr 10 SL 100 g ai/ha, quizalofop-p-ethyl 5 EC at 50 g ai/ha (all applied at 20 DAS), pendimethalin 750 g ai/ha (3 DAS), hand weeding (20 and 35 DAS) and unweeded control. Groundnut plant and weed samples collected from each plot at the time of harvest were oven dried at 70ºC and then ground in a Willey mill to pass through 40 mesh sieve. The ground

material was collected in butter paper bags and later used for chemical analysis. Nitrogen (Subbaiah and Asija, 1956), phosphorus and potassium (Jackson, I973) uptake was calculated for plants and weeds for each treatment separately using the formula and expressed in kg ha^{-1}.

$$\text{Nutrient uptake} = \frac{\text{Nutrient concentration in plant}}{100} \text{ X biomass (kg } ha^{-1})$$

The groundnut cv. TMV-2 was sown at a spacing of 30 cm X 15 cm on 31st of July. Pendimethalin was applied three days after sowing, where asfluazifop-p-butyl, imazethapyr and quizalofop-p-ethyl were applied 20 DAS. Pre-emergent herbicides was sprayed on three days after sowing using a spray volume of 750 litre/ha, while post-emergent herbicides were sprayed on 20 DAS coinciding with 2 to 3 leaf stage of grasses using a spray volume of 500 lit/ha. The experimental data on plant growth, weed parameters, yield components, pod yield were subjected to analysis by using Fisher's method of "Analysis of Variance" (ANOVA) as outlined by Panse and Sukhatme (1978).

RESULTS AND DISCUSSION

Among weed management practices, hand weeding, fluazifop-p-butyl 134 to 167 g ai/ha, imazethapyr 50 g ai/ha, pendimethalin 750 g ai/ha 3 DAS showed similar growth components, as a result of lower crop-weed competition, as also indicated by earlier studies of Bandiwaddar *et al.* (1999) in soybean. Unweeded control had significantly lower number of branches/plant than hand weeding, fluazifop-p-butyl at 100 to 167 g ai/ha, imazethapyr, pendimethalin and quizalofop-p-ethyl treatments as a result of weed competition (Table 3). The result of this study confirmed the earlier findings of Ghosh (2000), Selvamani and Sankaran (1989) in groundnut.Use of herbicides and hand weeding improved the growth components significantly as compared to weedy check as a result of less weeds' density and growth, which provided ample space, light and nutrients for root growth, nodulation, optimum expansion of leaves, branches and dry weight of plant parts in groundnut as suggested by Akobandu (1988) and Wesley *et al.* (2008).

Higher yield components namely pod yield, pod filling per cent, pod weight per plant, 100 kernel weight and kernel weight per plant were observed in hand weeding, fluazifop-p-butyl at 167g ai/ha, imazethapyr 100 g ai/ha and pendimethlain 750 g ai/ha, as a result of lower weed competition leading to good growth of crops which in turn improved yield components (Table 1).Similar findings were also reported by earlier studies of Jayaram (2001), Prusty *et al.* (1990) in groundnut, While significantly lower pod yield, pod filling per cent, pod weight per plant, 100 kernel weight and kernel weight per plant were observed in unweeded control as a result of weed competition leading to lowered yield and growth components.

Total nutrient uptake of nitrogen, phosphorus and potassium was significantly higher (1.6 to 1.8 times higher) in hand weeding as compared to unweeded control, but it was on par with fluazifop-p-butyl at 167 g ai/ha, fluazifop-p-butyl at 134 to 167 g ai/ha and imazethapyr 100 g ai/ha . The higher nutrient

Table 1: Yield and yield components as influenced by different weed management practices in groundnut

Weed management practices, g ai/ha	Filled pods/plant	Hundred kernel weight (g)	Kernel weight/ plant (g)	Pod yield (kg/ha)	Haulm yield (kg/ha)	Weed Index
T1: Fluazifop-p-butyl 13.4 EC at 100 g -20 DAS	20.8	30.75	7.30	1273	1484	22.32
T2: Fluazifop-p-butyl 13.4 EC at 134 g -20 DAS	23.5	31.63	7.80	1542	1618	6.10
T3: Fluazifop-p-butyl 13.4 EC at 167 g -20 DAS	25.0	33.03	8.33	1681	1773	-1.77
T4 : Imazethapyr 10 SL at 100 g -20 DAS	23.7	32.12	8.05	1577	1679	2.16
T5 : Pendimethalin 30 EC at 750 g -3 DAS	21.9	31.61	7.71	1528	1618	4.56
T6 : Quizalofop-p-ethyl 5 EC at 50 g-20 DAS	21.0	31.00	7.46	1485	1570	9.03
T7 : Hand weeding (20 and 35DAS)	27.3	32.64	8.10	1655	1823	0.00
T8: Unweeded control	10.1	29.47	5.67	720	849	56.29
SEm ±	1.6	0.62	0.27	106.94	140.0	NA
CD at 5 %	4.9	1.90	0.83	324.40	424.7	

Table 2: Nutrient uptake by plants and weeds as influenced by weed management practices

Weed management practices, g ai/ha	Uptake by groundnut crop (kg/ha)			Uptake by weeds (kg/ha)		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
T1: Fluazifop-p-butyl 13.4 EC at 100 g-20 DAS	72.40	11.32	30.90	16.40	6.20	16.42
T2: Fluazifop-p-butyl 13.4 EC at 134 g -20 DAS	78.00	13.90	33.17	14.07	5.80	14.09
T3: Fluazifop-p-butyl 13.4 EC at 167 g -20 DAS	79.77	14.72	35.14	13.48	4.60	13.97
T4: Imazethapyr 10 SL at 100 g -20 DAS	78.93	14.13	35.17	13.00	4.44	13.50
T5: Pendimethalin 30 EC at 750 g -3 DAS	77.45	13.39	32.87	15.08	5.71	14.63
T6: Quizalofop-p-ethyl 5 EC at 50 g -20 DAS	75.13	12.10	31.53	15.60	6.12	15.82
T7 : Hand weeding (20 and 35DAS)	80.73	15.10	35.80	10.63	2.67	10.87
T 8: Unweeded control	43.17	8.43	20.27	28.47	10.10	28.62
SEm ±	1.17	0.41	0.88	0.78	0.54	0.76
CD at 5 %	3.55	1.24	2.66	2.35	1.65	2.30

NA- Not Analyzed; NS- Non significant at 5%

Table 3: Influence of different weed management practices on plant height, leaf area, total dry weight, No. of nodules and No. of branches per plant in groundnut

Weed management practices, g ai/ha	Plant height (cm)At harvest	Leaf area/plant (cm^2)90 DAS	Total dry weight /plant (g)At harvest	No of nodules /plant at 50 DAS	Number of branches /plant At harvest
T1: Fluazifop-p-butyl 13.4 EC at 100 g – 20 DAS	30.2	1217.1	18.00	57.3	4.53
T2: Fluazifop-p-butyl 13.4 EC at 134 g -20 DAS	32.8	1303.4	21.03	56.3	4.67
T3: Fluazifop-p-butyl 13.4 EC at 167 g -20 DAS	34.0	1490.6	23.53	56.0	4.73
T4: Imazethapyr 10 SL at 100 g ai/ha -20 DAS	34.0	1336.8	22.78	56.3	4.67
T5: Pendimethalin 30 EC at 750 g -3 DAS	33.9	1270.0	20.92	58.3	4.67
T6 : Quizalofop-p-ethyl 5 EC at 50 g -20 DAS	32.9	1243.6	19.85	55.0	4.53
T7 : Hand weeding (20 and 35DAS)	35.5	1423.7	23.17	57.7	4.87
T8: Unweeded control	24.3	902.4	12.97	58.0	3.47
SEm ±	2.17	102.8	1.14	2.8	0.15
CD at 5 %	6.57	311.8	3.45	NS	0.46

Table 4: The correlation matrix of pod yield (kg/ha) and other attributes with weed density and dry weight, nutrient uptake by weeds under various weed management practices

	1	2	3	4	5	6	7	8	9
1.Pod yield (kg/ha)	1.00**								
2. Total plant dry weight (g)	0.98**	1.00							
3. Kernel weight/plant (g)	0.99**	0.99**	1.00						
4. Haulm yield (kg/ha)	0.99**	0.97**	0.99**	1.00					
5. Total weed dry weight (g) at 55 DAS	-0.94**	-0.93**	-0.94**	-0.97**	1.00				
6. Total weed density (g) at 55 DAS	-0.94**	-0.95**	-0.95**	-0.97**	0.99**	1.00			
7. N uptake by weed (kg/ha)	-0.96**	-0.94**	-0.95**	-0.98**	0.98**	0.98**	1.00		
8. P uptake by weeds (kg/ha)	-0.93**	-0.94**	-0.93**	-0.96**	0.97**	0.97**	0.98**	1.00	
9. K uptake by weeds (kg/ha)	-0.94**	-0.92**	-0.94**	-0.97**	0.98**	0.98**	1.00**	0.99**	1.00

** - Significance at 1% level

uptake by crop in these treatments was due to lower weed population and dry weight which helped the crop to grow luxuriantly in weed free environment and absorb more nutrients from the soil. The results of this study are confirmed by the earlier studies of Murthy *et al*. (1992) and Jat *et al*. (2011) in groundnut. The significantly higher nutrient uptake by weeds was noticed in unweeded control (N, P_2O_5 and K2O) due to more weeds' density and dry weight (Table 2). Similarly, increase in nutrient uptake by weeds due to increase in weed population was also reported by Kondap *et al*. (1985), Murthy *et al*. (1992) and Nimje (1992) in groundnut.

Weed competition lowered the leaf area/plant by 63%, total dry matter production/plant by 56%, number of leaves/plant by 62% and consequently lowered the kernel weight/plant by 70% and 100 kernel weight by 90%, as compared to hand weeding (Table 1). Thus, adoption of suitable weed management through hand weeding or use of herbicides (fluazifop-p-butyl 134 to 167 g ai/ha, imazethapyr 100 g ai/ha and pendimethalin 750 g ai/ha) improved the yield and growth components by 56 to 90% and consequently lowered the pod yield by 56%, as revealed from weed index (Table 1). As observed in the present study, Jayaram (2001) in groundnut and Shobha (2001) in soybean have revealed that weed competition lowered the yield and growth components by 48- 60% and pod yield by 45-50 %, confirming the present findings.

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