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Evaluation of Post Emergence Herbicides in Groundnut under Rainfed Conditions

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A B S T R A C T

Experiment was conducted at Agricultural research station, Kadiri to evaluation of post emergence herbicides in groundnut under rainfed conditions. Among the herbicidal treatments, highest weed control efficiency, lowest weed index was recorded with T3 (Pendimethalin + one HW) followed by T6 (Pendimethalin + Quizalofop ethyl) and T7 (Pendimethalin + Imazethaphyr). Pod and haulm yields are also higher with pre emergence application of Pendimethalin @ 1.0 kg a.i ha^{-1} + one hand weeding which was significantly superior to all herbicidal treatments followed by T6. This increased yields in this treatment was due to lowest crop weed competition which resulted in more number of pods per plant and hundred pod weight. Highest gross returns, net returns and beneficit cost ratio were also higher with T3 which was significantly superior to any of the treatments.

Introduction

Groundnut is an important oilseed crop of india, occupying about 7.0 million hectare area, scattered over 260 district of 12 states. Indian has a diverse climate, as such groundnut is grown throughout the year in kharif, rabi, summer and spring seasons in one or other part of the country. Area wise, about 85 % groundnut is grown during the kharif seasons under rainfed situations where the vagaries of monsoon and seasonal biotic and abiotic stress attenuating to low productivity (Devi dayal, 2004). Weeds are undesirable plants that interfere with the utilization of land, water and nutrient resources, adversely affecting crop production and human welfare. Weed and crop plants have intimate association with each other, demand identical needs of natural resources and compete more than other crop pests. Groundnut is grown under tropical climate with hot and humid weather and hence confronted by repeated flushes of various grassy and broad leaf weeds throughout its growing season. The weed infestation intensity is more severe in kharif groundnut because of congenial season which allows weeds to grow more luxuriantly than rabi/summer season. Besides their competition for water, nutrients and light with the crop, weeds hinder pegging, compete for underground space and make harvesting of groundnut cumbersome. Depending on the

severity of infestation and yield losses caused by weeds, it is most critical factor for groundnut cultivation. The competition with the weeds is maximum during the early stages of groundnut crop because of its slow initial growth and small foliage cover, and unless a good control of weed is achieved substantial yield losses upto 70% may occur which are more in rainfed than in irrigated conditions.

Materials and Methods

A field experiment was conducted during kharif season of 2012 at agricultural research station, kadiri to Evaluate the performance of post emergence herbicides in groundnut under rainfed conditions. The soils of the experimental plot was sandy loam in texture with P^H 7.5, organic matter 0.4% and available N,P,K 210, 18.9 and 250 kg/ha respectively. The experiment was laid out in randomized block Design with three replications comprising seven different weed control treatments *viz.,* Pre emergence application of Pendimethalin @1.0 kg a.i./ha and one hand weeding, Pre emergence application of Pendimethalin @1.0 kg a.i./ha fb post emergence application of Quizalofop Ethyl @ 50 g a.i. /ha (750 ml/ha) at 20 DAS, Pre emergence application of Pendimethalin @1.0 kg a.i./ha fb post emergence application of Imazethapyr @ 75 g a.i./ha (750 ml/ha) at 20 DAS, Post emergence application of Quizalofop Ethyl @ 50 g a.i. /ha (750 ml/ha) at 20 DAS, Post emergence application of Imazethapyr @ 75 g a.i./ha (750 ml/ha) at 20 DAS, Un weeded control and Weed free check. Quizalofop ethyl and imazethapyr were post emergence herbicides which were applied at 2-3 leaf stage of weeds using knapsack sprayer fitted with a flat fan nozzle with the spray volume of water 500 l/ha. Groundnut cultivar kadiri-6 was sown in lines with a spacing of 30 cm × 10 cm. All recommended packages of practices except weed control was adopted in the experimental plot during the experiment. Fertilizer at 20 kg N/ha, 45 kg P/ha and 50 kg K/ha was applied in each plot through urea, single superphosphate and muriate of potash at the time of sowing of groundnut. Observation on weeds density was recorded at 30 & 60 days after herbicide application by randomly placing a quadrate of 1 m × 1 m at two places in each plot.

The Weeds inside each Quadrate were uprooted, cleaned and dried. After drying, weight and weed control efficiency was calculated by using the formula WCE= (weed biomass in unweeded control – weed biomass in managed treatment)/weed biomass in unweeded control × 100. Yield and yield component of groundnut were recorded at harvest.

Results and Discussion

Pooled data over three years of study reveals that total number of weeds at 30 and 50 DAS was significantly lower with weed free check which was on par with pre emergence application of Pendimethalin @ 1.0 kg a.i ha^{-1} + one hand weeding. Among the two post emergence herbicides, Quizalofop ethyl @ 50 g a.i ha^{-1} has significantly reduced the total number of weeds compared to Imazethaphyr. Weed dry weight m^{-2} due to T3 (Pre emergence application of Pendimethalin + one hand weeding) was on par with weed free check at 30 DAS and while, significantly varied at 50 DAS. The next lowest weed dry weight was recorded with T6 at both the stages which was on par with T7. Though the weed dry weight due to Quizalofop ethyl was lower, statistically not varies with Imazethaphyr at 30 and 50 DAS. Among the herbicidal treatments, highest weed control efficiency, lowest weed index was recorded with T3 (Pendimethalin + one HW) followed by T6 (Pendimethalin + Quizalofop ethyl) and T7 (Pendimethalin + Imazethaphyr) (Table 1–8).

Table.1 Weed dry weight (g $m^{-2)}$ at 30 DAS as influenced by different weed management practices

	Treatments	2006	2007	2008	Pooled Mean
T1	Un weeded control	136.3 (11.7)	160 (12.7)	273 (16.5)	189.8 (13.8)
T2	Weed free check	2.0 (1.6)	3 (1.9)	5 (3.4)	3.3 (2.0)
T3	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + 1HW	4.3 (2.1)	12 (3.5)	43 (6.6)	19.8 (4.5)
T4	Post emergence application of Quizalofop Ethyl @ 50 g a.i. /ha (750 ml/ha) at 20 DAS	47.0 (6.9)	90 (9.5)	158 (12.6)	98.3 (9.9)
T5	Post emergence application of Imazethapyr @ 75 g a.i./ha (750 ml/ha) at 20 DAS	121.0 (11.0)	62 (7.9)	163 (12.8)	115.3 (10.8)
T6	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T4	30.0 (5.3)	60 (7.8)	49 (7.0)	46.3 (6.8)
T7	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T5	71.0 (8.2)	52 (7.3)	35 (6.0)	52.7 (7.3)
	CV %	19.1	18.4	21.4	18.7
	SEm±	1.04	1.08	1.19	1.24
	CD (P=0.05)	2.3	2.4	2.6	2.7

Table.2 Weed dry weight (g $m^{-2)}$ at 50 DAS as influenced by different weed management practices

	Treatments	2006	2007	2008	Pooled Mean
T1	Un weeded control	247.7 (15.7)	257 (16.0)	480 (21.9)	328.2 (18.1)
T2	Weed free check	3.5 (2.0)	6 (2.6)	11 (3.4)	6.8 (2.7)
T3	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + 1HW	8.8 (3.0)	14 (3.8)	63 (8.0)	28.6 (5.4)
T4	Post emergence application of Quizalofop Ethyl @ 50 g a.i. /ha (750 ml/ha) at 20 DAS	67.7 (8.2)	173 (13.2)	389 (19.7)	209.9 (14.5)
T5	Post emergence application of Imazethapyr @ 75 g a.i./ha (750 ml/ha) at 20 DAS	203.5 (14.3)	177 (13.3)	184 (13.6)	181.2 (13.5)
T6	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T4	58.5 (7.4)	157 (12.5)	46 (6.8)	87.2 (9.4)
T7	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T5	140.7 (11.5)	12 (11.3)	26 (5.2)	97.9 (9.9)
	CV %	19.6	19.1	23.0	20.1
	SEm±	1.62	1.47	1.29	1.10
	CD (P=0.05)	3.5	3.2	2.8	2.4

Table.3 Weed Control efficiency (WCE) at 30 DAS as influenced by weed management practices

	Treatments	2006	2007	2008	Pooled Mean
T1	Un weeded control	-	-	-	-
T2	Weed free check	98.4	96.6	95.7	96.9
T3	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + 1HW	94.8	93.2	93.1	93.7
T4	Post emergence application of Quizalofop Ethyl @ 50 g a.i. /ha (750 ml/ha) at 20 DAS	79.6	43.5	36.4	53.2
T5	Post emergence application of Imazethapyr @ 75 g a.i./ha (750 ml/ha) at 20 DAS	12.6	33.0	39.0	28.2
T6	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T4	87.4	73.3	68.5	76.4
T7	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T5	56.4	74.2	72.7	67.8

Table.4 Weed Index % (WI) at 30 DAS as influenced by weed management practices

	Treatments	2006	2007	2008	Pooled Mean
T1	Un weeded control	82.7	62.9	86.5	77.4
T2	Weed free check	-	-	-	-
T3	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + 1HW	15.0	18.1	21.5	18.2
T4	Post emergence application of Quizalofop Ethyl @ 50 g a.i. /ha (750 ml/ha) at 20 DAS	57.7	51.0	70.6	59.8
T5	Post emergence application of Imazethapyr @ 75 g a.i./ha (750 ml/ha) at 20 DAS	76.1	38.7	52.2	55.7
T6	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T4	40.8	31.8	37.0	36.5
T7	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T5	57.7	27.3	37.5	40.8

Table.5 Pod and haulm yield of groundnut as influenced by weed management practices

	Treatments	Pod yield (kg/ha)				Haulm yield (kg/ha)			
		2006	**2007**	**2008**	**Pooled Mean**	**2006**	**2007**	**2008**	**Pooled Mean**
T1	Un weeded control	106	432	73	204	540	1056	440	679
T2	Weed free check	612	1163	540	772	1635	2097	1597	1776
T3	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + 1HW	520	953	424	632	1500	1722	1268	1497
T4	Post emergence application of Quizalofop Ethyl @ 50 g a.i. /ha (750 ml/ha) at 20 DAS	260	569	159	329	1119	1167	647	978
T5	Post emergence application of Imazethapyr @ 75 g a.i./ha (750 ml/ha) at 20 DAS	146	713	258	372	738	1292	807	946
T6	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T4	362	793	340	498	1318	1569	1157	1348
T7	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T5	253	845	347	482	1000	1583	1198	1260
	CV %	17.5	22.4	18.6	16.4	22.1	9.2	20.4	14.8
	SEm±	79.5	97	90.8	48.6	207.6	114	118.4	100.5
	CD (P=0.05)	173	211	198	106	452	248	258	219

Table.6 Number of pods and hundred pod weight of groundnut as influenced by weed management practices

	Treatments	Number of pods/plant				Hundred pod weight (g)			
		2006	2007	2008	Pooled Mean	2006	2007	2008	Pooled Mean
T1	Un weeded control	6.0	8.6	2.3	5.6	64.5	75.2	55.0	64.9
T2	Weed free check	9.7	13.7	7.4	10.3	79.5	86.7	63.3	76.5
T3	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + 1HW	9.3	13.8	6.8	10.0	79.2	87.2	63.7	76.7
T4	Post emergence application of Quizalofop Ethyl @ 50 g a.i. /ha (750 ml/ha) at 20 DAS	7.7	10.3	4.3	7.4	72.0	79.8	63.3	71.7
T5	Post emergence application of Imazethapyr @ 75 g a.i./ha (750 ml/ha) at 20 DAS	6.0	12.3	5.3	7.9	68.6	84.0	72.0	74.9
T6	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T4	8.0	11.7	5.3	8.3	75.0	78.3	65.0	72.8
T7	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T5	7.0	12.3	6.5	8.6	71.8	81.0	62.3	71.7
	CV %	18.2	15.4	16.8	13.6	7.4	6.6	9.8	7.9
	SEm±	1.39	1.5	1.28	0.96	4.39	4.4	2.94	2.80
	CD (P=0.05)	3.0	3.2	2.8	2.1	9.6	9.6	6.4	6.1

Table.7 Hundred kernel weight and shelling percentage of groundnut as influenced by weed management practices

	Treatments	Hundred kernel weight (g)				shelling percentage %			
		2006	2007	2008	Pooled Mean	2006	2007	2008	Pooled Mean
T1	Un weeded control	26.2	34.2	28.3	29.6	69.7	74.8	55.0	66.5
T2	Weed free check	30.5	39.7	26.3	32.2	72.3	76.8	63.3	70.8
T3	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + 1HW	29.8	38.3	27.3	31.8	72.2	74.8	63.7	70.2
T4	Post emergence application of Quizalofop Ethyl @ 50 g a.i. /ha (750 ml/ha) at 20 DAS	29.0	38.8	31.3	33.0	71.3	77.0	63.3	70.5
T5	Post emergence application of Imazethapyr @ 75 g a.i./ha (750 ml/ha) at 20 DAS	27.3	41.9	31.7	33.6	69.7	77.0	72.0	72.9
T6	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T4	29.8	34.3	27.3	30.5	71.8	77.0	65.0	71.3
T7	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T5	27.5	38.2	25.7	30.5	70.2	78.2	62.3	70.2
	CV %	8.63	7.5	12.2	10.5	3.3	5.3	6.8	4.8
	SEm±	2.0	2.3	2.4	2.2	1.9	3.3	2.8	3.3
	CD (P=0.05)	4.4	5.0	5.2	NS	4.2	7.2	6.2	NS

Table.8 Economics of rainfed groundnut as influenced by different weed management practices

	Treatments	Cost of cultivation (Rs/ha)	Gross returns (Rs/ha)	Net returns (Rs/ha)	Benefit cost ratio
T1	Un weeded control	11107	6119	-4988	0.55
T2	Weed free check	14013	21964	7951	1.57
T3	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + 1HW	13157	18046	4889	1.37
T4	Post emergence application of Quizalofop Ethyl @ 50 g a.i. /ha (750 ml/ha) at 20 DAS	12457	9692	-2765	0.78
T5	Post emergence application of Imazethapyr @ 75 g a.i./ha (750 ml/ha) at 20 DAS	12307	10719	-1588	0.87
T6	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T4	13507	14472	965	1.07
T7	Pre emergence application of Pendimethalin @1.0 kg a.i./ha + T5	13357	13940	583	1.04

Sential Kumar (2009) reported that maintenance of a planting density of 5 lakh plant per ha effectively reduced weed density, weed dry weight and there by recording higher weed control efficiency. Pod and haulm yields are also higher with pre emergence application of Pendimethalin @ 1.0 kg a.i ha^{-1} + one hand weeding which was significantly superior to all herbicidal treatments followed by T6. These results are in conformity with Dixit *et al.,* (2012). This increased yields in this treatment was due to lowest crop weed competition which resulted in more number of pods per plant and hundred pod weight. In rainfed conditions the crop should be kept free from the weeds up to 45 days after sowings (Naidu *et al* 1982 and Rajan *et al* 1982). Highest gross returns, net returns and benefit cost ratio were also higher with T3 which was significantly superior to any of the treatments. The results generated gains support from the other reports (Solanki *et al.,* 2005).

In conclusions the pre emergence application of Pendimethalin @ 1.0 kg a.i ha^{-1} + one hand weeding is the best for weed management, higher pod yields and net returns in rainfed groundnut. Quizalofop ethyl is relatively better compared to Imazethaphyr in terms of weed control efficiency, weed index, higher pod yields and economics returns in rainfed groundnut. Application of any of these two post emergence herbicide alone without any pre emergence herbicide or hand weeding would not result in significant weed control in rainfed groundnut.

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