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Evaluation of post emergence herbicides on summer groundnut (*Arachis hypogaea* L.) in new alluvial zone of West Bengal

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A field experiment was conducted during summer season of 2010 and 2011 at district seed farm, Kalyani under Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal, to find out the effect of different post emergence herbicides on summer growing groundnut in new alluvial zone of West Bengal. All the herbicidal treatments as well as weed free check significantly increased the yield and yield attributing characters of groundnut and also reduce the weed population as well as weed biomass production as compared to un-weeded control. Post emergence application of quizalofop Ethyl at 100g a.i./ha was found better to control the weeds as compared to imizathapyr. Among the post-emergence herbicidal treatments pod yield, haulm yield and yield attributes of groundnut was found maximum with the treatment received post emergence application of quizalofop Ethyl at 100 g a.i. /ha. Among all the herbicidal treatments best results was obtained with pre-emergence application of pendimethalin at 1.0 Kg a.i./ ha along with one hand weeding and recorded highest pod yield (2675 Kg/ha), haulm yield (3123 Kg/ha), number of pods/plant (17.3), shelling % (71.3) and SMK % (91.4). This might be due to application of pendimethalin as a pre emergence, suppresses the weed growth at early stage of the crop as a result of better crop stand. Practices of weed control by chemical and /or mechanical gave the significantly better pod yield of groundnut as compared to un-weeded control and pod yield of groundnut was decreased even up to 26 to 47% in un-weeded condition. Among the herbicidal treatments maximum gross return (Rs.80550), net return (Rs.55937) and B:C ratio (3.27) were recorded in the treatment received pre-emergence application of pendimethalin at 1.0 Kg a.i./ ha along with one hand weeding.

Key words: Groundnut, herbicide, pre-emergence, post-emergence, yield, economics.

INTRODUCTION

Groundnut is an important food legume and an oil seed crop in the world which is presently grown in about 90 countries over an area of 25 million hectares under different agro climatic regions. It is grown on large scale in India, China, USA, Senegal, Indonesia, Nigeria, Brazil and Argentina. India accounts for about 34.5% world groundnut area and about 27.3% of world groundnut production while China is the highest producer of groundnut with 37% of total world groundnut production. In West Bengal the total area under groundnut is

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Table 1. Effect of post emergence herbicide on weed flora of groundnut (Pooled over 2010 and 2011).

Treatment	Weed density (Number / m^2)						Weed dry matter (g / m^2)	
	45 DAS			75 DAS				
	NLW	BLW	Total	NLW	BLW	Total	45DAS	75DAS
T_1	179	23	202	243	78	321	207	319
T_2	13	7	20	19	7	26	11	23.1
T_3	17	8	25	39	21	60	26	63.1
T_4	43	12	55	63	22	85	128	236.3
T_5	44	18	62	84	31	115	115.2	226.1
T_6	34	17	51	53	26	79	89.3	146.5
T_7	48	26	74	81	36	117	104.3	169.3
T_8	41	13	54	58	28	86	78.3	138.7
T_9	38	11	49	59	23	82	74.8	102.8
T_{10}	29	16	45	47	29	76	54.4	95.3
T_{11}	44	15	59	54	36	90	42.3	94.1

NLW, Narrow leaved weed ; BLW, Broad leaved weed ; DAS, Days after saowing.

65826 ha and total production is about 113018 tons with average productivity of 1717 kg/ha. The low yield of groundnut in our state as well as in the country can be attributed to many factors, among them many folds losses caused by weeds is of serious nature. Competition of weeds with the crops was observed to be very high during 50 to 60 days period. This period was found to be critical period for crop weed competition (Mahadkar et al., 1993). Weeds when allowed to compete till harvest depleted 162.8 kg N, 21.7 kg P_2O_5 and 141.8 kg K_2O per ha. Herbicides and hand weeding significantly brought down the nutrient removal by weeds and enhanced the uptake of nutrient by groundnut crop (Yadav et al., 1986). Hence, the present experiment was conducted to find out the effect of post emergence herbicide application in groundnut in order to control weed infestation (Table 1).

MATERIALS AND METHODS

Present investigation was carried out during summer seasons of 2010 and 2011 at district seed farm, kalyani under Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Nadia, West Bengal to study the effect of post emergence herbicides on summer groundnut in new alluvial zone of West Bengal. The soil of the experimental field was alluvium sandy loam in texture with content of organic carbon 0.79%, total N 0.07%, available phosphorus 24.65 kg/ha and Potassium 189.59 kg/ha. The pH of the soil was 6.81. The experiment was laid out in randomized block design with eleven (11) treatments and three (3) replications. The treatment details are as follows: **T_1**= Un-weeded control; **T_2** = Weed free check; **T_3** = Pre-emergence application of pendimethalin at 1.0 Kg a.i. /ha + one hand weeding; **T_4** = Post emergence application of Quizalofop Ethyl at 50 g a.i./ ha 20 DAS ; **T_5**= Post emergence application of Quizalofop Ethyl at 75 g a.i./ ha 20 DAS ; **T_6**= Post emergence application of Quizalofop Ethyl at 100 g a.i./ ha 20 DAS; **T_7** = Post emergence application of Imizethapyr at 50 g a.i./ ha 20 DAS ; **T_8** = Post emergence application of Imizethapyr at 75 g a.i./ ha 20 DAS ; **T_9** = Post emergence application of Imizethapyr at 100 g a.i./ ha 20 DAS ; **T_{10}** = Pre-emergence application of pendimethalin at 1.0 Kg a.i. /ha + T_4 ; **T_{11}**= Pre-emergence application of pendimethalin at 1.0 Kg a.i. /ha +T_8 ; **T_{12}** = farmers practice (one hand weeding + one intercultural operation). The recommended dose of N: P_2O_5 and K_2O was 20:60:40 kg /ha and gypsum at of 400 kg /ha was applied uniformly in all the treatments. The variety TAG 24 was sown in 27th and 30th January during 2010 and 2011 respectively.

RESULTS AND DISCUSSION

Herbicide application to groundnut had the significant influence to increas the groundnut yield. Results indicated that all the herbicidal treatments as well as weed free check resulted in significant increase in yield and yield attributing characters of groundnut along with reduction in the weed population and weed biomass production, compared to un-weeded control.

Effect on weed population and weed dry matter

Best herbicidal response to weed density and weed dry matter production was recorded from T_3 that is, pre-emergence application of pendimethalin at 1.0 Kg a.i. /ha along with one hand weeding. Among the post-emergence herbicidal treatments, best response was observed from application of Imizathapyrat 100 g a.i./ha at 20 DAS (T_9) and application of quizalofop Ethyl at 100g a.i./ha 20DAS (T_6) at 45 DAS and at 75 DAS ,respectively regarding total weed density and weed dry matter production. Best results of weed density and weed dry matter production was found when pendimethalin as a pre-emergence along with quizalofop Ethyl as a post emergence was applied at 20 DAS. Murthy (1982) and Yadav et al. (1983) observed that pendimethalin was most effective in checking most of the monocot as well as dicot weeds and thus by improved the yield components like number of pods per plant, shelling percentage and test weight. Application of pendimethalin at1.5 kg a.i per

Table 2. Effect of post emergence herbicide on yield and yield attributes of groundnut (Pooled over 2010 and 2011).

Treatment	Pod yield (kg/ha)	Haulm yield (Kg/ha)	No.of pods/ plant	Shelling (%)	100 Kernel weight (g)	SMK (%)	Gross return (Rs./ha)	Net return (Rs./ha)	Total cost (Rs./ha)	BCR
T_1	1512	1813	13.2	66.9	37.4	84.0	45360	22742	22618	2.01
T_2	2871	3305	18.6	70.9	38.0	92.6	86130	60505	25625	3.36
T_3	2685	3129	17.3	71.3	37.6	91.4	80550	55937	24613	3.27
T_4	2252	2713	15.4	69.8	37.9	88.9	67560	44440	23120	2. 92
T_5	2383	2911	14.4	70.0	38.0	90.0	71490	48572	22918	3.12
T_6	2409	2941	15.2	69.6	38.2	88.6	72270	49550	22720	3.18
T_7	2082	2546	14.7	69.8	37.3	87.9	62460	39340	23120	2.70
T_8	2109	2598	15.2	70.1	38.1	89.7	63270	40352	22918	2.76
T_9	2211	2731	15.0	69.3	37.3	88.7	66330	43610	22720	2.92
T_{10}	2391	2926	15.8	70.2	38.0	90.6	71730	48414	23316	3.08
T_{11}	2304	2833	16.0	69.9	37.5	89.0	69120	46010	23110	2.99
T_{12}	2598	3181	15.8	70.8	38.6	91.0	77940	52482	25458	3.06
SEm (±)	94.574	71.943	0.709	0.191	0.257	0.546				
CD at 5%	276.858	210.607	2.075	0.559	NS	1.598				

NS, Non significant.

ha showed equal performance in pod yield (16.51 q/ha) with hand weeding at 15 and 35 days after sowing (18.4 q/ha) and was found better in controlling grassy weeds in groundnut (Kondap et al., 1989).

Yield and yield attributes

Effect of different herbicidal treatments on yield and yield attributing characters of groundnut was found to be significant, except in case of 100 kernel weight. Among all the herbicidal treatments, T_3 that is, pre-emergence application of pendimethalin at 1.0 Kg a.i./ ha along with one hand weeding, recorded highest pod yield (2675 Kg/ha), haulm yield (3123 Kg/ha), number of pods/plant (17.3), shelling % (71.3) and SMK % (91.4) as compared to post emergence herbicidal treatments. This might be due to application of pendimethalin as a pre emergence suppresses the weed growth at early stage of the crop as a result of better crop stand. Among the post-emergence herbicidal treatments pod yield, haulm yield and yield attributes of groundnut was found maximum with the treatment received post emergence application of quizalofop Ethyl at 100 g a.i. /ha i,e $T_{6,}$ which was significantly superior to T_7 and T_8 (treatments received Imizathapyr at 50 and 75g a.i./ ha at 20 DAS respectively) but statistically at par with T_9 (Imizathapyr at 100g a.i./ ha at 20 DAS). Among the combinations of pre and post emergence herbicide application, the treatment T_{10} (Pendimethalin at 1.0 kg a.i. / ha and Quizalofop Ethyl at 50 g a.i./ha) and T_{11} (Pendimethalin at 1.0 kg a.i./ha and Imizathapyr 75 g a.i./ha) was statistically at par among each other. From the Table 2 it was found that weed free check (T_2) gave the highest pod yield (2871 kg/ha) as compared to rest of the treatments except T_3 (treatment received pre-emergence application of Pendimethalin at1.0kg a.i./ha and one hand weeding) and T12(one hand weeding and one intercultural operation), those were statistically at par with T_2 .Practices of weed control by chemical and/or mechanical(T_2 to T_{12}) gave the significantly better pod yield of groundnut as compared to un-weeded control (T_1) and pod yield of groundnut was decreased even up to 26 to 47% in un-weeded condition . Groundnut being a deep rooted legume crop proliferation of the root at early stage is essentially required to establish the sufficient numbers of nodule and better crop growth for pegging. Weed growth is faster than crop growth at early stage so controlling of weeds at early stage reduced the crop weed competition and thus providing nutritional security to the crop as result of better pod yield. Maximum gross return (Rs.86130) , net return (Rs.60505) and B:C ratio (3.36) were recorded in the treatment T_2 that

is, weed free check and among herbicidal treatments maximum gross return (Rs.80550), net return (Rs.55937) and B:C ratio(3.27) were recorded in T_3 that is, pre-emergence application of pendimethalin at 1.0 Kg a.i./ ha along with one hand weeding. So it can be revealed that application of quizalofop ethyl at 50 g a.i. / ha can be more effective than imazethapyr at 100 g a.i. / ha in groundnut as post emergence herbicide to control different narrow leaved and broad leaved weeds.

Conflict of Interest

The author(s) have not declared any conflict of interest.

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