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Effectiveness of herbicides for weed management in pre-monsoon groundnut (*Arachis hypogaea*)

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ABSTRACT

A field experiment was conducted during monsoon seasons 2012 to 2014 at Junagadh (Gujarat) to study the integrated weed management in pre-monsoon groundnut. Pendimethalin and oxyfluorfen as pre-emergence, while quizalofop-ethyl, imazethapyr and oxadiargyl as post-emergence were tested alone and in integration with hand weeding and interculturing. The results revealed that pre-plant incorporation of pendimethalin 38.7 per cent CS 0.75 kg ha^{-1} or pre-emergence application of pendimethalin 30 per cent EC 0.9 kg ha^{-1} supplemented with IC and HW at 40 DAS were found equally effective to the weed free check in controlling weeds and improving growth and yield attributes and ultimately pod yield (1580 and 1538 kg ha^{-1}) and haulm yield (2533 and 2472 kg ha^{-1}) of groundnut. These treatments also recorded higher WCE (92.40 and 87.93%) and B:C ratio (1.87 and 1.81), therefore, these integrated weed management practices could become effective and economical under south Saurashtra agro-climatic conditions of Gujarat.

Keywords : *Arachis hypogaea*, groundnut, hand weeding, herbicide, interculturing, pre-monsoon

Groundnut is the predominant *kharif* crop of Saurashtra region. In irrigated area of south Saurashtra, pre-monsoon sowing of groundnut is very common. Generally farmers do not apply pre-emergence herbicides, which cause subsequent heavy infestation of weeds. So farmers are doing repeated manual weeding and interculturing leading to increased cost of cultivation besides creating interference to pegging and pod development. The problem can be further aggravated by unpredictable weather conditions as well as rising price and scarcity of farm labourers. These all together warrants for alternate effective and economical weed management specifically by pre and post-emergence herbicides. In search of new herbicide molecules, the present field investigation was, therefore, conducted to tackle the weed problem in pre-monsoon groundnut.

MATERIALS AND METHODS

A field experiment was conducted at Weed Control Research Scheme, Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh (Gujarat) during *kharif* seasons of 2012 to 2014. The soil of the experimental plot was clayey in texture and slightly alkaline in reaction (pH 7.9 and EC 0.39 dS m^{-1}) as well as low in available nitrogen (226-239 kg ha^{-1}), available phosphorus (19-22 kg ha^{-1}) and medium in available potash (275-363 kg ha^{-1}). The experiment comprising of 10 treatments *viz*., T_1: Pendimethalin 30% EC @ 0.90 kg a.i. ha^{-1} PE *fb* IC and HW at 40 DAS, T_2: Pendimethalin 38.7 per cent CS @ 0.75 kg a.i. ha^{-1} PPI *fb* IC & HW at 40 DAS, T_3: Oxyfluorfen 0.24 kg ha^{-1} PE *fb* IC and HW at 40 DAS, T_4: Quizalofop-ethyl 40 g ha^{-1} POE at 20 DAS *fb* IC and HW at 40 DAS, T_5 : Imazethapyr 75 g ha^{-1} POE at 20 DAS *fb* IC and HW at 40 DAS, T_6: Oxadiargyl 90 g ha^{-1} POE at 20 DAS *fb* IC and HW at 40 DAS, T_7: Propaquizafop 90 g ha^{-1} POE at 20 DAS *fb* IC and HW at 40 DAS, T_8: IC and HW at 20 and 40 DAS, T_9: Weed free (IC and HW at 15, 30, 45 and 60 DAS) and T_{10}: Unweeded control was laid out in randomized block design with three replications.

The groundnut variety 'GG 20 was sown at 60 cm row spacing using seed rate of 120 kg ha^{-1}. The crop was fertilized with 12.5-25-0 kg N-P_2O_5-K_2O ha^{-1} as basal. The pre-emergence herbicides were applied to soil on next day of sowing, while post-emergence spray was done at 40 DAS. The spray volume herbicide application was 500 L ha^{-1}. The crop was raised as per the recommended package of practices.

RESULTS AND DISCUSSION

The major weed flora noticed were *Cynodon dactylon, Brachiaria* spp., *Asphodelus tenuifolius, Indigofera glandulosa, Dactyloctenium aegyptium* and *Echinochloa colona* among the monocots; *Digera arvensis, Chenopodium album, Amaranthus viridis, Physalis minima, Portulaca oleracea, Euphorbia hirta* and *Leucas aspera* among the dicot weeds and *Cyperus rotundus* as sedge weed.

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Table 1: Effect of integrated weed management on growth and yield attributes of groundnut (Pooled over three years).

Treatment	Plant height (cm)	Pods plant^{-1}	100-kernel weight (g)	Shelling (%)	Oil content (%)
Pendimethalin 30% EC	30.09	11.87	52.66	71.52	49.51
Pendimethalin 38.7% CS	30.52	12.52	53.12	72.26	49.64
Oxyfluorfen	29.12	11.07	52.39	70.94	49.43
Quizalofop	27.42	9.76	50.43	68.81	48.58
Imazethapyr	28.00	10.13	50.84	69.73	48.93
Oxadiargyl	26.71	8.48	49.32	67.47	47.75
Propaquizafop	27.11	9.23	49.83	68.32	48.11
IC and HW twice	28.53	10.66	51.10	70.44	49.22
Weed-free check	30.70	12.84	53.60	72.80	49.70
Weedy check	23.10	5.39	41.70	65.07	47.13
SEm(±)	**0.76**	**0.32**	**0.82**	**1.38**	**0.61**
LSD (0.05)	**2.15**	**0.90**	**2.33**	**3.91**	**1.73**

Table 2: Effect of integrated weed management on yield of groundnut and weed dry weight (Pooled over three years).

Treatment	Pod yield (kg ha^{-1})		Haulm yield (kg ha^{-1})		Weed dry weight (kg ha^{-1})		WCE (%)	B:C Ratio
Pendimethalin 30% EC	1538	b	2472	ab	247	fg	87.93	1.81
Pendimethalin 38.7% CS	1580	ab	2533	ab	156	gh	92.40	1.87
Oxyfluorfen	1487	bc	2318	bc	335	f	83.64	1.71
Quizalofop	1112	d	1841	ef	1011	d	50.66	1.32
Imazethapyr	1182	d	1991	de	928	d	54.68	1.39
Oxadiargyl	827	e	1477	g	1688	b	17.62	0.98
Propaquizafop	942	e	1724	f	1520	c	25.81	1.12
IC and HW twice	1378	c	2194	cd	613	e	70.06	1.58
Weed-free check	1676	a	2643	a	41	h	98.02	1.69
Weedy check	441	f	1042	h	2048	a	0.00	0.61
SEm.(±)	**46**		**84**		**44**			
LSD (0.05)	**131**		**237**		**124**			

Effect on crop

An appraisal of data presented in table-1 showed that various weed management practices significantly influenced growth and yield attributes of groundnut. Significantly the highest plant height, pods/plants,100-kernel weight, shelling percentage and oil content were recorded under the weed-free check, however it remained mostly at par with pendimethalin 38.7 per cent CS @ 0.75 kg a.i. ha^{-1} PPI *fb* IC and HW at 40 DAS and pendimethalin 30 per cent EC @ 0.90 kg a.i. ha^{-1} PE *fb* IC and HW at 40 DAS. Whereas, significantly the lowest values of these growth and yield attributes were registered under the weedy check.

The data furnished in table-2 showed that different weed management treatments significantly influenced the pod and haulm yields of groundnut. The weed-free check out yielded by producing significantly the highest mean pod yield of 1676 kg ha^{-1} and haulm yield of 2643 kg/ha over three years. The next best treatments in this regard were pendimethalin 38.7 per cent CS @ 0.75 kg a.i. ha^{-1} PPI *fb* IC and HW at 40 DAS and pendimethalin 30 per cent EC @ 0.90 kg a.i. ha^{-1} PE *fb* IC and HW at 40 DAS. These treatments increased pod yield by 280, 258 and 249 per cent over the unweeded control having B:C ratio of 1.69, 1.87 and 1.81, respectively. Efficient control of weeds and improved growth and yield attributes under these treatments might have reflected in increased pod and haulm yields. These results are in conformity with findings of Dutta *et al*. (2005), Sonwalkar and Londhe (2011), Mathukia *et al.* (2014) and Sharma *et al.* (2016).

Effect on weeds

The data (Table-2) indicated that different weed management treatments exerted significant effect on dry weight of weeds. The weed-free recorded significantly the lowest dry weight of weeds, followed by pendimethalin 38.7 per cent CS @ 0.75 kg a.i. ha^{-1} PPI *fb* IC and HW at 40 DAS and pendimethalin 30 per cent EC @ 0.90 kg a.i. ha^{-1} PE *fb* IC and HW at 40 DAS having WCE of 98.02, 92.40 and 87.93 per cent, respectively. The results corroborate the findings of Kumar *et al.* (2013), Patro *et al.* (2014), Mathukia *et al.* (2014) and Sharma *et al.* (2016).

RECOMMENDATION

It was concluded that effective control of weeds in pre-monsoon groundnut along with higher yield could be achieved by pre-plant incorporation of pendimethalin 0.75 kg ha^{-1} or pre-emergence application of pendimethalin 0.9 kg ha^{-1} supplemented with IC & HW at 40 DAS under south Saurashtra agro-climatic conditions of Gujarat.

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