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EFFECT OF HERBICIDES ON WEED CONTROL AND YIELD OF MAIZE

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Abstract: An experiment conducted to find out suitable weed control measures and their effect on crop yield, revealed that weed control treatments gave significant increase in grain yield over control. Herbicides proved slightly better as compared to hand weeding. Weeds removed 41.69, 18.97 and 66.77 kg N, P_2O_5 and K_2O/ha, respectively. Weed control proved helpful in arresting nutrient depletion to the extent of 50 per cent or slightly more. Weed control efficiency of all other treatments, except 0.5 kg /ha alachlor, was almost at par.
Keywords: Maize, herbicides, water use efficiency, weed control efficiency.

Introduction

Maize (Zea mays L.) is one of the most important among the cereal crops in the world agricultural economy both as food and fodder crop and is regarded as queen of cereals. Maize grains are used for human consumption, feed for poultry and livestock, for extraction of edible oil and for starch and glucose industry. In India, maize is grown over an area of 8.33 million ha with an annual production of about 16.68 million tonnes and an average productivity of about 2002 kg per hectare. It is grown both in *kharif* and *rabi* season but its yield during *kharif* season is very low as compared to the *rabi* sowing to weed competition for fertility and moisture. Guleria and Singh (1979) reported that weeds when allowed to compete till harvest depleted 60 kg N, 12 kg P_2O_5 and 124 kg K_2O/ha. Thus, it is of utmost importance to save the wasteful loss caused by weeds. Hand weeding is the only method in vogue for controlling weeds. But most of the times weeding is done after critical period of competition due to non-availability of labour. This results in ineffective weed control and lower crop yields. The present experiment was carried out to find out suitable weed control measures and their effect on crop yield.

Material and methods

An experiment with six weed control treatments was carried out in a randomized block design with three replications for two consecutive years during *kharif* season of 2013 and 2014 at NBPGR experimental farm, IARI, New Delhi. Maize variety 'Pusa Composite 3'was sown on 7thJuly, in 2013 and on 5thJuly in 2014, respectively. Nitrogen, phosphorus

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and potassium were applied at 120, 60 and 20 kg/ha in the form of urea, DAP and muriate of potash, respectively. Half of the nitrogen and full dose of P_2O_5 and K_2O were applied at sowings in the lines. The remaining half of the nitrogen was applied in two equal splits at knee high and tasseling stages. Herbicides were sprayed two days after sowing as pre-emergence. Soil of the experimental plot was sandy loam with a pH of 7.4, organic carbon of 0.45%, EC of 0.42 mmhos/cm., availableP_2O_5 of 38 kg/ha and available K_2O of 250kg/ha. Observations on weeds were recorded on 80th day of sowing placing two quadrat of 0.5 m x 0.5 m. Nitrogen was analysed by modified Kjeldahl's method, phosphorus and potassium were analysed using colorimeter and Flame Photometer, respectively as described by Jackson (1973).Weed control efficiency was worked out by the formula, DWC – DWT/DWC, where DWC and DWT are dry weight of weeds in unweeded control and treated plots.

Results and Discussion

Weed flora

The weed flora of the experimental field comprised of *Dactyloctenium Faegyptium*, *Echinochloa colonum, Eragrostis cilianensis, Paspalum disticum* among the annual grasses, *Euphorbia hirta, Eclipta alba, Digra arvensis, Cleome viscosa, Physalis minima* and *Biothytum sensitivum* among broad leaf weeds, and *Cyperous rotundus, Cynodon dactylon, Fimbristylis dicotoma* and *sorghum halepense* among the rhizomatus weeds. Grassy and rhizomatus weeds were predominating, occupying the bulk of weed population (90%), whereas the dicot weeds were sparse (10%).

Yield

Data revealed that in both the years weed control treatments brought about significant increase in grain yield as compared to control. In 2013, hand weeding proved superior to atrazine application @ 0.5 kg/ha, which was at par with the rest of the treatments. Results of 2014 were in accord with the result of 2013, except that none of the treatments proved inferior to hand weeding. Herbicide, alachlor gave slightly higher yield than hand weeding which is in accordance with the findings of Chopra and Angiras (2008). Higher yield in weed control treatments may be attributed to decreased weed competition and increased water and nutrient availability (Guleria and Singh, 1979).

Weed dry weight

Dry matter accumulation in weed was similar in both the years. In both the years, weed control treatments brought down dry matter accumulation significantly compared to control. In 2013, simazine and atrazine 1.0 kg/ ha and alachlor 2.0 kg/ ha reduced the dry

matter accumulation to the extent of hand weeding, but in 2014, hand weeding proved inferior to herbicides. This is perhaps due to higher rainfall during the growth period, July to September, which helped in faster regeneration and greater dry matter accumulation (Singh and Sairam, 2016). Herbicides differed significantly among themselves in reducing dry matter accumulation in weeds. Alachlor at 1.0 kg/ ha and atrazine at 0.5 kg/ ha proved inferior to the rest of the herbicide treatments in both the years.

Water use and weed control efficiency:

In both the years, water use efficiency was higher in treated plots as compared to control but it varied in different years. This is due to variation in yield. Except alachlor at 1.0 kg / ha and atrazine 0.5kg / ha, all other treatments helped the crop to utilize soil water more efficiently compared to control. Weed control efficiency was similar in both the years.

Nutrient content and removal

Nutrient content was affected due to weed control treatments. Except K, content of all other nutrients was slightly lower in hand weeded and control plots as compared to herbicides. Weeds removed higher amount of major nutrients (Table 2). Weed control treatments resulted in 50 per cent saving of nutrients.

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Table 1. Effect of weed control treatments on grain yield, weed dry weight, water use and weed control efficiency

Treatments	Grain yield (q/ha)			Weed dry wt. (g/0.25 m^2)		Water use efficiency (kg/ha.mm)		Weed control efficiency	
	2013	2014	Mean	2013	2014	2013	2014	2013	2014
Atrazine @ 0.50 kg/ha	35.2	18.8	27.0	7.24	6.86	8.23	3.95	31.20	40.47
Atrazine @ 1.0 kg/ha	39.7	20.1	29.2	6.72	6.46	9.23	4.23	40.63	47.13
Simazine @ 0.75 kg/ha	39.0	20.0	29.5	6.38	6.28	9.12	4.19	41.48	50.00
Alachlor @ 1.0 kg/ha	33.3	20.9	27.1	7.44	6.57	7.80	4.39	28.02	45.35
Alachlor @ 2.0 kg/ha	37.0	23.1	30.0	6.88	6.28	8.67	4.80	40.63	47.13
Hand weeding at 20 & 40 DAS	41.3	21.6	31.4	6.88	6.70	9.67	4.53	48.73	43.19
Control	27.2	12.0	19.6	8.77	8.91	6.36	2.52	-	-
S. Em±	2.7	1.7	-	0.03	0.006	-	-	-	-
CD (P = 0.05)	7.6	4.9	-	0.08	0.018	-	-	-	-

Table 2. Effect of weed control treatments on major nutrient content and their removal by weeds (Pooled data of 2 years)

Treatments	Weed dry wt. (kg/ha)	Nutrient content (%)			Nutrient removal (kg/ha)		
		N	P_2O_5	K_2O	N	P_2O_5	K_2O
Atrazine @ 0.50 kg/ha	2009	1.361	0.590	1.88	27.34	11.85	37.76
Atrazine @ 1.0 kg/ha	1756	1.401	0.592	1.85	24.60	10.39	32.48
Simazine @ 0.75 kg/ha	1698	1.421	0.588	1.95	24.13	9.98	33.11
Alachlor @ 1.0 kg/ha	1980	1.395	0.589	1.98	27.62	11.66	39.20
Alachlor @ 2.0 kg/ha	1791	1.411	0.599	2.01	25.27	10.73	35.99
Hand weeding at 20 & 40 DAS	1696	1.482	0.594	1.96	25.13	10.07	33.24
Control	3135	1.330	0.605	2.13	41.69	18.97	66.77