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Effect of Weed Control Methods and Nitrogen Levels on Crop-Weed Competition in Maize

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Field experiments on the competitive effect of weeds for soil nutrients in hybrid maize (Ganga 5) indicated that weeds removed about 65 kg N, 8 kg P 205 and 47 kg K_2 0/ha at the early stage (30 days) of the crop growth. The weeds removed seven times more nutrients than the crop at this stage. Pre-emergence application of Simazine at 1.00 kg a. i./ha plus one hand weeding as well as hand weeding twice effectively checked the nutrient depletion by weeds and increased the NPK uptake of the crop. The grain yield in these two treatments was higher when compared to the rest of the weed control treatments which included 2, 4-D alone and in combination with manual weeding due to increased uptake of nutrients by crop and minimum removal of nutrient by weeds.

It has become axiomatic that weeds compete with crops for available nutrients, moisture, air, space etc. Crop-weed competition begins early from weeds that emerge ahead of the crop and often persists through a major portion of the growing season. Competition between crop plants and weeds is therefore a critical factor in the growing of useful plants (Crafts and Robbins, 1962).

Sankaran and Mani (1972) reported that weeds in sorghum crop removed on an average. 37.8 kg. of nitrogen. 13.4 kg of phosphorus and 32.8 kg of potash per hectare. Bandeen and Buchholtz (1965) estimated that quack grass grown with corn removed 105, 15 and 60 kg of nitrogen, phosphorus and potash respectively per hectare.

MATERIAL AND METHODS

Field experiment was conducted at Agricultural College Farm, Madurai in Kharif season 1977 with hybrid maize Ganga 5. Twenty one treatments consisting of three levels of nitrogen viz., N1 : 60; N_2 : 120 and N_3 : 180 kg/ha and seven weed control methods viz., T_1 : Unweeded control; T_2 : Hand weeding twice on 15th day and 30th day after sowing. T_3 : Simazine @ 1.00 kg a. i./ha as pre-emergence spray; T_4 : Simazine @ 1.00 kg a. i./ha as pre-emergence spray Plus one hand weeding on 30th day after sowing; T_5 : 2, 4-D @ 1.5 kg a. i./ha as post-emergence spray; T_6 ; 2, 4-D @ 1.5 kg a. i./ha as post emergence spray plus one hand weeding on 30th day after sowing and T_7 ; Simazine @ 1.00 kg a.i./ha as pre-emergence spray plus 2, 4-D @ 1.5 kg a. i./ha as post emergence spray, were accomadated in a Factorial Randomised Block Design, replicated thrice. The gross and net plot sizes were 7.0x5.4 m and 5.2 x 4.8 m reapecrively. A basal application of 60 kg phosphorus and 50 kg potash per hectare was made. The nitrogen as per treat-

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mental schedule was applied in the form of urea in three equal splits, on the day of sowing, 30th day and 50th day after sowing. Simazine and 2, 4-D were sprayed as pre and post-emergence spray respectively.

The uptake of nutrient (N, P and K) by weeds and crop plants was estimated at harvest stage. Ovendry composite samples were powdered and analysed for total N, P and K in plants and weeds following the standard analytical procedures.

RESULTS AND DISCUSSION

Trianthema portulacastrum L., occupied nearly 50 per cent of the experimental field. The other weeds recorded were *Cyperus rotundus, Trianthema decandra* L., *Portulacia oleraceae* L., *Amaranthus viridis* L., and *Eclipta alba*.

The data on the weed drymarter production and uptake of nutrient by weeds and plants at the time of harvest and its effect on grain yield are presented in Table 1.

Weed drymatter production:

Significant differences among dry weight of weeds were observed for applied nitrogen. The weed dry weight at higher level of nitrogen application (180 kg N/ha) was however on par with that at medium level (120 kg N/ha). Increase in dry weight of weeds at each additional level of applied nitrogen was reported by Bandeen and Buchholtz (1964).

The dry weight of weeds was markedly higher in the unweeded check compared to that in the weed control treatments. Amongst the weed control treatments, pre-emergence application of Simazine followed by one hand weeding together with twice hand weeding were effective in suppressing the weed growth by recording the least dry weight of weeds. Decrease in dry weight of weeds due to weed control methods was reported by Rajan, (1972).

The interaction effect between nitrogen levels and weed control treatments was not significant.

Uptake of Nutrient by weeds:

The levels of nitrogen influenced the NPK uptake by weeds. NPK uptake by weeds progressively increased with each additional application of N. However the differences in phosphorus uptake between successive levels of nitrogen applied was not significant. The reason for the increased nutrient uptake may be attributed to the increased dry weights of weeds at each level of additional applied nitrogen.

Maximum nutrient uptake by weeds was observed under unweeded check and least nutrient uptake by weeds was recorded under hand weeding twice which was on par with that at Simazine plus one hand weeding. Reduced nutrient uptake by weeds under these two treatments in controlling the weeds effectively over other weed control treatments. Similar reduction in depletion of nutrients by weeds in maize was reported by Mani (1971).

The interaction effect between Nitrogen levels and weed control treatment was not significant.

Uptake of nutrient by crop:

The uptake of nitrogen. phosphorus and potassium recorded at harvest stage exhibited an increasing trend as the level of nitrogen application was enhanced. This increase was mainly due to higher concentration when the nitrogen level was from 60 kg/ha to 120 kg/ha and 120 kg/ha to 180 kg/ha and due to higher drymatter production at the initial increased level of nitrogen (60 to 120 kg N/ha). Nitrogen application increasing nutrient uptake was reported by Nieto and Staniforth (1961).

The nutrient uptake viz., N. P. and K by the maize was more in the treatments Simazine plus one hand weeding and hand weeding twice as compared to other treatments. The increased uptake of nutrient by the crop in these two treatments (T_4 and T_2) may be attributed to the less weed competiton for nutrition in the weed control treatments and also increased plant drymatter production. Increased nutrient uptake by maize due to weed control methods was reported by Fisyunov (1969).

The interaction effect was not significant.

Grain Yield:

The response of grain yield to applied nitrogen was linear and the highest yield was recorded at 180 kg N/ha. The yield components. 1000 grain weight etc., increased significantly with each additional level of nitrogen applied. Moreover at increased nitrogen application on the uptake of major nutrients viz., N, P and k were higher resulting in the linear response of grain yield to applied nitrogen. Similar linear response of grain yield to maize upto 180 kg N/ha was reported by Shah *et al.* (1971).

The yield differences between weed control treatments were significant. The grain yield recorded was highest under Simazine plus one hand weeding treatment and it was on par with hand weeding twice treatment. The highest grain yield under T_4 and T_2 treatments might be due to the cumulative effect of better weed control which resulted in more availability of nutrients to crop. Similar results of increased grain yield with Simazine followed by manual weeding were reported by Khan and Malik (1969) and Spasov (1976).

The interaction effect between nitrogen levels and weed control treatments was not significant.

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TABLE-1 Weed dry matter production, uptake of N, P and K by weeds and crop as influenced by nitrogen levels and weed control methods and its effect on grain yield.

Treatments	Weed dry matter production (kg/ha) (Trans) (At harvest)	Nutrient uptake by weeds (kg/ha) (At harvest)			Nutrient uptake by Maize (kg/ha) (At harvest)			1000 grain weight (g)	grain yield (kg/ha)
		N	P	K	N	P	K		
Nitrogen levels :									
N_1	31.68	19.29	3.16	16.59	119.88	18.83	102.72	240.76	3570
N_2	32.57	23.17	3.64	21.00	146.54	26.65	132.74	262.76	4610
N_3	32.80	26.48	4.17	25.93	185.40	33.98	173.91	293.09	5054
SED	0.21	1.51	0.31	1.23	1.91	1.32	1.97	3.09	65
CD (0.05)	0.42	3.05	0.63	2.50	3.86	2.66	3.98	6.25	132
Weed Control Methods :									
T_1	53.21	65.44	9.85	54.65	120.98	19.16	105.40	243.44	3286
T_2	24.72	12.03	1.89	11.25	172.73	32.17	155.96	274.00	4978
T_3	29.40	16.47	2.68	15.92	150.01	25.24	132.64	268.33	4401
T_4	24.86	12.25	1.92	11.38	174.96	32.29	157.50	275.33	5033
T_5	34.60	22.01	3.71	22.03	137.23	23.40	126.43	260.88	4046
T_6	31.50	17.10	2.94	18.28	150.09	25.79	134.32	260.00	4451
T_7	28.16	15.56	2.60	14.72	161 26	27.38	142.95	270.77	4681
SED	0,32	2 30	0.48	1.89	2,91	2.01	3.01	4.73	100
CD (0.05)	0.65	4.66	0.97	3.82	5.90	4.07	6.09	9.55	202