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Studies on Crop-Weed Competition for Nutrient and its Effect on Grain Yield of Maize (Var. Ganga-5)

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ABSTRACT

Field experiment on the competitive effect of weeds for soil nutrients in hybrid maize (Var. Ganga-5) indicated that weeds removed about 59 kg N, 10 kg P and 59 kg K per ha at the early stage (30 days) of the crop growth. The weeds removed 7 to 10 times more nutrients than the crop at this stage. Pre-emergence application of simazine at 1.0 kg a. i/ha effectively checked the nutrient depletion and caused 41, 73 and 35 per cent increase in the NPK uptake of the crop over unweeded control. Simazine-treated crop recorded higher grain yield than the manual weeding treatment.

INTRODUCTION

Weeds cause severe competition with maize for moisture, nutrient, light and space due to wider spacing of the crop, heavy fertilisation and adequate supply of moisture. As weeds grow at a faster rate, they deplete nutrients quickly from the soil and subject the crop for severe harships in the early stages of crop growth leading to low production.

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

MATERIALS AND METHODS

Field experiment was conducted with hybrid maize (Var. Ganga—5) at the Agricultural College Farm, Coimbatore in *kharif* (August to November) season 1971 under split plot design with three replications to find out the effect of weed growth on the nutrient uptake and grain yield of maize. The main plot treatments comprised of 0; 30, 60, 90 and 120 kg N/ha (denoted by symbols N_0, N_1, N_2, N_3, and N_4 respectively) while the five sub plot treatments were unweeded control (C), hand weeding twice (W), pre-emergence application of simazine 0.25 kg a. i/ha (S_1), Simazine 1.0 kg

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a. i/ha (S_2) and Simazine 1.75 kg a.i/ha (S_3).

The gross and net plot sizes were 4.8 x 8.0 m and 2.4 x 7.2 m respectively. A basal application of 68 kg of phosphorus and 45 kg of potash per ha was made. Half the dose of nitrogen was applied at the sowing time and the rest applied 30 days after sowing of maize as per the treatments. Simazine (80%) was sprayed as a pre-emergence spray on the third day after sowing.

The uptake of nutrients (N, P and K) due to weed growth in maize field was estimated at 30 days of the crop growth and harvest. Oven dry composite samples were powdered and analysed for total N, P and K in plants and weeds. The uptake of nutrients by crop and weed were calculated in terms of kg/ha and are presented in table 1.

RESULTS AND DISCUSSION

Trianthema portulacastrum L. (purslane) an annual dicot, was the most dominant weed forming nearly 90 per cent of the total weed population. The other weeds recorded were *Lagasca mollis*, *Portulaca oleracea* and *Cyperus rotundus*.

Uptake of nutrients at 30 days: The maize crop without nitrogen application took 7.3, 0.8 and 10.4 kg of N, P and K per ha respectively while the weeds at the same time removed 12.9, 2.1 and 14 6 kg of N, P and K per ha. When the levels of nitrogen were increased from 0 to 120 kg/ha, there was corresponding increase in the uptake by the crop and the weeds. The weeds removed more of plant nutrients than the crop at 30 days of crop growth Duly and Miller (1921) and and Nieto and Staniforth (1961) reported increased nutrient uptake by maize and weeds with increased levels of nitronen.

The weeds in unweeded check (C) removed 58.8, 10.2 and 59.5 kg of N. P and K per ha respectively while the crop at the same time could only utilise 6.3, 0.8 and 8.0 kg/ha of the corresponding nutrient. This showed that on an average, weeds removed 9 times more of nitrogen, 10 times more of phosphorus and 7 times more of potash than crop at the early stage (30 days) of crop growth. Tsvetkova (1966) reported that pre-emergence application of simazine at 2 kg/ha increased the uptake of plant nutrients by the crop. The uptake of nutrient by weeds in simazine treatments was low and superior to two hand weedings. This indicated the importance of weeding at early stage of crop growth. Similar reductions in depletion of nutrients by weeds was reported by Mani (1971) in maize.

Uptake of nutrients at harvest stage: The nutrient uptake by the crop was increased for each increment of nitrogen from 0 to 120 kg/ha, while the uptake by weeds was not influenced in a definite pattern with increased levels of nirtogen. The total uptake of N, P and K in plants was increased by 60.6, 23.0 and 28.3 per cent respectively when nitrogen levels were raised from 0 to 120 kg/ha

TABLE. 1. Uptake of nutrients (N, P and K) by maize crop and weeds and its effect on yield

Treatments	Nutrient uptake at 30 days after sowing (kg/ha)						Nutrient uptake at harvest of the crop (kg/ha)						Mean cob weight (kg/ha)	Mean weight of 1000 grains (g)	Mean grain yield (kg/ha)
	Maize			Weeds			Maize			Weeds					
	N	P	K	N	P	K	N	P	K	N	P	K			
a] Levels of Nitrogen															
N_0	7.3	0.8	10.4	12.9	2.1	14.6	97.0	22.9	117.5	12.8	1.9	6.7	4815	383.5	3499
N_1	7.8	0.9	11.4	13.5	2.4	13.1	135.3	24.4	135.8	10.3	2.2	7.8	5660	397.1	4121
N_2	8.5	1.0	12.5	13.6	2.5	16.4	150.8	26.6	142.5	12.0	1.8	7.2	6852	416.0	4956
N_3	9.2	1.1	15.0	15.9	2.2	14.0	155.5	26.4	145.1	13.5	2.2	7.5	6863	401.2	4910
N_4	9.1	1.1	15.0	18.1	2.6	14.0	156 8	28.2	150.7	16.3	2.1	9.1	7164	400.2	5165
S. E.	—	—	—	—	—	—	—	—	—	—	—	—	214.1	3.6	138 9
C. D.5%	—	—	—	—	—	—	—	—	—	—	—	—	694.4	11.7	462.9
b] Methods of weeding															
C	6.3	0.8	8.0	58.8	10.2	59 5	106.1	16.9	109.9	39.4	6.4	23.6	4850	342.2	3504
W	8.0	1.0	13.3	21.5	1.1	18.3	146 7	26.5	143 6	8 1	1.0	3.5	6575	412.3	4760
S_1	10.2	1.1	13.8	2.7	0.4	3.3	156.2	29.3	148.0	7.8	1.1	4.6	6794	418.2	4876
S_2	9.5	1.0	14.4	1.0	0.1	0 7	149.5	29.3	148.0	6.5	1.0	3.5	6759	412.1	4887
S_3	7.9	0.9	12.8	0.4	0.1	0.3	135.8	26.4	141.9	3.6	0.7	3.2	6377	412.5	4625
S. E.	—	—	—	—	—	—	—	—	—	—	—	—	196.7	5.8	138.9
C.D.5%	—	—	—	—	—	—	—	—	—	—	—	—	543.9	16.1	393.5

Nutrient uptake by the crop was minimum under unweeded check while, it was high in all the weed control treatments. The increase in the uptake of N, P and K under simazine 1 kg a.i/ha was 41, 73 and 35 per cent over the unweeded check and superior to manual weeding. Fisyunov (1969)

reported increased uptake of nutrients by maize crop with reduced weed population due to weed control treatments.

The uptake of nutrients by weeds was also minimised markedly in all the weed control treatments. The efficiency of simazine in controlling the weed growth and its uptake increased with increased dose of simazine.

Grain yield : The grain yield recorded under different levels of nitrogen indicated that highest dose of nitrogen, 120 kg N/ha produced the maximum yield while the least was under no nitrogen level. The yield differences between 60, 90 and 120 kg N/ha were not significant. The yield components like cob weight and grain weight and uptake of plant nutrients were influenced chiefly by levels of nitrogen as compared to no nitrogen level. These factors seem to be responsible, cumulatively, for the increased yield under high nitrogen levels. Overton and Long (1969) in their studies with graded doses of nitrogen in maize reported the maximum grain yield at 150 kg N/ha.

The yield differences between weed control treatments were not significant while the maximum yield was obtained under simazine 1 kg a. i/ha. The high yields under simazine and hand weeded treatments might be due to increased uptake of nutrient by the crop. The yield components like cob weight and test grain weight have also been influenced by the weed control treatments. The increase in grain yield under simazine 1.0 kg a.i/ha over unweeded control was 39.5 per cent.

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