https://doi.org/10.29321/MAJ.10.A02732

Madras Agric J 69 (6) 372-375 June 1982

Response of Some Promising Maize Varieties to Nitrogen Levels under Irrigated Condition

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In a study twelve maize types (4 hybrids, 7 composites, and one local) with four nitrogen levels (0,60,120 180 kg N/ha)were tried in two seasons at Satpura plateau of M. P. Deccan-101, EH-400175 and B-6 gave the high yields of 27.2, 25.3 and 24.2 q/ha with net-profit of Rs. 1432 Rs. 1223 and Rs. 1102/ha respectively. Nitrogen upto 180 kg/ha produced 28.3 q/ha more grain yield with Rs. 2342/ha more net profit over no nitrogen. These types in combination with 180 kg N/ha yielded 44.8, 40.6 and 43.1 q/ha with net-profit of Rs. 3048, Rs. 2586 and 2861/ha respectively.

The average grain yield of maize in India is only 1 tonne/ha, however, the yields upto 11.5 tonnes/ha have been obtained at certain places through improved agronomic practices (Jain, 1981). Though, maize hybrids and composites have a high-yielding ability yet a great harvest cannot be expected without the use of adequate fertilizers: Jain (1981) concluded that at most of the places in India at least 120 kg N/ha. should be applied to obtain 12-25 kg grain/kg N. Under irrigated conditions. the crop has responded upto 120 kg N/ha (Prabhakar, 1980), and upto 180 kg N/ha (Singh and Prasad, 1980). It was essential to evaluate the optimum level of nitrogen for some of the promising maize varieties for Satpura region of Madhya Pradesh.

MATERIAL AND METHODS

A field experiment was conducted during kharif seasons of 1977 and 1978 in a sandy-loam soil at JNKVV Agriculture Research Station, Chhindwara (M.P.) The rainfall data for both the seasons are given as below:

The treatments consisted of twelve maize types (B-6, B-19, Manjari, Hunius EH-400175, J-603, Ganga Safed-2, Chandan-3, Kisan, Vijay, Deccan-101 and a local) as main-plot treatments, and four levels of nitrogen (0, 60, 120 180 kg N/ha) as sub-plot treatments were tried in a split-plot design with four replications. The varieties were sown at 75 × 25cm spacings during third week of June after giving preliminary irrigation for land preparation. One-third of nitrogen with full dose of 60 kg P_2O_5 and 40 kg K_2O/ha was applied at sowing time, and remaining two-third of nitrogen was top-dressed in two equal splits *viz.*, at the knee high and at tasselling stages of crop growth. Maize yield was recorded at 15% seed-moisture. In all two irrigations were given to the crop, at sowing and after 10 days of sowing.

RESULTS AND DISCUSSION

Effect of varieties : The maize types differed significantly with respect

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to yield and yield-components, J-603 and Ganga Safed-2 possessed the maximum height, while, Chandan-3 and Kisan the minimum height. Much variation in plant height did not affect the yield and its components (Table 1) The cob-numbers were the highest in local variety, followed by B-19, B-6 and Deccan-101. The local variety came to silk earliest in 58 days, whereas, B-6 in 66 days and Vijay or Deccan-101 latest in 67 days. Amongst the types, B-6 produced the maximum grain of, 24.2 q/ha in the first year, while Deccan-101 gave 27.2 q/ha and EH-400175. 25.3 q/ha in the second year, the economics being Rs. 1102, Rs. 1432 and Rs 1223/ha respectively (Table II). These varieties also produced a higher number of cobs/ha which contributed the higher yield. The local variety, on an average, although gave the highest cob numbers, produced the lowest yield which reflects upon the smaller size of cobs. The local variety proved to be the lowest yielder (16.2 q/ha) af compard to the remaining varieties except Ganga Safed-2 (13.6 q/ha).

Effect of nitrogen : The increasing levels of nitrogen upto 180 kg/ha enhanced the yield and yield-attributes significantly and advanced the silk period (Table 1). On an average, the total increase went upto 83cm in plant height, and 21 thousand in cob-number per hectare over no nitrogen. Similarly the silk period was advanced by 10 days. Each increment in nitrogen level increased the grain yield significantly in both the years, Application of 60, 120 and 180 kg N/ha increased the yield, on an average, by 10.4, 21.4 and 28.3 q/ha with the net-profit of Rs. 803, Rs. 1868 and Rs. 2342/ha respectively over no nitrogen.

Effect of types x nitrogen : The interaction effect between the two factors was found significant in both the years (Table 2). In 1977, B-6 responded significantly upto 180 kg N/ha giving 43.1 q/ha yield with net-profit of Rs. 2861/ha. This was followed by J-603 (38.7 q, net-profit Rs. 2377), Vijay (37.9 q. net-profit Rs. 2289) and Manjari (36.7 q/ha, net-profit Rs. 2157/ha). Whereas in the year 1978, the best results were obtained with Deccan-101 (44.8 q, Rs. 3048) and EH-400175 (40.6 q, Rs. 2586/ha) under the same level of nitrogen. The rest of the varieties have given a significant response only upto 120 kg N/ha in both the years. The variety, Ganga Safed-2, grown in 1978 gave the lowest response to nitrogen level as compared to all the remaining varieties including the local. The present findings agree with the findings of Singh and Prasad (1980). Jain (1981) has reported that maize hybrids, on an average, yield 14-22 kg grain/kg of N, while, locals give 9-16 kg grain/kg of N In the present study, the varieties, on an average, yielded 18.7 kg grain /kg of N, while, local gave 14.7 kg grain/kg of N

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Table I Yield and yield-components of maize varieties under different treatments

Treatments	Plant-height		No. of cobs ('000'/ha)		Days to silk		Yield (q/ha)	
	1977	1978	1977	1978	1977	1978	1977	1978
Maize-types								
B-6	202	176	36	40	66	67	24.2	22.0
B-19	207	165	31	46	59	63	18.1	20.1
Manjari	203	171	29	35	67	66	19.0	18.1
Hunius/EH-400175*	202	178	29	35	56	66	16.2	25.3
J-803/Ganga Safed-2*	218	187	28	29	63	62	21.3	13.6
Chandan-3/Kisan*	189	163	28	31	61	68	17.4	15.3
Vijay/Deccan-101*	222	170	28	42	68	67	20.7	27.2
Local	189	170	45	44	53	63	16 1	16.4
S. Em	8.3	4.3	2.1	1.7	1.0	1.2	1.6	1.6
C. D. (5 %)	NS	12.5	6.0	5.2	3.0	3 5	4 6	4.6
Nitrogen levels (Kg/ha)								
0	148	117	19	22	69	70	4.4	4.5
60	204	166	31	41	62	65	13,3	16 4
120	227	198	36	45	58	64	24.7	26.9
180	237	195	40	44	57	62	34.3	31.2
S. Em	3.7	1.8	3.2	0.75	0·3	1.3	0.7	0.7
C. D. (5 %)	11.0	5.5	9.8	2.40	1.0	N.S.	2·1	2.1

* Varieties included in the year 1978. The types-Hunius, EH-400175, Ganga Safed-2, Deccan-101 are hybrids and remaining are composite

§ TABLE II Interaction effect between types and nitrogen on yield of maize (q/ha)

Types/ N-levels	1977				Mean	1978				Mean
	0	60	120	180		0	60	120	180	
B-6	8.7 [−203]	15.9 [349]	29.1 [1561]	43.1 [2361]	24.2 [1102]	4.9 [−621]	18.7 [657]	32.6 [1946]	21.9 [1929]	22.0 [860]
B-19	3.6 [−764]	14.3 [173]	24.6 [1066]	29.9 [1409]	18.1 [431]	5.6 [−544]	17.1 [481]	27.9 [1429]	30.0 [1420]	20.1 [651]
Manjari	4.0 [−720]	12.2 [−58]	23.0 [890]	36.7 [2157]	19.0 [530]	4.2 [−698]	15.0 [250]	23.6 [956]	29,9 [1409]	18.1 [431]
Hunius/EH-409175*	4.8 [−632]	10.7 [−223]	20.9 [659]	30.2 [1442]	16.2 [222]	4 6 [−654]	19·3 [723]	36.1 [2431]	40.6 [2586]	25 3 [1223]
J-603/Ganga Safed-2*	3.6 [−764]	14.5 [195]	28.6 [1506]	38.7 [2377]	21.3 [783]	1 6 [−984]	10.6 [−234]	19.7 [527]	22.2 [562]	13.6 [−64]
Chandan-3/Kisan	3.1 [−819]	14.0 [140]	22.0 [780]	30.4 [1464]	17 4 [354]	3 1 [−819]	12.9 [19]	20.2 [582]	24.9 [859]	15.3 [123]
Vijay/Deccan-101-*	4.4 (−676]	14.3 (173)	25,3 (1253)	37.9 (2289)	20.7 (717)	6.2 (−478)	22.3 (1053)	35.4 (2254)	44.8 (3048)	27.2 (1432)
Local	3.1 (−819)	10.7 (−223)	22.8 (868)	27.6 (1156)	16.1 (211)	4.8 (−632)	15.7 (327)	19 6 (516)	25.3 (903)	16.4 (244)
Mean	4 4 (−676)	13.3 (63)	24.7 (1077)	34 3 (1793)		4.5 (−665)	16,4 (404)	26.9 (1319)	31.2 (1552)	

*Types included in the year 1978 Figures in parenthesis are net profits (Rs./ha)

S. Em	[Types]	1.6	1.6
C.D. (5%)	[Types]	4.6	4.6
S. Em	[Nitrogen levels]	0.7	0.7
C.D. (5%)	[Nitrogen levels]	2.1	2.1
S. Em	[Types × Nitrogen]	2·2	2.1
C.D (5%)	[Types × Nitrogen]	6.3	6.3