Agri Res. J. Kerala, 1975 13 (1) 80-84

EFFECT OF DATE OF SOWING AND NITROGEN FERTILIZATION WITH MICRONUTRIENTS ON THE YIELD AND QUALITY OF HYBRID MAIZE - DECCAN MAKKA*

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Hybrid Maize is one of the important food grain crops of India. From a number of experiments conducted all over India it has been found that the yield of maize can be increased 50 to 60 per cent more by providing good soil and better crop management. Due to the vast deviation in the agro-climatic condition in the country detailed investigation on various agronomic aspects like optimum sowing time fertilizer application including micronutrient are essential to achieve maximum potential yield and quality of the crop Under the agro-climatic conditions of Kerala little work on these aspects have been conducted Hence the present investigation was undertaken to find out the optimum sowing time and nitrogen and micronutrient requirements of the crop.

Materials and Methods

The experiment was conducted to study the comparative response to three dates of sowing viz., 17th June (D_1) 2nd July (D_2) and 17th July (D_3) - 3 levels of nitrogen – 111 kg per ha. (N_1) 148 kg per ha (N_2) and 185 kg nitrogen per ha (N_3) and to a combination of micronutrients viz. Zinc 6 38 kg per ha in the form of Zinc sulphate + copper 7.12 kg per ha, as copper sulphate + manganese 18 23 kg per ha. in the form of manganese sulphate to Decean Hybrid Makka variety of Maize. A uniform dose of 98 kg of P_2O_5 per ha and 75 kg K_2O per ha was given in addition to farm yard manure applied at the rate of 3 tonnes per ha. The experiment was laid out as a split plot experiment in Randomised Block Design replicated thrice.

Results and Discussion

The grain and stover yield data are presented in Table I. The results show that D_1 sowing (17th June increased the yeild of grain by 12.21 per cent and 37.85 per cent over the D_2 (2nd July) and D_3 (17th July dates of sowing respectively. However there were no significant differences in yield between D_1 and D_2 dates of sewing and between D_1 and D_3 dates of sowing. The stover yield for all the three dates of sowing differ significantly and maximum stover yield was obtained for the D_1 date of sowing. The increasing total rain fall received during the vegetative growth period for the D_1 sowing has helped to increase the yields of the crop. This finding is in agreement with that of Glover (1957).

* Part of the M. Sc. (,Ag.) thesis of the first author.

Table 1

Yield of grains and stover per plot (5.4 x 3. sq. M) as affected by the various treatments

Dates of sowing	Grain weight in gms	Stover yield in kg
D_1 17 th June	5095.61	6.68
D_2 2nd July	4541.05	4.43
D_3 17th July	3696.33	3.17
F test	Significant	Significant
S. E.	±433.095	± 0.426
C. D. at 5%	918 17	0.903
Levels of Nitrogen		
N_1 (111 kg/ha)	4054.00	4.4?
N_2 (148 kg/ha)	4483.00	4.98
N_3 (185 kg/ha)	4796.00	4.S4
F. test	N.S.	N.S.
Micronutrients		
M_0	4508.2	4.87
M_1 (Mixture)	4380.5	4.65
F. Test	N.S.	N S.

None of the levels of nitrogen tried in this experiment did not differ significantly with respect to grain and stover yields thcugh there was an increasing trend in grain and stover yields for the successive additions of nitrogen. Similar findings have been reported by Shaw and Gautam (1963).

Due to heavy rains immediately after fertilization especially at the early stages of crop growth, the added nitrogen might have been leached out and so the plants could not utilize the added fertilizer nitrogen to the maximum level.

The plant population used under the present investigation was approximately 43, 250 per hectare and the higher fertilizer application might have been

Table 2

Yield attributes of maize as influenced by dates of sowing levels of nitrogen and nlicronutrients

Treatments	Length of cob. in cm.	Girth of cob. in cm.	Weight of cob. in gm.	Grain heart ratio	Percentage of protein
Dates of sowing					
D_1 - 17th June	20.08	4.78	221.68	3.94	8.44
D_2 - 2nd July	17.62	4.36	187.43	4.56	8.73
D_3 - 17th July	16 84	4.3!	173.88	4.69	8.10
F - test	Sig.	Sig.	Sig.	Sig.	N. S.
S. E.	0.809	0.1148	15.61	0.2046	..
C. D. at 5%	1.175	0.2433	33.0932	0.4337	..
1evels of nitrogen					
N_1 (111 kg N/ha)	17.48	4.45	189.50	4.26	7.07
N_2 (148 kg N/ha)	17.79	4.57	196.00	4.56	9.05
N_3 (185 kg N/ha)	19.27	4.62	240.44	4.37	9.87
F. test	Sig.	N. S.	N. S.	N. S.	Sig.
S. E,	0.809	..	..	..	0,984
C. D. at 5%	1.175	..	..	..	2.08
Levels of Micronutrients					
Mo (control)	17.79	4.49	191.35	4.52	8.79
Mt (Mixture)	18.39	4.60	200.58	4.26	8.53
F. test	N. S.	N. S,	N. S.	Sig.	N. S.
S. E.	..	..	..	0.1466	..
C, D. at 5%,				0.3080	

fully utilized had a higher population been used in this experiment. This is in agreement with the findings of Willcox (1954), and Long *et. al* (1956). More over under the climatic conditions of the area it reveals that a low level of nitrogen tried in the present investigation would have been sufficient enough to attain an economic yield with the plant population studied. Liard *et al.* (1959). Shaw and Gautam (1963) and Stanberry (1963) also recommended 120 kg nitrogen per ha. as economic and optimum nitrogen for maize.

Micronutrients did not show any significant effect either on grain or stover yields in the present investigation.

The data on the various cob-characters viz, length of cob, girth of cob, protein content of grains and grain heart ratio are presented in Table 2.

The dates of sowing significantly affected the length of cob, girth of cob, weight of cob and grain heart ratio. The D_1 date of sowing was found to be significantly superior for all the above mentioned characters over D_2 and D_3, however there were no significant difference between D_2 and D_3. These yield attributing characters were responsible for the increase in grain yield for the D_1 date of sowing But with regard to protein content the dates of sowing had no significant effect. It can be seen from the table that D_2 date of sowing gave a maximum protein content (8.37 per cent) and D_3 date the minimum (8.1 per cent)

It can also been seen from the table that N levels had significant effect only on the length of cob and protein content of grains. The higher level of N (N_3) increased the length of cob significantly over N_2 and N_1. But N_1 and N_2 did not differ significantly. Since higher levels of nitrogen had no effects on the yield contributing factors other than length of cob, the levels of nitrogen did not increase the total grain yield significantly. With respect to protein content higher levels of nitrogen significantly enhanced the percentage of protein in the grain over the lowest level of nitrogen (N_1). However there was no significant difference between N_3 and N_2 and between N_2 and N_1 levels of nitrogen. Earlier findings by Nandpuri (1960) revealed similar results.

Application of micronutrient has not shown any significant effect on characters viz. length of cob, girth of cob, weight of cob and percentage of protein, except on grain heart ratio. This finding is in partial agreement with those obtained by Viets (jr.) *et al.* (1953).

Economics of N fertilization

Eventhough the levels of Nitrogen used in this experiment did not show significant effect it was found that the response of corn to different levels of nitrogen behave in a linear fashion except for the pre-monsoon sowing (D_1) which was found to be the most suitable date of sowing as adjudged by the various plant characters studied. As such the theoretical optimum and economic

doses of nitrogen for the D, date of sowing was worked out. It was found that the optimum level of N for the D_1 sowing would be 186.82 kg per ha. while economic dose would be only 169 kg N/ha.

Summary

An investigation carried out at the Agricultural College Vellayani to study the effect of date of sowing and nitrogen fertilization combined with a mixture of micronutrients revealed that the most suitable date of sowing would be before the onset of the South West monsoon round about June 10 and June 20 provided there is adequate pre-monsoon showers for early agricultural operations. For a plant population of about 43, 250 per ha. the optimum level of nitrogen would be 186 kg per ha. Application of micronutrient mixture does not seem to influence the growth and yield attributes of corn.

സംഗ്രഹം

അധികോല്പാദനശേഷിയുള്ള ഡക്കാൺ സങ്കരചോളം കൃഷിയിറക്കുന്നതിനുള്ള ഏറ്റവും അനുയോജ്യമായ കാലയളവു്, ഉചിതമായ വളപ്രയോഗം, വിളവുവർദ്ധനവിൽ സൂക്ഷ്മമൂലകങ്ങളായ ചെമ്പു്, നാകം, fliOotnmlrrv[0] ഇവയുടെ പങ്കു് എന്നീ പ്രശ്നങ്ങളെ ആധാരമാക്കി വെള്ളായണി കാർഷികഗവേഷണത്തോട്ടത്തിൽ നടത്തിയ ഒരു പരീക്ഷണത്തിൽ നിന്നും താഴെ കൊടുത്തിരിക്കുന്ന വസ്തുതകൾ തെളിയിക്കപ്പെട്ടിരിക്കുന്നു.

കാലവർഷാരംഭത്തോടടുത്തു അതായതു് ജൂൺമാസം 10–ാം rai1'aj)anlc9«io 20–ാം തീയതികൾക്കിടക്കു് സങ്കരചോളം കൃഷിയിറക്കുന്നതു് വിളവു് വർദ്ധനവിനെ ഗണ്യമായി സഹായിക്കുന്നു. ഏകദേശം 43250 ചെടികൾ നട്ടിട്ടുള്ള ഒരു ഹെക്ടർ സ്ഥലത്തു് 186 കിലോഗ്രാം പാക്യജനകം വളമായി കൊടുക്കുന്നതു് മതിയായ വിളവുവർദ്ധനവുണ്ടാക്കുന്നു. സൂക്ഷ്മ മൂലകങ്ങൾ ഉയർന്ന വിളവിനു ഗണ്യമായ സംഭാവനയൊന്നും നൽകുന്നതായി കാണപ്പെട്ടുന്നില്ല.

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(*M.S. received: 31-1-1974*)