

INFLUENCE OF N, P AND K ON THE QUALITY OF CO. H. 1 HYBRID MAIZE SEED

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In CO. H. 1 hybrid maize seed production, application of N and P significantly influenced the 100-seed weight and germination, whereas K did not influence any of the quality parameters studied. The study revealed that the optimum doses of N, P and K for obtaining good quality seed were 200, 100 and 100 kg/ha, respectively.

In seed production, the twin objectives, viz., yield and quality have to be achieved without sacrificing one for the other. The term 'quality' refers to viability, vigour, uniformity for size and weight and structural soundness apart from genetic and physical purity of seed (Perry, 1972). Though considerable work has been carried out with N, P and K for increasing the yield of grain crop, little attention has been paid for improving the quality of a seed by the application of N, P and K nutrients. Therefore it becomes important to undertake studies on these above quality aspects and make available the information thus obtained to the seed growers.

MATERIALS AND METHODS

A field trial was carried out adopting split plot design replicated three times during June, 1983 to find out the effect of application of nitrogen at 0, 100 and 200 kg/ha and P and K each at 0, 50 and 100 kg/ha in different

combination on the quality of CO. H.1 hybrid seed.

Application of N and P was taken as the main plot treatment and of K as the sub-plot treatment. The net plot size was 4 x 3.6 m. The planting ratio adopted was 4:2 (4 lines of female (UMI-29) : 2 lines of male (UMI-51)). The experimental area was surrounded by 2 rows of male line as border rows. The seeds of female lines were dibbled 3 days before sowing of male line to avoid nonsynchronous flowering. The crop was thinned to maintain one plant per hill on the 10th day after sowing. The recommended cultural and plant protection measures were followed.

In each treatment and replication the cobs in the five randomly marked plants of the female line were harvested individually labelled and dried to bring down the moisture content around 15 per cent. Similarly the cobs

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from the remaining plants in each plot were harvested, labelled and dried to uniform moisture content. The cobs collected from the remaining plants were shelled and the seeds thus obtained were dried to uniform moisture content of 10 ± 0.5 per cent. Then the weight of seeds was recorded and expressed in kilograms.

The bulk seeds obtained from different treatments were graded using 19/64" and 18/64" round perforated metal sieves. The seeds retained in the above two sieves and that passed through 18/64" sieve were designated as G1, G2 and G3, respectively, and their weight recorded to work out the percentage recovery on weight basis to the total.

The graded (G) seeds from each replication were pooled gradewise

and mixed thoroughly and samples were drawn for conducting the tests namely 100-seed weight, germination (ISTA, 1976), Dry matter production and vigour index was calculated by multiplying the germination percentage and dry production.

The soil of the experimental plot was tested (Table 1) and the results are furnished below.

Table 1. Soil Analysis

pH	8.1
Electrical conductivity (micro mhos/cm)	0.5
Available nitrogen (kg/ha)	232 (low)
Available phosphorus (kg/ha)	7.8 (low)
Available potassium (kg/ha)	940 (high)

RESULTS AND DISCUSSION (Table 2, 3, 4 & 5)

Table 2. Influence of application of N, P and K at different levels on hundred seed weight (g) of size grades of CO H. 1 maize hybrid seed

		N ₀			N ₁			N ₂		
		P ₀	P ₁	P ₂	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂
G ₁	K ₀	23.42	23.22	21.30	24.64	22.25	25.10	26.18	15.81	25.78
	K ₁	23.00	24.94	25.11	24.83	23.79	25.73	23.19	25.72	24.55
	K	24.15	24.96	25.25	24.71	25.30	25.05	23.54	24.00	23.29
	K ₀	20.71	21.22	19.18	18.95	19.50	20.85	23.72	24.24	20.15
	K ₁	19.70	21.67	22.31	20.08	20.63	22.08	20.58	21.79	22.21
G ₂	K ₂	19.36	22.44	19.32	20.44	20.71	22.03	19.51	19.62	20.37
	K ₀	16.19	17.63	16.42	16.82	17.04	16.73	17.90	19.67	18.85
	K ₁	18.25	15.97	17.19	14.25	17.40	18.35	15.58	19.09	17.83
	K ₂	17.22	14.46	17.58	15.61	17.40	17.84	18.20	16.24	17.06

Table 2. Interaction

	N ₀	N ₁	N ₂	P ₀	P ₁	P ₂	K ₀	K ₁	K ₂
G ₁	23.93	24.60	24.67	24.19	24.44	24.62	24.18	24.54	24.47
G ₂	20.65	20.58	21.35	20.33	21.31	20.94	20.94	21.22	20.42
G ₃	16.76	16.83	17.82	16.58	17.25	17.53	17.42	17.10	16.85
Mean	20.44	20.67	21.26	20.36	21.00	21.03	20.84	20.95	20.58
P ₀	20.23	20.03	20.93	K ₀ 20.94	21.17	20.48	N ₀ 19.92	20.91	20.52
P ₁	20.72	20.44	21.79	K ₁ 19.94	21.22	21.70	N ₁ 20.21	20.79	21.01
P ₂	20.40	21.53	21.12	K ₂ 20.30	20.57	20.86	N ₂ 22.47	21.17	20.20

G N P K NP NK PK NG PG KG

CD (P=0.05) 0.489** 0.489** 0.489** NS NS 0.847** 0.847* NS 0.847* 0.847*

Table 3. Influence of application of N, P and K at different levels on germination of size grades of CO H. 1 maize hybrid seed

	N ₀			N ₁			N ₂			
	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂	
G ₁	K ₀	88.0 (69.73)	93.0 (74.66)	95.0 (77.08)	80.0 (64.16)	86.0 (68.03)	85.0 (67.21)	85.0 (67.21)	98.0 (81.87)	98.0 (81.87)
	K ₁	80.0 (64.16)	93.0 (74.66)	90.0 (71.57)	85.0 (67.21)	85.0 (67.21)	98.0 (81.87)	95.0 (77.08)	97.0 (80.83)	88.0 (69.73)
	K ₂	93.0 (74.66)	85.0 (67.21)	88.0 (69.73)	91.0 (72.54)	93.0 (74.66)	98.0 (81.87)	98.0 (81.87)	95.0 (77.08)	80.0 (64.16)
G ₂	K ₀	80.0 (64.16)	93.0 (74.66)	90.0 (71.57)	91.0 (72.54)	98.0 (81.87)	93.0 (74.66)	98.0 (81.87)	98.0 (81.87)	93.0 (74.66)
	K ₁	85.0 (67.21)	88.0 (69.73)	90.0 (71.57)	93.0 (74.66)	96.0 (78.46)	96.0 (78.46)	93.0 (74.66)	91.0 (72.54)	98.0 (81.87)
	K ₂	83.0 (65.65)	95.0 (77.08)	95.0 (77.08)	95.0 (77.08)	98.0 (81.87)	80.0 (63.43)	98.0 (81.87)	93.0 (74.66)	93.0 (74.66)
G ₃	K ₀	80.0 (64.16)	91.0 (72.54)	96.0 (78.46)	91.0 (72.54)	96.0 (78.46)	88.0 (69.73)	90.0 (71.57)	93.0 (74.66)	98.0 (81.87)
	K ₁	75.0 (60.00)	85.0 (67.21)	91.0 (72.54)	91.0 (72.54)	98.0 (81.87)	90.0 (71.57)	85.0 (67.21)	98.0 (81.87)	91.0 (72.54)
	K ₂	85.0 (67.21)	90.0 (71.67)	93.0 (74.66)	93.0 (74.66)	96.0 (78.46)	91.0 (72.54)	85.0 (67.21)	93.0 (74.66)	96.0 (78.46)

(figures in parenthesis indicate transformed values)

Table 3. Interaction

	N ₀	N ₁	N ₂	P ₀	P ₁	P ₂	K ₀	K ₁	K ₂
G ₁	89 [70.63]	89 [70.53]	93 [74.66]	88 [69.73]	92 [73.57]	91 [72.54]	90 [71.57]	90 [71.57]	91 [72.54]
G ₂	89 [70.63]	93 [74.66]	95 [77.08]	91 [72.54]	94 [75.82]	92 [73.57]	93 [74.66]	92 [73.57]	92 [73.57]
G ₃	58 [49.60]	93 [74.66]	92 [73.57]	86 [68.03]	93 [74.66]	93 [74.66]	91 [72.54]	89 [70.63]	91 [72.54]
Mean	78.6 [63.62]	91.6 [73.31]	93.3 [75.10]	88.3 [70.1]	93.0 [74.68]	92.0 [73.55]	91.3 [72.92]	90.3 [71.92]	91.0 [72.88]
P ₀	90.0 [65.65]	90.0 [71.57]	92.0 K ₀ [73.57]	87.0 [68.87]	94.0 [75.82]	93.0 N ₀ [74.66]	89.0 [70.63]	86.0 [68.03]	89.0 [70.63]
P ₁	90.0 [71.57]	94.0 [75.82]	95.0 K ₁ [77.08]	87.0 [68.87]	92.0 [73.57]	92.0 N ₁ [73.57]	90.0 [71.57]	92.0 [73.57]	93.0 [74.66]
P ₂	92.0 [73.57]	91.0 [72.54]	93.0 K ₂ [74.66]	91.0 [72.54]	93.0 [74.66]	90.0 N ₂ [71.57]	95.0 [77.08]	93.0 [74.66]	92.0 [73.56]

(Figures in parenthesis indicate transformed values)

	G	N	P	K	NP	NK	PK	NG	FG	KG
CD(P=0.05)	NS	2.69**	2.69**	NS	NS	NS	NS	NS	NS	NS

Table 4. Influence of application of N, P and K at different levels on dry matter production of seedling of size grades of CO H. 1 maize hybrid seed

	N ₀			N ₁			N ₂		
	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂
G ₁ K ₀	0.169	0.201	0.181	0.196	0.166	0.183	0.152	0.176	0.167
K ₁	0.191	0.192	0.187	0.151	0.204	0.179	0.174	0.159	0.181
K ₂	0.195	0.177	0.174	0.183	0.185	0.167	0.167	0.166	0.202
G ₂ K ₀	0.156	0.191	0.167	0.134	0.138	0.150	0.160	0.156	0.142
K ₁	0.154	0.167	0.133	0.144	0.166	0.167	0.159	0.139	0.157
K ₂	0.171	0.138	0.162	0.170	0.139	0.160	0.152	0.163	0.193
G ₃ K ₀	0.192	0.158	0.156	0.127	0.105	0.126	0.158	0.135	0.120
K ₁	0.147	0.138	0.136	0.125	0.157	0.133	0.137	0.133	0.142
K ₂	0.151	0.125	0.137	0.124	0.117	0.134	0.132	0.134	0.151

Table 4. Interaction

	N ₀	N ₁	N ₂	P ₀	P ₁	P ₂	K ₀	K ₁	K ₂
G ₁	0.185	0.179	0.171	0.175	0.180	0.180	0.176	0.178	0.179
G ₂	0.159	0.152	0.157	0.155	0.155	0.159	0.155	0.154	0.160
G ₃	0.148	0.127	0.139	0.143	0.133	0.138	0.142	0.138	0.133
Mean	0.164	0.152	0.155	0.157	0.156	0.159	0.157	0.156	0.157
P ₀	0.169	0.150	0.154	K ₀ 0.160	0.158	0.155	N 0.174	0.160	0.158
P ₁	0.165	0.153	0.151	K ₁ 0.153	0.161	0.157	N ₁ 0.147	0.158	0.153
P ₂	0.159	0.155	0.162	K ₂ 0.160	0.149	0.164	N ₂ 0.152	0.158	0.162

	G	N	P	K	NP	NK	PK	NG	PG	KG
CD(P=0.05)	0.018*	NS	NS	NS	NS	NS	NS	NS	0.030**	0.030**

Table 5. Influence of application of N, P and K at different levels on vigour index of size grades of CO H. 1 maize hybrid seed

	N ₀			N ₁			N ₂		
	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂	P ₀	P ₁	P ₂
G ₁ K ₀	13.37	16.36	15.86	16.66	16.26	17.93	13.52	17.28	15.38
K ₁	13.92	14.78	16.29	13.34	19.78	15.75	16.23	16.32	18.32
K ₂	15.53	14.11	17.77	17.93	17.57	13.36	17.74	16.46	17.05
G ₂ K ₀	12.80	14.50	12.78	13.13	13.52	13.95	14.19	18.71	15.53
K ₁	13.51	12.23	14.13	13.39	15.10	16.36	14.32	10.03	12.76
K ₂	12.61	15.48	18.33	16.66	12.92	14.88	16.24	13.52	12.96
G ₃ K ₀	12.64	12.28	12.38	11.43	9.76	12.34	17.47	15.16	13.72
K ₁	10.27	11.30	12.92	10.62	15.38	12.10	13.37	13.52	12.24
K ₂	11.22	12.06	14.04	10.54	10.88	12.86	14.04	12.00	12.46

Table 5. Interaction

	N ₀	N ₁	N ₂	P ₀	P ₁	P ₂	K ₀	K ₁	K ₂
G ₁	15.33	16.62	16.47	15.47	16.54	16.41	15.84	16.19	16.39
G ₂	14.04	14.43	14.91	14.09	14.66	14.63	14.34	14.20	14.84
G ₃	12.12	11.76	13.77	12.40	12.48	12.78	13.02	12.41	12.23
Mean	13.83	14.27	15.05	13.98	14.56	14.60	14.40	14.26	14.48
P ₀	12.87	13.85	15.23	K ₀ 13.91	14.87	14.43	N ₀ 13.66	13.26	14.57
P ₁	13.67	14.57	15.44	K ₁ 13.33	14.93	14.54	N ₁ 13.88	14.75	14.17
P ₂	14.94	14.39	14.49	K ₂ 14.72	13.88	14.85	N ₂ 15.66	14.79	14.71

	G	N	P	K	NP	NK	PK	NG	PG	KG
CD [P=0.05]	0.864**	0.864*	NS	NS	NS	NS	NS	NS	NS	NS

NITROGEN

Highly significant differences were observed between levels of nitrogen for 100-seed weight and germination. Application of 200 kg of N/ha increased the 100-seed weight as well as germination over the other levels. According to Karche and Khuspe (1970), 100-seed weight was influenced by applied N to maize. Vanangamudi and Ramasamy (1984) in bajra and Krishnasamy and Ramasamy (1979) in sorghum did not report significant influence for germination due to N application.

PHOSPHORUS

The difference between the levels of phosphorus were significant for 100-seed weight and germination. Application of 100 kg P/ha recorded the maximum 100-seed weight. However, application of 50 kg P/ha recorded the highest germination. The results were in close agreement with the findings of Vanangamudi and Ramasamy (1984) and Krishnasamy and Ramasamy (1979).

POTASSIUM

The differences obtained between the levels of potassium was not significant for any of the quality parameters studied. However, higher levels of K application improved. However, higher levels of K applied the quality

of seeds over other levels. The poor response for K application was due to the higher amount of potassium already available in the soil. Similar results were reported by Vanangamudi and Ramasamy (1984).

The interaction was significant (i) between nitrogen and potassium for 100 seed weight; (ii) between nitrogen and phosphorus for germination and (iii) between phosphorus and potassium for 100 seed weight.

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