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EFFECT OF N, P AND K ON CSH-5 SORGHUM HYBRID SEED CROP. II. SEED WEIGHT, GERMINATION AND VIGOUR *

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A field experiment was conducted to study the effect of N at 0,100 and 200 kg/ha; and P and K at 0,50 and 100 kg/ha each on the quality of sorghum CSH-5 hybrid seed during the winter season of 1979. Application of N at 100 kg/ha increased the the seed weight significantly than of 0 or 200 kg/ha P and K at 100 kg each increased the weight significantly more than other doses. The difference in germination due to doses of nutrients was not significant. N and P at 100 Kg/ha each improved the seed vigour over other dose levels.

In seed production, the twin objcetives of yield and quality need to be achieved. Sometime, applied nutrients may not increase the yield. However, It may enhance the quality. Mother plant nutrition plays an important role on seed quality (Austin, 1972). Krishnasamy and Ramaswamy (1979) studied the influence of N, P and K on the germination and vigour of CSH-5 hybrid seed but they failed to get positive association between the nutrients and the two seed quality attributes. Hence, studies were initiated with the parental lines of CSH-5 hybrid to elucidate information on the effect of N, P and K on seed quality during the winter season.

MATERIALS AND METHODS

A field trial was laid out in the winter season of 1979 to find out the effect of application of nitrogen at 0 (N_0), 100 (N_1) and 200 (N_2) kg/ha, P at 0 (P_0), 50 (P_1) and 100 (P_2) kg/ha and K at 0 (K_0), 50 (K_1) and 100 (K_2) kg/ha in the forms of urea (46% N), double super phosphate (16% P O_5) and muriate of potash (60% K_2O) respectively on the quality of CSH-5 hybrid seed (ms 2077A X CS 3541).

After harvest, the bulk seeds from individual plots were graded with sieves having 10/64" (G_1), 9/64" and 8/64. (G_2) round holes. The graded seeds from each replication were pooled treatment-wise and gradewise. They were mixed throughly and samples were drawn so as to have sufficient quantity of seeds for the following evaluations: (a) Thousand seed weight, (b) Germination in between roll towel medium (ISTA, 1976) and (c) Vigour index (Abdul Baki and Anderson, 1973).

RESULTS AND DISCUSSION

The weight of seed increased with increase in size, positive association between seed size and seed weight has been reported in many crops (Siva subramanian and Ramakrishnan, 1974). Application of N at 100 kg/ha significantly improved thousand seed weight (Table 2). Availability of nitrogen would

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have induced the formation of protein and enzymes in adequate quantities which would have acted on the metabolites in the leaves and stems enhancing their conversion, transportation and accumulation in the seeds (Tisdale and Nelson, 1975). But the increase in weight for the application of 200 Kg N/ha was lower to that of 100 Kg N/ha. Gill and Abichandani (1976) reported significant reduction in grain weight with levels of N beyond 120 Kg/ha. Over stimulation of leaf and stem growth under dosage of N, could have impared the transportation of assimilates to the seeds leading to reduction in weight (Singh and Bains, 1972).

The seed weight increased with increase in the doses of P. While enumerating the multivarious metabolic functions of P, Tisdale and Nelson (1975) stressed its importance on seed formation.

The increase in thousand seed weight was not significant among levels of K. Blum (1967) reported similar results.

The germination of seed did not improve due to application of N, but seed vigour measured through vigour index showed significant improvement. Germination capacity having low sensitivity to seed quality (Heydecker, 1972), could reveal the differences only when the variations were huge. In the present study, while the vigour tests could reveal the differences among seeds from different treatments, germination test had failed, emphasising the important of conducting vigour tests for precise seed quality estimations. The increase in seed weight and protein content in wheat due to application of N has been positively associated with seedling vigour (Ries and Everson, 1973).

Application of P significantly improved the seed vigour as measured through vigour index values. Phosphates play an extremely important role in a variety of reactions within a seed. Tisdale and Nelson (1975) emphasized the role of P in root proliferation. With water cress, Austin (1966) found that freshly harvested seed from phosphorus deficient plants had a slower rate of germination and a lower final percentage germination than normal one. However, in none of the species studied by Harrington (1960) germination was affected by the phosphorus nutrition of the parent plants.

Application of K failed to record significant improvement on seed germination or vigour.

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Table 1. Effect of application of N, P and K on the mean weight of thousand seeds in three size grades of CSH 5 hybrid (g)

		P_0			P_1			P_2		
		K_0	K_1	K_2	K_0	K_1	K_2	K_0	K_1	K_2
G_1	N_0	31.62	31.08	31.57	31.64	31.36	30.78	31.58	31.38	31.16
	N_1	31.12	30.41	31.42	32.36	31.37	31.60	32.00	32.75	32.48
	N_2	29.47	31.20	30.80	32.20	31.47	31.74	31.48	31.94	32.60
G_2	N_0	25.31	25.99	24.68	25.42	25.41	24.74	25.35	24.66	24.64
	N_1	23.66	24.86	25.57	24.56	25.33	25.44	25.57	25.36	25.34
	N_2	24.09	25.12	23.81	24.16	24.39	24.97	24.96	25.04	26.20
G_3	N_0	18.71	18.20	17.61	18.54	18.60	17.62	18.02	17.26	18.39
	N_1	18.15	18.36	18.44	18.00	18.52	18.47	17.68	18.43	18.96
	N_2	17.84	18.28	17.90	17.44	18.09	18.65	19.04	18.75	18.82

Mean Values

G_1	G_2	G_3	N_0	N_1	N_2	P_0	P_1	P_2	K_0	K_1	K_2
31.50	24.99	18.25	24.86	25.03	24.84	24.64	24.92	25.18	24.82	24.95	24.98

Comparison of significant effects

N,P,K and G	NP, NK, PK, NG and PG
CD 0.13 (P=0.05)	0.224

Table 2. Effect of application of N, P and K on germination in three size grades of CSH 5 hybrid seed (Angular values of the percentages)

		P_0			P_1			P_2		
		K_0	K_1	K_2	K_0	K_1	K_2	K_0	K_1	K_2
G_1	N_0	68.0	65.7	70.2	66.4	65.7	65.7	64.9	62.0	61.7
	N_1	66.0	64.9	63.4	69.7	68.8	68.0	69.7	67.2	68.0
	N_2	61.7	66.4	63.4	70.2	64.5	61.3	68.0	69.7	64.9
G_2	N_0	62.4	59.3	64.9	64.9	64.9	62.7	66.0	67.6	61.7
	N_1	71.1	63.1	60.3	63.8	67.2	64.9	67.2	62.2	63.8
	N_2	55.9	69.7	62.0	67.6	56.2	64.9	63.2	63.1	66.4
G_3	N_0	56.8	55.6	63.8	55.6	50.8	59.3	62.0	57.1	59.0
	N_1	59.3	61.0	55.6	60.7	59.3	63.4	62.0	58.7	61.7
	N_2	60.7	59.3	56.8	61.7	55.6	64.9	64.5	59.3	57.1

Mean Values

G_1	G_2	G_3	N_0	N_1	N_2	P_0	P_1	P_2	K_0	K_1	K_2
66.2	64.0	59.3	62.4	64.1	62.9	62.5	63.3	63.7	64.1	62.4	63.0

Comparison of Significant effect

G
CD 1.61 (P=0.05)

Table 3. Effect of application of N, P and K on the mean Vigour indices in three size grades of CSH 5 hybrid seed

		P_0			P_1			P_2		
		K_0	K_1	K_2	K_0	K_1	K_2	K_0	K_1	K_2
G_1	N_0	2525	2637	2819	2659	2866	2865	2698	2583	2630
	N_1	2812	2435	2750	2836	2745	2847	2892	2889	2898
	N_2	2454	2649	2678	2842	2751	2872	2871	2741	2959
G_1	N_0	2423	2459	2522	2444	2482	2641	2535	2572	2518
	N_1	2940	2351	2487	2587	2720	2632	2563	2578	2676
	N_2	2355	2425	2627	2627	2464	2752	2618	2705	2641
G_3	N_0	2242	1968	2169	2168	2074	2172	2283	2103	2292
	N_1	2387	2140	2257	2348	2111	2133	2362	2282	2354
	N_2	2357	2315	2074	2239	2251	2220	2453	2468	2195

Mean Values

G_1	G_2	G_3	N_0	N_1	N_2	P_0	P_1	P_2	K_0	K_1	K_2
2744	2569	2238	2454	2555	2542	2455	2531	2564	2538	2473	2540

Comparison of significant effect

	N, P and G
CD (p=0.05)	60

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