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NUTRIENT CONTENTS IN SIZE GRADED SEEDS OF SORGHUM HYBRID (CSH 5) AS INFLUENCED BY MOTHER PLANT NUTRITION WITH N, P AND K

KRISHNASAMY[1] and K. R. RAMASWAMY[2]

A seed crop of CSH 5 sorghum was raised during the winter season of 1979 to study the influence of N at O, 100 and 200 kg/ha and P and K each at O, 50 and 100 kg/ha on Seed quality. The seeds obtained were size graded using 10/64", 9/64" and 8/64" round hole sieves and protein phosphorus and potassium contents were estimated. Protein content was maximum in the seeds retained by 10/64" sieve while phosphorus and potassium content was maximum in the seeds retained by 8/64" sieve. Application of N did not significantly improve seed protein content while that of P increased the P content K in conjunction with N increased the seed K content.

Mother plant nutrition brings about manifold changes in the elemental composition of the seed and consequently on the viability and vigour (Austin, 1972). Application of N increased the grain N content and consequently the protein level in sorghum (Miller *et al*, 1964) Deosthale *et al*. (1972) observed that the levels of Ca, Mg, P, Fe and Mn in the grain increased with increase in P_2O_5 levels applied. Nutrient content in seed plays a vital role on seedling growth, especially when it is sown in deficient soil (Ozanne and Asher, 1965). Hence, investigations were initiated to gather information on the effect of N, P and K on the nutrient content of seeds in CSH 5 hybrid sorghum.

MATERIALS AND METHODS

A seed crop of CSH 5 sorghum (ms 2077A x CS 3541) was raised during the winter season of 1979 to find out the effect of application of N at O (N_0), 100 (N_1) and 200 (N_2) kg/ha level, P at O (P_0), 50 (P_1) and 100 (P_2) and K at O (K_0), 50 (K_1) and 100 (K_2) kg/ha, on the nutrient content of hybrid seeds.

Female and male lines were sown adopting a planting ratio of 4:2($\frac{♀}{+}$:♂) Of the two rows of male line, ons was sown nine days and the other twelve days after sowing the female line. Size of the plot was 4.05 m X 3 75 (gross) and 1.80 m X 3.45 m (net). A spacing of 45 cm X 15 cm was followed. Nitrogen, phosphorus and potassium were applied in the form of urea (46% N). super phosphate (16% P_2O_5) and muriate of potash (60%K_2O), respectively. Full dose of P and K and half the dose of N were applied as basal dressing at the time of sowing the female line and the remaining dose of N, 30 days afterwards. The recommended cultural and plant protection measures were followed.

The crop was harvested on the 12th day after sowing when the seed moisture content was around 20 per cent. The earheads were sun-dried till the moisture

1 and 2 Department of Seed Technology, Tamil Nadu Agricultural University, Coimbatore-641 003.

content of seed came down to 14 per cent and threshed. After cleaning, the seeds were dried to uniform moisture content of 10 per cent.

The bulk seeds from individual plots were graded with sieves having 10/64" (G_1), 9/64" (G_2) and 8/64" (G_3) round holes. Seeds were sampled from each grade to estimate the following.

a) Protein content:

Protein content in air dried seed was calculated by multiplying the nitrogen content with 6.25. Nitrogen content was estimated by using the microkjeldahl method described by Humphries (1956).

b) Phosphorus content

Phosphorus content in seeds was determined using the method of Jackson (1967)

c) Potassium content:

Potassium content in seeds was determined using the method of Flame Photometry (Jackson, 1967).

Soil from the experimental field initially contained 150, 5 and 282 kg/ha of available N, P and K with pH of 8.2 and E. C. of 0.3m mhos/cm.

RESULTS AND DISCUSSION

Among three size grades of seeds, protein content was relatively more in the seeds retained by 10/64" sieve. Malm (1968) reported similar results. However, Chakravorty (1967) reported no correlation between portein content and grain size in sorghum.

Phosphorus content was 0.338, 0.319, and 0.325 per cent, respectively in the small, medium and large size seeds. But, when P content was calculated as the amount for thousand seeds based on mean thousand seed weight, the values obtained were 0.102 g, 0.080 g and 0.062 g for large, medium and small seeds, respectively.

Smaller the size of seeds, more was the content of K (Table 1). When calculatad on mean thousand seed weight basis, the mean K content was 0.159 g, 0.131 g and 0.107 g, respectively for large, medium and small seeds, thus setting up a reverse trend to that of concentration. According to Ozanne and Asher (1965), variation in concentration was lesser than the content of K in different species of grasses and the content per seed increased with its size.

Seed protein content has not increased significantly due to addition of N. Raheja and Krantz (1957) obtained similar results. According to Cooke (1967), normal fertilizer dressings which were just adequate to produce optimum yields were unlikely to alter the percentage of N, P, K, Ca and Mg in most crops by more than 25 per cent.

Phosphorus application significantly increased the P content in seeds. Similar result was reported by Chinna swami *et al*, (1978) in sorghum. Potassium application did not improve the seed K content, probably because of the high level of available potassium in soil.

A significant interaction obtained between size grades of seeds and phosphorus application on protein content showed that in small seed P had caused a reduction in the protein content whereas,

Table 1 : Interaction effects of N, P and K and size grades on protein, phosphorus and potassium content (per cent) in CSH 5 hybrid seed

	N_0	N_1	N_2		P_0	P_1	P_2		K_0	K_1	K_2	Mean
Protein												
G_1	10.76	10.73	10.75	G_1	10.77	10.73	10.75	G_1	10.83	10.73	10 68	10.75
G_2	10.40	10.64	10.75	G_2	10.48	10.53	10.79	G_2	10.65	10.47	10.68	10.60
G_3	10.29	10.38	10.40	G_3	10.68	10.17	10.22	G_3	10.21	10.43	10.44	10.36
Mean	10.49	10.59	10.63	Mean	10.64	10.48	10.59	Mean	10 56	10.54	10.60	
P_0	10.52	10.52	10.79	K_0	10.59	10.52	10.58	N_0	10.32	10.46	10.68	10.49
P_1	10.27	10.66	10.50	K_1	10.67	10.34	10.62	N_1	10.61	10.60	10,55	10.59
P_2	10.66	10.50	10.60	K_2	10.67	10.58	10,56	N_2	10.76	10.56	10.57	10.63
Phosphorus												
G_1	0.344	0.314	0.317	G_1	0.326	0.331	0.317	G_1	0.321	0.313	0.340	0.325
G_2	0.336	0.306	0.315	G_2	0.301	0.330	0.326	G_2	0.319	0 311	0.326	0.319
G_3	0.334	0.344	0.335	G_3	0.317	0.348	0.348	G_3	0.329	0.325	0.359	0.338
Mean	0.338	0.321	0.322	Mean	0.315	0.337	0.330	Mean	0.323	0 316	0.342	
P_0	0.340	0.302	0.302	K_0	0.319	0.324	0.325	N_0	0.304	0.347	0.363	0.338
P_1	0.359	0.331	0.320	K_1	0.292	0.327	0 330	N_1	0.327	0.302	0.335	0.321
P_2	0 314	0.332	0.344	K_2	0.332	0.358	0.336	N_2	0.338	0.301	0.328	0.332
Potassium												
G_1	0.531	0.500	0.488	G_1	0.514	0.510	0.494	G_1	0.505	0.508	0.506	0.506
G_2	0.533	0.523	0.522	G_2	0.517	0.551	0.511	G_2	0.522	0.526	0.531	0.526
G_3	0.578	0.586	0.589	G_3	0.594	0.567	0.592	G_3	0 581	0.575	0.597	0.584
Mean	0.547	0.536	0.533	Mean	0.542	0.543	0.532	Mean	0.536	0.536	0.544	
P_0	0.548	0.528	0.550	K_0	0.531	0.544	0.533	N_0	0.548	0.567	0.528	0.547
P_1	0.561	0.540	0.527	K_1	0.531	0.543	0.536	N_1	0.533	0.512	0.564	0 536
P_2	0.533	0.542	0.522	K_2	0.564	0.542	0 528	N_2	0.527	0 531	0.542	0.533

Comparison of significant effects

	Protein	*Phosphorus*				*Potassium*			
	G	P x G	N, P and G	K	NxP and NxK	G	NxK and PxG	NxG
CD (P=0.05)	0.154**	0.267**	0.014*	0.014**	0.025**	0.014**	0 024**	0.024*

* Significant at P = 0.05; ** Significant at P = 0.01

in the medium, sized seed, a significant increase was evident. Normally, increased P would reduce the N and consequently the protein content (Austin, 1972). According to McCalla and Woodford (1938), increasing the supply of one nutrient resulted in a decreased uptake of another nutrient absorbed as an ion of the same sign or an increased total uptake of the nutrients absorbed as ion of the opposite sign. A close perusal of Table 3 would reveal that small seeds contained more of K. Potassium being a cation, would have increased the accumulation of anions. A complex interaction of these factors could have caused such a diagonally opposite trends in the protein content in different size grades. Interaction between N and P on seed P content indicated that the negative effect of N was perceptible only when P was not applied.

Interaction of K with N revealed that application of K at 100 kg per ha in conjunction with similar quantity of N had increased significantly the K content in the seed. Jocic (1976) found the applied N to enhance the K content of maize grain. According to McCalla and Woodford (1938), nitrogen should increase the K uptake through anion: cation balance.

It could be concluded that the application of N, P and K nutrients individually and in interaction significantly influence their content in different size grades of sorghum seeds.

REFERENCES

AUSTIN, R.B. 1972. Effects of environment before harvesting on viability. In *"Viability of seeds"* (Roberts. E H., ed.). Syracuse University Press, London, pp. 114-49.

CHAKRAVORTY, S.C. 1967. Chemical study of sorghum as a staple food in India: II. Protein content in relation to size of jowar grains. *Indian agric.*, *11* : 113-6.

CHINNASWAMI, K.N., C.P. NATARAJAN and N. S LOGANATHAN. 1978. Response of CSH 1 jowar to phosphorus and its method of application. *Madras agric. J.*, *65* : 747-50.

COOKE, G.W. 1967. *The Control of Soil Fertility*. English language Book Society, pp. 319.

DEOSTHALE, Y. G., V. NAGARAJAN and K. V. RAO. 1972. Some factors influencing the nutrient composition of sorghum grain. *Indian J. agric. Sci*, *42* : 100-8.

HUMPHRIES, E.C. 1956. Mineral components and ash analyses. Modern Methods of Plant Analysis. Springer-Verlag, Berlin, 1 468-501.

JACKSON, M. L. 1976. *Soil Chemical Analysis*. Prentice Hall of India (Pvt.) Ltd., New Delhi.

JOCIC, B. 1976. Correlations between yield, leaf area and components of N, P and K and Ca in maize plants as affected by mineral nutrition. From *Fld. Crop Abstr*, *31* : 4078 (1978).

MALM, N. R 1968. Exotic germplasm use in grain sorghum improvement. *Crop Sic.*, *8*, 295-8.

McCALLA, A. G. and E K WOODFORD. 1938. Effects of a limiting element on the absorption of individual elements and on the anion:cation balance in wheat. *Pl. Physiol.*, *13* : 695-712.

MILLER, G. D., C. M. DEYOE, T. L. WALTER, and F. W. SMITH 1964. Variations in protein levels in Kansas sorghum grain *Agron J.*, *56* : 302-4.

OZANNE, P. G. and C. J. ASHER. 1965. The effect of seedling potassium on emergence and root development of seedlings in potassium deficient sand. *Aust. J. agric. Res*, *16* : 773-84.

RAHEJA, P. C. and B. A.KRANTZ. 1957. Growth, nutrient uptake and yield of grain sorghum as influenced by fertilization in Imperial Valley, California. *Indian J. Agron.*, 2 : 125-7.