https://doi.org/10.29321/MAJ.10.A02397

Madras Agric. J. 72 (9): 500—504 September, 1985

BIO-CHEMICAL STUDIES IN CO H. 1 MAIZE SEED DURING STORAGE*

K. KRISHNAVENI[1] and K. R. RAMASAMY[2]

Seeds obtained from the mother crop fertilized with N, P and K at the rate of 200, 100 and 100 kg/ha and packed in 700 gauge thick polyethylene bag recorded lower values for electrical conductivity and leaching of free amino acids and sugars than that obtained from other treatments.

Storability of a seed is largely determined by the history of the seed as well as the temperature and relative humidity that prevail around the stored seed. Seed lots of the same kind, cultivar, chronological age and even germinability do not store equally well under identical condition. Variation in the standard germination and vigour is not only influenced by environmental conditions (Hawthorn *et al*, 1966), but also by the availability of nutrients to the mother plant during development and maturation of seed (Austin and London, 1966). How far the nutrition to the mother plant influences the storability of resultant seed has not been studied in detail in many crops keeping this in view, two size grades of CO H.1 hybrid seed obtained from the plants supplied with different levels of N, P and K nutrients were stored for 9 months and assessed for biochemical changes.

MATERIALS AND METHODS

Hybrid seed samples retained in 19/64 " (G_1) and 18/64" (G_2) diameter round perforated metal sieves from the bulk seed obtained from plots manured with the following doses of N, P and K nutrients. (i) N_0 P_0 K_0 (T_0); (ii) N_{100} P_0 K_0 (T_1); (iii) N_{200} P_0 K_0 (T_2); (iv) N_0 P_{50} K_0 (T_3); (v) N_0 P_{100} K_0 (T_4); (vi) N_0 P_0 K_{50} (T_5); (vii) N_0 P_0 K_{100} (T_6); (viii) N_{100} P_{50} K_{50} (T_7) and (ix) N_{200} P_{100} K_{100} (T_8) were treated with a slurry made of 2 grams of thiram (tetramethyl thiuram disulphide) 75 percent WDP and 200 mg of DDT 50 percent WP and 2 ml of water for every kg of seed. The treated seeds were dried to 10 percent seed moisture and stored separately in (1) fresh gada cloth bag of size 20 cm X 15 cm (C_1) and (2) 700 gauge thick polyethylene bag of size 12 cm X 10 cm (C_2). The cloth bags were hand sewen, while the polyethylene bags were heat sealed.

The packed seeds were kept in storage for 9 months under ambient conditions of temperature and relative humidity. The stored seeds were tested once in three months for the electrical conductivity of the seed leachate (Presley, 1958) and the amounts of free amino acids (Ching and Ching, 1964) and sugars (Somogyi, 1952) present in the seed leachate.

* Part of thesis approved by the Tamil Nadu Agricultural University, Coimbatore-3 for the award of M. Sc. (Ag.) degree in Seed Technology

1 Department of Seed Technology; 2 Dean (Agriculture, Tamil Nadu Agricultural University, Coimbatore-3.

RESULTS AND DISCUSSION

Effect of seed size

Highly significant differences were observed between size grades for the electrical conductivity, free amino acids and sugars (Table 1 to 3). The relatively high electrical conductivity of the leachate of large seed in the present study could be ascribed to the leaching of free amino acids and sugars in greater amounts owing to their high internal concentrations than entirely due to loss of membrane integrity (Paul and Ramasamy, 1979) besides the surface area possessed by them Mullat, 1979). Paul and Ramasamy (1979) reported that the electrical conductivity values, amount of free amino acids and sugars in the leachate increased with increase in seed size in cowpea due to the presence of more reserve food material.

Effect of N, P and K nutrients

The N, P and K treatment showed significant effect for the electrical conductivity, leaching of free amino acids and sugars. The higher the nutrients stored in the seed, the greater the vigour of the seedling and its potential for survival (Pollock and Roos. 1972).

In the present study, seeds obtained from crop fertilised with $N_{200}P_{100}K_{100}$ during storage recorded lower values for electrical conduetivity and leaching of free amino acids and sugars in respect to their leachate compared with those from plants that received other fertilizer treatments. The minimum leaching of ions from seeds fertilised at 200. 100 and 100 kg of N, P and K/ha might be due to inhibition in the formation of endogenous free radicals and antioxidant property of phosphorus and thus protecting the cell membrane from free radical damage (Basu, 1976).

Effect of storage container

The electrical conductivity of the seed leachate and leaching of free amino acids and sugars determined periodically had revealed the superiority of moisture-vapour proof container for storing of the seed. The relatively higher values recorded by the seed stored in cloth bag than in polyethylene bag could be related to the higher obsorption of moisture by the seeds stored In cloth bag (Vanangamudi and Ramasamy, 1984) in bajra.

Effect of storage period

In general, the electrical conductivity and the leaching of free amino acids and sugars significantly increassed with the increasing periods of storage, which may be due to the membrane aberrations increasing with increasing age of seed (Berjak and villiers, 1972). waning of vigour in seed is associated with weakening of cell membranes and this leads to the leaching of sugars, free amino acids and electrolytes along with other water soluble cell contents through their membranes into the seed steep water (Heydecker, 1972).

The author thanks to Dr. K. Vanangamudi, Assistant professor of Seed Technology for his help during the course of this study.

Table 1 Electrical conductivity (micromhos/cm) in CO H. 1 maize hybrid seed leachate as influenced by size grades, N, P and K nutrients, containers and periods of storage

		C_1				C_2			
		P_0	P_1	P_2	P_3	P_0	P_1	P_2	P_3
G_1	T_0	66	190	195	328	66	50	231	251
	T_1	22	174	212	274	22	60	132	268
	T_2	11	196	185	273	11	55	160	285
	T_3	39	152	196	285	39	71	248	268
	T_4	17	196	196	317	17	44	160	251
	T_5	48	180	180	295	48	55	186	230
	T_6	28	140	262	285	28	55	143	275
	T_7	50	175	191	296	50	72	193	279
	T_8	17	158	190	278	17	44	160	241
G_2	T_0	33	174	179	253	33	44	165	202
	T_1	6	124	158	251	6	33	104	209
	T_2	10	159	185	241	10	28	110	191
	T_3	17	161	190	262	17	33	110	197
	T_4	11	158	168	209	11	33	105	196
	T_5	42	135	146	229	42	44	149	208
	T_6	22	124	163	241	22	33	182	219
	T_7	33	163	168	229	33	44	138	208
	T_8	10	102	135	228	10	55	127	208

Comparison between significant factors

	Grades	Treatments	Containers	periods	GT	GC
CD (P=0.05)	5.61**	11 90**	7.93**	7.93**	16.83**	NS
	GP	TC	TP		CP	
	31.83	NS	NS		31.83**	

Table 2 Leaching of free amino acids (ug) in CO H. 1 maize hybrid seed as influenced by size grades, N, P and K nutrients containers and periods of storage

		C_1				C_2				Mean
		P_0	P_1	P_2	P_3	P_0	P_1	P_2	P_3	
G_1	T_0	19	38	57	75	19	32	32	75	40
	T_1	22	32	38	75	22	28	28	63	35
	T_2	7	13	25	75	7	13	38	56	29
	T_3	13	13	25	63	13	25	40	56	34
	T_4	10	25	38	63	10	19	40	63	33
	T_5	7	38	57	63	7	13	25	63	27
	T_6	16	25	32	75	16	32	44	63	39
	T_7	13	25	63	88	13	25	32	50	30
		7	32	38	50	7	13	34	38	23
G_2	T_0	16	19	38	63	16	32	25	50	34
	T_1	10	25	32	50	10	19	28	50	31
	T_2	4	13	25	50	4	7	25	50	22
	T_3	4	25	25	38	4	7	25	38	19
	T_4	7	7	13	50	7	13	15	50	22
	T_5	4	25	32	57	4	7	15	38	16
	T_6	13	25	32	57	13	25	28	38	26
	T_7	11	13	19	57	11	19	15	25	18
	T_8	4	7	13	50	4	7	25	28	16

Comparison between significant effects

	Grades	Treatment	Container	Period	GT	GC	GP
(CD P=0.25)	1.93**	4.10**	1.93**	2.73**	NS	NS	3.87**
	TC	TP	CP				
CD (P=0.05)	5.88**	NS	3.87**				

Table 3. Leaching of sugars (μg) in CO. H. 1 maize hybrid seed as influenced by size grades, N, P and K nutrients, containers and periods of storage

		C_1				C_2			
		P_0	P_1	P_2	P_3	P_0	P_1	P_2	P_3
G_1	T_0	94	98	2025	1875	94	209	724	823
	T_1	87	89	940	1900	87	91	583	676
	T_2	79	98	192	1600	79	138	450	657
	T_3	83	105	280	1375	83	95	417	769
	T_4	49	88	270	1375	49	90	417	544
	T_5	57	163	1013	1363	57	79	335	622
	T_6	79	230	297	1625	79	83	572	625
	T_7	120	183	656	1625	120	160	551	905
	T_8	57	79	148	1500	57	76	309	309
G_2	T_0	57	68	153	775	57	78	395	674
	T_1	49	83	235	900	49	90	375	402
	T_2	57	87	153	731	57	87	219	430
	T_3	75	87	153	775	75	87	182	484
	T_4	42	68	240	900	42	83	351	352
	T_5	83	120	230	1013	83	153	225	428
	T_6	54	142	153	900	54	66	245	358
	T_7	64	83	220	550	64	113	222	290
	T_8	49	53	102	675	49	68	250	269

Comparison between significant factors

	Grades	Treatments	Containers	Periods		
CD (P=0.05)	39.56**	83 92**	39.56**	55.95**		
	GT	GC	GP	TC	TP	CP
CD (P=0.05)	NS	55.95**	79.12**	118.69**	NS	79.12**

REFERENCES

AUSTIN, R. B. and P. C. LONGDEN. 1969. The effects of manurial treatment on the yield and quality carrot seed. *J. Hort. Sci., 41* : 361-70.

BASU, R. N. 1976. Physio-chemical control of seed deterioration. *Seed Res., 4* : 15-23.

BERJAK, P. and T. A. VILLIERS. 1972. Ageing in plant embryos, II. Age - induced damage and its repair during early germination. *New phytol., 71* : 135-144.

CHING, T. M. and K. K. CHING. 1964. Freeze drying pine pollen. *Pl. Physiol., 39* : 705-709.

HAWTHORN, L. R., L. B. KERR. and W. F. CAMPBELL. 1966, Relation between temperature of developing pods and seeds and scaided seeds in garden peas, *Proc. Amer. Soc. Hort. Sci., 88* : 437.

HEYDECKER, W. 1972. Vigour. In : Viability of seeds (Ed.) E. H. Roberts. PP. 209-252. Chapman and Hall, London.

MULLAT. H. J. 1979. The relationship between seed size, total seed electrolytes, electron lytes leakage and embryo growth of *Phseolus Vulgaris, Aust. Seed Sci. News letter.* 5 : 605-64.

PAUL S. R. and K. R. RAMASAMY. 1979 Relationship between seed size and seed quality attributes in cowpea, *Seed Res.* 7 : 63-70.

POLLOCK, B. M. and E. E. ROOS. 1972. Seed and Seedling vigour. PP. 313-387. In: *Seed Biology* - I (Ed. OT. T. Kozlowski), Academic Press, New York.

PRESLEY, J. T. 1958 Relation of protoplast permeability to cotton seed viability and pre-disposition to seedling disease. *PL. Dis Reptr., 42* : 852.

SOMOGYI. M. 1952. Note on Sugar determination. *J. Bio Chem., 195* : 19-23.

VANANGAMUDI, K. and K. R. RAMASAMY 1984. Bio-Chemical studies in K. M. 2 bajra seed during storage. *Madras agric, J.*