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Some Biochemical Changes in Relation to Loss of Seed Viability in Cauliflower Germplasm

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Nine cultivars of cauliflower were evaluated for seed longevity by accelerated ageing test (40°C, 90% RH). Six cultivars viz., Early Patna, Early Kunwari, Super Snow Ball, Alert, Poosi and Early Cauliflower were found to be good storer and capable of withstanding high storage temperature and relative humidity. Cultivars Aghani and Snow Ball were classified as moderate and Early Dawn as poor storer. The leaching of electrolytes, soluble sugars, amino acids and reduction of tetrazolium salt was more from seeds on deterioration. The quantum of leakage differ among different genotypes.

Cauliflower (*Brassica oleracea* var *botrytis* L.) is an important vegetable crop. The raising of seedlings and its successful establishment depend on the nature of seeds. The quality of seeds is often affected by the improper storage conditions, resulting in drop of germination potential and poor establishment of seedling in field and consequently low yield. Delouche and Baskin (1973) have developed accelerated ageing technique which is effective for evaluating relative storability of seed lots. At the same time certain biochemical changes were found to be associated with deterioration of seed such as excessive leaching of electrolytes, soluble sugars and free amino acids from the seeds (Givelberg *et al.*, 1984, and Doijode, 1985). Such an information is inadequate in the crop and an attempt was made to study seed longevity in different cauliflower germplasm and also to determine certain biochemical changes associated with seed deterioration.

MATERIALS AND METHODS

The experiment was conducted with nine cultivars of cauliflower both indigenous and exotic viz., Early Patna, Early Kunwari, Super Snow Ball, Alert, Poosi, Early Cauliflower, Aghani, Snow Ball and Early Dawn at the Indian Institute of Horticultural Research, Bangalore. These genotypes exhibited wide genetic variability for yield and its attributes. Accelerated ageing technique was employed for artificial ageing of seeds (Schoettle and Leopold, 1984), wherein seeds were exposed to 40° C and 90 per cent RH for three and six days.

Seeds were germinated by top paper method at 25°C in Cleland seed germinator. Seeds viability expressed as percentage of germination was recorded on hundred seeds each in three replications (ISTA Procedure, Anon, 1985). Seedling vigour

was compared using shoot length and dry weight on seven days old seedling. Based on percentage of germination, the relative storability of seeds was categorized as good (> 75), moderate (50-75) and poor (< 50). For biochemical analysis, seeds were surface sterilized with 0.1 per cent mercuric chloride, washed, dried and soaked in 25 ml sterile water for 18 hr at 25°C. Electrical conductivity *of leachates was measured with conductivity meter. Soluble* sugars were estimated as per the method of Dubois *et al.*, (1956) and free amino acids according to procedure of Lee and Takahashi (1966) in leachates. In seeds Dehydrogenase activitiy (DHA) was determined by estimation of formazan and expressed in terms of optical densitty at 480 nm (Kittock and law, 1968).

RESULTS AND DISCUSSION

Seed germination was significantly affected by accelerated ageing in different cauliflower cultivars and it was maximum (95%) in Early Patna and minimum (29%) in Early Dawn after six days of ageing (Table 1). Six cultivars viz., Early Patna, Early Kunwari, Super Snow Ball, Alert, Poosi and Early Cauliflower, showed good germination (above 75 per cent) after six days of ageing. These cultivars exhibit the capacity to tolerate high temperature and relative humidity during storage. Seeds of Aghani and Snow Ball were grouped as moderate and Early Dawn as poor storer.

Seedling vigour in terms of shoot length and dry weight were reduced on ageing of seeds. This was more conspicuous in moderate and poor storer cultivars (Table 2). Pesis and Ng (1983) also observed that longer period of ageing resulted in greater decline in seed quality.

The leaching of electrolytes increased with increase in duration of ageing in all cultivars (Table 3). Similarly, there was excessive leaching of soluble sugars and free amino acids from seeds with the advance in ageing. However, the quantum

TABLE 1. SEED VIABILITY IN DIFFERENT GERMPLASM OF CAULIFLOWER FOLLOWING AGEING TREATMENT

Cultivars	Ageing period (days)		
	0	3	6
Early Patna	100 (88.2)	97 (79.6)	95 (77.9)
Early Kunwari	100 (88.2)	97 (79.6)	91 (72.3)
Super Snow Ball	100 (88.2)	95 (77.9)	89 (71.2)
Alert	100 (88.2)	82 (64.9)	83 (66.0)
Poosi	100 (88.2)	87 (68.8)	83 (66.1)
Early Cauliflower	100 (88.2)	89 (71.3)	79 (64.4)
Aghani	100 (88.2)	85 (67.9)	74 (59.2)
Snow Ball	95 (77.9)	51 (45.3)	55 (47.7)
Early Dawn	100 (88.2)	89 (70.3)	29 (32.7)

CD at 5% = 6.7 (Figures in parenthesis are angular transformed values).

TABLE 2. SEEDLING VIGOUR IN DIFFERENT GERMPLASM OF CAULIFLOWER FOLLOWING AGEING

Cultivars	Shoot length (cm)			Dry weight (mg)		
	0	3	6	0	3	6
Early Patna	3.3	3.6	3.6	2.85	2.75	2.16
Early Kunwari	3.2	3.6	3.0	2.63	2.29	1.86
Super Snow Ball	2.8	3.3	3.9	3.14	3.06	2.49
Alert	2.6	2.9	3.4	2.90	2.58	2.05
Poosi	3.4	3.3	3.8	3.81	4.48	3.38
Early Cauliflower	3.2	3.4	3.4	3.00	3.25	2.64
Aghani	3.5	3.4	3.7	3.05	2.97	3.00
Snow Ball	3.0	3.1	2.6	3.84	3.03	3.31
Early Dawn	3.8	3.2	2.7	4.55	3.45	3.67
C D at 5%		0.58			0.57	

TABLE 3. LEACHING OF METABOLITES FROM SEEDS OF DIFFERENT CAULIFLOWER GERMPLASM DURING AGEING.

Cultivars	E C (μ mhos)			Soluble Sugars (mg/g)			Free amino acids (mg/g)		
	0	3	6	0	3	6	0	3	6
Early Patna	241	474	718	2.06	7.20	7.95	1.29	5.62	11.40
Early Kunwari	199	211	226	0.10	0.78	1.40	0.26	1.05	1.09
Super Snow Ball	185	255	298	0.80	1.46	3.05	0.57	1.92	2.47
Alert	246	296	378	1.64	3.52	4.75	1.52	3.17	3.98
Poosi	269	297	354	1.86	2.01	3.35	1.16	2.52	3.22
Early Cauliflower	193	203	237	0.99	1.33	2.05	0.95	1.25	1.26
Aghani	221	284	316	0.80	1.22	2.90	0.78	2.10	2.46
Snow Ball	342	587	859	4.95	8.00	13.60	2.54	7.90	11.90
Early Dawn	189	209	282	0.23	0.71	1.25	0.28	0.95	0.85
CD at 5%		54			0.59			0.36	

of leachates varied with the genotypes. Dehydrogenase activity also decreased with the ageing of seeds (Table 4), which coincided with loss of seed vigour and viability.

The above results suggest that seed longevity differs among cultivars. Certain genotypes have capacity to withstand high storage temperature and relative humidity and thus exhibit high longevity as well as high seedling vigour. In general longer period of ageing resulted in greater decline in seed quality. There was uneven leaching of metabolites in different genotypes and some genotypes have been found to be more sensitive to ageing than others (Pesis and Ng, 1983). This excessive leaching of metabolites was attributed to the deterioration of cell membrane (Powell and Matthews, 1977 and Schoettle and Leopold, 1984). Since the damage to cell membrane was more at high temperature and relative

TABLE 4. CHANGES IN DEHYDROGENASE ACTIVITY (OD 480) IN DIFFERENT CAULIFLOWER GERMPLASM AFTER AGEING.

Cultivars	Ageing period (days)		
	0	3	6
Early Patna	0.30	0.08	0.12
Early Kunwari	0.48	0.09	0.09
Super Snow Ball	0.55	0.12	0.13
Alert	0.38	0.21	0.20
Poosi	0.37	0.10	0.09
Early Cauliflower	0.46	0.20	0.20
Aghani	0.53	0.15	0.18
Snow Ball	0.31	0.14	0.14
Early Dawn	0.20	0.10	0.11
CD at 5%		0.086	

humidity, therefore it is advisable to protect the seeds by storing them at low temperature and low moisture for high quality of seeds in terms of high viability and seedling vigour.

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