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EFFECT OF PACKAGING AND STORAGE TEMPERATURES ON LONGEVITY OF CARROT SEEDS

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Carrot seeds cv Nantes were stored at ambient, 5°C and –20°C. Seeds with seven per cent moisture were packed in paper, glass, polyethylene aluminium foil laminated pouches and viability, vigour and longevity were studied. Seeds remained viable for two years. The process of seed deterioration was faster and greater at ambient storage. The initial viability was maintained at 5°C and –20°C storage. Polyethylene and paper bags were effective in retaining high seed viability at 5°C and suitable for the medium term storage. The aluminium foil laminated bags maintained high viability and seedling vigour at –20°C thus effective for long term conservation of invaluable germplasm.

Key words : Carrot seeds, longevity, temperature, conservation

Carrot (*Daucus carota* L.) cv nantes is an important and choicest vegetable crop in India. It is primarily cultivated through the seeds, which also forms a valuable tool for genetic conservation, owing to simpler nature, practicable and inexpensive operation. High seed quality in terms of vigour and viability is first step towards higher production. Seeds are viable for shorter period under ambient conditions (Agrawal, 1980). The viability of seeds is predominantly dependent on age and nature of seeds (Harrington and Satyati- Harjadi, 1966) and method of storage (Popovska *et al.*, 1981). High temperatures and high moistures increase the deterioration process in seeds resulting in loss of germinability as well as vigour (Abdul-Baki and Anderson, 1972). Different kinds of packaging material are available to protect the seeds from high humidity as well as from insects and microorganisms. The experiment was conducted with the view to conserve the viability of carrot seeds for longer period by use of different packaging material at lower temperatures.

MATERIALS AND METHODS

The experiment was conducted with the seeds of carrot cv Nantes. Seeds were dried to 7.0 per cent moisture and packed in different containers viz., kraft paper, glass, polyethylene (200 gauge) and aluminium foil laminated

pouches. These containers were stored at low (5°C), sub-zero (–20°C) and ambient temperatures (16 - 35°C) for two years. Seed viability was expressed in terms of percentage of germination. Seeds were germinated on 'top of paper' at 20-30°C in Cleland's seed germinator. Seedlings were evaluated as per the standard procedures and germination percentage was recorded on normal seedlings. Seedling vigour was compared by means of (coefficient of velocity of germination) shoot length, root length, dry weight and seedling vigour index, which was expressed as a sum of ratio of number of normal seedlings on a particular day of emergence till last count taken.

RESULTS AND DISCUSSION

Seed germinability was significantly affected by the packaging material and storage temperatures. The percentage of germination was significantly reduced under ambient storage. It was 61 per cent after second year of storage (Table 1). Initial percentage of germination was maintained at low (5°C) and

Table 1. Seed viability as influenced by temperatures and containers during storage of carrot seeds

Storage Temp.	Storage Containers	First year % G after		Second year % G after	
		48 Hrs.	Final	48 Hrs.	Final
Ambient	paper	10	75	0	61
	Glass	13	84	2	73
	Poly	22	92	0	70
	Lam	9	87	2	80
5°C	Paper	19	87	17	88
	Glass	22	81	21	81
	Poly	27	90	22	84
	Lam	26	87	25	87
– 20°C	Paper	17	76	0	0
	Glass	25	91	21	83
	Poly	19	81	17	80
	Lam	19	89	20	88
CD at 5%		7.4	8.7	5.2	7.6

sub-zero (–) 20°C) temperature. Similarly the emergence of seedlings after 48 hours of sowing was faster and higher in seeds stored at 5°C and – 20°C. Amongst different packaging material used, the percentage of germination was higher in aluminium foil pouches stored at ambient conditions. All the storage

containers showed higher percentage of germination at 5°C storage. None of seeds germinated when stored in paper bags at – 20°C owing to the chilling injury. The coefficient of germination was higher in seeds stored at 5°C or –20°C than ambient temperatures (Table 2). Similarly shoot length, root length, dry weight and vigour index were greater for the low temperature stored seeds. The decline in these parameters suggests loss of seedling vigour and seeds are heading towards deterioration.

Table 2. Seedling vigour as affected by temperatures and containers during storage of carrot seeds.

Storage Temp.(°C)	Storage Containers	Coeff. of Germination	Shoot Length (cm.)	Root Length	DWT (mg.)	Vigour Index
Ambient	Paper	28.6	0.5	2.4	0.72	17.4
	Glass	29.8	0.7	2.6	0.78	22.4
	Poly	30.4	0.9	3.1	0.60	24.7
	Lam	29.9	0.5	1.9	0.58	21.6
5	Paper	34.4	0.9	1.8	1.34	30.6
	Glass	34.7	1.0	3.1	1.04	30.3
	Poly	34.6	1.2	3.3	1.33	30.6
	Lam	34.5	1.0	3.2	1.07	31.7
–20	Paper	-	-	-	-	-
	Glass	35.2	2.7	2.7	0.82	30.6
	Poly	33.3	3.2	3.2	1.09	27.9
	Lam	33.7	2.7	2.7	1.10	31.3
CD at 5%		1.60	0.33	1.06	0.30	3.10

Carrot seeds exhibit orthodox type of storage behaviour and remain viable for the shorter period especially for 6 months under ambient conditions (Agrawal, 1980). Seed longevity is affected by the relative humidity and temperature of a particular place.

The seeds stored in ambient conditions without any control over relative humidity or temperatures lost their vigour and viability. The seed viability was conserved for two years at 5°C or –20°C without loss of vigour. The process of seed deterioration is rapid under ambient conditions and the seeds exhibit low germination and seedling vigour (Fonseca et al. 1980). The reduction of viability was slower especially at lower temperatures (Harrington, 1972). The retention of viability varies in different containers at –20°C. Packaging acts as a small storage room where it protects seeds from atmospheric humidity.

The aluminium foil pouches were effective in preserving initial viability. The paper containers are not suitable for storage of seeds at sub-zero temperatures. The choice of packaging material depend on temperature and storage period. Hence, inexpensive polyethylene and paper bags can be used for medium term storage of seeds while aluminium foil pouches at -20°C for long term conservation of germplasm.

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