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PROBLEMS AND PROSPECTS IN CONSERVATION OF GENETIC RESOURCES IN RADISH (*Raphanus sativus* L)

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Radish germplasm is commonly conserved through the seeds. These are relatively short lived under ambient conditions. Seeds of cv 'Pusa Reshmi' dried to 6.5 per cent moisture were packed in glass, kraft paper, polyethylene bags (300 gauge) and laminated aluminium foil pouches, stored at low (5°C) and sub-zero (–20°C) temperatures for 15 years. Seed viability was successfully conserved for 15 years both at 5°C and –20°C storage. The retention of high viability and vigour observed in seeds stored in polyethylene and laminated aluminium foil pouches at 5°C and in laminated aluminium foil pouches at –20°C. There were no morphological changes is shoot and root characteristics. This conservation process can easily be practiced, which is cheaper and retains the identity of genotype.

Key words: Radish, conservation, seed storability

Radish is an important commercial vegetable crop in temperate, sub-tropical and tropical regions. Its fleshy tuberous roots are eaten fresh and cooked. Also tender foliage and pods are used as vegetables. It exhibits large variations for root shape, size and colour. The preference and choice of genotype vary in different agro-climatic regions of the world. The variations for plant characteristics genetically controlled and required for survival of plant under changing environments includes emergence of pests and diseases. Now these valuable genes are being eroded due to changing cultivation practices wherein low yielding cultivars have been replaced with high yielding ones. Non-availability of suitable simple storage technology poses threat to genetic conservation. In radish, seeds are predominantly used for cultivation. Seeds exhibit orthodox storage behaviour. It deteriorates faster especially at higher storage temperatures and humidity (Abdul-Baki and Anderson, 1972). Seed longevity depends on age and nature of seed conservation (Harrington and Satyati-Harjadi, 1966) and method of storage (Popovska *et al.*, 1981). The crop yields are also affected by raising the plants from older seeds (Frohlich and Henkel, 1964). Certain packaging materials are effective in protecting seeds from high level of humidity, insect pests and other storage fungi. Selection of suitable packaging depends on kind of seed material and duration of storage. Such information is lacking in radish that is essential for designing suitable techniques for long term genetic conservation. Thus, an experiment conducted with the view to enhance seed storability in radish by using certain packaging and storage temperatures.

MATERIALS AND METHODS

Seeds of radish cv Pusa Reshmi extracted from mature pods and dried to 6.5 per cent moisture with the help of silica gel were packed in glass, kraft paper, polyethylene bags (300 gauge) and laminated aluminium foil pouches and stored at (5°C) and sub-zero temperatures (–20°C) for

15 years. Seed viability is expressed in percentage of germination. Seed was tested for viability and vigour periodically. One hundred seeds in each replication, in three replications germinated by 'top of paper' method at an alternate temperature of 20-30°C for 16 and 8 hours respectively in seed germinator. Seedlings were evaluated according to the standard ISTA procedures. Seedling vigour compared by means of coefficient of germination, root length, shoot length, dry weight and vigour indices. Shoot and root length recorded on 7 days old seedlings. Dry weight was recorded on seedlings dried at 60°C for 48 hours. Seed vigour was calculated by using germination speed and expressed as sum of days taken for germination while vigour indices I and II were calculated by multiplying percentage of germination with seedling length and dry weight respectively.

RESULTS AND DISCUSSION

Seed viability was significantly affected by packaging and storage temperatures. Radish seeds could be conserved successfully for 15 years during experimentations. It has been reported that viability was lost after 7 years of ambient storage wherein only about 50 per cent of seeds germinated (Doijode, 1991). Further, seed storability extended longer with the help of certain packaging and storage temperature. At 5°C storage, seeds exhibited higher percentage of germination (> 99) when stored in polyethylene, glass and laminated aluminium foil pouches whereas only 54 per cent seeds germinated when stored in kraft paper bags. Likewise, there was significant decline in coefficient of germination and delay in emergence of seedlings in kraft paper bags stored seeds. This suggests commencement of seed deterioration process which follows by the reduction in germination percentage

Table 1. Influence of packaging and storage temperatures on seed viability during 15th years of storage

Storage Temp (°C)	Storage Containers	Coeff of germination	Germination (%) after 24 hrs	Final 15 days
5	Glass	60.8	40	99
	Kraft paper	26.4	0	54
	Polyethylene	82.5	79	100
	Al foil	91.3	89	99
– 20	Glass	0	0	0
	Kraft paper	0	0	0
	Polyethylene	50.2	35	89
	Al foil	83.7	83	99
C D at 1%		14.9	8.3	8.9

Table 2. Effect of packaging and storage temperature on seedling vigour of stored seeds for 15 years

Storage Tempr. (°C)	Storage Containers	Shoot length (cm)	Root length (cm)	Dry wt. (mg)	Vigour	Vigour indices	
						I	II
5	Glass	5.3	4.6	9.3	68.9	953	887
	Kraft paper	2.9	1.5	3.2	16.2	242	171
	Polyethylene	4.2	2.6	9.3	89.3	680	896
	Al foil	3.7	2.2	5.6	94.0	778	812
– 20	Glass	-	-	-	-	-	-
	Kraft Paper	-	-	-	-	-	-
	Polyethylene	5.8	4.8	8.6	90.7	973	922
C D at 1%		1.3	1.1	3.4	8.7	167	192

At sub-zero (–20°C) temperature, seeds stored in polyethylene and laminated aluminium foil pouches exhibited greater percentage of germination (> 89) unlike none in kraft paper and glass containers, which might be due to moisture. Seeds stored in polyethylene bags exhibited early deterioration as evidenced by decline in coefficient of germination and delay in seeding emergence.

Seedling characteristics such as shoot, root length and dry weight were greater for seeds stored at –20°C than at 5°C (Table 2). Seed vigour was the maximum in seeds stored in laminated aluminium foil pouches both at 5°C and –20°C storage. Similarly, vigour indices I and II were greater for seeds stored in laminated aluminium foil pouches at sub-zero temperatures.

Radish seeds are fairly good storer under ambient conditions. Thus, germplasm in the form of seeds can be effectively conserved for shorter period. Fonseca *et al.* (1980) said that seeds stored at ambient temperatures began to deteriorate faster and showed lower germination and low seedling vigour. Seeds stored in polyethylene bags at 5°C retained high viability. The semipervious nature of polyethylene bags prevent the entry of moisture vapour as well as gases to certain extent. Thus it helps in preserving high viability especially for moderate period (15 years). These polyethylene bags are easily available and cheaper therefore germplasm can be conserved economically at 5°C for 15 years. James (1967) reported that high seed moisture is more injurious particularly when stored in moisture proof containers. Therefore care should be taken to preserve well-dried seeds especially while using moisture proof containers like laminated aluminium foil pouches. Seeds stored in laminated aluminium foil pouches exhibited higher percentage of germination and higher seedling vigour. It has many advantages like moisture vapour proof, handy, moderately expensive and effective in retaining high viability for very long period at sub-zero temperatures. These stored seeds were sown in the field and no morphological differences were noticed for plant characteristics.

It is concluded that seed germplasm can be effectively conserved in polyethylene bags at 5°C for medium term storage (up to 15 years). However, for long term conservation (> 15 years), it is advisable to pack well-dried seeds in laminated aluminium foil pouches and store them at sub-zero temperatures (–20°C), resulting effective germplasm conservation in radish.

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