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STORABILITY OF ONION SEEDS AT LOW MOISTURE LEVELS

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The objective of the study was to asses the storability of onion seeds at reduced seed moisture levels in ambient condition so as to know how well it compared with that under medium term conditions of the genebank. Seed moisture levels chosen ranged from 7.5 to 1.66 per cent. Germination and radical lengths were taken as criteria to asses the seed storability. Seeds stored at 4.0 - 4.5 per cent moisture (over silica gel) at ambient temperature retained viability comparable to those at 7.5 per cent moisture at +10o C upto 12 months of storage. In an another experiment, laminated aluminium foil (LAF) packets and metal cans with rubber lined caps werre used as containers for seeds at moisture levels of 2.8 and 1.6 per cent. Seeds stored in LAF pouches showed higher vigour (as measured by radical lengths) than those stored in metal cans. Vigour was higher in seeds at lower moisture level. Seed lots of different vigour did not retain same relative vigour rating when exposed to stress condition of accelerated ageing.

Key words : Onion, seeds, moisture; storability

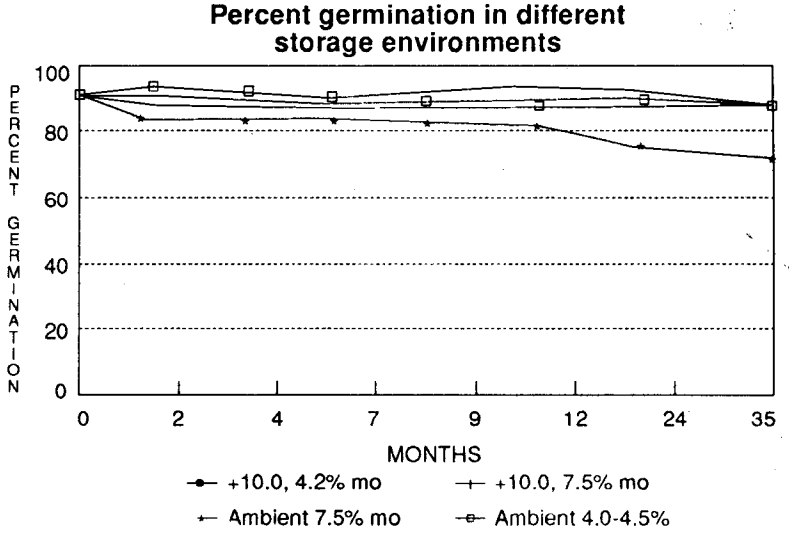
The longevity of orthodox seeds may be dramatically improved by controlling the storage environment because the increase in longevity with decrease in either temperature or moisture content is approximately exponential. It has been proposed that the seeds be dried to 5% ± 1% moisture content for longterm storage. For seeds with poor storage characteristics further drying may be recommended (Ellis *et al*, 1986, Ellis 1988). It has been shown in certain crops that longevity at high temperature is considerably increased by reducing moisture content of seed stored below 5% ± 1% previously recommended by IPGRI. Seeds with high oil content which tend to have poor longevity particularly benefit from ultra dry (less than 5% moisture content) storage. The ultimate aim of ultra dry seed storage research is the development of practical method for establishing a low input technology for genebank in which seeds would be stored hermetically sealed and ultra dry at ambient temperature or at least with considerably less refrigeration requirement than currently used.

The objective of present experiment was to assess the storability of onion seeds at low moisture level at ambient temperature vis a vis under medium term conditions of the gene bank i.e. +10°C. Two containers viz., laminated aluminium foil pouches and metal cans were used to evaluate their suitability for storage of seeds. The response of seed vigour level to accelerated ageing conditions was also studied.

MATERIALS AND METHODS

Freshly harvested seeds of Onion (cv. Ratnar) were obtained in the year 1988. After testing initial viability seed lot was divided into two lots and dried over regularly regenerated silica gel in a desiccator at room temperature. This provided seeds at moisture content of 7.5 and 4.0 - 4.5 per cent. Lowe moisture contents of 2.8 and 1.6 per cent were obtained by equilibrating seeds over concentrated sulphuric acid solution. The moisture content of the seeds was determined by the hot air oven method (Anon., 1985).

Storage treatments for different lots were as follows. Seeds with 7.5 per cent moisture were sealed in Laminated Aluminium Foil (LAF) packets and stored at +10°C and ambient temperatures. Seeds with 4-4.5 per cent moisture were stored in paper envelops over silica gel in a dessicator at room temperature. Another lot with 4.2 per cent moisture content was sealed in LAF packet and stored at +10°C. All the seeds were tested for germination in petri dishes at 20°C as prescribed by ISTA (1985 b). Three replicates of 100 seeds each were used. Seedlings were evaluated and counted according to the criterion of normal germination (ISTA, 1985 a, b). For another experiment seeds with 2.8 and 1.6 percent moisture content were divided into four sub samples each. These were stored in sealed LAF packets and in metal boxes with rubber



lined caps at both ambient and medium term conditions. This provided a total of eight treatments. At least 20 seeds were used for vigour measurement. Vigour was assessed by measuring radical lengths at 25°C after 144 hrs. Seeds were prehumidified before sowing in all cases.

To test whether seed lots of different vigour will retain same relative vigour rating when exposed to environmental stress, two lots of two cultivars *viz.*, Ratnar selection and Pusa red each were taken. The moisture content of the seeds was 7.8 ± 1° C per cent. Vigour was measured as radicle length.

RESULTS AND DISCUSSION

The initial germination of seed was 95 per cent. Under ambient conditions of storage the loss in viability was maximum in seeds with 7.5 per cent moisture level where it decreased from the initial value to 76 per cent after 35 months of storage (Fig. 1). The percentage drop in germination at +10°C, at both the moisture levels viz. 4.2 and 7.5 per cent was comparable to that in the seeds stored at 4.0 – 4.5 per cent moisture in a desiccator under less favourable ambient temperature conditions (Fig. 1).

Vigour measured as radicle length was found to be higher in seeds with 1.6 per cent moisture content than in seeds with 2.8 per cent moisture in both ambient and medium term conditions of temperature irrespective of type of container (Table 1). Vigour was higher in seeds stored sealed in LAF packets than in metal cans in all cases. Decline in vigour was most rapid in cans at 2.8% moisture and ambient temperature. LAF packets were found to be more suitable for seed storage at these moistures.

Table 1. Radicle lengths (mm) in two storage environments

Period of storage in month	Moistures							
	2. 86				1.66			
	LAF	Can	LAF	Can	LAF	Can	LAF	Can
	Ambient		+ 10°C		Amibent		+10°C	
00	43.52				46.00			
6	39.01	36.61	39.27	33.75	45.17	40.22	45.41	44.42
11	32.16	15.66	34.21	27 87	43.26	37.47	45.10	39.10
15	24.72	14.65	31.36	22.35	38.80	33.27	38.80	37.71
19	23.15	13.00	26.85	16.87	28.16	27.06	38.00	26.00

Storage of seeds of different species under reduced moisture has been found to maintain viability for longer periods (Agarwal, 1982; Ellis *et al.*, 1988)

A lower limit to negative logarithmic relations between seed longevity and seed moisture content has been demonstrated in several species (Ellis *et al.*, 1988; Roberts and Ellis, 1989). Nakamura (1975) showed that in lettuce seeds stored for 20 years at ambient temperature longevity at 2.5 per cent moisture content was greater than that at 6.3 per cent moisture content. Reports on the maintenance of viability of onion show that seeds dried to 6.3 per cent moisture before sealing retain good viability for upto 3 years at 32°C (Asgrow Seed Co. 1949), whereas under ambient conditions of storage and uncontrolled moisture the germination percentage decreased from initial 97 per cent to 3 per cent after 28 months (Varier and Agarwal, 1989).

Results from this study show that at ambient temperature seeds retain good viability when stored at 7.5 per cent moisture even upto 35 months of storage and desiccation below this level i.e. to 4.0 – 4.5% enhances the storability at ambient temperatures. Further reduction in moisture content is unlikely to be hazardous as evident by maintainence of high vigour in seeds at 1.6 per cent moisture.

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