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Effects of Storage Temperature, Storage Period and Seed Moisture Content on Seed Viability of Mash Bean (*Vigna mango*)

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Abstract: The study was conducted to investigate the effects of different storage conditions on seed viability of mush bean, variety Mash-3. Three factors were included period and seed moisture content. Viability and Moisture content were determined in control which were 91.0 and 8.0 percent respectively. The maximum germination percentage was observed in seeds with low moisture content. There was a decline in germination percentage after 90 days of storage at all temperatures in seeds with high and medium moisture contents. High moisture content and high temperature decreases germinability of seeds. The storage life of mashbean can be increased by lowering temperature and seed moisture content during storage.

Key Words: Mashbean, Storage, Seed moisture content, Storage temperature, Viability

Introduction

Plant genetic resources are the most valuable and essential basic raw materials to meet the current and future needs of crop improvement programmes. A wider genetic base, thus assumes priority in plant breeding research aimed at developing new varieties for increased crop production. The collection and conservation of this diversity in a systematic manner requires suitable conditions for their storage (Watanabe, 1988). Seed preservation is one of the most effective methods for preserving the useful germplasm of seed plants (Takayanagi, 1988).

The seed deterioration under storage condition is the natural phenomenon. Germination of soybean seed decline rapidly during storage (Tekrony et al., 1993). Although the germplasm is stored under preferred/optimal storage conditions, even then the seed viability/germinability is affected during storage of seeds. It is therefore, imperative to test the viability of crop germplasm before and during storage. The ultimate object of testing for germination is to gain information with respect to the field planting value of the seed and to provide results which can be used to compare the value of different seed lots (ISTA., 1985).

The principal factors determining the storage life of seeds are storage temperature and seed moisture content. For each rise of one percent in moisture content and for each rise of 5°C in temperature, the storage life of seed is halved (Harrington, 1973). Temperature is an important factor in affecting seed viability. The lower the storage temperature, the longer is the life of seed. Between 0 and 50°C, every 5°C lowering of storage temperature doubles the life of the seed (Harrington, 1973).

The purpose of this study is to optimize/standardize storage conditions to maintain maximum seed viability of Mashbean during storage.

Materials and Methods

The study was conducted to investigate the effects of different seed moisture contents; storage temperature and storage period on seed viability of mashbean. The seeds of mashbean variety, Mash-3 were selected for experiment. After cleaning, the moisture content of seeds was determined before starting the experiment by "high constant temperature oven" method, which was 8.0 percent. This moisture content was taken as medium. To adjust low and high moisture contents, seed lot was divided into three parts. Moisture content of one part was taken as medium. The other two parts were, used to decrease or increase the seed moisture content by artificial methods (ISTA., 1985).

To lower the seed moisture content, seeds were kept in a seed dryer operating at 20°C and 10 percent relative humidity for a period of 4-6 weeks. The other seed lot was kept in humidifier operating at 20°C and 90 percent relative humidity to increase at 20°C and 90 per cent relative humidity to increase the seed moisture content, as given in the Table 1.

Table 1: Seed moisture contents of Mashbean

S. No.	Moisture Content	Percentage (%)
1	Low	6.0
2	Medium	8.0
3	High	12.0

The seeds of different moisture contents were tested for viability before storage. The percentage of germination was calculated. From all the seed lots, i.e. seed lots with low, medium and high moisture contents, packets of 200 seeds each, were prepared, packed in plastic bags and sealed. The seeds were stored at -20, 5, 25, 37 and 50°C for 12. months. The samples were drawn from each storage temperature at regular intervals and subjected to standard germination test using three replicates of 50 seeds per replication grown under dark conditions at 25°C in an incubator as per ISTA-Rules. The germination data were recorded on 7th day. The experiment continued for 180 days.

Results and Discussion

The interaction between the species and different seed moisture contents was highly significant. The seed lots with low and medium seed moisture content showed high percentage of germination except at temperatures of 37 and 50°C, at which there was a decline in germination after 90 days storage (Fig. 1).

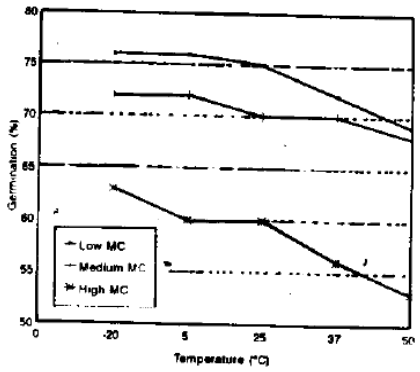

Fig. 1: Effect of storage temperature and seed moisture content (MC) on seed viability of mashbean after six months stage

The seed lots with high moisture content showed decreased germination at all temperatures after 120 days. High seed moisture content significantly affected the germination of mashbean at all temperatures after 90 days of storms.

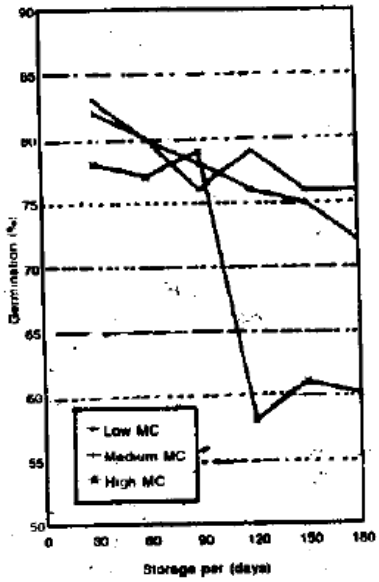

Fig. 2: Effect of storage period and seed moisture content (MC) on seed viability of mashbean during storage at 5°C

Seeds with medium moisture content (8.0%) did not show large differences in germination percentage as compared to those with low seed moisture content. Seeds with low moisture content showed high germination percentage up to 150 days. Interaction between storage temperature and seed moisture content was highly significant. After 90 days, seeds with high moisture content showed about 60 percent seed germination at -20 and 5°C while seed germination decreased rapidly at 25 and 37°C. Seed with medium moisture content showed nearly the same germination percentage as those with low seed moisture content. Optimum storage conditions may differ with different species, but common important factors are the relative humidity and temperature of the ambient atmosphere. The relative humidity of air usually determines the moisture content of the seeds (Takayanagi, 1988) (Fig. 2).

Moisture content, through its effect on humidity influence the growth of fungi. High temperature promotes both fungal growth and insect development (Christensen, 1972). The relative humidity of the air usually determines the moisture content of the seed. In a range of seed moisture between approximately 20 and 40 percent, respiration of both the seeds and associated micro organisms results in heating during storage (Harrington, 1970). if seed moisture is in the range between approximately 14 and 20 percent, the seed will deteriorate rapidly due to the destruction of its embryo by invasion of micro-organisms. Below 14 percent seed moisture for many species, a 1.0 percent loss in seed moisture doubles the life span of the seed. This rule of thumb applies down to about 40 percent seed moisture (Harrington, 1970). Because of variations in chemical composition, each species has a different moisture equilibrium with a given relative humidity. Seeds of species with a high oil content such as *Linum* and *Brassica* equilibrated at lower moisture levels than cereal seeds. Seed storage at low moisture level and low temperature increases the longevity of seeds (Roberts, 1972).

From this discussion, it can be inferred that seed viability is influenced significantly when the seeds are stored at high temperature. The best suitable temperatures for mashbean germplasm storage are -20 and 5°C with low moisture content (6.0%). That is why many seeds retain their viability better in sealed containers than in open storage (Bass, 1973).

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