http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (12): 2003-2004, 2000

The Effect of Storage Temperature Storage period and Seed Moisture Content on Seed Viability of Soy bean

Syeda Nasreen, Bakht Roidar Khan and Akbar Shah Mohmand
Oilseed Research Programme, National Agriculture Research Centre,
Park Road, Islamabad, Pakistan

Abstract: The study was conducted to investigate the effect of different seed moisture contents, temperatures and storage period on seed viability of soybean variety, NARC 2. Three factors were included in the experiment, which were storage temperature, storage period and seed moisture content. During storage, the interaction among the three above mentioned factors was statistically significant. In Soybean, the maximum seed viability was observed in control with seed having low moisture content. There was a decline in germination percentage after two months of storage at all temperatures in seed with high and medium moisture contents. High moisture content and high temperature decreases germinabitity of seeds. Viability was zero at.37°C after two month storage in seeds with low, medium and high moisture contents. The storage life of soybean seed can be increased by lowering temperature and seed moisture content during storage.

Key words: Soybean, seed moisture content, storage, storage temperature, viability

Introduction

The seed deterioration under storage condition is the natural phenomenon. Although the germplasm is stored under preferred optimal storage conditions in the gene bank at low temperatures and with low seed moisture contents, even then the viability germinability is affected during storage of the 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.

Testing under field conditions is normally unsatisfactory as the results cannot be repeated with reliability. Laboratory methods have, therefore, been evolved in which the external conditions are controlled to give the most regular, rapid and complete germination of the majority of samples of a particular species (ISTA, 1985).

The principal factors determining the storage life of seeds are storage temperature and seed moisture content. Moisture content through its effect on humidity influence the growth of fungi (Roberts, 1972). High temperature promotes both fungal growth and insect development. 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).

The storage of oil seed is most critical due to the presence of glycerides (An International proceeding, 1976). The oil seeds are susceptible to various infections and also they lose their germination and violability potential quickly if not stored under optimum conditions (ISTA). The purpose of this study is to optimize/standardize storage conditions to maintain maximum viability during storage.

Materials and Methods

The study was conducted to investigate the effects of different seed moisture contents, storage temperature and storage period on viability of soybean seeds. The seeds of soybean, variety NARC-2 were selected for experiment. After cleaning, the moisture content of seeds was measured before starting the experiment by "low constant oven temperature method" - This was taken as a medium moisture content. To adjust low and high moisture contents, seed lot was divided into three parts. Moisture content of one part was measured and was taken as medium moisture content. The other two parts were used to decrease or increase the seed moisture content by artificial methods. To lower the seed moisture content, the seeds were kept in seed dryer operating at 200 °C and 90% Relative humidity (RH) for a period of 4-6 weeks. The other seed lot was kept in humidifier operating at 20 °C and 90% relative humidity RH to increase the seed moisture content, as given in the Table 1.

Table 1: Seed moisture contents of soybean seed

Moisture Content	Percentage (%)
Low	6.0
Medium	7.7
High	9.8

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. seeds 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/replication, grown under dark conditions at 25°C in incubator as per ISTA-Rules. The germination data were recorded on 7th day. The experiment continued for 12 months.

Results and Discussion

The interaction between 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 temperature of 37 and 50°C, at which there was a decline in germination after two months storage (Fig. 1). The seed lots with high moisture content showed decreased germination which ranged from 50-0 % after second month at all temperatures (Fig. 2). High seed moisture content significantly affected

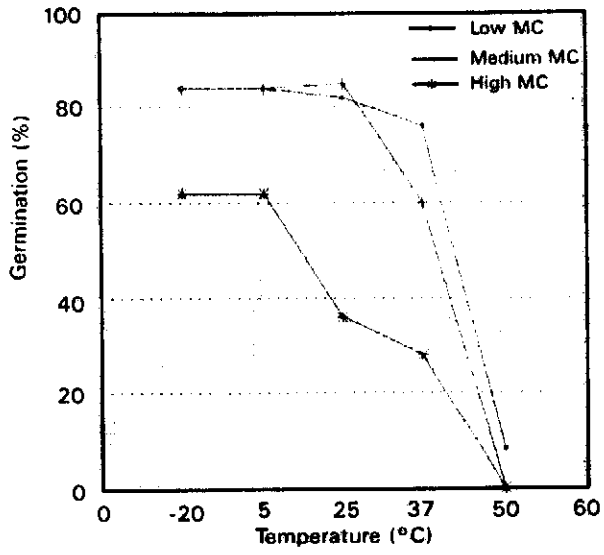

Fig. 1: Effect of storage temperature and seed moisture content on seed viability of soybean after two month storage

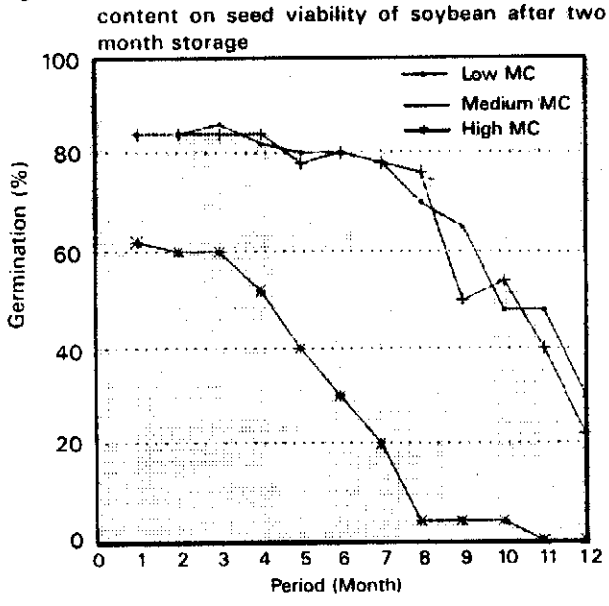

Fig. 2: Effect of storage period and seed moisture content (MC) on seed viability during storage at 5°C.

the germination of soybean right from the first month. Seeds with medium seed moisture content did not show large differences in germination percentage as compared to seeds with low seed moisture content. Low seed moisture content showed high germination percentage up to four months. Interaction between storage temperature and seed moisture content was highly significant on second month. seeds with high moisture content showed 60% seed germination at -20 and 5°C, while seed germination decreased rapidly at 25 and 37°C. At 50°C, no germination was recorded. Seeds with medium moisture content showed same germination (80-90 %) as that of low seed moisture content up to 25°C, but at 37 and 50°C dropped rapidly. This indicates that, the seed moisture content and temperature are the two principal factors controlling viability of seed during storage. Moisture content, through its effect on humidity influence the growth of fungi. High temperature promotes both fungal growth and insect development (Christensen, 1972). According to Harrington rule of thumb, for each rise of 1 % in moisture content and for each rise of 5°C in temperature, the storage life of seed is halved (Harrington, 1973). The activities of fungi and other contaminants of stored seeds are more strictly related to the RH of the interseed atmosphere than to the moisture content of the seeds themselves. This is because the moisture contents of some seeds (e.g, oil seeds) may be different from others (e.g. starchy seeds) even though the equilibrium RH is same for both.

For example, all the grasses and cereals and most of the legumes (except soybean and peanut) which are high in starch and low in oil content have a moisture content of above 10% at a RH of 45%, whereas oil-containing seeds (e.g, sunflower) have a moisture content of only 6-7% at this RH. (Christensen, 1972). From this discussion, it can be inferred that seed viability is influenced significantly when the seeds are stored at high temperatures. The best suitable temperature for storage of soybean germplasm is 5 °C with low moisture content (6.0 %). Therefore many seeds retain their viability better in sealed containers than in open storage (Bass, 1973).

References

Bass. L.N., 1973. Controlled atmosphere and seed storage. Seed Sci. Technol., 1: 463-492.

Christensen C.M., 1972. Micro flora and seed deterioration. In: viability of seeds. Roberts, E.H (ed.) London Chapman and Hall, pp: 59-93.

Harrington, J.F., 1973. Biochemical basis of seed longevity. Seed Sci. Technol., 1: 453-461.

International Seed testing Association (1985) Seed Sci. and Technol., 13:299-355. Zurich, Switzerland.

Proceeding of International Sunflower conference held USSR., from June 27 to July 3, 1976.

Robersts, E.H., 1972. Loss of viability and crop yield. In Viability of Seeds Edited by E.H. Roberts, London, pp 307-302.