From Forest Nursery Notes, Summer 2008

130. Low cost seed storage techniques for certain hardy indigenous pod vegetables.
Doijode, S. D. Acta Horticulturae 752:589-591. 2007.

Low Cost Seed Storage Techniques for Certain Hardy Indigenous Pod Vegetables

S.D. Doijode
Indian Institute of Horticultural Research, Bangalore – 560089
India

Keywords: Seed viability, storability, vigour, desiccants, pod vegetable, cluster bean, and cowpea

Abstract

Cowpea and cluster bean are indigenous, hardy and popular in rural areas. Seed and quality decreases with storage of pod vegetables, rendering them unfit for sowing. High seed quality helps in raising healthy plant and establishment of optimal plant population in field. Seed quality is largely dependent on storage temperature and relative humidity. High temperature and humidity promote seed deterioration, enhances microbial activity and reduce the seed quality. An experiment was conducted with the view to preserve high seed viability and vigour under ambient condition (16-35°C; 25-90% RH) using desiccants and modifying the storage atmosphere. High seed viability (80%) was recorded in cluster bean in seeds stored with carbon dioxide for 5 years under ambient conditions as compared to control. Likewise, seeds of cowpea showed higher germination (95%) when packed in partial vacuum and in carbon dioxide after 3 years of storage. In both cluster bean and cowpea seed germination was also higher in seeds stored with desiccants like silica gel and charcoal than the control, under ambient conditions. Seedlings emerged from stored seeds were normal, healthy and vigorous.

INTRODUCTION

Seeds are widely used for plant propagation. Farmers prefer to store seeds till next growing season. Improper storage of seeds causes reduction in vigour and loss of viability. High seed quality helps in better establishment of seedling in field, better crop growth, higher yield and also in extending seed storability. Seed quality is affected predominantly by high temperature, relative humidity and oxygen contents during storage. High seed moisture along with higher temperature causes deterioration of seed quality (Bass, 1980). Seeds with low moisture inhibits the growth and activity of microorganisms and extends seed longevity. High level of oxygen in storage container reduces seed storability while in partial vacuum it maintains high viability and longer storability. Replacement of air with certain gases such as nitrogen or carbon dioxide in storage container lowers the process of seed deterioration and maintains high seed viability and vigour (Bass and Stanwood, 1978). Usefulness of modified atmosphere and desiccant storage and its potential in storage of hardy pod vegetable seeds is reported here.

MATERIALS AND METHODS

Seeds of cluster bean cv Pusa Naubahar and cowpea cv Pusa Komal were extracted from fully matured pods. Seeds were stored in moisture impervious container viz., laminated aluminum foil pouches along with nitrogen, carbon dioxide, and partial vacuum using PAC – vacuum and gas sealing machine and the pouches were triple sealed to avoid free exchange of gases with atmosphere. Another lot of seed was stored in kraft paper bags to serve as control. Cluster bean seeds were also packed with desiccant such as silica gel and charcoal in different proportion. These packets were stored in ambient conditions (16-35°C; 25-90% RH). One hundred seeds in each replication were germinated on triple layered moist rolled crepe kraft paper at alternate temperature of 20 and 30°C for 16 and 8 h respectively in a seed germinator. Vegetative growth was recorded after 7 days of sowing. Dry weight was recorded on seedlings dried at 65°C for 48 h. Vigour was compared by means of seedling characters (Mugnisjah and Nakamura,

Proc. I[st] IC on Indig. Veg. and Legumes
Eds. M.L. Chadha et al.
Acta Hort. 752, ISHS 2007

1986).

RESULTS AND DISCUSSION

Seed quality (in terms of viability and vigour) decreased with increase in storage period. Seeds of cluster bean and cowpea remained viable for 5 and 3 years respectively with modified atmosphere storage under ambient conditions. High germination (80%) was recorded in seeds stored with carbon dioxide as compared to nil in control after 5 years of storage under ambient condition (Fig. 1).

Similarly cowpea seeds stored for 3 years showed >90% germination when stored in sealed condition (with CO_2, N_2 or air) while there was no germination in control (Fig. 2). Seeds showed slightly greater storability with carbon dioxide storage. Modified atmosphere storage of seeds with devoid of oxygen exhibited greater retention of viability for an appreciable period. Seedling dry matter content and seedling vigour were relatively greater for seeds stored in carbon dioxide (Table 1). High seed quality was preserved with modified atmosphere storage especially with carbon dioxide in storage container.

Seed germination was greater in seeds stored with desiccant such as silica gel and charcoal (Fig. 3). Seeds are hygroscopic in nature and readily exchange the moisture with atmosphere. Seeds lose viability rapidly under ambient conditions. Seeds stored in carbon dioxide environment in moisture proof container such as laminated aluminum foil pouches showed high viability and high seedling vigour even after 3-5 years of storage under ambient conditions. Removal of air especially oxygen, was beneficial for maintenance of high seed quality during storage. Seed storage in modified atmosphere was superior over the seeds sealed in air (Doijode, 2000), and with carbon dioxide was beneficial in maintaining high quality during seed storage. Similar effects were reported in cabbage (Doijode, 2003). There was greater loss of seed viability during initial stages of storage. Thus it is utmost important to preserve high quality in planting material for raising a healthy crop. It is beneficial to pack dry seeds in laminated aluminum foil pouches along with carbon dioxide or silica gel for longer retention of high viability and vigour under ambient condition.

Literature Cited

Bass, L.N. 1980. Seed viability during long term storage. Hort. Rev. 2:117-141.

Bass, L.N. and Stanwood, P.C. 1978. Long term preservation of sorghum seeds as affected by seed moisture, temperature and atmosphere environment. Crop Sci. 18:575-577.

Doijode, S.D. 2000. Modified atmosphere storage of onion (*Allium cepa* L.) seeds. Proc. Nat. Symp. Onion garlic production and Post harvest management: Challenges and strategies. NHRDF, Nasik. p.162-166.

Doijode, S.D. 2003. Maintenance of seed quality through modified atmosphere storage in cabbage. Indian J. Pl. Physiol. 8:186-188.

Mugnisjah, W.Q. and Nakamura, S. 1986. Methanol and ethanol stress for seed vigour evaluation in soybean. Seed Sci. Technol. 14:95-103.

Tables

Table 1. Seedling characteristics after 5 years of modified atmosphere storage in cluster bean.

Storage Environment	Shoot length (cm)	Root length (cm)	Dry wt. (mg)	Coeff. of germination (%)	Vigour	Vigour Index-I	Vigour Index-II
Carbon dioxide	3.2	3.0	6.0	24.8	22.4	498	482
Nitrogen	-	-	-	-	-	-	-
Vacuum	2.7	2.1	4.0	18.7	5.9	143	119
Air	2.5	2.2	2.6	23.7	11.2	206	108
Control	-	-	-	-	-	-	-
CD at 5%	0.51	0.39	0.78	1.04	1.9	63.5	20.0

Figures

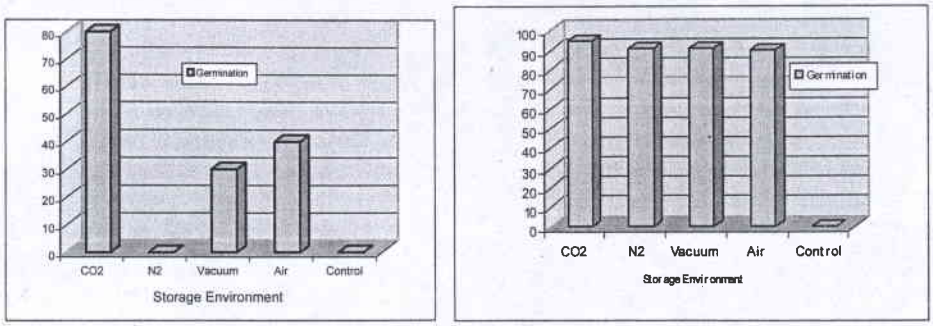

Fig. 1. Seed viability in modified atmosphere after 5 years of storage in cluster bean.
Fig. 2. Seed viability in modified atmosphere storage after 3 years in cowpea.

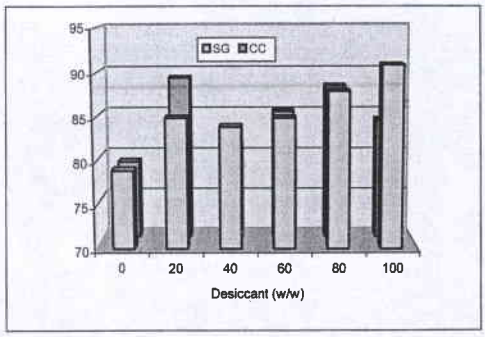

Fig. 3. Seed viability after 5 years of storage with desiccant under ambient condition in cluster bean.