*Journal of Tropical Forest Science* 10(1): 18 - 23 (1997)

# EFFECT OF SEED TREATMENTS ON STORAGE LIFE OF *CASUARINA EQUISETIFOLIA*

**R. Umarani, A. Bharathi & T.V. Karivaratharaju**

*Department of Seed Technology, Forest College and Research Institute, Tamil Nadu Agricultural University, Mettupalayam 641 301, Coimbatore, India*

*Received June 1995*

**UMARANI, R., BHARATHI, A. & KARIVARATHARAJU, T.V. 1997. Effect of seed treatments on storage life of *Casuarina equisetifolia*.** Seeds of *Casuarina equisetifolia* were treated with leaf powders of arappu (*Albizia amara*), neem (*Azadirachta indica*) and notchi (*Vitex negundo*), and neem oil, Captan, Thiram, Carbaryl, Captan + Carbaryl, and Thiram + Carbaryl. The dosage per 100 g of seed for each of the leaf powders was 10 g; neem oil, 1 ml; Captan, 2 g; Thiram, 2 g; Carbaryl, 200 mg; Captan + Carbaryl, 1 g + 100 mg; and Thiram + Carbaryl, 1 g + 100 mg. They were stored in polythene and paper bags for seven months and then subjected to germination test. Measurements were made of percentage germination, root and shoot lengths, dry matter production and vigour index. Although seed viability and vigour decreased with increase in period of storage, the arappu treatment followed by that of Captan and Carbaryl recorded higher values compared to the rest of the treatments and control. For example, from an initial percentage germination of 70%, the value dropped to 22% in the control after seven months storage. However, treatments with arappu leaf powder and Captan + Carbaryl resulted in values of 88% and 31% respectively after the same period of storage. Germination and vigour were maintained better in polythene than paper containers.

Key words: *Casuarina equisetifolia* - seeds - treatments - leaf powders - chemicals - storage - viability - vigour

**UMARANI, R., BHARATHI, A. & KARIVARATHARAJU, T.V. 1997. Kesan rawatan biji benih kepada jangka hayat *Casuarina equisetifolia* yang disimpan.** Biji benih *Casuarina equisetifolia* dirawat dengan serbuk daun arappu (*Albizia amera*), neem (*Azadirachta indica*) dan notchi (*Vitex negundo*), dan minyak neem, Captan, Thiram, Carbaryl, Captan + Carbaryl, dan Thiram + Carbaryl. Dos setiap 100 g biji benih bagi setiap serbuk daun ialah 10 g, minyak neem 1 ml, Captan 2 g, Thiram 2 g, Carbaryl 200 mg, Captan + Carbaryl 1g + 100 mg, dan Thiram + Carbaryl 1 g + 100 mg. Ia disimpan dalam beg politin dan beg kertas selama tujuh bulan, kemudian barulah dibuat ujian percambahan. Peratus percambahan, panjang akar dan panjang pucuk, pengeluaran bahan kering dan indeks kecergasan telah disukat. Walaupun keboleh hidupan dan kecergasan biji benih berkurangan dengan bertambahnya jangka masa penyimpanan, rawatan arappu diikuti oleh rawatan Captan dan Carbaryl mencatatkan nilai yang lebih tinggi berbanding dengan rawatan dan kawalan yang lain. Contohnya, daripada peratus percambahan awal sebanyak 70%, nilainya jatuh kepada 22% dalam kawalan selepas penyimpanan selama tujuh bulan. Bagaimanapun, rawatan dengan serbuk daun arappu dan Captan + Carbaryl masing-masing mencatatkan sebanyak 88% dan 31% selepas tempoh penyimpanan yang sama. Percambahan dan kecergasan mempunyai tempoh bertahan yang lebih baik dalam bekas politin berbanding dengan beg kertas.

## Introduction

*Casuarina equisetifolia* is a fast spreading tree species in most parts of Tamil Nadu of India. The tree is noted for its fast growth and good economic returns in a relatively short period of time. Seed quality of *Casuarina* spp. varies with the season of collection (El Lakany *et al.* 1989). Hence it is imperative to store seeds of good viability and vigour to be used subsequently. One of the problems of controlling seed micro-organisms by chemical seed treatment is that chemicals can have an adverse effect on seed viability or vigour and some of them are even dangerous to handle. Increasing cost of production and storage is a possible limiting factor to supply good quality seeds; this also stresses the necessity to protect the seeds under a long period of storage with cheap protectants (Ravichandran 1991). Considering the natural environment and vast resources of the forest, an attempt was made to utilise forest products like leaf powders of *Albizia amara, Vitex negundo* and *Azadirachta indica,* and neem oil along with conventional chemicals in the treatment of the seeds against viability loss.

## Materials and methods

Mature cones of *Casuarina equisetifolia* were collected from the Tamil Nadu Agricultural University Campus, Coimbatore and dried under sunlight for five days. The extracted seeds were cleaned to remove the inert matter. The seeds were then divided into 10 lots and subjected to the following treatments besides maintaining an untreated control.

| Treatment | Dosage/100 g of seeds |
|---|---|
| Leaf powder | |
| *Albizia amara* (arappu) | 10 g |
| *Azadirachta indica* (neem) | 10 g |
| *Vitex negundo* (notchi) | 10 g |
| Kernel oil | |
| *A. indica* | 1 ml |
| Chemicals | |
| Captan | 2 g |
| Thiram | 2 g |
| Carbaryl | 200 mg |
| Captan + Carbaryl | 1 g + 100 mg |
| Thiram + Carbaryl | 1 g + 100 mg |

The treated seeds with 6.2% moisture content were stored in polyethylene bags (350 gauge) and paper bags, under ambient conditions of temperature and relative humidity. After seven months of storage, seeds were subjected to germination test, for which 100 seeds were arranged in rolled towels, replicated thrice and

placed in a germination room maintained at 25 ± 2 °C and 90 ± 3% relative humidity. Fourteen days after sowing (Ng & Mat Asri 1979, Halos 1981) counts were made and germination expressed as the percentage of seeds which produced normal seedlings (FAO 1985). After the germination count, ten random seedlings were measured for their root and shoot lengths. The vigour index (VI) was derived from the formula (Abdul-Baki & Anderson 1973),

$$VI = \text{percentage germination} \times \text{dry matter production (mg)}$$

For the estimation of dry matter production (mg), ten seedlings were selected at random and kept in an oven maintained at 80 °C. The results were subjected to analysis of variance and tested (*t*-test) for significant difference ($p = 0.05$) (Panse & Sukhatme 1967). Percentage values were transformed into arc-sine values prior to statistical analysis.

## Results and discussion

The storability of *Casuarina equisetifolia* was significantly influenced by the seed treatments and containers of storage. The germination test conducted after seven months of storage revealed that seeds treated with arappu (*Albizia amara*) leaf powder were superior to the rest of the treatments by recording 38% of germination although the value had dropped from an initial value of 70%. It was followed by Captan + Carbaryl (31%), Captan (26%), Thiram (26%) and Thiram + Carbaryl (26%) treatments. Arappu leaf treatment recorded a shoot length of 2.5 cm followed by that of Captan + Carbaryl treatment (2.4 cm). Captan + Carbaryl treatment recorded a dry matter production of 15 mg followed by that of Thiram + Carbaryl (14 mg). The vigour index recorded was highest for treatments with arappu leaf powder (460) and Captan + Carbaryl (473).

The performance of seed treatment with the oil of neem (*Azadirachta indica*) was poor even when compared to the control with respect to all the seed quality parameters.

The seeds stored in polyethylene bags were superior to those stored in paper bags. The percentage increases in germination, shoot length, dry matter production and vigour index were 32.0%, 6.1%, 4.3% and 45.6% respectively.

The results of the experiment indicate that arappu leaf powder and Captan + Carbaryl can improve the storage life of *Casuarina equisetifolia* seeds.

Loss of seed viability is the final stage in seed deterioration. Prior to death, ageing results in a decline in many aspects of seed performance such as rate of germination (Ellis & Roberts 1981). In listing the factors affecting seed longevity in storage, Agarwal (1980) emphasises the effect of storage micro-organisms on the storability of seeds. Hence, for better protection of seeds it is necessary to treat the seeds with pesticides. There was some loss of seed viability in the present study, even with the best treatment. However, compared to the control, the treatments, especially with arappu leaf powder and Captan + Carbaryl, were effective in reducing this loss.

**Table 1.** Effect of seed treatments on seed quality of *Casuarina equisetifolia* after seven months of storage

| Treatments | Germination % | | | Root (cm) | | | Shoot (cm) | | | Dry matter (mg) | | | Vigour index | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Paper | Poly* | Mean | Paper | Poly | Mean | Paper | Poly | Mean | Paper | Poly | Mean | Paper | Poly | Mean |
| **Leaf powder** | | | | | | | | | | | | | | | |
| Arappu (*Albizia amara*) | 36 | 40 | 38 | 2.0 | 2.5 | 2.3 | 2.1 | 2.9 | 2.5 | 10 | 14 | 12 | 360 | 560 | 460 |
| Neem (*Albizia indica*) | 16 | 30 | 23 | 2.5 | 1.7 | 2.1 | 2.3 | 2.4 | 2.4 | 14 | 9 | 12 | 224 | 270 | 247 |
| Notchi (*Vitex negundo*) | 22 | 26 | 24 | 1.8 | 2.0 | 1.9 | 2.1 | 2.4 | 2.3 | 12 | 14 | 13 | 264 | 364 | 314 |
| **Oil** | | | | | | | | | | | | | | | |
| Neem | 4 | 10 | 7 | 1.3 | 1.0 | 1.2 | 1.7 | 0.9 | 1.3 | 10 | 10 | 10 | 40 | 100 | 70 |
| **Chemical** | | | | | | | | | | | | | | | |
| Captan | 24 | 28 | 26 | 2.1 | 2.5 | 2.3 | 2.1 | 2.6 | 2.4 | 10 | 10 | 10 | 240 | 280 | 260 |
| Thiram | 23 | 28 | 26 | 1.8 | 1.5 | 1.7 | 1.8 | 1.8 | 1.8 | 12 | 14 | 13 | 276 | 392 | 334 |
| Carbaryl | 12 | 20 | 16 | 0.9 | 0.6 | 0.8 | 1.0 | 1.0 | 1.0 | 10 | 10 | 10 | 120 | 200 | 160 |
| Captan + Carbaryl | 27 | 36 | 31 | 2.4 | 2.5 | 2.5 | 2.5 | 2.3 | 2.4 | 15 | 15 | 15 | 405 | 540 | 473 |
| Thiram + Carbaryl | 24 | 28 | 26 | 2.3 | 2.6 | 2.5 | 2.3 | 2.4 | 2.4 | 14 | 14 | 14 | 336 | 392 | 364 |
| Control | 18 | 26 | 22 | 2.1 | 1.8 | 2.0 | 1.8 | 2.2 | 2.0 | 9 | 11 | 10 | 162 | 286 | 224 |
| Mean | 20.6 | 27.2 | | 1.92 | 1.87 | | 1.97 | 2.09 | | 11.6 | 12.1 | | 243 | 338 | |
| CD 0.05% | | | | | | | | | | | | | | | |
| Treatment | 3.720 | | | 0.34 | | | 0.40 | | | 2.23 | | | 6.82 | | |
| Container | 1.23 | | | ns | | | ns | | | 1.00 | | | 3.05 | | |
| Treatment × Container | ns | | | 0.49 | | | 0.56 | | | ns | | | 9.6 | | |

* Poly = polyethylene bag.

There are many reports supporting the positive impact of seed treatment with arappu leaf powder. Ravichandran (1991) reported an increase in germination and root length when soybean and groundnut seeds were treated with leaf powders of arappu and notchi.

In the present study also, arappu leaf powder treatment recorded higher seedling length compared to the others. Balaji (1990) confirmed the findings with soybean. Treatments with notchi (Balaji 1990) and arappu (Ravichandran 1991) leaf powders protected the seeds from faster biochemical degradation and maintained the seed coat integrity. The leaf powder of arappu is known for its saponin content. Saponin, a raw material for hormone manufacture, possesses a pronounced insecticidal property. It reacts with cell membrane sterols to form insoluble complexes, thereby changing the membrane structure. In this process, hexagonally "arranged pores of 80A" in diameter are formed through which cell contents leak into the surrounding medium. This irreversible change in selective permeability of insect cell wall finally leads to cell death.

The effect of different packaging material on germination has been demonstrated in many crop seeds. Grabe and Isley (1969) reported that ordinary paper and cloth containers were least effective while various laminate and polyethylene materials were comparatively effective in increasing the storage life of the seeds. Agarwal (1980) regards polyethylene bags as the most attractive of various possibilities because of their relatively low cost compared to other kinds of sealed containers.

From the present study it is concluded that seeds of *Casuarina equisetifolia* may be treated with the leaf powder of arappu (*Albizia amara*) or Captan + Carbaryl and stored in polyethylene bags to decrease their loss of viability.

## References


ABDUL BAKI, A.A. & ANDERSON, J.D. 1973. Vigour determination in soybean seed by multiple criteria. *Crop Science* 13 : 630 - 633.

AGRAWAL, R.L. 1980. Benefits of seed treatment. In *Seed Technology*. Oxford and IBH Publishing Company Private Ltd., New Delhi.

ANONYMOUS. 1985. International rules for seed testing. *Seed Science and Technology* 13(2) : 307 - 355.

BALAJI, D.S. 1990. Studies on seed soil relationship in certain crops. M.Sc (Ag.) thesis, Tamil Nadu Agricultural University, Coimbatore, India.

ELLIS, R.H. & ROBERTS, E.H. 1981. The quantification of ageing and survival in orthodox seeds, *Seed Science and Technology* 9 : 373 - 409.

EL-LAKANY, M.H., QURRAN, T.A. & SHETA, M.S. 1989. Variation in seed characteristics of *Casuarina* as affected by species, season of collection and position on tree grown. *International Tree Crops Journal* 5 : 237 - 245.

FAO. 1985. *A Guide to Forest Seed Handling*. FAO Forestry Paper No. 20/2. FAO, Rome.

GRABE, D.F. & ISLEY, D. 1969. Seed storage in moisture resistant packages. *Seed World* 104 (27): 2 - 5.

NG, F.S.P. & MAT ASRI, N.S., 1979. Germination of fresh seeds of Malaysian trees IV. *Malaysian Forester* 42 : 221 - 224.

HALOS, C.S. 1981. Production practices for *Casuarina equisetifolia*. Pp. 133 - 134 in Midgley, S.J., Turnbull, J.W. & Johnston, R.D. (Eds.) *Casuarina Ecology, Management and Utilization*. CSIRO, Australia.

PANSE, V.G. & SUKHATME, P.V. 1967. *Statistical Methods for Agricultural Workers.* 2nd edition. Indian Council of Agricultural Research, New Delhi. 361 pp.

RAVICHANDRAN, G. 1991. Studies on the pattern of seed deterioration, the performance of progenies of differentially aged seeds in the field and the quality of their resultant seeds in maize, groundnut and soybean. M.Sc (Ag.) thesis, Tamil Nadu Agricultural University, Coimbatore, India.