Agric. Res. J. Kerala 29 (1991) : 57 - 60

# EFFECT OF SEED TREATMENT ON GERMINATION OF SEEDS IN BANANA

Seeds borne by edible bananas possess hard seed coat and show poor viability. The germination of banana seeds is low and erratic (Simmonds, 1962). The various seed treatments such as scarification, acid treatment, hot water treatment and chipping the testas were effective in enhancing germination of crop seeds possessing hard testa (Jadhave, 1960; Hett, 1971; Hartman and Kester, 1972). Since banana seeds possess a hard testa, several attempts were made by various investigators to soften the testa and to get early germination. An exhaustive study was conducted by Simmonds (1952) on germination of banana seeds. He noticed that presowing treatments such as chipping of the testa, soaking seeds in sulphuric acid, soaking in water and the application of temperature shocks are usually deleterious and often lethal. Dodds (1958) stated that failure of seed germination was usually due to a lack of viable embryo and this difficulty cannot be overcome by chemical means. Stotzky *et al.* (1962) revealed that the mechanical scarification i.e., removing a chip from lateral portion of seed coat so as to expose the endosperm, was the most effective method of scarification to get maxium germination under artificial conditions. They further reported that alternating temperatures were needed for germination. Germination was maximum when seeds were held for 6-12 h at high (27-32°C) and for 12-18 h at low (12-18°C) temperatures. They concluded that factors affecting delayed germination and mechanisms affected by alternating temperature resided not in embryo, but in other parts of seed.

Germination of hybrid seeds plays an important role in hybridization programmes. In the present investigation, hybrid banana seeds from the crosses, Palayankodan x Pisang Lilin, Rasthali x Pisang Lilin and Nendran x Pisang Lilin were taken. The seeds were treated with concentrated sulphuric acid for 5 min, boiling water for 2 s and GA 250 and 500 ppm for 12 h.

The seeds extracted from well mature ripe fruits were used for the study (Simmonds, 1952, 1959, 1966; De Langhe, 1969; Sathiamoorthy, 1973; Purseglove, 1975; Karmacharya, 1984). The seeds after treatments as mentioned above, were sown in a mixture of sand and soil (Simmonds, 1966; Purseglove, 1975). Out of the five seed treatments, only two seeds in the acid treatment from the cross, Palayankodan x Pisang Lilin germinated (Table 1). However, the treatments were not effective in getting better and quicker germination.

Various workers have reported that germination per cent in banana seeds is very low. Simmonds (1959) observed 21.0 per cent viability for Gros Michel seeds, while Shepherd (1960) reported 5 to 25 per cent for triploid clones. Sathiamoorthy (1973) noticed germination per cent ranging from 0.003 to 0.600 in banana seeds.

The stimulating effect of sulphuric acid in seed germination of various crops, the seeds of which possess hard seed coat was revealed by many investigators. Jadhave (1960) observed 72 per

Table 1. Effect of seed treatments on germination of banana seeds

| Sl. No. | Treatments | Cross | | | | | |
|---|---|---|---|---|---|---|---|
| | | Palayankodan x Pisang Lilin | | Rasthali x Pisang Lilin | | Nendran x Pisang Lilin | |
| | | Number of seeds treated | Germinated | No. of seeds treated | Germinated | No. of seeds treated | Germinated |
| 1 | Conc. $H_2SO_4$ | 50 | 2 | 6 | Nil | 8 | Nil |
| 2 | Boiling water | 50 | Nil | 6 | " | 8 | " |
| 3 | Chipping testas | 50 | " | 6 | " | 8 | " |
| 4 | GA treatment | 50 | " | 6 | " | 8 | " |
| 5 | Control | 50 | " | 6 | " | 8 | " |

cent germination in hard, black seeds of canna upon chemical scarification with $H_2SO_4$ for 3 h. Hett (1971) found that in pelargonium seeds, possessing a hard seed coat, the germination could be enhanced by seed treatment with $H_2SO_4$ for 5 to 8 min. The acid treatment often helps to soften the hard seed coat, exposing the lumens of the macroscleroid cells and thereby permitting imbibition of water (Liu and Khatamian, 1981).

The hot water treatment was effective in improving germination of many crops. Aranjo *et al.* (1983) obtained 92 to 98 per cent germination in *Cassia multijuga* seeds when subjected to hot water treatment (60°C) for 20 min. However, in the present studies, there was no effect of hot water treatment on germination of banana seeds. Inhibitory effects of hot water on seed germination was established by several workers. Hartman and Kester (1972) suggest that exposure of seeds to high temperature is hazardous since it is likely to injure seeds. The mechanically sacrified (removal of a chip from lateral portion of seed coat to expose the endosperm) banana seeds when sown in soil, failed to germinate, as a result of their decomposition by microbes (Stotzkey *et al.*, 1962a). They suggested that such seeds

have to be germinated under artificial conditions.

Banana seeds do possess hard seed coat and as the various seed treatments have failed to enhance the seed germination per cent, new methods like embryo culture have to be tried. Advances in emyro culture methods have served to open the way effectively to obtain plants from seeds which are traditionally condemned and discarded due to their inability to germinate under normal conditions. The studies on embryo culture technique in banana seeds (Cox *et al.*, 1960) revealed that excised embryos do not exhibit any dormancy, and so embryo culture could be applied to increase the germination rate. Embryo culture technique has been effectively used in raising embryos from hybrid banana seeds in West Indies (Shepherd, 1968) and in United Fruit Company, Honduras (Rowe and Richardson, 1975).

This paper forms a part of the M.Sc. (Hort.) thesis of the senior author and the authors are thankful to Dr. M.Aravindakshan, Director of Research and Sri. V.K.G. Unnithan, Associate Professor for their valuable advice and suggestions as members of the Advisory Committee.

College of Horticulture
Vellanikkara 680 654, Kerala, India

**M.P. Krishnakumar**
**P.K. Valsalakumari**

## REFERENCES

Cox, E.A. Stotzky, G. and Goos, R.D. 1960. *In vitro* culture of *Musa balbisiana* Colla embryos. *Nature* 185: 403-404

De Langhe, E. 1969. Banana (*Musa* spp). *Outlines of Perennial Crop Breeding in the Tropics.* Verman and Zone, N.V. Wageningen, p. 63-65

Dodds, K.S. 1958. Problems and techniques in breeding new varieties of bananas. *Indian J.Hort.* 15: 210-214

Hartman, H.T. and Kestar, D.E. 1972. *Plant Propagation Principles and Practices.* Prentice Hall of India Private Ltd., New Delhi, p. 159-164

Hett, C.F. 1971. Germination studies with granium seed. *Proceeding of the Association of Official Seed Analyst.* New York Agri. Expt. Station Geneva, USA. 105-111

Jadhave, A.S. 1960. Canna seeds can be germinated. *Poona Agric. Col. Mag.* 51: 28-29.

Karmacharya, J.L. 1984. Pollen morphology, fertility and compatibility studies in banana. M.Sc. (Hort.) thesis. Kerala Agricultural University, Vellanikkara, Trichur

Liu, N.Y. and Khatamian, H. 1981. Seed coat structure of three woody legumes species, after chemical and physical treatments to increase seed germination. /. *Am. SOL. hort. Sci.* 106: 691-694

Purseglove, J.W. 1975. *Tropical Crops, Monocotyledons.* Vol.2. 2nd ed. The English Language Book Society and Longman, London, p. 356-377

Rowe, P.R. and Richardson, D.L. 1975. *Breeding Bananas for Disease Resistance, Fruit Quality and Yield.* Tropical Agriculture Research Series (SIASTSA), Lahima, Honduras, USA

Sathiamoorthy, S. 1973. Preliminary investigations on breeding potential of some banana clones. M.Sc.(Hort.) thesis, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu

Shepherd, K. 1960. Seed fertility of edible bananas. /. *hort.* Sri. 35: 6-30

Shepherd, K. 1968. Banana breeding in West Indies. *Pests. Arts. News Summ.* 14: 370-379

Simmonds, N.W. 1952. The germination of banana seeds. *Trop. Agric. Trin.* 29 (3): 2-16

Simmonds, N.W. 1959. Experiments on germination of banana seeds. *Trop. Agric.* 36: 259-273

Simmonds, N.W. 1962. *The Evolution of Bananas.* Longman, London, p. 32

Simmonds, N.W. 1966. *Bananas.* 6th ed. Longman, London, p. 512

Stotzky, G., Cox, E.A. and Goos, R.D. 1962a. Seed germination studies in *Musa.* I. Scarification and aseptic germination of *Musa balbisiana. Am.J..Bot.* 49: 515-520

Stotzky, G., Cox, E.A. and Goos, R.D. 1962b. Seed germination in *Musa II.* Alternating temperature requirement for the germination of *Musa balbisiana. Am. Bot.* 49 (7): 763-770

□□□