

## PROPAGATION OF INDIAN CYCADS: METHODS AND PRECAUTIONS

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**ABSTRACT:** Among all the living organisms, cycads are the most threatened and they are at verge of extinction in wild. Cycads need urgent protection and this can only be achieved through *in-situ* and *ex-situ* conservation. Through *ex-situ* conservation, several endangered cycad species are propagated, multiplied and popularized as ornamental for use as houseplants and landscaping purpose. In the present paper, methods and precautions in propagation techniques of four Indian cycads are discussed.

**Keywords:** Indian cycads, conservation, propagation, seeds, suckers

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Cycads are the most threatened group of organisms on earth with almost 64% of cycads are at the risk of extinction (Barnosky *et al.*, 2011). They are the oldest living seed plants and have survived three mass extinctions. Four species of cycads are now extinct in wild and can only be seen in botanic gardens. All the surviving species of cycads are under threats from various abiotic and biotic pressures and were listed amongst the most threatened plant families in the world in the 1997 IUCN Redlist of Threatened Plants (Walter and Gillet, 1998). They are threatened in wild due to clearing of forest, unsustainable harvesting of cycad seeds and forest fire. Walters (2003) pointed out that a successful long-term conservation of cycads can be achieved through combination of *in-situ* and *ex-situ* conservation. Protection of wild populations through establishment of conservation sites need proper policy making and co-operation of forest dwellers.

*Ex-situ* conservation is a boon for this rare and threatened group of plants in restoring its natural populations and protection from other biotic and abiotic factors including natural calamities and habitat destructions. *Ex-situ* conservation of cycads through a network of botanic gardens played an important role in conservation of threatened cycad species (Hill *et al.*, 2003). Some of the botanic gardens which conserve a good representative of cycads are Fairy Lake Botanical Garden (China), Montgomery Botanical Garden (United States), Nong Nooch Tropical Garden (Thailand), Lowveld National Botanic Garden (South Africa), Royal Botanic Gardens, Kew (UK) and Royal Botanic Gardens, Sydney (Australia). In India, only few botanic gardens carry out *ex-situ* conservation of cycads. Cycad Conservation Centre at CSIR-NBRI Botanic

Garden which comprises of three plant houses namely Cycad House, Jurassic Gallery and Conservatory is only such centre in India for *ex-situ* conservation for this endangered and threatened group of plants. The centre houses 56 species of cycads including 7 species of Indian Cycas.

At present, three species of *Zamia* and four Indian species of *Cycas* namely *Cycas beddomei*, *C. pectinata*, *C. sphaerica* and *C. zeylanica* have been propagated and multiplied in the Conservation Centre.

### MATERIALS AND METHODS

Four species of Indian cycads were used to carry out the study. Seeds of *Cycas beddomei*, *C. pectinata* and *C. sphaerica* were collected from their natural habitats during 2013-2014. For vegetative propagation, offshoots (suckers) of *Cycas zeylanica* from the Conservatory were used.

Cycads are generally propagated through seeds and offshoots. Seed germination needs specialized techniques and care which differ slightly species-wise. In seed germination, breaking dormancy is the main problem faced by all the cycads. Germination is fast in seeds without fleshy outer coat than with it. As soon as the matured seeds are collected, the fleshy outer coat should be removed in order to avoid spread of rot resulting from the decay of the fleshy coat. The coat may be removed with a knife exposing the hard inner shell. The seeds should be treated with fungicide before storing in a hanging basket preferably in shade with proper aeration and moderately cool temperature (preferably 25-27°C). Holding capacity of seeds differ in species and also in individual seeds. Seed holding is a time period where embryos undergo development into fully mature stage before germination. In some cycads, seed holding capacity may last few weeks and in some, it

may take many years. Among Indian species, mature seeds of *Cycas pectinata* complete holding time in 2-3 months and germinate readily in few weeks. Seeds of *C. beddomei* and *C. sphaerica* have longer holding time and may extend upto 5-7 months or even one year. Dissecting one or two seeds every month help in knowing the stage of embryo development and avoid drying off. Seeds with fully grown embryo can be sown during April to July. Vegetative propagation through offshoots (suckers) should be carried out in June-July. Bulbs or suckers are produced mainly at the base of the trunk however they may occur throughout the length of the trunk. Like *C. rumphii*, *C. zeylanica* produce several bulbs throughout the entire length of the trunk. Bulbs can be removed using sharp knife and it should be make sure that all the leaves on the bulbs are removed. Wounds both on the parent and bulbs should be clean and treated with fungicides. In order to initiate rooting, root hormones can be applied on the bulbs.

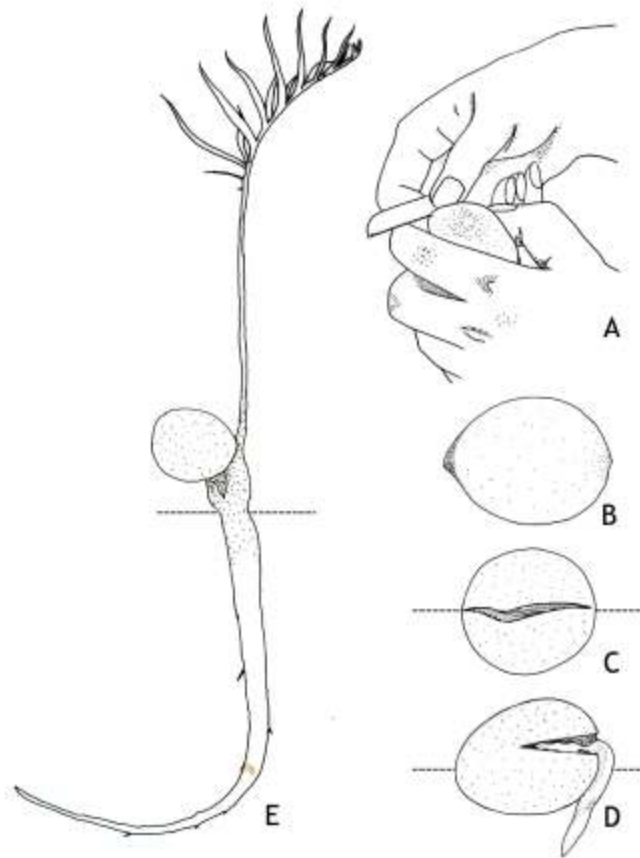
**Growing medium and watering**

Seeds as well as offshoots require sterile well drained growing medium. In the wild, cycads are most often

found in situations where water drains away quickly, such as on limestone, sandy soils and mountain slopes (Tang, 1995). Roots will rot if there is poor drainage. Hence the growing medium should be able to drain out water as soon as it is poured in. The most preferred medium for sowing seeds for Indian species is 1:1, sand (coarse) and peat mould. The peat mould should be well treated with insecticide and fungicide before use. As for the offshoots, the medium should be 3:2. Seeds should be placed horizontally on the growing medium with half seed buried and half seed exposed. This will help in easy germination and facilitate growth of seedling.

**Care for seedlings**

The seedlings just after germination should be transplanted to deep pots for better development of tap roots which will help in good intake of nutrients and eventually improving its growth. Young seedlings like warmth and humidity. Water regularly however water logging should be avoided. Spraying of insecticides and fungicides once in fortnight helps in keeping away infections. Adding of organic nutrients helps in better growth.



**Figure 1:** A. Removal of fleshy outer coat using sharp knife, B. Seed after removal of outer coat, C. Initial stage of germination, D. A germinated seed, E. A ten months old seedling



**Figure 2:** (A) A female plant of *Cycas beddomei* with matured seeds in natural habitat in Tirumala Hills, Andhra Pradesh, (B) Young seedling of *Cycas beddomei*, (C) Germinated seed of *Cycas pectinata*, (D) Seedlings of *Cycas sphaerica*.

## CONCLUSION

Cycads are hardy but slow growing plants with attractive leaves and growth habit. Due to lack of knowledge on its cultivation and propagation techniques, *ex-situ* conservation of Indian cycads has not been successful. The seed germination of cycads need patience as it takes long time to germinate as compared to vegetative propagation.

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## REFERENCES

- Barnosky AD, Matzke N, Tomiya S, Wogan GOU, Swartz B, Quental TB (2011) *Has the Earth's sixth mass extinction already arrived?* Nature 471: 51–57.
- Hill KD, Chase MW, Stevenson DW, Hills HG, Schatzman B (2003) The families and genera of cycads: a molecular phylogenetic analysis of Cycadophyta based on nuclear and plastid DNA sequences. International Journal of Plant Sciences 164(6): 933-948.
- Tang W (1995) *Handbook of cycad cultivation and landscaping*. Tang, Florida (U.S.A)
- Walters TW (2003) Off-Site Collections. pp. 48-53 in Donaldson, J. (ed.) *Status survey and conservation action plan: Cycads*. IUCN (World Conservation Union), Switzerland.
- Walter KS, Gillet HJ (eds) (1998) 1997 IUCN Red List of Threatened Plants. Compiled by the World Conservation Monitoring Centre. IUCN -The World Conservation Union: Gland.