

## Short Communication

# Seed biology of *Coscinium fenestratum* (Gaertn.) Colebr.- A critically endangered medicinal plant of Western Ghats

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*Coscinium fenestratum* (Gaertn.) Colebr. is a rare and endemic medicinal plant locally known as “Maramanjai” belonging to the family Menispermaceae. Due to its high economic and medicinal value, the species is overexploited from the wild and it is very rare and need high conservation value. The species is under severe threat due to several reasons including its reproductive inefficiency. The present study aimed to analyze the seed biological characters and germination rate in the natural as well as in the laboratory condition. The fresh seeds showed 65% viability and 28% germinability. But the seeds pretreated with GA<sub>3</sub> (1000-4000 ppm) showed 55 to 70% germinability and 79% of the seed germination observed after 6 months.

**Key words:** *Coscinium fenestratum*, endangered, medicinal plant Seed biology, Western Ghats.

## INTRODUCTION

*Coscinium fenestratum* is a dioecious, large, woody climber, a more or less primitive group, indigenous to the Indo-Malayan region. In India, it is restricted to the few habitats of Western Ghats, mostly in the high rainfall receiving wet evergreen forests, moist evergreen, semi-evergreen and semi-deciduous forests at 500 to 750 m asl (Mohan and Sivadasan, 2002). It grows well in humus rich soil having good drainage and areas receiving more than 2000 mm rainfall with an annual mean temperature of 27°C (Ravikumar and Ved, 2000).

It has very high economic value and it is extensively used in Ayurveda and Siddha preparations, for the treatment of digestive disorders, chronic fevers, wounds and ulcers. Its stem has long been used in South India and Sri Lanka as a yellow dye and bitter tonic and has found its way to Europe under the name False Calumba or Tree Turmeric. The roots and stem are reported to contain alkaloids berberine, dihydroberberine, noroxyhydrastine, berberine etc. The medicinally active compound of *C. fenestratum* is berberine, an isoquinoline alkaloid with numerous bioactivities (Birdsall and Kelly,

1997). The drug is useful in vitiated conditions of *kapha* and *vata*, inflammations, wounds, ulcers, jaundice, burns, skin diseases, abdominal disorders, diabetes, fever and general debility (Agusta, 2003). It purifies the blood and decoction of stem is given internally in cases of bites from monkeys, snakes, brahmin-lizards and geckos. The root bark is used for dressing wounds, ulcers and in cutaneous leishmaniasis. *Coscinium* is also used to treat bleeding piles and excessive bleeding during menstruation. The paste of *Coscinium* and turmeric is applied for snakebite. It is used in over 62 ayurvedic preparations like Aswagandharishtam, Khadirarishtam, Anuthailam, Katakakhadiradi kashayam, Elaneer kuzhampu, Mahapanchagavyam etc. Other preparations made include Infusum *Coscinii*, I.C.A.-infusion of *Coscinium*. Liquor *Coscinii* Concentratus, I.C.A.-concentrated solution of *Coscinium* and Tinctura *Coscinii*, I.C.A.-tincture of *Coscinium*. Stem pieces are used against rheumatism, jaundice and skin diseases by the Oorali tribes of Idukki district and Kaadar tribes of Thrissur district of Kerala (Udayan et al., 2005).

Population studies of *C. fenestratum* revealed that they survive and regenerate naturally in disturbed habitats compared to undisturbed forest. Assessment of genetic diversity in *C. fenestratum* using RAPD markers revealed

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Figure 1a. Adult plant.



Figure 1b. Mature fruiting twig.



Figure 1c. Germinated seedlings.

that there was less genetic diversity between the populations. This slow growing liana takes 10-15 years to reach its reproductive stage. But due to its huge demand for industrial consumption, it gets chopped down before it

is fit to regenerate and also the traders directly engage tribals and other collectors for the supply of raw drug. Combination of rampant destruction of the forests along with over exploitation of the species for the raw drug market and very slow rate of regeneration has seriously depleted its population in the wild, making conservational measures very urgent. The threat status of this species has been assessed as Critically Endangered for Karnataka, Kerala and Tamil Nadu in India, due to more than 80% decline in the wild populations over the last 30 years. In India and Sri Lanka, *C. fenestratum* has already been listed as an endangered species (Ravikumar and Ved, 2000). Hence, this species is now banned from export by the Ministry of Commerce, Govt. of India (vide notification No. 47 (PN)/92-97 dated 30 March, 1994).

The species is under severe threat due to degradation of natural habitat, reproductive inefficiency, forest dwelling nature, habitat specificity, and fragmentation of population and unscientific overexploitation of the plant for medicinal purposes which have resulted in the dwindling of population in the wild. Therefore, the present investigation was aimed to study the seed biology of *C. fenestratum* including seed moisture content, seed viability, seed storage and germinability for the sustainable growth of this endangered species in the wild.

## MATERIALS AND METHODS

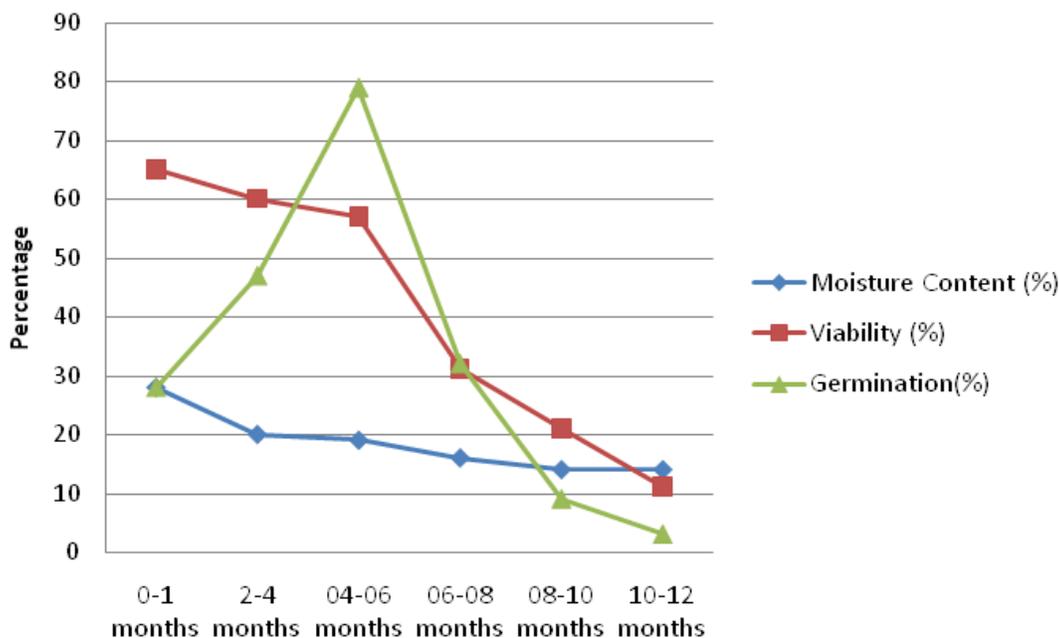
The mature plants of *C. fenestratum* (Figure 1a) were located from the different forest ranges of Kuzhathupuzha and Wyanad of Kerala, India. Fruits (Figure 1b) and seeds maturation periods were studied on 25 individuals and seed moisture content, viability and germination percentages were also analyzed at different periods of storage ranging from 0 to 21 months.

Seed moisture content was calculated by the given formula developed by International Seed Testing Association and the viability of the seeds was analyzed as per the method suggested by Enescu (1995). The seeds were collected from individual plants separately during the fruiting seasons. Three replicates of 50 seeds were germinated every month to determine the optimal seed germination and seedling establishment. Quantitative features such as the number of days taken for seed germination and percentage of seed germination in the field as well as in the laboratory conditions were also analyzed periodically.

## RESULTS AND DISCUSSION

The seeds were collected from matured fruits randomly and stored in the polycarbonate bottles to avoid the loss of viability at the exposed conditions. The stored seeds at this condition showed better results. The moisture content of the fresh seeds was 28% at the time of ripening/ detached from the mother plant. The fresh seeds showed 65% viability and 28% germinability in the field/ laboratory stored condition. When the fresh and seeds of 4 to 6 months old when pretreated with different concentration of  $GA_3$  (1000 to 4000 ppm) showed 55-70% germinability (Figure 2). There was 79% of the seed

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**Figure 2.** Seed germination at different time intervals in *C. fenestratum*.

germination observed at 6 months period but at the same time the moisture content was reduced to 19% (9% reduction from the initial moisture content). This is the optimal moisture content for the better seed germination of *C. fenestratum*. After 6 months, there was a considerable moisture reduction and viability observed, subsequently the seed germination percentages were also decreased (<3%). The similar results were observed by several authors (Tushar et al., 2008; Jose et al., 2003) and confirmed the seed germination of *C. fenestratum*. Incidentally, the embryo is fully developed at the time of ripening/ dispersal and dormancy period of up to 6 months may be controlled by some other physiological factors such as GA<sub>3</sub> ratio. The actual factors responsible for determining the dormancy was not studied so far. These factors such as low viability of seeds and poor seed germination alone or in combination with others are the responsible for the reduction of *C. fenestratum* in the wild condition.

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