

Cost effective and *ex-situ* (Seed Germination) conservation of *Cullenia exarillata* Robyns. an Endemic and Keystone species in Western Ghats, South India

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Abstract

The Western Ghats is a chain of mountains and is one of the 33 recognized ecologically sensitive zones in the world. There are several centres of plant endemism and species richness within the Western Ghats. *Cullenia exarillata* Robyns is a large evergreen tree in the mid-elevation evergreen forests which is endemic to Western Ghats. This tree acts as a hot bed of activity when in flower and functions as a keystone resource for several species of arboreal mammals, including the endangered primate Lion tailed macaque and Nilgiri langur. A preliminary attempt is carried out to regenerate and restore the populations of *C.exarillata*. Seed germination studies were performed and seeds were treated using 3 different pre-sowing treatments. Seeds were soaked in Dithane-45 for 5 minutes, in cow dung extract for two nights and in gibberillic acid (100 ppm) for 24 hours. Untreated seeds were also used as control. Dithane-45 treatment showed 80% seed germination and the cow dung extract treatment showed 20% seed germination. Dithane-45 treatment promotes speedy seed germination when compared to other treatments. Therefore, pre-sowing treatment with Dithane-45 for 5 minutes was more effective for this plant.

Keywords: Western Ghats, *Cullenia exarillata*, keystone species, seed germination and Dithane-45..

1. Introduction

The Western Ghats is a chain of mountains, 1600 Km in length running parallel to the West cost of Peninsular India from the river Tapti to Kanyakumari, the southern tip of peninsular India. Western Ghats is one of the 33 recognized ecologically sensitive zones in the World, which is a home to 1500 flowering plants, at least 84 amphibian species, 16 bird species, 7 mammals, which are not only found nowhere else in the world, but also restricted to specific habitat niches. The significance of the Western Ghats is that along with its rich biodiversity, it also supports a rich Environment-dependant civilization of several thousand years. It is estimated that there are four thousand species of flowering plants known from the Western Ghats. Of these 1,500 (nearly 38 percent) are endemic [1].

Approximately 63 percent of India's woody evergreen taxa are endemic to the Western Ghats [2]. There are several centres of plant endemism and species richness within the Western Ghats. For instance, of the 280 woody endemic species found in the south of Karnataka, 70 species are endemic to the

southernmost Travancore region. This high level of diversity and endemism in the Western Ghats has conferred on them the hot spots statuses. The southern section of Western Ghats is by far the richest area in context to floristic composition and concentration of endemic taxa [3].

The Anaimalai is located at the northern end of the largest contiguous stretch of mountainous natural areas in the Western Ghats of south India. The large elevational range of the mountains supports diverse habitat types, including wet-montane forest/grasslands in higher elevations, wet-evergreen forests on the windward slopes and dry tropical forests on the leeward slopes. The forests here contain many biotic treasures including an amazing diversity of flora, herpetofauna, small vertebrates and invertebrates, a large proportion of which are unique to the Western Ghats. The mountains here are noteworthy for the mammalian specialties, including the endangered lion-tailed macaque and Nilgiri tahr and some of its locations are among the best bird-watching sites in south India - with potential sightings of rarities such as the Wynaad laughing thrush,

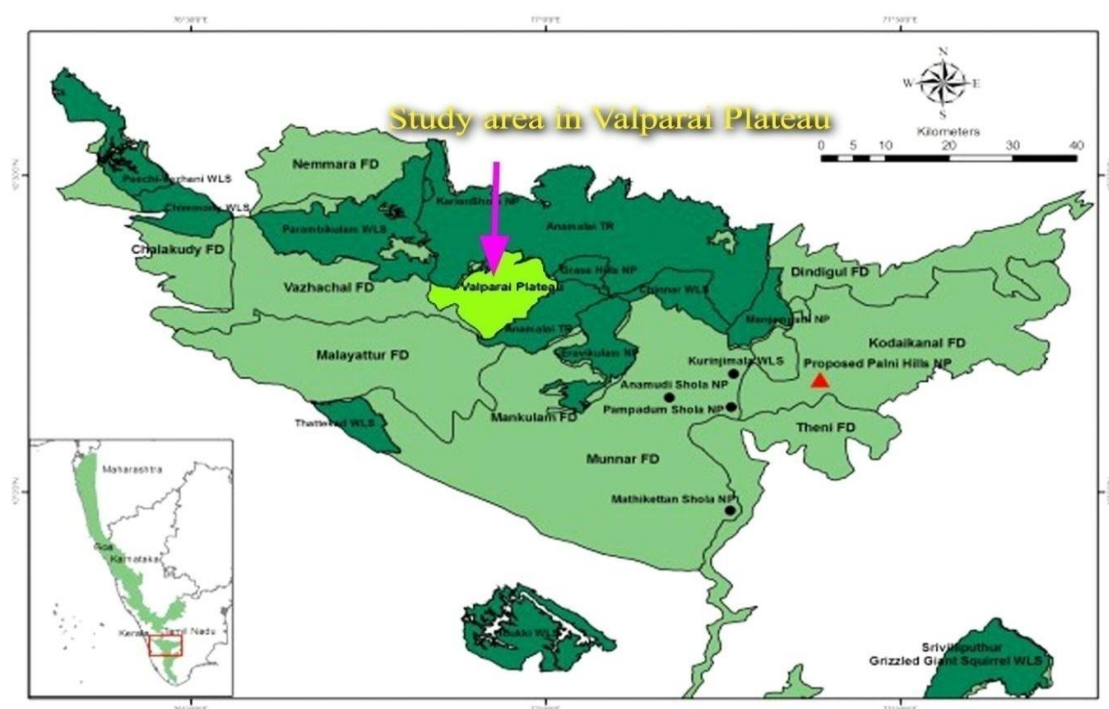
Malabar Trogon, Rufous Bellied Eagle and Great Pied Hornbill, among 300 plus species recorded from here. The Anaimalai also contains healthy population of megafauna, including tigers, elephants, leopards, wild dogs and gaur. As such, the Anaimalai mirrors the diversity of habitats, flora and fauna that occur throughout the Western Ghats of south India [4]. In the thickets of a tea-grower's paradise, patches of rich forest lie untouched by human avarice. In these oases thrives a great abundance of nature, where wildlife, and the observer of it, can roam freely. Many species of birds, mammals and other fauna endemic to the Western Ghats find sanctuary here. In the Anaimalai mountain range, the small plantation town of Valparai offers a big invitation for a rendezvous [5].

Cullenia exarillata an abundant canopy tree in the mid-elevation evergreen forests of Western Ghats is dependent on a variety of arboreal mammals including endangered primates and bats for its survival [6]. This tree acts as a hot bed of activity when in flowers and functions as a keystone resource for several species of arboreal mammals, including the endangered primate lion tailed macaque [7-9]. The seeds of *C. exarillata* are eaten by a variety of mammals both in the canopy and in the ground [10]. The macaques wait eagerly for the blooming of the *C. exarillata* tree. The occurrence of Lion-Tailed macaque is said to be dependent on the flowering of the *C. exarillata* in the forest. The entire forest is a visual treat of the floral outburst of *C. exarillata*. The yellow flowers contain nectars that attract the macaques. *C. exarillata* is a common tree in the mid-

elevation of the Western Ghats. It has spiny fruits, and the macaques feed on their seeds [11]. The role of *C. exarillata* as a keystone species for arboreal mammalian community has been well documented. The brownish-yellow tubular flowers in dense clusters around the terminal branches also attract many species of birds. 14 species of insectivores birds were recorded foraging within its inflorescence. The dense floral clusters are a veritable haven for insects. Preliminary sampling of insects has revealed that at least 14 families of insects are found in the canopy. In addition, three species of frugivorous birds also dined on the fleshy tubular calyx of *C. exarillata*. Various bird species of the mid-elevation evergreen forests seem to preferentially forage on this dominant canopy tree [12]. *C. exarillata*, an important keystone and endemic species very important for the survival of endangered Lion tailed macaque and Nilgiri langur, is on the verge of threat as a result of fragmentation and poor reproduction and regeneration.

1.1 Study Area:

Valparai is a taluk and hill station in Coimbatore district of Tamil nadu, India (Geographical Coordinates: Lat: 10°22'N; Lon: 76°58'E). It is located 3,500 feet above sea level on the Anaimalai hills range of the Western Ghats, at a distance of 100 km from Coimbatore and 65 km from Pollachi. The fragmented patches of ever green forest present in Monica, Korangumudi and Murugan estate of Anaimalai tiger reserve which is 10 km away from Valparai, was selected as the study area.



2. Materials and methods

2.1 Collection of seeds:

Collection of seeds of *Cullenia exarillata* were carried out during late December 2014 and early February 2015. Help was sought from local residues belonging to the local Tea private estate company to locate the places of occurrence of *C. exarillata* in ever green forest patches.

2.2 Propagation studies:

The seed germination studies were conducted at different places, viz., Murugan estate shade house, Monica estate tea Nursery and Botanical Garden shade house, Bishop Heber College. The Murugan estate shade house facility was established with the help of local people. The shade house which is a small make shift structure was constructed and maintained at the church premises in Murugan estate. The management of the Monica NC (New Clearance, Woodbriar Group-Valparai) plantations also volunteered to take up the germination studies as part of their Eco-care Measures. The collected seeds of *C. exarillata* were also carried to Tiruchirappalli and the germination study was also conducted at the shade house of Bishop Heber College (Plate 1).

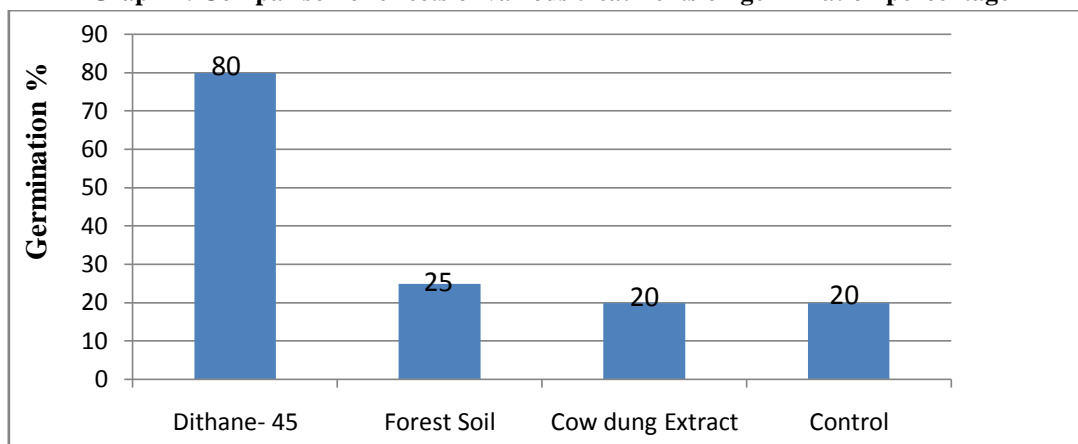
2.3 Soil media:

3 different soil media were used for seed germination studies [13]. Soil from the habitat of *C. exarillata* (forest soil) mixed with sand in two different ratios (1:1 and 3:2), and the red soil mixed with compost and sand (2:1:2). The jungle soil was heated under the direct sun light before sowing.

3. Results

The results revealed that germination percentage of *Cullenia exarillata* increased in seeds which were treated with Dithane-45. In Monica nursery, 24 seeds were sprouted out of 30 in 28 days which were treated with Dithane-45. 80% germination was noted in Dithane-45 treated seeds. The germination studies conducted at the Murugan estate shade house, maintained at the church premises revealed 25% germination. The germination was noticed after 70 days. The untreated seeds took 70 days for initiation of germination. 20% germination was noted in cow dung extract treated seeds and in the control. Germination was not observed in river bank of Korangumudi shola (Graph 1 and 2) (Plate 2).

Graph 1: Comparison of effects of various treatments on germination percentage



Graph 2: No. of days taken for germination

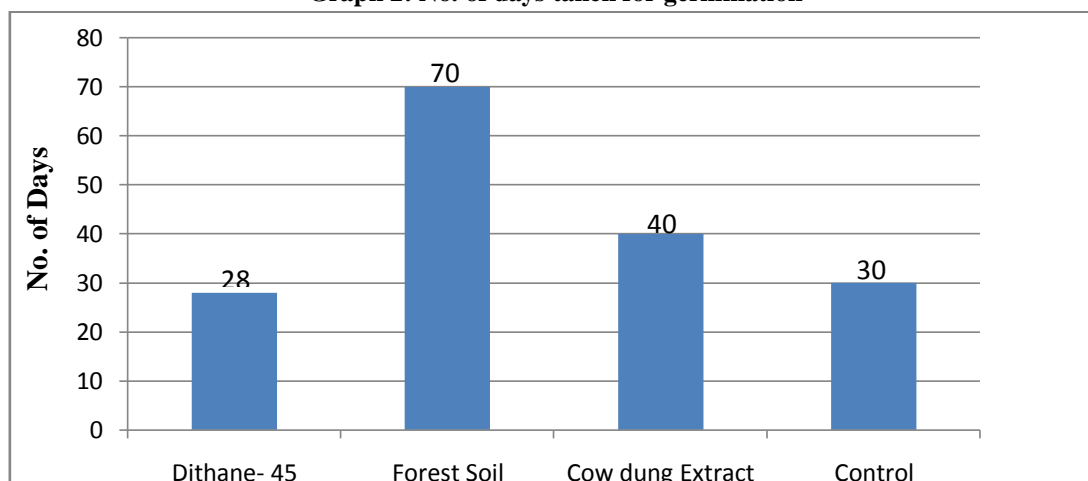


Plate 1: Germination and Propagation Studies on *Cullenia exarillata* in Different Places



Make Shift Structure Shade house in Murugan Estate at Valparai



Nursery in Monica NC (New Clearance) at Valparai



Shade House in Botanical Garden at Bishop Heber College



Plate 2: Germination Studies on *Cullenia exarillata* at Valparai and Bishop heber college
A, B, C. Seed Emerge out in jungle soil at valparai (Murugan Estate), D. Seed germination
in control, E, F. Seeds germination in treated with cow dung extract,

4. Discussion and Conclusion

The pre-sowing treatments were reported to enhance seeds germination [14]. According to obtained results Dithane-45 was the most effective treatment for the seed germination property in *Cullenia exarillata*. Speedy seed germination and high germination percentage reportedly noticeable in Dithane-45 when compare to cow dung treatment and the control. The study reveals that the untreated seeds

took more than two months for germination. This indicates that the seeds that fall in the natural areas under the mother tree are vulnerable to get damaged by the mammals that move under the tree and the seeds that fall at the edges of the fragments mostly are damaged in the road trafficking. The seeds that are treated and germinated under controlled environments revealed a positive response with speedy seed germination. The germinated seedlings will be maintained with the help of the youth members of the

local church and with the help of the private tea estate management.

The seedlings will be handed over to the forest department for regeneration and restoration.

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