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# REVIEW

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## Genus *Decalepis*

Jacob Leo, George Willams

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### ABSTRACT

Due to destructive wild harvesting, the steno-endemic species of the genus *Decalepis* are in grave danger. Due to its distinctive tuberous root traits and a vast variety of biological and therapeutic capabilities, the genus claimed significant importance to mankind. It's utilized in the pharmaceutical and food sectors, among other things. Plants of this genus are only found in a few places. Peninsular India, including the Eastern and Western Ghats, and according to the International Union for Conservation of Nature, *Decalepis* species are classified as globally threatened by the International Union for Conservation of Nature (IUCN).endangered. *Decalepis hamiltonii* Wight & Arn., *Decalepis hamiltonii* Wight & Arn., *Decalepis hamiltonii* Wight & Arn., *Decalepis hamiltonii* Wight & Arn. *Decalepis salicifolia* (J. Joseph & V. Chandras.) Venter, *arayalpathra* (J. Joseph & V. Chandras) (Bedd. ex Hook. f.) *Decalepis khasiana* (Kurz) Ionta ex Kambale, *Decalepis nervosa* (Wight & Arn.) Venter and *Decalepis nervosa* (Wight & Arn.) Venter All of the *Decalepis* species are utilized by indigenous peoples as well

as in traditional Indian and Chinese medicine. This plant's international trade is likewise growing, resulting in overharvesting. Traditional methods of propagation, such as seed germination and vegetative propagation are restricted and endanger species populations, whereas plant tissue culture allows for massive plant development in vitro without harming natural environments. This study aims to organize current information about the *Decalepis* genus, including geographic distribution, chemical profile, pharmacology, biological activity, micro propagation, somatic embryogenesis, synthetic seed, and genetic transformation.

**Key Words:** Medicinal plants; Natural products; Bioactive metabolites; Tissue propagation

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### INTRODUCTION

India, being a megadiverse nation, is home to about 17,000 angiosperms, with four major hotspots (Himalaya, Western Ghats, Indo-Burma, and Sundaland) out of thirty-four hotspots. India has 11% of the world's flora, with around 28% of the overall Indian flora being indigenous, and 33% of angiosperms existing in the nation. These biological habitats are threatened by increasing human population and interference, deforestation, and agricultural land development in the forest area, necessitating specific care *Decalepis* species are restricted to a few forest areas in Tamil Nadu, Kerala, and Andhra Pradesh, India. Plants grow in patches on exposed rocky slopes that are subjected to strong wind speeds and moderate rainfall throughout the year. *D. hamiltonii* (Wight & Arn.) Venter, *D. arayalpathra* (J. Joseph and V. Chandras.) Venter, *D. salicifolia* (Bedd. Ex Hook.f.)

Venter, *D. nervosa* (Wight & Arn.) Venter, *D. khasiana* (kurz) Ionta ex Kambale, and *D. khasiana* (kurz) I The International Union of Conservation of Nature (IUCN) classified *Decalepis* as Critically Endangered globally and proclaimed it a red-listed medicinal plant retrieved on February 12, 2022). The Indian National Biodiversity Authority (NBA) has designated the species as being of high conservation concern. The native Kani tribes of the Southern Western Ghats employ the herbs in traditional Indian and Chinese medicine to treat disorder in the lungs, digestive, and circulatory systems, stomach discomfort, cancer-like ailment, peptic ulcer, and as a revitalising tonic. The root tuber is the most essential plant portion, as it is a rich source of several alkaloids and phenolics. The tuberous root contains 97% 2-hydroxy-4-methoxybenzaldehyde (2H4MB), which is used to make the economically significant taste component vanillin. These

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Editorial Office, *Journal of Genetic Disorder and Genetic Medicine*, London, United Kingdom

Correspondence: Lilian Sinte Masule, Editorial Office, *Journal of Genetic Disorder and Genetic Medicine*, London, United Kingdom. e-mail: geneticmedres@esciencejournal.org

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species are a possible alternative for *Hemidesmus indicus* on the worldwide market due to the presence of fragrance (2H4MB) in the tuberous root. Because of its significant medical value, including as anti-cancerous, anti-ulcer, anti-oxidant, anti-inflammatory, anti-hyperglycemic, anti-venom, and anti-microbial qualities, the plant *H. indicus* is frequently employed in Ayurvedic and Unani systems of medicine. The tuberous root of *H. indicus* is very short and thin, and it is securely linked to the soil, requiring a lot of work to uncover the root tuber, but the tuberous roots of *D. hamiltonii* are big and plump, and they are loosely attached to the soil, requiring less exertion. Because of the abundance of tuberous roots in the genus *Decalepis*, the plant is in high demand as a substitute for *H. indicus* on the global market, with thousands of tonnes traded each year from uncultivated wild sources. Over exploitation and uncontrolled collecting have pushed the species to the brink of extinction. As a result, a useful outline for the species of the genus *Decalepis* is required for their long-term use whose field of expertise is the Convention on International Trade in Endangered Species (CITES). Regulates the trade of endangered species As a result, the current communication includes information on *Decalepis* species, their geographical distribution, current status, chemical ingredients, medicinal uses, and biotechnological interventions for the progress of *Decalepis* and their conservation through micro propagation.

**Genus *Decalepis*:** Due to destructive harvesting, the reported population of the genus *Decalepis* showed restricted range and occurrence in a recent research. Furthermore, niche specialisation, poor genetic diversity, restricted gene flow, fruit wasp damage, and genetic differentiation have all contributed to the species' decline in numbers. *Decalepis hamiltonii*, *D. nervosa*, and *D. khasiana* are climbing plants, whereas *D. salicifolia* and *D. arayalpathra* are upright shrubs found on rocky hill slopes of evergreen woods in poor soils. Except for *D. khasiana*, which is found in the easternmost portion of India, the species is endemic to the Eastern and Western Ghats of peninsular India. The most extensively spread species is *D. hamiltonii*, also known as Maredukommulu or Nannarikommulu in Telugu, Magalikizhangu in Tamil, and swallow root in English. The rocky slopes and crevices of dry and damp deciduous woods in Karnataka, Andhra Pradesh, and Tamil Nadu are where this species may be found.

Despite its widespread distribution, its population has been steadily declining as a result of destructive tuber harvesting. *D. arayalpathra* is a perennial lactiferous shrub that is also known as *Jankia arayalpathra*. It is only found in Kerala's Thiruvananthapuram district and Tamil Nadu's Tirunelveli and Kanyakumari districts. *D. salicifolia* has been found in the Anamalai Hills (Kerala and Tamil Nadu), Nelliampathy (Kerala), and Marayoor (Kerala) forests. The Nilgiris Mountains, as well as the Kothgiri and Wellington regions of Tamil Nadu are home to *D. nervosa*.

#### SYNTHETIC SEED PRODUCTION

Synthetic seed encapsulation has evolved as a cutting-edge method for germplasm conservation and plant material interchange. The somatic embryo, shoot tip, nodal segment, bulbs, and other parts of the plant can be encased in sodium gel, which is referred to as a synthetic seed. Synseed technology has several advantages, including the ability to exchange germplasm of this endangered and critically endangered plant, the ability to transport the capsules over longer distances due to their small size, and the ability to store the capsules for up to 8 weeks at a low temperature (4 °C). However, there are fewer reports on the employment of synthetic seed technologies on the *Decalepis* genus.

Germana and her associates. By encapsulating the juvenile nodal segment, devised a procedure for short-term preservation and conservation of *D. hamiltonii* utilising synthetic seed technology, and found that 4% Na-alginate and 100 mM CaCl<sub>2</sub>·2H<sub>2</sub>O are suitable for the gelling matrix and excellent Ca-alginate beads synthesis. Furthermore, the sodium content was noted to be high. The encapsulation is affected by alginate (Na-alginate) and calcium chloride (CaCl<sub>2</sub>·2H<sub>2</sub>O). Rooting, on the other hand, was not achievable in one step in this protocol, which necessitated a second phase. Rooting software As a result, the technology offers a unique method of storing and exchanging data. Of this indigenous plant germplasm and addresses a variety of issues connected to long-distance propagation plant germplasm transport. Shoot tips and nodal explants were encased in 3% sodium alginate and 100 mM CaCl<sub>2</sub>·2H<sub>2</sub>O in a recent publication by Rodrigues et al. on encapsulation techniques in *D. salicifolia*, and regeneration was accomplished after storage at a low temperature for up to 12 weeks.

#### Somatic Embryogenesis:

Production of somatic embryos in *Decalepis* is an uncommon occurrence, with just one early report accessible from Giridhar et al. who used leaf explants to create somatic embryoids in *D. hamiltonii*. MS + zeatin (13.68 M) + BA (10.65 M) was used to extract the callus from the leaf. On the same nutritional medium, embryo differentiation and maturation were achieved. When an even lower concentration of zeatin was applied, however, embryo differentiation improved, and MS + Zea (4.56 M) + BA (10.65 M) therapy was found to be more beneficial for embryoid maturation.

#### CONCLUSION

The key advancements of the genus *Decalepis* in terms of distribution, biology, and relevance are highlighted in this study. Furthermore, the review focused on biotechnological treatments and their progress in the *Decalepis* genus. The article explicitly states that *H. indicus* can be replaced with species from the genus *Decalepis*. *D. hamiltonii* is the most widespread and commonly utilised of the five species (*D. hamiltonii*, *D. arayalpathra*, *D. salicifolia*, *D. nervosa*, and *D. khasiana*). However, a more biased strategy is required to focus on improving 2H4MB production as well as better conservation of these vulnerable species. Effective methods for direct shoot regeneration from diverse explants have been described for *D. hamiltonii*, *D. arayalpathra*, and *D. salicifolia*, but for *D. nervosa* and *D. khasiana*, they have yet to be documented. As a result, a cloning procedure for these two *Decalepis* species that have yet to be discovered should be created. Similarly, for all species, callus-mediated organogenesis, somatic embryogenesis, and synthetic seed generation are understudied fields. The genus has yet to study genetic transformation, identification, and modification of the 2H4MB biosynthetic pathway to improve 2H4MB output.

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