

## Review Article

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## Medicinal Coleus (*Coleus forskohlii* Briq): Different Methods of Propagation – A Review

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**Abstract** *Coleus forskohlii* (Briq.), a prominent member of the Lamiaceae family, is a highly valued medicinal herb in Indian Ayurvedic medicine and the global pharmaceutical industry. Its primary therapeutic significance is attributed to forskolin, a unique labdane diterpene concentrated in the root tubers. Forskolin serves as a potent adenylate cyclase activator, making it indispensable for treating ailments such as hypertension, glaucoma, and congestive heart failure. However, the commercial cultivation of *C. forskohlii* faces significant challenges; conventional propagation via vegetative cuttings is often hindered by slow multiplication rates, seasonal limitations, and susceptibility to soil-borne pathogens. This review provides a comprehensive analysis of various propagation methodologies and biotechnological advancements aimed at enhancing biomass and forskolin yield. It evaluates the impact of plant density, cutting types, and planting methods on root productivity. A significant focus is placed on in vitro techniques, including shoot induction and callus formation using Murashige and Skoog (MS) media supplemented with specific growth regulators like BAP, NAA, and 2,4-D. Furthermore, the review explores the efficacy of brassinosteroids in promoting root development and the application of somatic embryogenesis and direct organogenesis for rapid, large-scale clonal propagation. These biotechnological approaches not only ensure the production of genetically uniform, disease-free planting material but also offer sustainable strategies for the conservation of this endangered medicinal species. By integrating tissue culture with elicitation strategies, the industry can better meet the rising global demand for forskolin while preserving natural germplasm.

**Keywords** Medicinal coleus (*Coleus forskohlii* Briq); Lamiaceae family; Direct organogenesis; Somatic embryogenesis; Brassinosteroid; Leaf explants; Stem cuttings; Forskolin

### 1 Introduction

*Coleus forskohlii* belongs to the family Lamiaceae is an important plant in Indian Ayurvedic medicine and herbaceous plant that usually grows at a height of 600–1,500 ft and is spread over the subtropical warm temperate climatic zones of India. It is an ancient and important root drug claimed to improve appetite, increase vitality and useful by curing the ailments like inflammation, flatulence, dropsy etc. (Rupp et al., 1986). It occurs in sub-tropical Himalayan regions from Kumaon to Nepal, Bihar and Deccan plateau of southern India. It is widely cultivated in Rajasthan, Maharashtra, Gujarat, Karnataka, Tamil Nadu and Andhra Pradesh and its present annual production is about 100 tons from the area of 700 ha in India, cultivation of *C. forskohlii* is picking up in recent years. It is a fast-growing herb and hence more amenable to get exposed to variety of environmental stress.

It is Commercially propagated by the means of vegetative cuttings (Reddy et al., 2001). Conventional means of propagation through vegetative cuttings is not suitable to meet the increasing demand of this species due to limited number of propagules produced in each cycle. In vitro propagation is the most efficient and reliable technique for production of ample planting stock of genetic uniformity. Its rapid mode of vegetative propagation makes it a suitable candidate for micro propagation (Biondi and Thorpe, 1982).

It is highly valuable as a medicinal plant due to a biologically active compound labdane diterpene present in the root tubers called 'forskolin' (Bhat et al., 1977). An active diterpenoid in roots, it poses multiple biological activities such as positive inotropic, anti-hypertensive and antiglaucoma (Seamon and Daly, 1981), which is