

Correlation and path analysis in shoot tip derived *in vitro* mutants of coleus (*Coleus forskohlii* Briq.) for high yield and forskolin content

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ABSTRACT

The present investigation was carried out at Tissue Culture Laboratory, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore during 2003-2007. Coleus ecotype 'Garmai' used as the mother plant for culture initiation. Based on the sensitivity studies, fourteen mutagenic treatments were formulated in completely randomized block design with three replications. The shoot tip derived mutants were evaluated. The results revealed that the highest positive and significant genotypic correlation of yield was observed with number of leaves plant⁻¹ and it was closely followed by number of laterals plant⁻¹. Other traits exhibited positive and significant genotypic correlations with yield were plant height and number of tubers plant⁻¹. The characters *viz.*, total alkaloids, essential oil and forskolin content showed negative correlation with yield. The path analysis of component traits on yield exhibited positive direct effects through the characters *viz.*, plant height, number of leaves plant⁻¹, tuber length, essential oil content and forskolin content. The direct effect was observed to be negative through number of laterals plant⁻¹, number of tubers plant⁻¹, tuber girth and total alkaloid content.

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Medicinal plants are one of the most important sources of medicines since the dawn of human civilization (Vedavathy, 2007). India is enriched with medicinal plant biodiversity and is one of the twelve-mega bio-diversity hot spot regions of the world having 2.4 per cent world's area with 8 per cent global diversity. The World Health Organization (WHO) estimated that 80 per cent of the populations in developing countries depend on traditional medicine for their primary health care needs. Medicinal plant trade is mounting rapidly in terms of volume and export. Total global herbal market is estimated at USD 62 billions having a growth rate of 7 per cent per annum and is expected to grow up to USD 5 trillion by the year 2050 (Kalpana *et al.*, 2004). Thus an enormous scope exists for India to emerge as a major player in the global herbal product based medicines. Recent years have witnessed a rapid growth in the world demand for essential oils and natural chemicals used in drug synthesis, food flavouring, fragrances, perfumes, cosmetics and related products. One such an important medicinal plant is medicinal coleus (*Coleus forskohlii* Briq.). The tuberous roots of coleus are found to be a rich source of forskolin, a diterpenoid activates Cyclic Adenosine Monophosphate or cyclic AMP in the cells (Bhat *et al.*, 1977). *C. forskohlii* is the only known natural source of forskolin. Due to its multifaceted pharmacological effects, forskolin is used for the treatment of eczema (atopic dermatitis), asthma, psoriasis, cardiovascular disorders

and hypertension, where decreased intracellular cAMP level is believed to be a major factor in the development of the disease process (Rupp *et al.*, 1986). The extent of genetic variation in *Coleus forskohlii* is limited. Continuous vegetative propagation for many years has reduced the vigour, tolerance to biotic and abiotic stress causing low yields. Hence yield and quality is enhanced possibly by developing a mutant in this species with high tuber yield and improved forskolin content through *in vitro* mutation technique. The ultimate goal of crop improvement in coleus is to achieve improved tuber yield and forskolin content. Tuber yield is being a complex trait largely influenced by many component characters. The information on strength and direction of correlation of these component characters on tuber yield and *inter se* association among them would be useful in designing breeding programmes for yield improvement. The relationship between yield and its component characters is likely to vary according to the genetic material used and environment under which the material is evaluated as well as due to interaction of these factors. Therefore, it is worthwhile to study the heritable association between variables (Genotypic correlation) for identification of important yield components so that the weightage can be given to these characters of importance in further breeding programmes (Johnson *et al.*, 1955). Keeping these views, the present investigation reveals the correlation and path analysis of shoot tip derived *in vitro* mutants of coleus in