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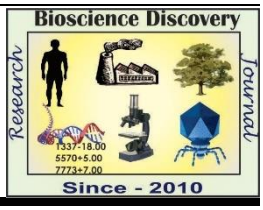

Influence of Triacontanol on Growth and Yield Attributes of *Coleus forskohlii* (Willd.) syn. *Plectranthus barbatus* (Andr.)

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Abstract

Coleus forskohlii Syn. *Plectranthus barbatus* is an important, aromatic, tuberous root bearing medicinal herb that has been part of traditional folk medicine and Ayurveda since centuries. It has multitherapeutic value, used against glaucoma, hypertension, intestinal disorders, respiratory disorders, heart diseases, skin diseases, thyroidal malfunctioning etc. This species root is an exclusive source of an active labdane diterpene forskolin which is an adenylate cyclase activator with a diversified pharmacological effect. In view of the medicinal and economical value of this herb, an experiment was conducted to determine the influence of foliar application of triacontanol (Vipul) on the growth and yield of *C. forskohlii.* One-month old well-established plantlets were sorted out and sprayed with triacontanol at 5 ppm and 10 ppm concentration weekly once for four successive weeks. Plants sprayed with D. W. were used as a control. Both concentrations of triacontanol significantly enhanced shoot and root length, number of leaves, average leaf area per plant, total leaf area, number of branches, number of roots, root circumference, stem base circumference, fresh weight and dry weights of leaf, stem and roots, chlorophylls and carotenoid content of leaves of *C. forskohlii*. Triacontanol at 10 ppm concentration found to be more promising in improving overall growth and root yield of *C. forskohlii* as compared to control and 5 ppm dose of triacontanol.

INTRODUCTION

Plectranthus barbatus syn. *Coleus forskohlii* is an aromatic, traditional, tuberous root bearing medicinal perennial herb belonging to mint family Lamiaceae. It is subtropical warm temperate species, grows about 45-60 cm in height. It has quadra-angular hairy stem with simple leaves about 7.5-12.5 cm in length, 3-5 cm in width, fleshy, hairy, narrowed into petioles. Inflorescence is raceme with purple, stout, bilabiate flowers. It bears highly diversified root stock – tuberous, semi-tuberous or fibrous having varied biochemical composition which are an exclusive source of labdane diterpene forskohlin/forskolin. Forskolin imparts multitherapeutic value to this species. It is widely used traditional medicine from centuries, effective against heart diseases, lung diseases, intestinal dieorders, thyroid mal functioning, respiratory disorders, insomnia, convulsions, obesity, glaucoma, painful urination, asthma, stomach ache etc. Its leaves are also medicinally useful (Shah, 1989; Kavitha *et al*., (2010); Lakshmanan *et al*., (2013). The plant also has an essential oil (Misra *et al*., 1994). Triacontanol is a novel plant growth regulator which is a long chain aliphatic primary alcohol popularly used as a potent growth stimulator. Its efficiency as a growth promotor has been very well established in many agricultural crops (Ries and Houtz, (1983); Naeem *et al*., (2009), (2010); Idrees *et al*., (2010) and Hashmi *et al*., (2011).

In view of this, influence of foliar application of triacontanol on various aspects of growth and development of *C. forskohlii* was assessed in the present investigation.

MATERIALS AND METHODS

Healthy, uniform, 14 cm. long, terminal stem cuttings of local variety of *C. forskohlii* with 3 pairs of leaves were obtained from local farmers. The basal part stem cuttings were disinfected by dipping in 0.1% carbendazim (Bavistin) solution for 10 min. and then they were washed with D. W. and planted in a nursery area. One-month old well-established, healthy, uniform plantlets were selected, transplanted in well sun dried, disinfected well irrigated soil for the foliar application of triacontanol (Vipul). The experiment was conducted in the campus of Botany Department, Shivaji University, Kolhapur. The plants were grown under natural uniform environmental condition.

Application of PGR and Growth analysis

After one month of transplantation, equally grown, well established plants were subjected to foliar application of triacontanol. Spraying was done with the help of a hand sprayer in the form of fine spray till the leaves of the plants get wetted completely. The spraying was done weekly once for four successive weeks. The treatments included control (D. W. sprayed plants) and two different concentrations of triacontanol (Vipul) at 5 ppm and 10 ppm. The plants were watered twice in a week at initial stages of growth which was then reduced to once in a week at later stages of crop growth. The growth analysis was assessed at the harvest stage that is at 165 DAP (days after plantation). Five plants from each foliar treatment were uprooted, washed with water and various growth attributes such as shoot and root length, number of leaves and branches, leaf length and breadth, average leaf area, total leaf area, number of roots, average root and stem base circumference, fresh weights and dry weights of leaf, root and stem were measured. The plants parts were cut into pieces to determine fresh weights of leaf, stem and roots and then they were kept into oven for drying. The dry weights of various plant parts were recorded when it showed constant dry weight. Each value obtained after the growth analysis is a mean of 5 determinations and expressed on per plant basis.

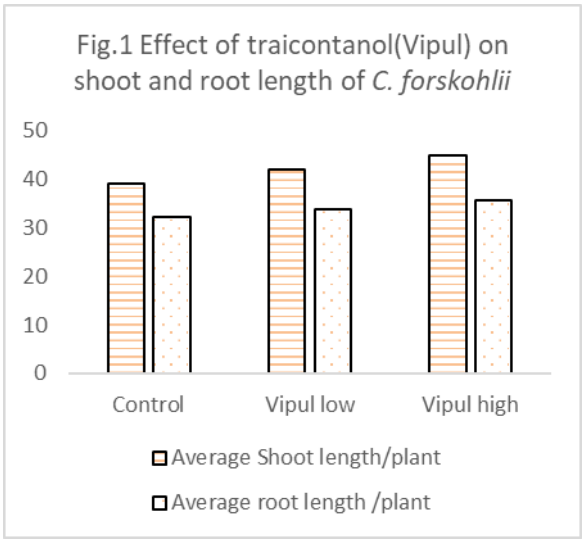
RESULTS AND DISCUSSION

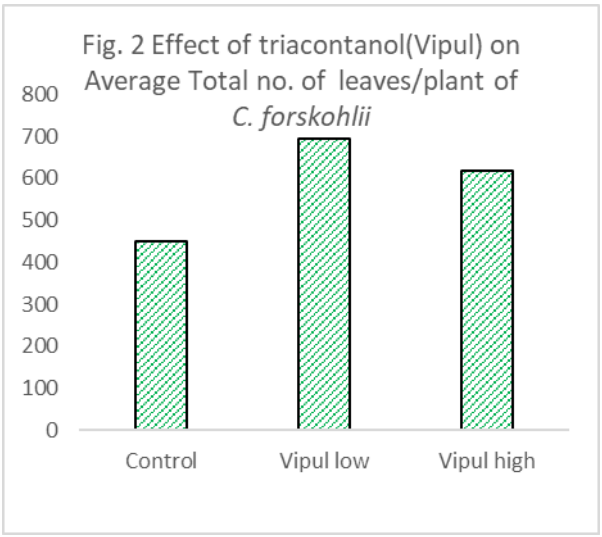
Effect of foliar application of triacontanol on growth and yield attributes

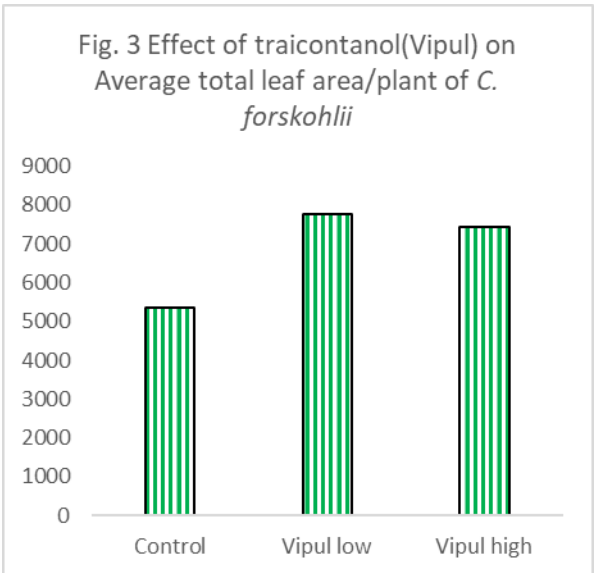
Both concentrations of triacontanol (5 ppm and 10 ppm) enhanced the overall growth and other yield parameters of *C. forskohlii* at 165 DAP/harvest stage such as shoot height, average total number of leaves, average leaf area per plant, average total leaf area per plant, average number of branches, leaf fresh weight and dry weight, stem fresh weight and dry weight, total number of tuberized roots per plant, average root length, root circumference, root fresh weight and dry weight per plant as compared to control. However, 10 ppm concentration of triacontanol was found more promising under given experimental conditions which significantly elevated all the shoot and root attributes. Being roots as most important sink organ of Coleus, both doses of triacontanol influenced root growth parameters significantly as compared to control. Our findings are in agreement with the results of many workers in various plants. The growth promoting ability of triacontanol on various growth parameters of various medicinal plants has been reported by Rao *et al*., (1989) in turmeric, Srivastava and Sharma (1990) in opium poppy (*Papaver somniferum*), by Misra and Srivastava (1991) in lemongrass (*Cymbopogon flexuosus* (Steud.) Watts.), Srivastava and Sharma (1991) in *Mentha arvensis* (L.), Shukla *et al*., (1992) in *Artemissia annua* (L.), Vasundhara *et al*., (1992) in Marjoram (*Majorana hortensis* Moench.) and by Gupta *et al*., (1992) in *Ocimum carnosum.* Balyan *et al*., (1994) in lemongrass var. ckp-25, Bhattacharya and Rao, (1996) in rose scented geranium var. Bourbon also reported positive effect of triacontanol on overall growth of the plant. In Ashwagandha (*Withania somnifera* L.), in *Artemissia annua* (L.), in *Mentha arvensis* L., in vetiver grass (*Chrysopogon zizanoids*), in *Ocimum basilicum* (L.), in ginger (*Zingiber officinale* Rosc.) and in lemongrass (*Cymbopogon flexuosus* Steud.) triacontanol was noticed to enhance the various growth parameters as reported by Nasir, (2009), Aftab *et al*., (2010), Naeem *et al*., (2011), Kamble and Chavan (2011), Hashmi *et al*., (2011), singh *et al*., (2012) and by Khan *et al*., (2014) respectively.

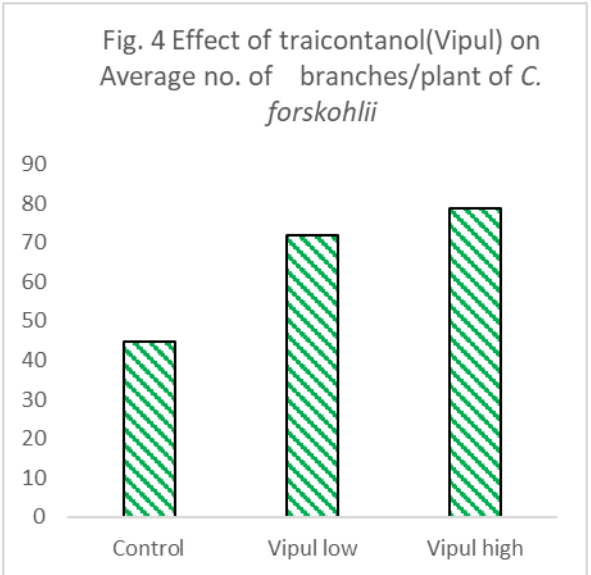
The elevation in various growth attributes in response to triacontanol was also reported by Kumaravelu *et al*., (2000) in green gram (*Vigna radiata*). The results found by Muthuchelian *et al*., (2003) about growth and biomass production are consistent with us. They reported that triacontanol treatment increased root and shoot length, leaf density, leaf area and fresh and dry weight of *Erythrina variegata* plants.

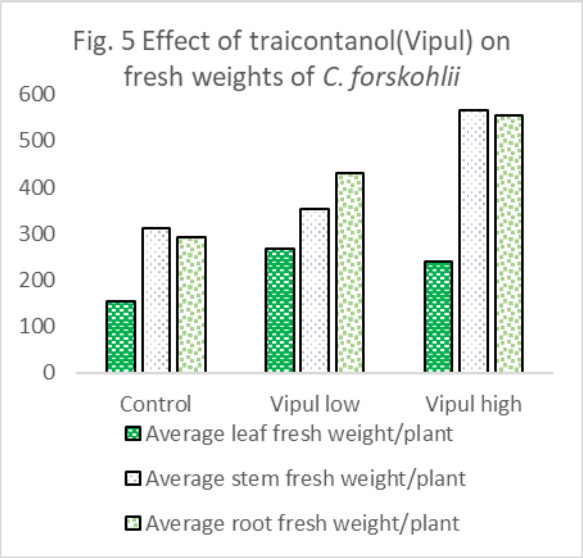
This stimulatory effect of triacontanol might be attributed to increased number of cells due to increased rate of cell division and cell expansion induced due to exogenous application of triacontanol. As proposed by Hangarter and Ries (1978), Ries and Wert (1992) the positive effect of triacontanol on plant growth and biomass accumulation most presumably due to effective and rapid translocation of triacontanol throughout the plant which brought about a cascade of metabolic activities resulting in significant boosting of plant growth and development along with increased root yield. This is also supported by Srivastava and Sharma (1991) and Naeem *et al*., (2010, 2011) who proposed that triacontanol causes increase in overall growth and yield of plant by increasing three most important growth attributes like shoot length, fresh and dry weights per plant. This proves consistent with our findings in *C. forskohlii*.

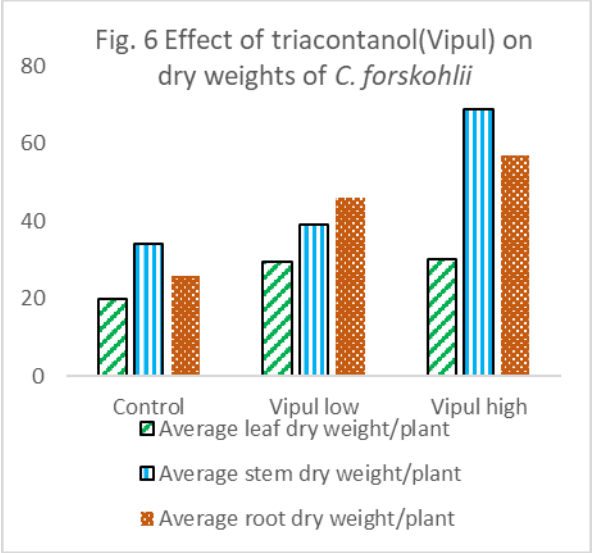


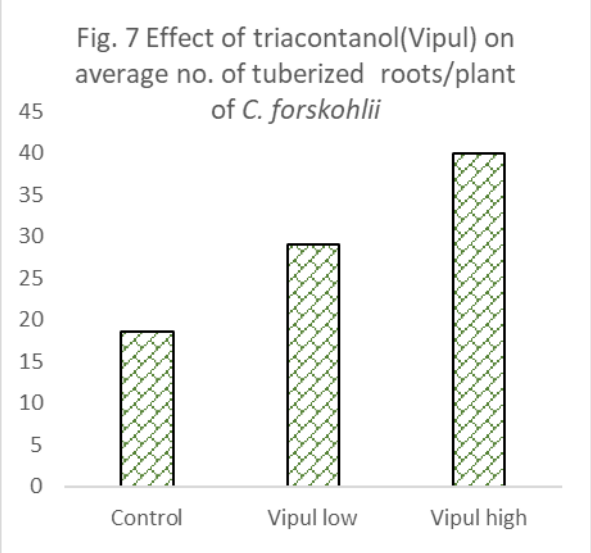












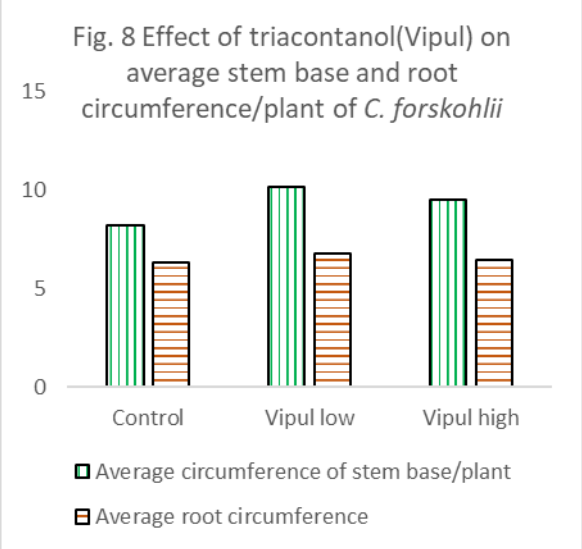


Fig. A. Effect of foliatr spray of TRIA. (Vipul) on growth of *C. forskohlii*. B. Effect of foliar spray of TRIA. (Vipul) on root growth. CN-control, VL- Triacontanol(Vipul) low (5ppm) dose, VH- Triacontanol(Vipul) high (10ppm) dose

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