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# Defence strategies adopted by the medicinal plant *Coleus forskohlii* against supplemental ultraviolet-B radiation: augmentation of secondary metabolites and antioxidants

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**Abstract**

Supplementary ultraviolet-B (ambient+3.6kJ $m^{-2}$ $day^{-1}$) induced changes on morphological, physiological, and biochemical characteristics (specifically the defence strategies: UV-B protective compounds and antioxidants) of *Coleus forskohlii* were investigated under field conditions at 30, 60, and 90 days after transplantation. Levels of secondary metabolites increased under s-UV-B stress; flavonoids and phenolics (primary UV-B screening agents) were recorded to be higher in leaves which are directly exposed to s-UV-B. This was also verified by enhanced activities of phenylpropanoid pathway enzymes: phenylalanine ammonia lyase (PAL), cinnamyl alcohol dehydrogenase (CAD), 4-coumarate-CoA ligase (4CL), chalcone–flavanone isomerase (CHI), and dihydroflavonol reductase (DFR). Antioxidants, both enzymatic (ascorbate peroxidase, catalase, glutathione reductase, peroxidase, polyphenol oxidase, and superoxide dismutase) and non-enzymatic (ascorbic acid and α-tocopherol) also increased in the treated organs of the test plant, higher contents being recorded in roots except for ascorbic acid. On the contrary, protein and chlorophyll content (directly implicated in regulating plant growth and development) declined under s-UV-B. These alterations in plant biochemistry led the plant to compromise on its photosynthate allocation towards growth and biomass production as evidenced by a reduction in its height and biomass. The study concludes that s-UV-B is a potent stimulating factor in increasing the concentrations of defense compounds and antioxidants in *C. forskohlii* to optimize its performance under stress.

**Key words**: antioxidants; *Coleus forskohlii*; oxidative stress; secondary metabolites; s-UV-B

**Abbreviations**: APX- ascorbate peroxidase; BSA- bovine serum albumin; CAD- cinnamyl alcohol dehydrogenase; CHI- chalcone flavanone isomerase; CAT- catalase; $C_i$- internal $CO_2$; DAT- days after transplantation; DCPIP- 2, 6-Dichlorophenol indophenol; DFR- dihydroflavanol