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SHORT COMMUNICATION

BIOCHEMICAL CONSTITUENTS UNDER DIFFERENT LIGHT INTENSITIES IN *ANDROGRAPHIS PANICULATA*

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An attempt has been made to study the effect of different light intensities on the concentration of total proteins, amino acids, carbohydrates and total chlorophyll in different parts of *Andrographis paniculata*. Increase in concentration of total proteins, amino acids and carbohydrates was observed in the plants grown in higher light intensity ($1.44x10^3$- $2.24x10^3$ μmol m^{-2} s^{-1}). The leaves of these plants showed increased amount of these metabolites compared to other parts. However, the total chlorophyll was found higher in the leaves of the plants grown in less light intensity ($0.24x10^3$-$0.96x10^3$ μmol m^{-2} s^{-1}). The results suggest that less light intensity hinders the production of total proteins, amino acids and total carbohydrates, while it has promoting effect on the synthesis of total chlorophyll.

Key words: **Amino acids, *Andrographis paniculata*, carbohydrates, chlorophyll, light intensity, proteins.**

Growth of a plant is greatly affected by many environmental conditions which affects the physiology of plant. Light, which predominantly originates as a radiant flux, is unique among the environmental factors acting as a driving variable, and individual organism may be affected by any one of its aspect such as; intensity, color, duration and direction (Kapur 1999).The medicinal plants are greatly affected by the change in light intensity as their medicinal property varies greatly with the change in light intensity. *Andrographis paniculata* (Kalmegh) is an important annual medicinal herb having astringent and anti-bacterial properties and is useful in treatment of diabetes, influenza, bronchitis, hepatomegaly, skin disorder and many such diseases (Patra *et al.* 2004). In addition to the alkaloid, the plant is also rich in other metabolites such as; total protein, amino acids and carbohydrates which act as the primary constituents for the growth of any plant which are greatly affected by changes in light intensity. The total chlorophyll content is also reported to be affected by changes in light intensity (Treshow 1970, Kapur 1999). In the present study an attempt has been made to analyze the effect of two different light intensities on the concentration of different metabolites in the plant.

Two months old plantlets of *A. paniculata* were brought from Anand Agricultural University and planted in experimental plots of size 10 x 10 ft with 50 x 50 cm spacing between two plantlets. The plantlets were then allowed to grow in two different light intensity conditions i.e., sunlight 1.44 x 10^3- $2.24x10^3$ μmol m^{-2} s^{-1} and shade 0.24 x 10^3-0.96 x 10^3 μmol m^{-2} s^{-1}. After proper acclimatization of one month, the plants were used for estimation of different metabolites. Estimation of metabolites like total protein, total amino acids, total carbohydrates and total chlorophyll content were carried

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out for different plant parts using standard methodologies of Lowry *et al.* (1951), Lee and Takahasti (1966), Witham *et al.* (1971) and Vernon (1960), respectively.

In the present study, light shows detrimental effect on the chlorophyll concentration. The plants grown in less light intensity show higher chlorophyll content compared to those grown in higher light intensities (Fig.1A). Similar results were reported by Kapur (1999) in *A. paniculata* and Baig *et al.* (2005) in grasses and legumes. This negative correlation between chlorophyll and light intensity for *A. paniculata* may be due to the fact that the leaves with high chlorophyll content do not photosynthesize more rapidly because they lack the enzymes or coenzymes which are the product of light reaction for reducing the available CO_2 (Salisbury and Ross 1974, Kapur 1999). The differences in the rate of photosynthesis between the light-grown and shade-grown plants are often associated with altered ribulose-1, 5-biphospahe carboxylase/oxygenase content under saturating CO_2 concentration (Stitt 1986, Seemann *et al*., 1987, Baig *et al.* 2005).

The concentration of other metabolites i.e., total protein, amino acids, carbohydrates was found higher in the leaves of plants grown under higher light intensity.

The content of total amino acids was more in leaves compared to the stems and roots. The plants grown in shade showed comparatively less amount of amino acids (Fig.1B). The highest concentration of total proteins was observed in the plants grown in sunlight condition. The maximum amount of total protein was recorded in leaves followed by stems and roots. Similar trend was found in plants grown in shade condition in three vegetative parts of plants (Fig.1C).The increase in total protein and amino acid content may be due to the increased production of light induced proteins in the plants grown under higher light intensity (Baig *et al*. 2005).

The plants grown in higher light intensity showed higher values of total carbohydrate compared to plants of shade condition. The values were decreasing from leaves to stem and minimum in roots of plants in both the conditions (Fig.1D). The fluctuation in light intensity affects the photosynthetic rate of the plants as this acts as the stress condition to the plant (Setter *et al*. 2001).

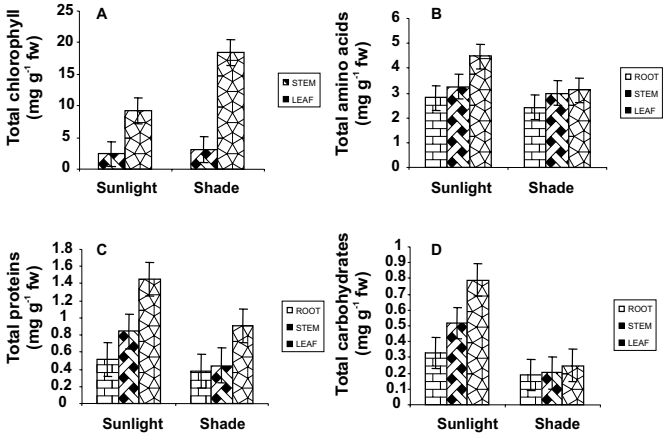

Fig. 1. Effect of different light intensities on total chlorophyll (A), total amino acids (B), total proteins (C) and total carbohydrates (D) contents in different plant parts

The higher concentration of the total carbohydrate might be due to the fact that starch mobilization is most efficient in leaves, followed by petioles, stems and roots. Leaves are the whole plant's primary source of carbon during the dark as well as the light condition. As the leaf starch pool was greater than all other non-structural carbohydrate pools combined at the end of the photosynthetic period (Kerr *et al*.1985). The physiology of *A. paniculata* is greatly affected by change in light intensities. Thus, the plants grown in higher light intensity synthesize total proteins, amino acids and carbohydrates more efficiently compared to those grown in low light intensity. While the production of chlorophyll is triggered in the plants grown in less light intensity.

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