International Journal of Plant Sciences (2006) **1** (1) : 45-47

Effect of tree canopy shade on enzyme activity and photosynthetic pigment in French bean (*Phaseolus vulgaris* L.)

SUDHA R. MATHUR AND K. B. SHUKLA
Department of Plant Physiology, Rajasthan College of Agriculture, M.P.U.A.T, Udaipur-313 001.

(Accepted : September 2005)

SUMMARY
French bean is an important legume crop to be used as green pod vegetable or as dry seeds. The dry seed type varieties are called as "Rajmash" in India. The present pot experiment was therefore, planned to study the effect of light on activities of some enzymes of activated oxygen metabolism viz; Superoxide dismutase Peroxidase and Catalase, lipid peroxidation by measuring malondialdehyde (MDA) content and chlorophyll content in leaves of plants of French bean "PDR-14" growing under open light and tree canopy (Dark). The plants grown under open light having low SOD and peroxidase activity, while catalase activity was found to be high in open light grown plants. Similarly the MDA content accumulation was higher in open light grown plants. It was interesting to note that chlorophyll content (Chl"a"; Chl"b" and total) was found to be higher in plants grown under tree canopy in comparison to open light grown plants.

Key Words: Shade, enzyme activities, pigment, French bean.

Plants often try to adapt themselves to their environment by external as well as internal modification (Moore, 1991). Plants which appears to be adapted to low light intensity make use of available light energy and these plants invest a greater portion of this towards the synthesis and maintenance of light harvesting machinery than do sun grown plants. The effect of light intensity on dry matter production and physiological yield characteristics in crop plants has been well established (Sing 1988, Sing *et al.*, 1988).Thin leaves with reduced dry matter accumulation reported in shade grown plants are not the general characteristics in many species. Goodchild *et al.*, (1972) reported that many rainforest species grown in shade has thick leaves, a high ratio of dry matter to leaf area and high chlorophyll content per unit leaf area. The present study was aimed to understand the effect on enzyme activity and chlorophyll contents in French bean plants growing under tree canopy.

Activated oxygen species such as superoxide (O_2) or H_2O_2 and their interaction products react with proteins, lipids and nucleic acids (Halliwell, 1978; Choudhari, 1988; Shalata and Tal, 1998) and the accumulation of these free radicals may initiate the change in chlorophyll content and lipid peroxidation. We have also monitored the activities of superoxide dismutase, catalase and peroxidase which are known to destroy free radicals and control the level of lipid peroxidation. (Fridovich,1976., Halliwell, 1978., Dhindsa *et al.*, 1981; Choudhari, 1988 and Zhang and Kirkham,1996).

MATERIALS AND METHODS

A pot experiment was conducted under the ten years old nursery of nitrogen fixing tree species at Rajasthan College of Agriculture, MPUAT, Udaipur. Pots were filled with virgin soil. The seeds were treated with fungicide thiram 75% (contents) and carbondozim (systemic) 50 wp and with rhizobium culture before sowing. Finally two plants/ pot were raised upto maturity. Lipid peroxidation in leaf tissue was measured in terms of MDA a decomposition product of the oxidation of polyunsaturated fatty acids, as thiobarbituric –acid – reactive material (Heath and Packer,1968 and Dhindsa *et al.*,1981) from leaf extract in 0.5% TBA. The absorbance of the extract was read at 532nm and the values were correlated for nonspecific turbidity by substracting the absorbance at 600nm. The concentration of MDA was calculated using its extinction coefficient (Heath and Packer,1968).

For determination of SOD activity, leaf extract was homogenized in 5ml of 50mM phosphate buffer (pH 7.8) containing 1% insoluble polyvinyl pyrrolidone (PVP). Enzyme activity was assayed essentially as described by Dhindsa *et al.*, (1981) by measuring the ability to inhibit the photochemical reduction of nitro blue tetrazolium (NBT). Chlorophyll was estimated in 80% (V: V) acetone leaf extract using the method of Arnon (1949).

Enzyme assays for catalase and peroxidase leaf sample were homogenized in 0.05M Tris-HCl buffer (pH=7.0) containing 0.001M EDTA and 0.003M $MgCl_2$ and prepared a extract. Activities were assayed by measuring the rate of disappearance of hydrogen peroxide using the method of Chance and Maehly (1955). The decrease in hydrogen peroxide was followed as a decline in absorbance at 240nm. For guiacol peroxidase (PO) the reaction mixture contained 50mM phosphate buffer (pH=6.1), 6% hydrogen peroxide and 1% guiacol and the enzyme extract. The increase in

*Author for correspondence