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EVALUATION OF ANTIOXIDANTS (CAT AND SOD) ROLE IN *CYAMOPSIS TETRAGONOLOBA* (L.) AND *VIGNA RADIATA* (L.) UNDER FLUORIDE INDUCED OXIDATIVE STRESS

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Abstract
Fluoride affects plants in negative mode by escalating the ROS (Reactive oxygen species) level and reducing the plant growth. In this study Guar (*Cyamopsis Tetragonoloba Taub.*L.) and Moong (*Vigna radiata* L.) was exposed to fluoride (NaF) treatment in a half-strength Hoagland solution. In this study, a concentration- dependent analysis (*Cyamopsis Tetragonoloba L.* 0, 10, 20, 30, 40, 50, and 60 mM NaF) and (*Vigna radiata L.* 0, 2.5, 5, 7.5, 10, 12.5, and 15 mM NaF). Biochemical expression CAT and SOD activity was highly elevated in Guar (*Cyamopsis Tetragonoloba L. Taub.*) at 30 mM NaF and in Moong (*Vigna radiata* L.) at 7.5 mM NaF. The current study reveals, as a consequence of the high stress produced by fluoride, SOD and CAT gene showed significant changes in both Plant Root's treated samples. However the only up-regulation changes observed in treated root sample is more evident for CAT at 30 mM NaF for Guar (*Cyamopsis Tetragonoloba L. Taub.*) and for 7.5 mM NaF for Moong (*Vigna radiata* L.). However, molecular analysis of SOD showed the down regulation in both plants. In the fluoride concentration based analysis, the highest expression of CAT was observed in the roots compared to the control. This study would help to understand the role of antioxidants for endurance of plants under fluoride stress condition.

Key words: Antioxidant enzymes, Abiotic stress, (*Cyamopsis Tetragonoloba L.*), *Vigna radiata (L.).* Fluoride stress (NaF), Catalase (CAT) Glutathione reductase (GR)

Introduction

Fluoride is a common environmental pollutant and Fluoride rich soil is a potential source of its contamination in the groundwater, in the food chain and ultimately in the human body. Many regions of India are heavily affected by Fluoride pollution (Meenakshi and Maheshwari 2006).

Fluoride toxicity affects the most morphological, physiological and biochemical parameters in the plant due to germination and early seedling growth. Changes in enzyme activity and intermediate metabolism caused by chronic fluoride exposure may cause the organism to grow, develop and multiply (McCune and Weinstein, 1971). Fluoride occurs mainly in plants of two forms. First, the deposition of gaseous Fluoride in the air occurs through stomata diffusion. Through the stomach of the leaves, the iron flesh penetrates the cell walls and migrates to the edges and tips, which are the places with the highest evaporation (Kamaluddin and Zwiazek, 2003). Fluoride is transferred to the crotch via the apoplastic and symplastic pathways in unidirectional distal move men (Pant et al., 2008). Fluoride is toxic due to changes in metabolic chains (Miller, 1993). Fluoride is taken up from the soil through the roots and then transported via the xylem to the leaves, where it accumulates and visible effects become visible (Klumpp et al., 1996).

Typical symptoms that can be attributed to fluoride contamination are marginal necrosis (maximum burns), which is characterized by a red-brown line in both monocotyledons and dicotyledons (Ruthsatz and Wey, 1991). The phytotoxicity of fluoride impaired germination and decreased in different ways

Physiological parameters such as dry weight, fresh weight, root weight and rice plant length (Gupta et al.,2009). Different tolerance mechanisms have been proposed based on the biochemical and physiological changes associated with dryness. A lack of water can increase the formation of free oxygen radicals. These reactive oxygen species (ROS) include superoxide O2-, hydroxyl radical (•OH), hydrogen peroxide (H2O2) and single oxygen (O2). To protect cell membranes and organelles from the harmful effects of ROS, plants are equipped with an antioxidant system. This system consists of antioxidants such as Superoxide Dismutase (SOD, EC 1.15.1.1) and Catalase (CAT, CE1.11.1.6). SOD is an enzyme that catalyzes the dismuation of $O_2^{\cdot}$ to H_2O_2. CAT is responsible for the removal of H_2O_2 by reducing H_2O_2 to 2 H_2O. Most but not all, of CATs are found in Peroxisome (Foyer et al., 1994).
This study's aim to investigate the expression pattern of SOD and CAT at biochemical and molecular level for *Cyamopsis Tetragonoloba* L. and *Vigna radiata* L. under fluoride stress.

Materials & Methods

Collection of plants

Guar (*Cyamopsis tetragonoloba L*. Taub.) seeds Var. RGC-1038 was collected from the Agricultural Research Station (Swami Keshwanand Agricultural University of Rajasthan SKRAU Bikaner), Rajasthan, India. Moong (*Vigna. Radiata L*.) Var. RMG-492 was obtained from Agricultural Research Institute (Sri Karan Narendra Jobner University of Agriculture), Rajasthan.

Seed Germination and plant growth

Guar (*Cyamopsis tetragonoloba L*. Taub.) and Mung beans (*Vigna radiata L*.) seeds sterilization was performed with 0.5% sodium hypochlorite and Triton X 100. Sterilized seeds were germinated in a petridish (10 cm) containing autoclaved filter paper soaked in distilled water under dark conditions. Germinated seeds (10 in one pot) were transferred to Half Strength Hoagland Solution (Hoagland and Arnon, 1950) with a 16-hour photoperiod under thermostatically controlled culture room, maintained at 25 ± 2 ° C and 50% relative humidity.