IJPS INTERNATIONAL JOURNAL OF PLANT SCIENCES
Volume **7** | Issue 2 | July, 2012 | 366-370

RESEARCH ARTICLE

Induction of oxidative stress and antioxidant responses in *Azolla microphylla* by cadmium stress

■ ABHISHEK CHRIS

SUMMARY

In the present srudy, *Azolla microphylla* fronds were grown in with different concentrations (0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 mg l^{-1}) of cadmium chloride, in order to investigate the effects of cadmium on the growth (dry weight), lipid peroxidation, ascorbate peroxidase (APX), superoxide dismutase (SOD) and proline content. A concentration dependent reduced growth was observed in the *Azolla* fronds.MDA which is the measure of lipid peroxidation increased in plants under all the treatments of cadmium. Stimulation of antioxidant enzymes (SOD and APX) was observed due to Cd stress. Proline accumulation also showed significant increase at all the concentrations of cadmium. The results suggested that *Azolla microphylla* may have better protection against oxidative stress by increasing antioxidant activity exposed to cadmium stress.

Key Words : Bitter gourd, Seed quality, Cloth bag, Storage

How to cite this article : Chris, Abhishek (2012). Induction of oxidative stress and antioxidant responses in *Azolla microphylla* by cadmium stress. *Internat. J. Plant Sci.*, **7** (2) : 366-370.

Article chronicle : Received : 06.04.2012; **Revised :** 24.05.2012; **Accepted :** 15.06.2012

The *Azolla- Anabaena* symbiosis represents potentially an ideal biofertilizer for rice production due to its high nitrogen fixing ability and rapid growth (Peters and Meeks 1989). According to Watanabe *et al.* (1977) *Azolla* can fix atmospheric nitrogen at the rate of 1.1 kg N $ha^{-1}day^{-1}$. It is suitably called green "gold" because it is economically important as an animal feed, medicine, hydrogen fuel, biogas producer and weed controller (Wagner, 1997). Furthermore *Azolla* ferns have been also reported as an important biological component cleaning up contaminated surface waters with either inorganic or organic pollutants (Bennicelli *et al.* 2004; Rai, 2008).

Cadmium is a major heavy metal pollutant in the environment resulting from agricultural, mining and industrial activities as well as from automobiles emissions (Wagner, 1993). This non essential element with a long biological half life strongly inhibits the growth and development of plants and cause death, even at very low concentrations (Hernandez *et al.*, 1996). Cd is also highly toxic in humans and even trace amounts of it can result in neurological disorders and kidney damage (Lang *et al.*, 2005). In plants it affects many physiological and biochemical processes, such as, photosynthesis, respiration nitrogen metabolism, pigment degradation etc (Chaffei *et al.*, 2003; Dai *et al.*, 2006; Gharmash and Golovko, 2009; Chen *et al.*, 2011; Gill *et al.*, 2012).

Cadmium not only damages the biomolecules such as nucleic acids and proteins in living organisms but also triggers oxidative stress through the formation of reactive oxygen species (ROS), which in turn cause enhanced lipid peroxidation (Arora *et al.*, 2002; Xu *et al.*, 2009). Plants can reduce cadmium toxicity through a variety of mechanisms, including the production of ROS scavengers and cadmium binding factors and by excretion or compartmentization (Siripornadulsil *et al.*, 2002).The efficient destruction of ROS requires the action of several antioxidative enzymes, including superoxide dismutase (SOD) and catalase which can convert superoxide radicals into hydrogen peroxide, water and oxygen (Dinakar *et al.*, 2010). Plants can also synthesize non-enzymatic ROS scavenging molecules, such as proline which can detoxify oxygen free radicals directly (Chris *et al.*, 2006a).

The toxic effect of cadmium on *Azolla* in terms of growth (Masood and Abraham, 2003) and nitrogen metabolism (Dai *et al.*, 2009) studied earlier but the effect of Cd on oxidative

AUTHOR FOR THE CORRESPONDENCE

ABHISHEK CHRIS, Department of Botany, Wilson College, Chowpatty, MUMBAI (M.S.) INDIA
Email: achris1@rediffmail.com