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Effect of cadmium on seedling growth, lipid peroxidation and photosynthetic pigments of mothbean cultivar

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SUMMARY

Moth bean is an important pulse crop of the drought region grows wild in India, Pakistan, Burma and from the Himalayas in the north to shri lanka in the south. It is considered to be a native of India. Moth bean [Vigna aconitifolia (Jacq.) Marechal] is an important arid legume tolerant to drought and high atmospheric temperature. The reason behind the selection of this crop for the investigatory research work is its tolerant to drought and high temperature. In the present investigation the effect of cadmium (Cd^{+2}) on seedling growth Malondialdehide (MDA) content, a product of lipid peroxidation and photosynthetic pigments (chlorophyll "a", chlorophyll "b", total chlorophyll and carotenoids) of moth bean cultivar Jadia. It was observed that Cd^{+2} drastically reduced the seedling growth, photosynthetic pigments and carotenoids, where as MDA accumulation was non significantly higher in CD^{+2} treated plants compared to control.

Key words : Moth bean, Malondialdehide, Chlorophyll, Carotenoid, Cadmium, Seedling.

Heavy metals exert adverse effect on physiological and biological activities of plants (Fornazier *et al.* 2002). Similarly to various other stress, heavy metal tends to increase permeability of tissue due to membrane damage in plants (Sharma *et al.* 2002). Recently, it has bean reported that membrane in plants is mainly due to upset in balance between production of active oxygen species (AOS) and quenching activities of antioxidants under various types of environmental stresses (Pereira *et al.*, 2002). In cotton chromium ions influences seed germination as well as with other process of fully grown up plants, which eventually depressed the economic yield (Rehab and Wallance, 1997). In the present study an attempt has been made to examine in an indirect way whether the effect of cadmium (Cd^{+2}) on the membrane damage of moth bean are mediated through free radicals by assessing extent of membrane damage by measuring malondialdehyde (MDA) contents, a lipid peroxidation product and reduction in photosynthetic products like chlorophyll and carotenoid contents and seedling growth under the heavy metal stress.

MATERIALS AND METHODS

Seed of moth bean (*Vigna aconitifolia L.)* cv. Jadia, were collected from agriculture research station, RAU, Mandor and surface sterilized using 4% sodium hypochloride solution and than washed thoroughly with distilled water. An experiment was conducted on moth bean cv. In Petri dishes under controlled conditions in growth chamber (16hr light and 8hr dark cycle, temperature $28+2^0C$) Petri dishes having filter paper moistened with distilled water as a control and with 5mM Cd^{+2} solutions. On 7^{th} day the hypocotyls and epicotyl length (cm) and number of lateral roots in seedlings were measured. Lipid peroxidation in leaftissue was measured in terms of MDA, a decomposition product of the oxidation of polynsatured fatty acids, as thiobarbituric-acid-reactive material (Heath and Packer, 1968) form leaf extract in 0.5% TBA. The absorbance of the extractwas read at 532nm. Chlorophyll and carotenoids were analyzed in 80% (vv) acetone leaf extracts using the method of Lichtenthaler (1987).

RESULTS AND DISCUSSION

In present study data showed higher accumulation of MDA contents, which is a decomposition product in Cd^{+2} stressed seedlings compared to control (Table 1). Thus, indicating free radicals mediated membrane damage in moth bean under Cd^{+2} stress. Mishra and choudhari (1996) also reported similar findings in rice cultivar under heavymatel stress. Results shows that Cd^{+2} drastically reduced the root, hypocotyls length and no. of laterals per seedlings in moth bean cultivar (Fig.1). Chlorophyll (Chl) and carotenoids is also one of the important parameter to asses the extent of damage in plants under different types of environmental stress. In present study data shows that Cd^{+2} drastically reduce the Chl a, Chl b, total Chl and carotenoids in leaves of Cd^{+2} treated seedlings of moth bean cultivar compared with respective control. Reductions in leaf chlorophyll concentration in several plants under heavy metal stress also have been reported by Mukherji (1997). And reduction in carotenoid content in Cd^{+2} treated seedling shows resistance to Cd^{+2} stress and magnitude of resistance depends upon percent reduction of carotenoids. Smirnoff (1993) reported that carotenoids are also reported to be one of the antioxidant which protect plants against photoxidation because they actively quench siglet oxygen and minimize its formation by absorbing excess energy from exited triplet status of chlorophyll.

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