RESEARCH PAPER International Journal of Agricultural Sciences, Vol. 7 Issue 1 (January, 2011) : 74-76

Influence of cadium on yield and its uptake by chickpea, wheat and nutrient status of soils

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ABSTRACT

The pot culture experiment was conducted during *Kharif*, 1999 by growing chickpea upto flowering and wheat upto maturity stage in a clay and a loamy sand soils of Karvan and Anand with five levels of Cd (0, 2.5, 5.0, 10.0 and 20.0 ppm). The pot culture study indicated a significant reduction in the dry weight of both crops. Wheat plant did not show any visual toxic symptoms, whereas chickpea plants showed visual symptoms for Cd toxicity at elevated Cd level even after the crop harvest. About 22 to 27 per cent of the total applied Cd remained in available form, indicating possible residual effect also. Particularly at Cd_4 level it crossed the critical level of 3.0 mg kg^{-1} suggested for Cd.

Jha, A.K., Dalwadi, M.R., Panchal, D.B. and Patel, J.C. (2011). Influence of cadium on yield and its uptake by chickpea, wheat and nutrient status of soils *Internat. J. agric. Sci.*, **7**(1): 74-76.

Key words : Yield, Uptake, Nutrient status of soil, Cadium

INTRODUCTION

Cadmium is one of the most important potential bio-toxic heavy metal encountered in soil and water pollution. Though it occurs naturally in soil, its addition as a pollutant has increased in recent times causing concern in the field of agriculture. This has necessitated research on Cd added to soil. It is naturally found in soil as mineral combined with other elements such as oxygen, chlorine or sulphur. In India Cd toxicity has also been reported from the rice growing area and other agricultural lands, near by industrial estates.

Cadmium is added to the soil as a contaminant in fertilizer, manure, municipal wastes, sewage sludge and also from aerial deposition. The amount of Cd contributed from each source varies with location due to difference in soil formation, management practices and exposure to pollution sources (Jones *et al.*, 1992). Among the different sources of Cd pollution, commercial fertilizers particularly phosphatic fertilizers contain a great range of heavy metals including Cd. In some phosphatic fertilizers 9-156 mg Cd kg^{-1} is reported (Williams and David, 1976). In case of manures, both composted and uncomposted municipal wastes may have about 2 mg Cd kg^{-1} dry weight (Purves, 1977). Sewage sludge, which is the most important source of Cd dissemination, may contain 2-1500 mg Cd kg^{-1} dry weight (Webber *et al.*, 1983). Generally much more Cd is added in one application of sewage sludge than in a normal application of fertilizer.

The critical content of Cd in soil is 3 ppm. Plants can tolerate Cd toxicity to a greater extent as compared to animals and human. The critical concentration of Cd is reported to be 5-10ppm in the dry matter of plants. Differential uptake of Cd was observed by different crop species. Plants of gramineae family like wheat, rice, oat etc. were reported to accumulate more Cd than leguminous plants.

MATERIALS AND METHODS

A pot experiment was conducted to study the effect of varying level of Cd on yield and nutrient uptake of chickpea and wheat grown on a loamy sand and a clay soils. The details of the treatments are as under

(a) Cd levels Five	(b) Type of soil : Two
0 ppm Cd (Cd_0)	Clay soil (S_1)
2.5 ppm Cd (Cd_1)	Loamy sand soil (S_2)
5.0 ppm Cd (Cd_2)	(c) Crops : Two
10.0 ppm Cd (Cd_3)	Chickpea (C_1)
20.0 ppm Cd (Cd_4)	Wheat (C_2)

The experiment was conducted in FCRD with three repetitions. The total numbers of pots were sixty. Ten kg capacity polythene lined earthen pots were filled with 8 kg soil. Before transferring the soil to pots calculated recommended doses of fertilizers were added through urea and DAP solution. Cd was applied as $3CdSO_4 8H_2O$ in form of solution. The pots were brought to field capacity and 10 seeds of chickpea and 15 seeds of wheat were sown in each pot. After sprouting, chickpea and wheat plants were thinned to keep 6 and 10 plants per pot,

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