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THE EFFECT ON MORPHOLOGY OF MEDICINAL PLANTS NEAR COPPER MINES IN KHETRI JHUNJHUNU DISTRICT, RAJASTHAN

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Abstract

The drought condition of Jhunjhunu area in Rajasthan and copper toxicity combination causes high stress conditions in plant morphology. The medicinal plants in this region get deprived of photosynthetic pigments and chlorophyll contents. Examples are Aloe vera, Cactus, *Fumaria parviflora*, *etc.* the heavy metal concentration like copper contents cause difference in root length and decrease root elongation. They also reduce uptake of minerals from soil and increase toxicity in plant species. There also increases metabolic disorders in plant cells. The productivity of medicinal plants decreases and exploitation of soil region also occurs due to drought stress in this region.

Keywords: Jhunjhunu, Rajasthan, copper toxicity, medicinal plants, stress, drought

Introduction

The present study deals with copper mines area in Khetri region of Jhunjhunu district where drought conditions and heavy metal accumulation causes toxicity in medicinal plants. *Ocimum sanctum, Cassia fistula, Withania somnifera* and *Azadirachta Indica, Aloe vera* and *Funaria parviflora* are gained with copper toxicity [1,2] and bioaccumulation in their roots, shoot and floral regions. This causes weakness in plants and they can not absorb minerals which further leads to reduction in plant growth. The morphology of plants is decreased and plant becomes weak which leads to death early.[18] The copper toxicity causes yellowing of leaves, and reduction in chlorophyll content. The medicinal plants get deprived of minerals and their basic medicinal contents. They become useless. We cannot utilize them ethnobotanicaly and the plants die early.[19]

The plants cannot tolerate the accumulation of heavy metals like copper especially in the drought region of Jhunjhunu (Khetri) in Rajasthan.[3,4] However copper is an essential micronutrient and is also necessary for normal growth and development of plant. But in the copper mines region here the bioaccumulation increases and high content of copper more than limit causes deprivation in plants.[17] The secondary metabolites and essential oil constituents are decreased in plants. The plants get injured easily due to weakness, and number of leaves are reduced, chlorosis occurs, lipid peroxidation increases toxicity in whole plant morphology and death occurs.

The leaf petioles get weakened causing early death of leaves and increased copper bioaccumulation in roots cause increased pH which leads to weakness. These negative effects decrease plant resistance, stomatal weakness, chlorophyll florescence, oxidative stress, and increase in phenolic compounds in plants. [5,6] The copper stress and copper pollution in drought region of this area, in Rajasthan. The copper suction becomes easy causing Cell damage index of lipid peroxidation in leaves easily.

Discussion

The Cu accumulation rate (AR), bioaccumulation coefficient (BAC), translocation factor (TF) and tolerance index (TI) of plants can be calculated by equations[15,16] described by scientists earlier as follows:-

The accumulation rate (AR) can be calculated as the sum up of Cu concentration in each plant tissue x plant DW divided by the number of days under Cu levels by the total plant :-

$$\text{Accumulation rate mg per (kg DW x day)} = \frac{([Cu]\ \text{leave} \times DW\ \text{leave} + ([Cu]\ \text{stem} \times DW\ \text{stem} + ([Cu]\ \text{petiole} \times DW\ \text{petiole} + ([Cu]\ \text{root} \times DW\ \text{root})}{\text{Days} \times (DW\ \text{leaves} + DW\ \text{stem} + DW\ \text{petiole} + DW\ \text{root})}$$

The bioaccumulation coefficient (BAC) can be calculated as the ratio of Cu concentration in plant tissue to that of Cu concentration in nutrient solution:-

$$\text{Bioaccumulation coefficient} = \frac{\text{Cu concentration in plant tissue (mg kg DW)}}{\text{Cu concentration in nutrient solution (mg per L)}}$$

The translocation factor (TF) can be calculated as the ratio of Cu concentration in plant tissue to that of Cu concentration in plant roots :-

$$\text{Translocation factor} = \frac{\text{Cu concentration in plant tissue (mg kg DW)}}{\text{Cu concentration in plant root (mg per kg DW)}}$$

Copper tolerance index (TI) can be calculated as the quotient of the dry weight of plants grown under copper treated and control conditions[13,14] according to the following the equations with the following modifications:

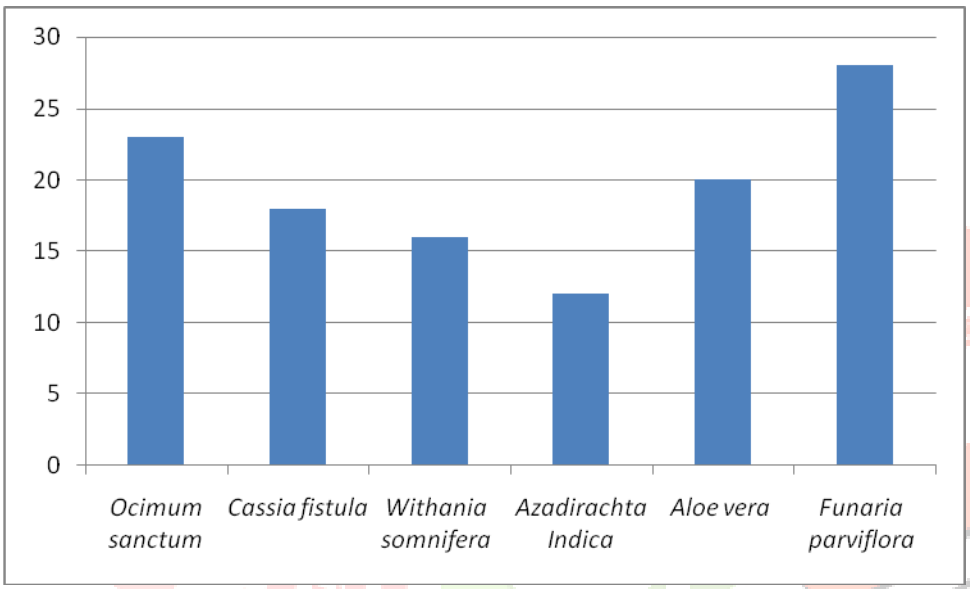
Tolerance index (%) =Dry weight of Cu?treated plants ×100

Dry weight of Cu?untreated plants (control)

Thus we can calculate the copper contents in the particular region and try to decrease the copper toxicity by certain methods which may lead to increase in suction of mineral content by medicinal plants and thus the plants can grow in better form and may not die. We usually utilize these medicinal plant species ethnobotanically. [7,8]

Results

The total plant bioaccumulation coefficient (mg/kg) is shown in the following graph:-



This was taken in this area of Khetri, Jhunjhunu in Rajasthan in this time period. We can decrease the copper content from soil and purify the bioaccumulation of heavy metals from soil utilizing certain purification methods. Thus the soil becomes nutritive and suction of minerals is easy by medicinal plants thus increasing their growth. [9,10]

Conclusions

The copper concentration in soil decreases biomass and growth of medicinal plants in Khetri region of Jhunjhunu in Rajasthan. [11,12] The drought conditions here with increased copper content due to presence of copper mines causes more stress and plant morphology gets affected. We should utilize purification methods of heavy metals in such regions and increase nutrient content in soil adding minerals. [20]

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