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NUTRITIONAL PROFILING AND ANTIOXIDANT ENZYME ANALYSIS OF CROTALARIA HEBECARPA (D.C) RUDD.

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ABSTRACT

Crotalaria hebecarpa (DC) Rudd is a prostrate annual herb with slender, hairy branches, belonging to the family Fabaceae. Though the identity and distribution of this plant is known, but its phytochemical and nutritional components and their biological activities are not known. In this work, we report nutritional and antioxidant enzyme analysis of *C. hebecarpa.* Nutritional profiling revealed that the plant contains Fe, Ca, N2, Mg, Zn, MO, Cu, Ni, B and Vitamin D in high quantities. Antioxidant enzyme analysis revealed that it showed high Peroxidase, Glycine betaine, SOD and Gluthathione reductase activities. Our results indicate that *C. hebecarpa* is potential unexplored plant.

KEYWORDS: *Crotalaria hebecarpa*, Nutritional profile, Antioxidant enzymes.

INTRODUCTION

The medicinal plants form an important component of human health care system since ancient days. Owing to this, extensive phytochemical and pharmaceutical screening has been carried out identifying a range of biologically active molecules and their therapeutic uses. Though much work has been done, but is not sufficient to meet the demand due to emergence of new diseases and their causative agents. Hence a large scale screening has to be carried out on a range of unexplored potential medicinal plants. In the present paper, we report the nutritional profiling and antioxidant enzyme analysis of Crotalaria *hebecarpa* (DC) Rudd.

Crotalaria hebecarpa (DC) Rudd is a prostrate annual herb with slender, hairy branches, belonging to the family Fabaceae. It is commonly known as fuzzy fruited rattle pod and is observed in open forests and as a weed in cultivated fields. The plants prefer a sunny

situation on fresh moist soil. The substrate should be sandy-loamy, gritty-loamy or sandy clay soil. The plant distributed in all districts of A.P (Madhava Chetty et al.,2008).

Fig 1: *Crotalaria hebecarpa* habit.

MATERIALS AND METHODS

Analysis of plant material for macro and micronutrients.

The fresh tissue is washed in sequence in detergent solution, dilute HCl and deionized water. The liquid detergent was removing waxy coating on leaf surface and any soil particles. N/10 HCl was removing metallic contaminants and deionized water was washing the previous two solutions. The extra moisture is wiped out; the sample is placed in new paper bags and dried in an oven at 70^0c. The samples are homogenized using a sample mill which should not give any metallic contamination. After grinding, the sample will be dried at 70^0C before taking up weighing for digestion.

Acid digest method for estimation of phosphorus, calcium, magnesium, iron, manganese, zinc, copper, boron and molybdenum.

It is carried out using a 9:4 mixture of HNO_3; $HClO_4$, then 1g sample material placed in 100 ml volumetric flask. To this, 10ml of acid mixture is added and the content of the flask is mixed by swirling. The flask is placed on low heat hot plate in a digestion chamber. Then the flask is heated at higher temperature until the production of red NO_2 fumes ceases. The contents are further evaporated until the volume is reduced to about 3 to 5 ml but not to dryness. The completion of digestion is confirmed when the liquid become colorless.

After cooling the flask, 20ml of deionizer water is added and volume is made up with de ionized water and the solution is filtered through Whitman No. 1filter paper. Aliquots of this solution are used for the determination of P, K, Ca, Mg, S, Fe, Mn, Zn, Ni, Bo and Cu.

Estimation of antioxidant enzymes

Proline: Proline from the third leaf from top was estimated according to the method of the Bates et al. (1973).

Superoxidismutase: The activity of SOD was determined by measuring its ability to inhibit the photo reduction of Nitroblue tetrazolium (NBT) following the method of Giannopolitis and Ries (1977).

Ascarbic peroxidase: Assay of ascorbic acid oxidase activity was carried out according to the procedure of oberbacher and vines (1963).

Glutathione reductase: The assay of glutathione reductase was done according to the procedure of David and Richard (1983)**.**

Glycine betaine: Glycine betaine was determined following the Grieve and Grattan (1983) method.

RESULTS

Table.1 Nutritional profiling of *Crotalaria hebecarpa*

S. No	Element	Amount (ppm/g)
	Iron	24.52
2	Calcium	1.35
3	Nitrogen	3.51
4	Phosphorous	0.94
5	Magnesium	0.68
6	Zinc	63.21
7	Molybdenum	0.64
8	Cupper	30.25
9	Nickel	2.41
10	Boron	347
11	Protein	0.44

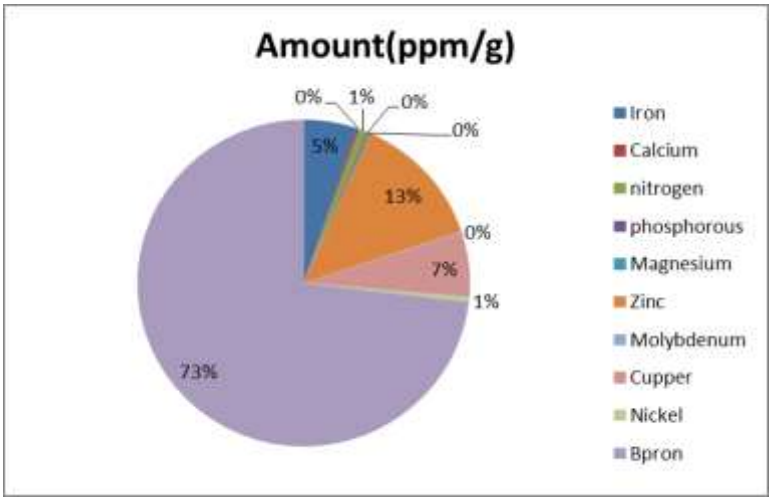

Fig 1: Nutritional profiling of *Crotalaria hebecarpa.*

Table 2: Antioxidant enzyme estimation of *Crotalaria hebecarpa.*

S.No	Enzyme	Concentration
1	Proline (µmoles/g)	24.52
2	Ascorbate peroxidase(µmoles/g)	1.87
3	Glycine betaine (µmoles/g)	6.3
4	Glutathione reductase (mU/ml)	1.57
5	Superoxide dismutase(µmoles/ml)	1.824

DISCUSSION

Plant growth and development depends on 17 essential nutrients such as macro and micro nutrients, among them 95% of the plant weight is C, H and O, the remaining 5% is micro nutrients (Fageria et al.,2002). Micronutrients have also been called minor or trace elements, indicating that their required concentrations in plant tissues are small compared to the macronutrients (Fageria et al., 2002; Mortved, 2000). Micronutrients are normally constituents of prosthetic groups that catalyze redox processes by electron transfer (such as with the transition elements Cu, Fe, Mn, and Mo) and form enzyme–substrate complexes by coupling enzymes with substrates (Fe and Zn) or enhance enzyme reactions by influencing molecular configurations between enzyme and substrate (Zn) (Fageria et al., 2002). *Crotalaria hebecarpa* contains high amount of micro nutrients, such as Zinc (63.21ppm/g), Cupper (30.25ppm/g) and Iron (24.52ppm/g)(Table.1). The wild vegetables selected in the study could be a good source of micronutrients and natural antioxidants in alleviating malnutrition problems of local societies especially the rural populace (Ng et al., 2012).

In plant cells chloroplasts, mitochondria and peroxisomes are important intracellular generators of ROS (Rich and Bonner, 1978). It is now widely accepted that reactive oxygen species (ROS) are responsible for various stress-induced damage to macromolecules and ultimately to cellular structure (Moftah and Michel, 1987; Kandpal et al., 1981). Proline accumulation is one of the most frequently reported modifications induced by salinity and water deficit in plants (Giridara Kumar et al., 2000; Ramanjulu and Sudhakar, 2001), *Crotalaria hebecarpa* shows high content of antioxidant enzyme like Proline (24.52), APX (187), Glycine betaine (6.3) and SOD (1.82)., It is well known that Zinc is an important component of many vital enzymes, and a structural stabilizer for proteins, membrane and DNA-binding proteins (Aravind and Prasad, 2004) and Zn deficiency is also recognized to cause higher levels of ROS in plants and relevant damages to plants (Marschner, 1995; Cakmak, 2000). The high contents of micro nutrients may lead to the high production of

antioxidant enzymes in *Crotalaria hebecarpa*. This is the first report of the *Crotalaria hebecarpa* plant nutritional value and antioxidant enzyme estimation.

SUMMARY AND CONCLUSIONS

Nutritional profiling revealed that the plant contains Fe, Ca, N2, Mg, Zn, MO, Cu, Ni, B and Vitamin D in high quantities. Antioxidant enzyme analysis revealed that it showed high Peroxidase, Glycine betaine, SOD and Glutathione reductase activities.

Our results indicate that *C. hebecarpa* is potential unexplored plant.

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