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Carbon and nitrogen metabolites in some ethno-botanical weed legumes of tripura during their seasonal maturity of growth

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ABSTRACT

Tripura possess a rich source of ethnobotanically important plant species. Among them some weed legumes are known to have good potential as cover crops in agro-based forestry and rubber plantation areas. In the present paper, we highlights the contents of certain carbon and nitrogen metabolites in three selected weed legumes which grow luxuriantly around the Tripura state. Superiority of Cajanus scarabaeoides in carotenoid content with a total free amino acid 4.29 ±0.27mg/ g. leaf fr.wt. is significant as ethnobotanicals besides its nitrogen fixing ability in the soil and potential cover crop.

Keywords: Ethno-botanical weed legumes, carbon and nitrogen metabolites.

INTRODUCTION

Tripura is one of the smallest state located in the North East region and surrounded in the three sides by the international border with Bangladesh. This small hilly state is characterized by hilly terrain, difficult topography, and remote inaccessible areas like the other eight sisters of North – East India. The State shares a very rich biodiversity containing an incredibly diverse number of plant species due to its tropical climatic condition. The Maximum Plant Diversity Index recorded in the state lies at 5.23 which is one of the highest in India (Bhattacharjee ,2012). More than 35 weed legumes are luxuriantly growing in different localities of Tripura (Deb,1983). The leguminous plants in association with certain bacteria are also capable of fixing atmospheric nitrogen. Among the weed legumes, three ethno-botanically important taxa *viz.*, *Cajanus scarabaeoides*, *Canavalia gladiata* and *Pueraria phaseoloides* were selected for the present study. The species are very common and found luxuriantly growing in different places of the state. Different Tribal people across the nation use these plants for ailment of various diseases (Sharma et al, 2013).

Plant decoction of *Cajanus scarabaeoides* is used as a tonic after delivery, fresh leaf paste or pod is used to cure swelling of leg, root paste is also used in night fever, dropsy, anaemia, burns and wounds.

Ointment containing methanolic extract of the plant has wound healing capacity (Pattanayak et al 2011). The methanolic extract of *Cajanus scarabaeoides* is reported to reduce blood glucose level significantly (Pattanayak et al 2009). Leaves of *Canavalia gladiata* are used to cure vomiting, abdominal dropsy, kidney diseases, asthma, obesity, stomach-ache, dysentery, coughs, headache, epilepsy, schizophrenia etc. Roots of *C. gladiata* has been found to be hepatoprotective (Pravakaran et al, 2014). It has been reported that lectin extracted from seeds of *C. gladiata* has the ability to proliferate lymphocytes (Laija et al,2007). In Tripura *Canavalia gladiata* fruits are used as vegetables which is a good source of protein and dietary fibres (Choudhury et al,2010). Plant decoction of *Pueraria*

phaseoloides is used as anti-infective agent; a poultice of the plant is applied to ulcers, and also used in abdominal pain, asthma, bodyache, diarrhoea, and fever. Roots of *Pueraria phaseoloides* have been reported to have estrogenic bioactivity (Cordial et al, 2006). Keeping the multifarious importance of the above weed legumes, the present study has been undertaken to find out possible implication of carbon and nitrogen metabolites.

MATERIALS AND METHODS

The three weed plants, *viz*., *Cajanus scarabaeoides*, *Canavalia gladiata* and *Pueraria phaseoloides* were collected from Suryamaninagar area (N-23º45´40.6´´and E-091º16´04.3´´).

The plant specimens were collected during December to January, 2013-2014 when maximum maturity is gained by the taxa after flowering. Estimation of Carbon metabolites viz, chlorophyll, carotenoids and total soluble sugar were carried out with fresh leaves following the method of Arnon (1949) and Yemm and Willis (1954). Estimation of various nitrogen metabolites including phosphate buffer soluble and insoluble protein and total free amino acids were also carried out. The phosphate buffer soluble protein was estimated in the freshly harvested leaves and that of insoluble protein by the modified method of Lowry et al,(1951) . The values of soluble and insoluble proteins estimated were summed together to get total protein in the raw leaves. The amount of total free amino acid was estimated following the method of Yemm and Cocking (1955).

RESULTS AND DISCUSSION

Studies of selective carbon metabolites namely, chlorophyll a, chlorophyll b, total chlorophyll and total soluble sugar were found to vary among the taxa (table,1) Chlorophyll and soluble sugar were highest in the leaves of *Pueraria phaseoloides* followed by *Canavalia gladiata* and *Cajanus scarabaeoides*.

However total carotenoid content in the raw leaves of *Cajanus scarabaeoides* was highest and minimum in *Pueraria phaseoloides*. Carotenoids are known to possess biological activity as a precursor of vitamin A (Simpson et al, 1981). In spite of its traditional medicinal value of *Cajanus scarabaeoides* (Chaohong et al. 2002., Pattanayak et al.2009) the species could be a source of carotenoids for vitamin A. Moreover, relatively higher amino acid content in the leaves (table:2) can serve as a good source of nutrients. Estimation of nitrogen metabolites namely, buffer soluble and insoluble protein and total free amino acids among the taxa revealed highest content in the leaves of *Pueraria phaseoloides* followed by *Cajanus scarabaeoides* and *Canavalia gladiata*. (Table2). High protein content in *Pueraria phaseoloides* was also reported by other workers (Dirven,1965 and Hussain et al ,1989) suggesting the taxon as a source of excellent supplement for animal feeding. Leguminous cover crops are of interest in sustainable agriculture as many of them improve the sustainability of agro-ecosystem and also fulfill several purposes in agro-forestry by providing permanent soil cover, reducing erosion, increasing soil nutrient concentration and increasing organic matter. Present weed legumes are very rich in terms of carbon and nitrogen estimates. In spite of nitrogen fixing capability, the weed legumes have the potential implication as cover crops in rubber and pineapple plantation in many underutilized plantation areas of hilly Tripura. Young leafy shoots are also good source of fodder for cattle.

Superiority of *Pueraria phaseoloides* as fodder over the rest two taxa was also recorded and could effectively be utilized as an important ethno-botanical resource besides its importance as cover crop. On the other hand, high carotenoids level in *Cajanus scarabaeoides* suggest its possible utility and significance in traditional medicine.

Table:1. Comparative estimates of certain carbon metabolites in the different weed taxa of Fabaceae

Name of the weed taxa	Estimates of various Carbon metabolites				
	Chlorophyll-a (mg/g leaf fr. wt.) Mean±SE	Chlorophyll- b (mg/g leaf fr. wt.) Mean±SE	Total Chlorophyll (mg/g leaf fr.wt..) Mean±SE	Carotenoid (mg/g leaf fr.wt.) Mean±SE	Soluble sugar (mg/g leaf fr.wt.) Mean±SE
Cajanus scarabaeoides	0.80±0.02	0.50±0.03	1.29±0.03	0.16±0.03	0.32±0.03
Canavalia gladiata	0.85±0.01	0.46±0.07	1.35±0.15	0.15±0.10	0.29±0.02
Pueraria phaseoloides	0.86±0.18	0.46±0.04	1.89±0.03	0.13±0.04	0.38±0.03

Table: 2. Comparative estimates of certain Nitrogen metabolites in the different weed taxa of Fabaceae

Name of the weed taxa	Estimates of various Nitrogen metabolites		
	Buffer Soluble protein (mg/g leaf fr. wt.) Mean±SE	Buffer insoluble protein (mg/g leaf fr. wt.) Mean±SE	Total free amino acid (mg/ g leaf fr. wt.) Mean±SE
Cajanus scarabaeoides	8.15±0.07	20.01±0.09	4.29±0.27
Canavalia gladiata	8.21±0.19	15.02±0.04	3.21±0.03
Pueraria phaseoloides	19.24±0.05	25.38±0.04	5.26±0.09

CONCLUSION

In the present investigation, certain carbon and nitrogen metabolites were studied in three selected weed legumes growing wild in Tripura. Mature leaves of *Cajanus scarabaeoides* revealed high carotenoid content while total free amino acid was recorded in *Pueraria phaseoloides* during their maturity of growth. Suitability of *P. phaseoloides* as fodder crop was also recorded over the rest two taxa in spite of their significance as cover crops.

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