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RESEARCH ARTICLE

EVALIATION OF CARBOHYDRATE CONTENT IN THREE MEDICINALPLANTS OF GENUS *SESBANIA* IN MAHARASHTRA

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ABSTRACT

The genus *Sesbania* belongs to the family Leguminoceae. *Sesbania* are known for exceptionally fast growth rates as well as a high affinity for association with several nitrogen fixing rhizobia in the soil that cause formation of numerous and large nodules in the plant roots. The member of this genus also have several potential uses including forage, poles for light construction, fuel wood, medicines, shade trees for other crops and gums. The seasonal variation of starch , total sugar and total carbohydrates content have been investigated from leaves, wood and bark of *Sesbaniarostrata* , *Sesbaniaexaltata* and *Sesbaniasesban* are the medicinal plants in Maharashtra. Comparative account of starch content of leaves, wood and bark of*Sesbaniarostrata* showed higher level (range 7.49 to 8.54 mg/g dry wt.) than *Sesbaniaexaltata*(range 7.16 to 7.52 mg/g dry/wt.) and*Sesbania*sesban (range 6.07 to 6.72 mg/g dry wt.).Comparative account of total sugar content of leaves, wood and bark of*Sesbaniarostrata* showed higher level(range 2.62 to 3.13 mg/g dry wt.) than *Sesbaniaexaltata* (range 2.34 to 2.87 mg/g dry wt.) and*Sesbaniasesban* (range 1.81 to 2.35 mg/g dry wt.).Comparative account of total carbohydrate content of leaves, wood and bark of*Sesbaniarostrata* showed higher level (range 10.11 to 11.67 mg/g dry wt.) than *Sesbaniaexaltata*(range 9.50 to 10.40 mg/g dry wt.) and*Sesbaniasesban* (range 7.88 to 9.07 mg/g dry wt.).

Keywords: Starch , Total sugar , Total carbohydrate , Medicinal plant , Sesbania

INTRODUCTION

The carbohydrates (saccharides) are divided into four chemical groupings: monosaccharides, disaccharides, oligosaccharides, and polysaccharides. In general, the monosaccharides and disaccharides, which are smaller (lower molecular weight) carbohydrates, are commonly referred to as sugars. Carbohydrates perform numerous roles in living things. Polysaccharides serve for the storage of energy and as structural components. The 5-carbon monosaccharide ribose is an important component of coenzymes and the backbone of the genetic molecule known as RNA. The related deoxyribose is a component of DNA. Saccharides and their derivatives include many other important biomolecules that play key roles in the immune system, fertilization, preventing pathogenesis, blood clotting, and development. In food science and in many informal contexts, the term carbohydrate often means any food that is particularly rich in the complex carbohydrate starch or simple carbohydrates, such as sugar.

The phytochemical constituents and medicinal properties of most of the medicinal plants were recorded in the last few decades by a number of workers[1-2] .[The]survey and documentation of medicinally important plants in each and every place is very much important for easy identification of local traditional healers, conservation and sustainable utilization. In India, we could locate thousands of plants, especially the angiosperms that are being exploited by the natives tribal in a variety of ways. The most important utilization of these plants is their application in medicines. Thus, there is enormous scope for tribal medicines based on plant products which are yet to be studied, analyzed and documented.

Medicinal plants have been used as traditional treatments for numerous human diseases for thousands of years. Plants have always played a major role in the treatment of human traumas and diseases worldwide. They have been used as sources of modern drugs, either by providing pure compounds, starting materials for partial synthesis of useful compounds or models for synthesis of new drugs. According to the World Health Organization, as much as 80% of world's population depends on traditional medicine for their primary health care needs [3] .

Sesbaniarostrata as an important dietary nutritive source in Southeast Asian country's.*Sesbaniarostrata*are richest source of amino acid, minerals and antioxidants vitamins. This species is unique because it fixes nitrogen not only in its roots in the soil, but also in its aerial parts including stems and branches [4] . Various parts of this plant are used in Indian traditional medicine for the treatment of diuretic, emetic, fevers, headaches, anemia, bronchitis, inflammation, leprosy, gout, rheumatism, anxiolytic, anticonvulsive and hepatoprotective[5]. It also has anti inflammatory, analgesic and antipyretic activity [6].Primarily used as green manure between rice crops [7].

Sesbaniaexaltata (Synonyms- Sesbaniaherbacea and Sesbaniamacrocarpa) is a crop generally cultivated for its nutritive value to soil. It is cultivated in monsoon season almost throughout India and grows sandy, loamy and clay soils. It is an ideal green manure crop as it is quick-growing, succulent, and easily decomposable with low moisture requirements and produces maximum amount of organic matter and nitrogen in the soil. Seed flour is used in the treatment of ringworm, skin diseases and wounds. The mature seeds of this species are known to be cooked and eaten by the Indian tribal's[8].

*Sesbaniasesban*seeds considered stimulants and astringent. Leaves considered purgative, anthelmintic and anti inflammatory. Study of the effect of *Sesbaniasesban*seed powder on female albino rats showed inhibition of ovarian function, change of uterine structure and prevention of implantation with 100 % control of fertility [9]. The aqueous extracts of leaves in STZ-induced diabetic rats showed significant increase in serum insulin and HDL level and decreases in blood glucose, total cholesterol and triglycerides when compared to glibenclamide[10]. *Sesbaniasesban* was referred to as milk shrub. Farmers were encouraged to feed *Sesbania* fodder to lactating cows to enhance milk secretion [8].

MATERIALS AND METHODS

Carbohydrates were estimated by methods suggested by McGready [11], and Nelson[12:]-

Reagents:

1) Somogys reagent (4gm $CuSo_4$+24 gm Anhydrous Na_2CO_3+16gm Na-K tartarate (Rocheette salt) + 180gm Anhydrous Na_2So_4.

2) Nelson arsenomolybdate reagent :- (24gm $(NH_4)_6MO_7O_{24}$, $4H_2O$ (Ammonium molybdate) + (3gm Na_2So_4, $7H_2O$).

   Both solution were mixed and incubated at 37^0C for 24 hours before use and stored in brown bottle.

3) Standard sugar solution was prepared by dissolving 10 mg of glucose in 100 ml distilled water.

Procedure:

1 gm of sample were crushed with 10 ml 80% ethanol in mortar by adding acid free sand then filtered through filter paper. The filtrate and residue were collected separately. The alcoholic residue was taken in 250ml in conical flask. 150ml distilled water & 5ml conc. HCL were added to it. Hydrolyzed for 30 minutes and cooled to room temperature. Na_2co_3 was added bit-by-bit until the extract became neutral (pH=7). The extract was filtrated. Residue was discarded. Total volume of filtered was served as a sample for starch. First filtrate was taken in conical flask and condensed on water bath unto 2-3 minutes and cooled to room temperature. Lead acetate and K-oxalate 2 gm each (1:1) .were in 15 ml of distilled water added to the filtrate and then filtered after mixing. Residue was discarded and the volume of filtrate was served for reducing sugar.

20 ml of this filtrate was taken in 150 ml conical flask, 2 ml of conical flask; 2 ml conc.HCL was added to it and corked. It was then hydrolyzed for 30 minutes and cooled at room temperature. Na_2co_3 was added bit-by- bit until the extract became neutral (pH=7). Then this extract was filtered and residue was discarded. The final volume of the filtrate was measured. It was served as a sample for total sugar.

0.5 ml of aliquot sample was taken in each test tube and 1 ml of Somogy's reagent was added to it .All tubes were placed in boiling water bath for 30 minutes, cooled the tubes to room temperature and 1 ml of arsenomolybdate reagent which is poisonous) was added to it . The content was mixed thoroughly. Then the contents were diluted to a total volume of 10 ml and its absorbance measure OD at 560 nm in spectrophotometer.

RESULTS AND DISCUSSION

Sesbaniarostrata - The continuous two year investigation showed that leaves generally accumulated total carbohydrate ranges from 10.11 to 10.39 mg/g dry wt. higher level of total carbohydrates observed at summer 10.39 mg/g dry wt. as compared to winter 10.26 mg/g dry wt. and monsoon 10.11 mg/g dry wt. In wood it was observed that at summer 11.67 mg/g dry wt. of total carbohydrates accumulates higher than winter 11.53 mg/g dry wt. and monsoon 10.41 mg/g dry wt. Summer show highest level of total carbohydrates .While in bark total carbohydrates ranges from 10.98 mg/g dry wt. to 11.15 mg/g dry wt. higher level observed in summer 11.15 mg/g dry wt. as compared to winter 11.05 mg/g dry wt. and monsoon 10.98 mg/g dry wt. The percentage of total carbohydrates were found to be increasing order of leaves < bark< wood.

The total sugar of wood show higher level than leaves and bark, wood ranges total sugar 3.01 mg/g dry wt. to 3.13 mg/g dry wt. Higher level observed at summer 3.13 mg/g dry wt. as compared to winter 3.09 mg/g dry wt. and monsoon 3.01 mg/g dry wt .In leaves total sugar accumulated high level observed at summer season 2.74 mg/g dry wt. than winter i.e. 2.67 mg/g dry wt. and monsoon 2.62 mg/g dry wt. While in bark range of total sugar is from 2.88 to 2.97 mg/g dry wt., highest level observed at summer 2.97 mg/g dry wt. as compared to monsoon 2.88 mg/g dry wt. and winter 2.92 mg/g dry wt. respectively. The percentage of total sugar were found to be in increasing order of wood< bark < leaves.

The starch ranges of leaves show from 7.49 to 7.65 mg/g dry wt. highest level observed at summer season i.e. 7.65 mg/g dry wt. as compared to winter i.e. 7.58 mg/g dry wt. and monsoon 7.49 mg/g dry wt. In wood starch accumulation observed high at summer 78.54 mg/g dry wt. as compared to winter i.e. 8.43 mg/g dry wt. and monsoon i.e. 8.39 mg/g dry wt. The starch accumulation in leaves show lower than wood and bark. Bark show higher accumulation of starch at summer 8.18 mg/g dry wt. than winter 8.13 mg/g dry wt. and monsoon 8.09 mg/g dry wt. The concentration of starch were found to be increasing order of leaves< bark <wood(Table.1)

Sesbaniaexaltata -The starch content of leaves show ranges from 7.16 to 7.27 mg/g dry wt. much more observed in summer 7.27 mg/g dry wt. than in winter 7.23 mg/g dry wt. and in monsoon 7.16 mg/g dry wt. In wood highest level observed at summer 7.52 mg/g dry wt. as compared to winter 7.48 mg/g dry wt. and monsoon 7.43 mg/g dry wt. while in bark starch accumulated much more in summer 7.39 mg/g dry wt. than winter 7.34 mg/g dry wt. and monsoon 7.28 mg/g dry wt. The percentage of starch were found to be increasing order of wood< bark< leaves.

The total sugar content of leaves and bark show lower than wood. In leaves, total sugar ranges from 2.34 mg/g dry wt. to 2.47 mg/g dry wt. Higher accumulation of total sugar observed at summer 2.47 mg/g dry wt. than winter 2.39 mg/g dry wt. and monsoon 2.34 mg/g dry wt. The range of total sugar content of wood was observed between 2.75

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mg/g dry wt. to 2.87 mg/g dry wt. it show higher than leaves and bark. While in bark, higher accumulation of total sugar observed at summer 2.67 mg/g dry wt. than in winter 2.63 mg/g dry wt. and monsoon 2.59 mg/g dry wt.

The total carbohydrates content of leaves, bark and wood were usually higher in summer. The range of total carbohydrates content of wood was higher in summer i.e. 10.40 mg/g dry wt. than winter 10.31 mg/g dry wt. and monsoon 10.18 mg/g dry wt. The range of total carbohydrates content of bark was between 9.87 mg/g dry wt. to 10.06 mg/g dry wt. Higher accumulation observed at summer 10.06 mg/g dry wt. as compared to winter 9.97 mg/g dry wt. and monsoon 9.87 mg/g dry wt. The concentration of total carbohydrates were found to be in increasing order of wood< bark <leaves. (Table .1).

Sesbaniasesban -The range of starch content of leaves was between 6.07 mg/g dry wt. to 6.22 mg/g dry wt. higher accumulation of starch observed at summer 6.22 mg/g dry wt. as compared to winter 6.14 mg/g dry wt. and monsoon 6.07 mg/g dry wt. while in wood higher accumulation of starch observed as summer 6.72 mg/g dry wt. than winter 6.64 mg/g dry wt. and monsoon 6.51 mg/g dry wt. In bark starch ranges in between 6.34 mg/g dry wt. to 6.47 mg/g dry wt. higher accumulation of starch observed at summer 6.47 mg/g dry wt. as compared to winter 6.41 mg/g dry wt. and monsoon 6.34 mg/g dry wt .The concentration of starch were found to be in increasing order of wood< bark< leaves.

The range of total sugar content of leaves was from 1.81 mg/g dry wt. to 1.93 mg/g dry wt. during different season. The range of total sugar observed high at summer i.e. 1.93 mg/g dry wt. as compared to winter i.e. 1.85 mg/g dry wt. and monsoon 1.81 mg/g dry wt., while in bark total sugar accumulated range from 2.13 mg/g dry wt. to 2.24 mg/g dry wt. Higher level of total sugar observed at summer 2.24 mg/g dry wt. than monsoon 2.13 mg/g dry wt. and winter 2.18 mg/g dry wt. In wood accumulation of total sugar was highest in summer 2.35 mg/g dry wt. as compared to winter 2.30 mg/g dry wt. and monsoon 2.27 mg/g dry wt. The concentration of total sugar were found to be in increasing order leaves < bark < wood.

The total carbohydrates of leaves were higher in summer 8.15 mg/g dry wt. than winter 8.00 mg/g dry wt. and monsoon 7.88 mg/g dry wt. The range of total carbohydrates content of wood was between 8.78 mg/g dry wt. to 9.07 mg/g dry wt., higher concentration was observed at summer 9.07 mg/g dry wt. as compared to winter 8.94 mg/g dry wt. and monsoon 8.78 mg/g dry wt. The range of total carbohydrates content of bark was from 8.48 mg/g dry wt. to 8.72 mg/g dry wt. during different season, higher level observed at summer 8.72 mg/g dry wt. as compared winter 8.59 mg/g dry wt. and monsoon 8.48 mg/g dry wt. The total carbohydrates concentration were found to be in increasing order of wood < bark < leaves (Table.1)

Table 1: Seasonal variation of total carbohydrates levels of differentPlants parts of *Sesbaniarostrata*, *Sesbaniaexaltata* and *Sesbaniasesban*

Plant parts	Season	Starch (mg/g dry wt.)			Total Sugar (mg/g dry wt.)			Total Carbohydrates (mg/g dry wt.)		
		Plant 1	Plant 2	Plant 3	Plant 1	Plant 2	Plant 3	Plant 1	Plant 2	Plant 3
Leaves	Summer	7.654	7.274	6.221	2.741	2.470	1.936	10.395	9.744	8.157
	Monsoon	7.490	7.162	6.070	2.622	2.345	1.813	10.112	9.507	7.883
	Winter	7.587	7.233	6.145	2.678	2.399	1.856	10.265	9.632	8.001
Wood	Summer	8.540	7.527	6.722	3.139	2.878	2.357	11.679	10.405	9.079
	Monsoon	8.395	7.439	6.512	3.018	2.750	2.276	11.413	10.189	8.788
	Winter	8.436	7.486	6.643	3.097	2.831	2.302	11.533	10.317	8.945
Bark	Summer	8.185	7.392	6.475	2.972	2.677	2.245	11.157	10.069	8.720
	Monsoon	8.092	7.283	6.346	2.888	2.591	2.136	10.980	9.874	8.482
	Winter	8.135	7.341	6.414	2.923	2.632	2.185	11.058	9.973	8.599

Plant 1 -*Sesbaniarostrata*, Plant 2 -*Sesbaniaexaltata*and *Plant* 3 - *Sesbaniasesban*

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