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BIOCHEMICAL EVALUATION OF SOME MEDICINAL PLANTS OF GENUS SESBANIA OF MARATHWADA REGION IN MAHARASHTRA, INDIA

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ABSTRACT

The seasonal variation of starch, total sugar and total carbohydrates content have been investigated from leaves, wood and bark of *Sesbania grandiflora , Sesbania bispinosa* and *Sesbania cannabina* are the medicinally important plant of Marathwada region. Comparative account of starch content of leaves, wood and bark of *Sesbania grandiflora* showed higher level (range 6.519 to 7.678 mg/g dry wt.) than *Sesbania bispinosa* (range 5.985 to 6.703 mg/g dry/wt.) and *Sesbania cannabina* (range 4.446 to 5.440 mg/g dry wt.). Comparative account of total sugar content of leaves, wood and bark of *Sesbania bispinosa* showed higher level (range 3.160 to 4.054 mg/g dry wt..) than *Sesbania grandiflora* (range 1.833 to 2.290 mg/g dry wt..) and *Sesbania cannabina* (range 2.185 to 3.205 mg/g dry wt..). Comparative account of total carbohydrate content of leaves, wood and bark of *Sesbania bispinosa* showed higher level (range 9.233 to 10.768 mg/g dry wt.) than *Sesbania grandiflora* (range 8.352 to 9.944 mg/g dry wt..) and *Sesbania cannabina* (range 6.881 to 8.645 mg/g dry wt.).

KEY WORDS: Medicinal plant, *Sesbania,* Starch, total sugar, total carbohydrate

INTRODUCTION

Carbohydrates is an organic compound with the empirical formula $C_m(H_2O)_n$ that is, consists only of carbon, hydrogen, and oxygen, with a hydrogen: oxygen atom ratio of 2:1 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 (Joshi, 2000; Nudrat and Usha, 2005). These medicinal plants are subjected to various processes and are then administrated to the patients. 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. However, plants and their parts and the pattern of administration vary from person to person. Thus, there is enormous scope for tribal medicines based on plant products which are yet to be studied, analyzed and documented. 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 (WHO) as much as 80% of world's population depends on traditional medicine for their primary health care needs (Azaizeh et al., 2003). Medicinal plants have been used as traditional treatments for numerous human diseases for thousands of years.

Sesbania grandiflora commonly known as agathi, has been uses as an important dietary nutritive source in southeast Asian countries. *Sesbania grandiflora* are richest source of amino acid, minerals and antioxidants vitamins. Various parts of this plant are used in Indian traditional medicine for the treatment of diuretic, emetic, fevers, headaches, smallpox, anemia, bronchitis, inflammation, leprosy, gout, rheumatism, anxiolytic, anticonvulsive and hepatoprotective (Pari and Uma, 2003). It also has anxiolytic and anticonvulsive, (Kasture *et.al.,* 2002) anti-inflammatory, analgesic and antipyretic activity. Beside Sesbania grandiflora is mentioned as potent antidotes for tobacco and smoking related diseases. *Sesbania grandiflora* has hypolipidemic property on cigarette smoke exposed rats (Ramesh and Hazeena begum 2006). Dhaincha (*Sesbania bispinosa*) is a crop generally cultivated for its nutritive value to soil. It is cultivated in monsoon season almost throughout India and grows well in loamy, clayey, black and sandy 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 tribals, Katkharis and Ghonds (Siddhuraju *et al*., 1995b).

Sesbania cannabina resorted to be aperient, diuretic, emetic, emmenagogue, febrifuge, laxative, and tonic, agati is a folk remedy for bruises, catarrh, dysentery, eyes, fevers, headaches, smallpox, sores, sore throat, and stomatit. Bark, leaves, gums, and flowers are considered medicinal. The astringent bark was used in treating smallpox and other eruptive fevers. The juice from the flowers is used to treat headache, head congestion, or stuffy nose. Legume seeds are valuable source of protein, oil, carbohydrates, minerals and vitamins. They are playing an important role in human nutrition mainly in developing countries (Mohamed and Rangappa, 1992; Yanez *et al.,* 1995).

MATERIALS AND METHODS

Carbohydrates were estimated by methods suggested by McGready (1950), and Nelson (1941):

Reagents

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

The seasonal variation of total carbohydrates levels of different plants parts of *Sesbania grandiflora, Sesbania bispinosa* and *Sesbania cannabina* shown in Table. 1.

Table. 1. Seasonal variation of total carbohydrates levels of different plants parts of *Sesbania grandiflora, Sesbania bispinosa and Sesbania cannabina*

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	6.635	6.442	5.259	2.182	3.442	2.924	8.818	9.885	8.183
	Monsoon	6.519	6.073	5.159	1.833	3.160	2.589	8.352	9.233	7.749
	Winter	6.595	6.216	5.234	2.054	3.241	2.773	8.650	9.457	8.008
Wood	Summer	7.678	6.703	5.44	2.266	4.065	3.205	9.944	10.768	8.645
	Monsoon	7.265	6.431	5.238	1.988	3.964	3.066	9.253	10.396	8.305
	Winter	7.477	6.545	5.351	2.191	4.054	3.135	9.668	10.599	8.486
Bark	Summer	7.271	6.187	4.955	2.290	3.889	2.495	9.562	10.076	7.450
	Monsoon	7.152	5.985	4.446	2.146	3.291	2.336	9.298	9.276	6.782
	Winter	7.255	6.132	4.696	2.238	3.632	2.185	9.493	9.764	6.881

Plant 1 - *Sesbania grandiflora,* **Plant 2** - *Sesbania bispinosa and* **Plant 3** – *Sesbania cannabina*

Sesbania grandiflora

The continuous two year investigation showed that leaves generally accumulated total carbohydrate ranges from to 8.35 to 8.81mg/g dry wt. higher level of total carbohydrates observed at summer 8.81mg/g dry wt. as compared to winter 8.65 and monsoon 8.35mg/g dry wt. In wood it observed that at summer 9.94mg/g dry wt. of total carbohydrates accumulates higher than winter i.e. 9.66mg/g dry wt. and monsoon 9.25mg/g dry wt. Summer show highest level of level of total carbohydrates .While in bark total carbohydrates ranges from 9.29mg/g dry wt. to 9.56 mg/g dry wt. higher level observed in summer 9.56mg/g dry wt. as compared to winter 9.49mg/g dry wt. and monsoon 9.29mg/g dry wt. The percentage of total carbohydrates were found to be increasing order of leaves < bark< wood.The total sugar of bark show higher level than leaves and wood, wood ranges total sugar 1.98mg/g dry wt. to 2.26 mg/g dry wt. Higher level observed at summer 2.26mg/g dry wt. as compared to winter 2.19 mg/g dry wt. and monsoon 1.98 mg/g dry wt. In leaves total sugar accumulated high level observed at summer season (i.e. 2.18mg/g dry wt. than winter i.e. 2.05mg/g dry wt. and monsoon 1.83mg/g dry wt., While in bark range of total sugar is it ranges from 2.14 to 2.29mg/g dry wt. highest level observed at summer 2.29mg/g dry wt. as compared to monsoon 2.23mg/g dry wt. and winter 2.14mg/g dry wt. respectively. The percentage of total sugar were found to be in increasing order of leaves<wood<bark.

The starch ranges of leaves show from 6.51mg/g dry wt. to 6.63mg/g dry wt. highest level observed at summer season i.e. 6.63mg/g dry wt. as compared to winter i.e. 6.59mg/g dry wt. and monsoon 6.51mg/g dry wt. In wood starch accumulation observed high at summer 7.67mg/g dry wt. as compared to winter i.e. 7.47mg/g dry wt. and monsoon i.e. 7.26mg/g dry wt. The starch accumulation in leaves show low than wood and bark. Wood show higher accumulation of starch at summer 7.67mg/g dry wt. than winter 7.47mg/g dry wt. and monsoon 7.26mg/g dry wt. The concentration of starch were found to be increasing order of leaves < bark<wood. (Table1).

Sesbania bispinosa

The starch content of leaves show ranges from 6.07 to 6.44mg/g dry wt. much more observed in summer 6.44mg/g dry wt. than in winter 6.21mg/g dry wt. and in monsoon 6.07mg/g dry wt.. In wood highest level observed at winter i.e. summer 6.70mg/g dry wt. as compared to winter 6.54mg/g dry wt. and monsoon 6.43mg/g dry wt., while in bark starch accumulated much more in summer 6.18mg/g dry wt. than winter 6.13mg/g dry wt. and monsoon 5.98mg/g dry wt. The percentage of starch were found to be increasing order of bark< leaves < wood.

The total sugar content of leaves and bark show lower than Wood, in leaf total sugar ranges from 3.16mg/g dry wt. to 3.44mg/g dry wt. Higher accumulation of total sugar observed at summer 3.44mg/g dry wt. than winter 3.24mg/g dry wt. and monsoon 3.16mg/g dry wt. The range of total sugar content of wood was between 4.06mg/g dry wt. to 4.05mg/g dry wt. it show higher than leaves and bark. Higher level observed at summer i.e. 4.06mg/g dry wt. as compared to winter 4.05mg/g dry wt. and monsoon 3.96mg/g dry wt.., while in bark, higher accumulation of total sugar observed at summer 3.88mg/g dry wt. than in winter 3.63mg/g dry wt. and monsoon 3.29mg/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. 10.76mg/g dry wt. than winter 10.59mg/g dry wt. and monsoon 10.39mg/g dry wt. The range of total carbohydrates content of bark was between 9.27 mg/g dry wt. to 10.07mg/g dry wt. higher accumulation observed at summer 10.07mg/g dry wt. As compared to winter (9.76mg/g dry wt.) and monsoon (9.27mg/g dry wt..). The concentration of total carbohydrates were found to be in increasing order of leaves < bark <wood. (Table 1)

Sesbania cannabina

The range of starch content of leaves was between 5.15mg/g dry wt. to 5.25mg/g dry wt., higher accumulation of starch observed at summer 5.25mg/g dry wt. as compared to winter 5.23mg/g dry wt. and monsoon 5.12mg/g dry wt. while in wood higher accumulation of starch observed as summer i.e. 5.44mg/g dry wt. than winter 5.35mg/g dry wt. and monsoon 5.23mg/g dry wt.. In bark starch ranges in between 4.44mg/g dry wt. to 4.95mg/g dry wt. higher accumulation of starch observed at summer 4.95mg/g dry wt. as compared to winter 4.69mg/g dry wt. and monsoon 4.44mg/g dry wt. The concentration if starch were found to be in increasing order of Bark< leaves, wood.

The range of total sugar content of leaves was from 2.58mg/g dry wt. to 2.92mg/g dry wt., during different season. The range of total sugar observe high at summer i.e. 2.92mg/g dry wt. as compared to winter i.e. 2.77mg/g dry wt. and monsoon 2.58mg/g dry wt., while in bark total sugar accumulated range from 2.18mg/g dry wt. to 2.49mg/g dry wt., Higher level of total sugar observed at summer 2.49mg/g dry wt. than monsoon 2.33mg/g dry wt. and winter 2.18mg/g dry wt. In wood accumulation of total sugar was highest in summer 3.20 mg/g dry wt. as compared to winter 3.13 and monsoon 3.06mg/g dry wt. The concentration of total sugar were found to be in increasing order bark< leaves < wood.
The total carbohydrates of leaves was higher in summer 8.18% than winter 8.00 % and monsoon 7.74%.The range of total carbohydrates content of wood was between 8.30% to 8.64%, higher concentration was observed at summer

8.64% as compared to winter 8.48% and monsoon 8.30% .The range of total carbohydrates content of bark was from 6.88mg/g dry wt. to 7.45mg/g dry wt. during different season higher level observed at summer 7.45mg/g dry wt. as compared winter 6.88mg/g dry wand monsoon 6.78mg/g dry wt. The total carbohydrates concentration were found to be in increasing order of bark < leaves< wood. (Table 1)

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