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IN VIVO AND IN VITRO BIOCHEMICAL ESTIMATION OF METABOLITES FROM TWO MEDICINALLY IMPORTANT PLANTS VIZ. *INDIGOFERA CORDIFOLIA* AND *INDIGOFERA LINNAEI*

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ABSTRACT

Since ancient times medicinal plants have been virtually used in all cultures as a source of medicines. Primary metabolites obtained from plants for their pharmacological assay. Wild plants are the vast source of innumerable therapeutic agents representing molecular diversity engineered by nature. This research article shows the composition of primary metabolites from two plants species of family Fabaceae. Two medicinally important plants were selected for the present study viz. *Indigofera cordifolia* and *Indigofera linnaei*. The primary metabolites (total soluble sugar, starch, lipids, proteins and phenol) of *Indigofera cordifolia* and *Indigofera linnaei* have been estimated from different plant parts *viz*., leaves, stem, root and callus. The observations of the study showed maximum amount of total soluble sugar and starch in roots (58.0±0.21 mg/g.d.w) and stem (56.33±0.47 mg/g.d.w) of *I. cordifolia* respectively. Proteins in the stem (48.3±1.24 mg/g.d.w), lipids (75.67 mg/g.d.w) in leaf explant of *I. cordifolia* but phenol content was highest(50.0±0.21 mg/g.d.w) in stem of *I. linnaei* in comparison to other parts investigated.

KEY WORDS: *Indigofera cordifolia*, *Indigofera linnaei*, Primary metabolites-total soluble sugar, starch, lipids, proteins and phenol.

INTRODUCTION

Medicinal plants are natural resources, yielding valuable herbal products, which are often used in the treatment of various human diseases. Since the ancient time medicinal plants are used in Ayurveda[1.] As medicinal plants play an important role in human life for the trouble

free living, therefore in the recent years, the interest in medicinal plants has increased many folds, deal. People have taken this subject with whole heart keenness with full devotion by conducting various researches on plant-based medicines [2]. Primary metabolites are the basic substances in the biosynthesis of complex substances in the cells. Primary metabolites obtained from higher plants for commercial use are high volume, low- value bulk chemicals. In plants, metabolites are the net product; in this process, many different types of organic compounds or metabolites are produced. These metabolites are divided into two groups primary and secondary metabolites. These metabolites are used as a major resource to find new drug molecules [3]. Primary metabolites directly involved in growth and development of plants. Primary metabolites *viz.*, chlorophyll, amino acids, nucleotides and carbohydrates have a key role in metabolic processes such as photosynthesis, respiration and nutrient assimilation. They are used as industrial raw material and food additives. Many plants such as *Nerium indicum*, *Gloriosa superba*, *Ricinus communis*, *Euphorbia hirta* and two plants of verbenaceae family have been evaluated for their composition of primary metabolites [4,5,6,7].

MATERIALS AND METHODS

Indigofera cordifolia B.Heyne ex Roth and *Indigofera linnaei Ali*, commonly known as Heart-Leaf Indigo, Gokhru, Bekara, Bechka and Birds ville indigo, leel, Bekario, Bhingule respectively, belongs to the family fabaceae**.** A regular collection of various plant parts of *I. cordifolia* from Aravalli ranges, Amber, Jaipur from May to November and the collection of *I. linnaei* from University Campus, Jaipur from May to December. The plants were identified and voucher specimen was deposited to the Herbarium, Department of Botany, University of Rajasthan, Jaipur (*I. cordifolia* RUBL NO. 20400; *I. linnaei* RUBL NO. 20399). The various plant materials were separately washed with running water to remove dust, shade dried and powdered, the calli was dry in oven and then with all parts were crushed with motar and pestle.The quantitative estimation of primary metabolites was carried out using different protocols. The powdered plant parts *viz*, leaves, stems, root and calli of *I. cordifolia* and *I. linnaei* were used for analysis of carbohydrate and starch [8], lipids [9], protiens[10] and phenol [11] respectively. All experiments were repeated in triplicate and means (±SD) were calculated.

RESULTS AND DISCUSSION

Plants are of great importance to the health of individuals and communities from time immemorial. Plant kingdom provides a treatment reservoir of various photochemical with potential therapeutic properties. India is rich in its plants diversity, a number of plants have

been documented for their medicinal poptential which are in use by the traditional healers, herbal folklorist. In the present investigation, *I. cordifolia* and *I. linnaei* were evaluated quantitatively for the analysis of total soluble sugar, starch, lipid, protein and phenol (Table 1). The various plant parts (Leaf, Stem, Root and Calli) of *I. cordifolia* and *I. linnaei* varied in composition of *in vivo* and *in vitro* metabolites are studied.

In the present investigation, maximum content of soluble sugar level was observed in roots of *I. cordifolia* (58.0±0.21 mg/g.d.w) and minimum in calli of *I. linnaei* (26.0±0.13 mg/g.d.w) (Table 1). Plant sugars can be used as artificial sweetener and they can even help in diabetes by supporting the body in its rebuilding [12]. Higher content of soluble sugar was reported in leaves of Madhuca indica[13] and Plant parts of cucurbitaceae family viz. *Luffa cylindrical* Linn and *Citrullus colocynthis* Linn[14]. The maximum content of starch was observed in stem of *I. cordifolia* (56.33±0.47 mg/g.d.w) and lowest content in calli of *I. cordifolia* (21.8±0.32 mg/g.d.w). Starch is one of the most abundant metabolite in plants. The major sources of starch are wheat, potato and cassava mostly used as food.

The amount of lipids was highest in the leaf part of *I. cordifolia* (38.0±0.81 mg/g.dw) while minimum amount of lipids in leaf of *I. linnaei* (20.0±0.87 mg/g.dw). Lipids, a diverse group of primary metabolites, include reserve plant material such as fats, essential oils, waxes, terpenoids and oleoresin. Lipids are major constituent of cell membranes, which act as vital cellular messengers and serving as module to hormones and vitamins. With a strong foundation in research and development, plant lipids have developed products that work with diverse requirements, be it culinary, medicinal or cosmetics[15].

Proteins are the most important things of living beings**.** The maximum content of proteins was observed in stem *I. cordifolia* (48.3±1.24 mg/gdw) while minimum was in stem part of *I. linnaei* (12.6±0.50 mg/gdw). The presence of higher protein level in the plant points towards their possible increase in food value or that a protein based bioactive compound could also be isolated in future [16].The highest amount of phenols was observed in stem of *I. linnaei* (50.0±0.21 mg/gdw) and lowest content in leaf of *I. cordifolia* (28.3±0.16 mg/gdw). Phenols, exhibit a number of biological activities such as antioxidant, antiseptic, disinfectant fungicide and pesticides. The higher amount of phenols is important in the regulation of plant growth, development and diseases resistance [17]. The stem of *I. linnaei* contains higher level of phenol. Phenols showed antibacterial and anti-inflammatory activities. Everybody knows the importance of plants. Life is not possible without these

Table 1: Yield content (mg/g.d.w) of primary metabolites of *I. cordifolia* and *I. linnaei.*

Plant	Plants parts	Primary metabolites (mg/g. dw)				
		Sugar	Starch	Lipids	Proteins	phenols
.					cordifolia	Root
58.0±0.21	**56.33±0.47**	28.03±0.16	46.34±1.69	35.00±0.26		
	Stem	50.00±0.21	49.00±0.47	24.00±0.44	**48.03±1.24**	31.00±0.08
	Leaf	48.33±1.24	47.02±0.48	**38.00±0.81**	29.01±0.53	43.03±0.37
	Calli	29.00±1.24	21.08±0.32	22.00±0.60	18.05±0.50	29.01±0.53
I. linnaei	Root	46.34±1.64	35.00±0.26	23.00±0.26	12.06±0.20	46.00±0.05
	Stem	43.03±0.37	38.06±0.40	31.00±0.08	18.05±0.50	**50.00±0.21**
	Leaf	35.00±0.26	33.33±0.94	20.00±0.87	24.04±0.49	28.03±0.16
	Calli	26.06±0.13	24.00±0.44	18.05±0.50	22.01±0.45	41.00±0.33

CONCLUSION

Plants not only produce food for survival but also play an important role in healthy environment and eco-friendly environment to live. It may be concluded from this study that the root, stem and leaves of *I. cordifolia* are highly rich in primary metabolites in comparison to that of *I. linnaei* but the high content of phenol was observed in the stem of *I. linnaei*. The results confirm the use of plants in traditional medicine. The investigation can be subjected to the therapeutic use and carry out further pharmaceuticals. They may also have an ecological significance, as a nutrient source. These studies show that plants having rich primary metabolites could be used industrially as raw materials.

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