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Quantitative estimation and comparative study of primary metabolites of some medicinal plants.

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Abstract
The present study was conducted for estimation of primary metabolites of two plants of family Rubiaceae viz. *Hamelia patens* and *Mitragyna parvifolia* and two plants of family Verbenaceae viz. *Durenta erecta* and *Petrea volubilis*. The plant parts leaves, stem and roots were used separately for the study. Results of the present work indicates that highest amount of starch (85.6±1.71 mg/gdw) was found in stem of *D. erecta,* protein (94.2±1.41 mg/gdw) in roots of *H. patens* and lipid (30.2±0.87 mg/gdw) in root of *D. erecta,* sugars (96.6±0.69 mg/gdw and phenols (135.5±0.91 mg/gdw) in leaves of *M. parvifolia* respectively.

Key Words
Primary metabolite, Phenol, Protein, Soluble sugar, Starch, Lipid.

Introduction
The medicinal plants are referred to plants that are used for their therapeutic or medicinal values. The whole plant or its different parts may be valued for its therapeutic, medicinal, aromatic or savoury qualities. Biologically active compounds present in medicinal plants have been of great interest to scientists working in the field. India is one of the leading countries in Asia in terms of the wealth of traditional knowledge systems related to the use of plant species. India is also known to harbor a rich diversity of higher plant species (about 17000 species) of which 7500 are known as medicinal plants[1]. Plant synthesizes a wide variety of chemical compounds, which can be sorted by their chemical class, biosynthetic origin and functional groups into primary and secondary metabolites. Primary metabolites make up the physical integrity of the plant cell and are involved with the primary metabolic process of building and maintaining of living cells. Secondary metabolites do not seen to be vital to the immediate survival of the organism that produces them and are not an essential part of the process of building and maintaining living cells[2]. The metabolites of plant are commercially important and find its use as raw material for various scientific investigations and in number of pharmaceutical compounds. In recent times, the blind dependence on synthetic drugs is surpassed over to the fact that the herbal drugs are cost effective, easily available and most importantly, with negligible side effects[3].

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Many plants such as *Nerium indicum*, *Gloriosa superba*, *Ricinus communis*, *Euphorbia hirta*, *Pongamia pinnata*, *Digera muricata etc.* have been evaluated for their composition of primary metabolites [4,5,6,7,8]. The present study was conducted to compare primary metabolites viz., total soluble sugar, starch, phenol, proteins and lipids of *Hamelia patens* (Rubiaceae), *Mitragyna parvifolia* (Rubiaceae), *Durenta erecta* (Verbenaceae) and *Petrea Volubilis* (Verbenaceae) and their quantitative estimation.

Material and Methods
Plant parts (stem, leaves and roots) of proposed plants were collected from the adjoining areas of Jaipur and campus of University of Rajasthan, Jaipur (26.92°NL-75.82°EL). The plants were identified and a voucher specimen was deposited to the Herbarium, Botany Department, University of Rajasthan, Jaipur. The collected plant parts were separately washed with running water to remove dust, shade dried and then powdered. The quantitative estimation of primary metabolites was carried out using different protocols. The powdered plant parts viz, leaves, stems and roots were used for analysis of starch and soluble sugars[9], protein[10], lipids[11] and phenol[12] respectively. All experiments were repeated in triplicate and data were calculated as means (±S.E.M).

Result and Discussion
A primary metabolite is directly involved in the normal growth, development, and reproduction. Primary metabolites are of prime importance and essentially required for growth of plants. Many

primary metabolites lie in their impact as precursors or pharmacologically active metabolites in of pharmaceutical compounds such as antipsychotic drugs[11,12]. In the present study a comparative analysis was made to determine primary metabolites *viz.* starch, soluble sugar, protein, lipid and ascorbic acid qualitatively.

Starch

It is white, odorless, tasteless, carbohydrate powder. It plays a vital role in the biochemistry of both plants and animals and has important commercial uses. In green plants starch is produced by photosynthesis; it is one of the chief forms in which plants store food. It is stored most abundantly in tubers (e.g., the white potato), roots (e.g., the sweet potato), seeds, and fruits; it appears in the form of grains that differ in size, shape, and markings in various plants. Quantitative estimation of starch indicates that highest content was more in stem of *D. erecta* (85.6±1.71 mg/gdw) and minimum in root of *M. parvifolia* (22.8±1.61 mg/gdw).

Soluble sugars

Plants are rich sources in flavouring, fragrances, insecticides; sweeteners and natural dyes[13]. Carbohydrates are one such group of carbon compounds which are essential to life. Almost all organisms use carbohydrates as building blocks of cells and as a matter of fact, exploit their rich supply of potential energy to maintain life. Highest amount of sugars was observed in leaves of *M. parvifolia* (96.6±0.69 mg/gdw) and minimum in stem of *P. volubilis* (17.4±1.57mg/gdw).

Proteins

Protein is an important component of every cell in the body. Hair and nails are mostly made of protein. Human body uses protein to build and repair tissues. Enzymes, hormones, and many immune molecules are proteins. Protein is an important building block of bones, muscles, cartilage, skin, and blood and it is a source of energy. Essential body processes such as water balancing, nutrient transport, and muscle contractions require protein to function. Total levels of protein were found to be higher in root of *H. patens* (94.2±1.41 mg/gdw) and lower amount in leaves of *D. erecta* (30.2±0.85 mg/gdw).

Lipid

The majority of lipids in biological systems function either as a source of stored metabolic energy or as structural matrices and permeability barriers in biological membranes. Very small amounts of special lipids act as both intracellular messengers and extracellular messengers such as hormones and pheromones. Maximum amount of lipid was found in root of *D. erecta* (30.2±0.87 mg/gdw) and minimum in stem of *H. patens* (2.6±0.41mg/gdw).

Phenol

Phenolic compounds are widely distributed in the plant kingdom. Plant tissues may contain up to several grams per kilogram. External stimuli such as microbial infections, ultraviolet radiation, and chemical stressors induce their synthesis. Ecologic functions include defense against microbial pathogens and herbivorous animals[14]. Total level of phenol was found to be higher in leaves of *M. parvifolia* (135.5±0.91 mg/gdw) and lower in root of *H. patens* (47.2±0.89 mg/gdw).

Conclusion

In the present study, it was found that highest amount of starch (85.6±1.71 mg/gdw) was in stem of *D. erecta*, protein (94.2±1.41 mg/gdw) in roots of *H. patens* and lipid (30.2±0.87 mg/gdw) in root of *D. erecta*, sugars (96.6±0.69 mg/gdw and phenols (135.5±0.91 mg/gdw) in leaves of *M. parvifolia* respectively. These results are suggestive of primary bioactive compound of commercially importance and may result in great interest in plants pharmaceuticals. Therefore, economic use depends partially on the quantitative and qualitative aspects of their organic reserves, specially carbohydrates, proteins, phenols and lipids. These primary metabolites further can be used for biosynthesis of secondary metabolites or bioactive compounds.

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Table 1: Yield content (mg/gdw)* of primary metabolites of *H. Patens, M. Parvifloia, D. erecta* and *P. volubilis*.

Plants and their parts name		Starch	Soluble Sugars	Protein	Lipid	Phenol
H. patens **(Rubiaceae)**	**Leaves**	37.5±0.41	48.2±0.64	87.8±0.79	28.5±0.77	104.6±1.12
	Stem	28.6±1.12	44.5±0.89	34.5±1.14	2.6±0.41	50.7±1.41
	Root	30.4±1.51	52.6±1.14	94.2±1.41	5.7±1.12	47.2±0.89
M. parvifloia **(Rubiaceae)**	**Leaves**	38.4±1.12	96.6±0.69	49.5±0.59	46±0.45	135.5±0.91
	Stem	26.2±1.16	74.4±1.17	58.3±1.71	7.6±1.12	130.3±1.16
	Root	22.8±1.61	78.2±0.85	36.2±1.12	18.3±0.69	85.3±1.41
D. erecta **(Verbenaceae)**	**Leaves**	65.2±1.32	77.6±0.69	30.2±0.85	28.3±1.41	95.4±0.89
	Stem	85.6±1.71	65.3±1.34	63.7±0.69	16.5±1.17	87.2±1.14
	Root	70.5±0.77	70.3±1.17	65.1±1.14	30.2±0.87	63.1±1.41
P. volubilis **(Verbenaceae)**	**Leaves**	30.5±1.54	38.6±1.31	54.2±0.77	18.2±0.89	60.3±1.16
	Stem	70.4±0.77	17.4±1.57	57.4±1.12	10.4±1.41	52.2±0.64
	Root	77.4±0.69	18.9±0.91	75.8±0.69	5.7±1.14	85.5±1.34

*****Abbreviations: mg/gdw= miligram per gm dry weight
Data are presented as mean ± S.E.M.

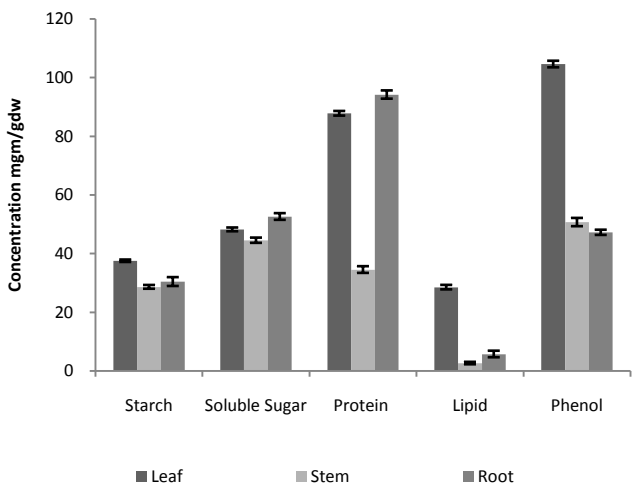

Figure 1.: Primary metabolites of *H. patens*

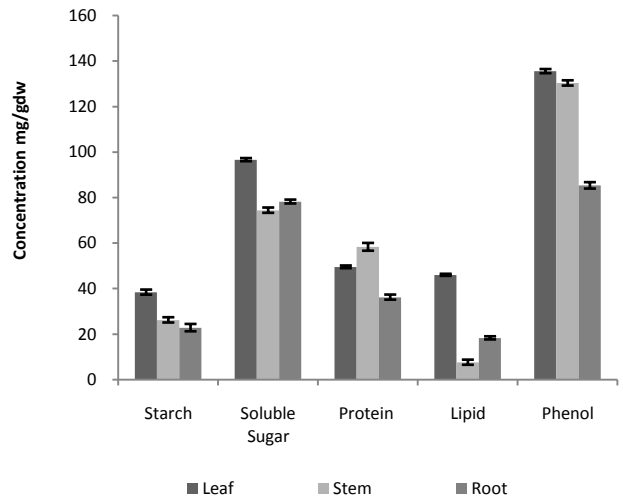

Figure 2.: Primary metabolites of *M. parvifolia*

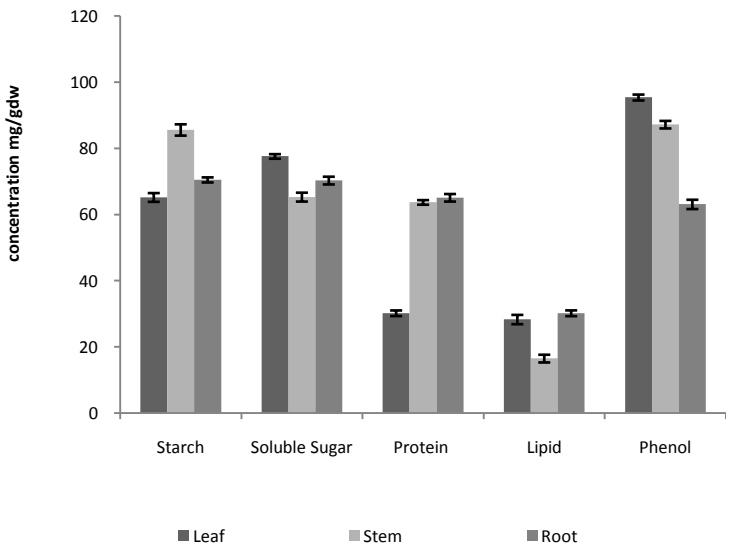

Figure 3.: Primary metabolites of *D. erecta*

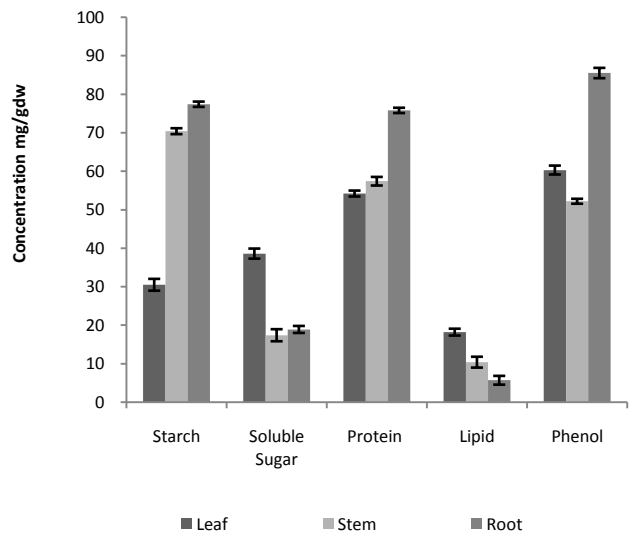

Figure 4.: Primary metabolites of *P. volubilis*

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