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**Comparative study of primary metabolites in different plant parts of *Clitoria ternatea* (L.), *Guazuma ulmifolia* (Lam.) & *Madhuca indica* (Gmel.)**

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**Abstract**

In recent times, focus on plant research has increased all over the world and a large body of evidence has collected to show immense potential of medicinal plants used in various traditional systems. Use of plant based drugs and chemicals for curing various ailments and personal adornment is as old as human civilization. The goal of research work is to estimate primary metabolites such as protein, lipid, starch, phenol, and carbohydrates in different plant parts which are present in different proportion in plant species viz. *Clitoria ternatea*, *Guazuma ulmifolia*, *Madhuca indica*. The highest amount of soluble sugar was observed 129.0 mg/gdw, protein 67.0 mg/gw in leaf of *G. ulmifolia*, phenol 46.0 mg/gdw in root of *M. indica*, lipid 42.0 mg/gdw in root of *G. ulmifolia* and starch 54.0 mg/gdw in stem of *M. indica*, similarly lowest amount of sugar was observed 102 mg/gdw, protein 21.0 mg/gdw in root of *C. ternatea*, and phenol 18.0 mg/gdw in leaf of *C. ternatea*, lipid 10.0 mg/gdw in leaf of *G. ulmifolia* and starch 23.0 mg/gdw in leaf of *M. indica*.

**Keywords:** *Clitoria ternatea*, *Guazuma ulmifolia*, Lipid, *Madhuca indica*, Primary metabolites, Phenol, Protein, Soluble sugar, Starch.

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**Introduction**

Plants continue to be a major source of medicines, as they have been throughout human history. It is estimated that roughly 1500 plant species in Ayurveda and 1200 plant species in Siddha have been used for drug preparation [1] [2]. Nearly 80% of the world population rely on

traditional medicines for primary health care, most of which involve the use of plant extracts [3]. The use of traditional medicine and medicinal plants in most developing countries, as a normative basis for the maintenance of good health, has been widely observed [4]. Plants are like natural laboratories where a great number of chemicals are biosynthesized and in fact they may be considered the most important source of chemical compounds there are. Primary plant metabolism synthesizes essential compounds which are present in all plant species. These compounds such as proteins, fats, carbohydrates and phenols etc. are chief components of animal nutrition.

*Clitoria ternatea* (L.) of family Fabaceae is natural habitat of tropical and subtropical region, known as the *aparajita*. This plant is used as laxative, diuretic, brain tonic, antiulcer, in the treatment of headache and snakebite [5] [6]. It is also useful in the treatment of severe bronchitis, asthma and hectic fever and is used by the local tribal people to cause abortion; paste is applied for curing abdominal swellings.

*Guazuma ulmifolia* (Lam.) of family Sterculiaceae, popularly known as “mutamba” presents wide geographical distribution, ranging from Mexico to Southern Brazil. In traditional medicine, this is used in the treatment of diarrhea, hemorrhages, fever, coughs, bronchitis, asthma, gastrointestinal pain and hypertension, and as stimulant for uterine contractions [7-8].

*Madhuca indica* (Gmel). of family Sapotaceae, commonly known as “Mahua”, is an important economic tree growing throughout the subtropical region of the Indo-Pak subcontinent. The bark is used traditionally in the treatment of rheumatism, ulcers, tonsillitis, and diabetes mellitus. It is also useful in the treatment of helminths, acute and chronic tonsillitis, pharyngitis [9] as well as bronchitis [10].

Primary metabolites are of prime importance and essentially required for growth of plants for example; sugars, protein, lipids, starch. Many primary metabolites lie in their impact as precursors or pharmacologically active metabolites in of pharmaceutical compounds such as antipsychotic drugs [11-12]. The present work is to analyze primary metabolites which are directly concerned with metabolic processes like respiration, photosynthesis, protein & lipid synthesis.

### **Material and methods**

For the quantitative estimation of primary metabolites different protocols were used. Leaves, roots and stems of the plants were collected, washed with distilled water, shade dried and powdered. The powder was used for analysis of carbohydrate, protein, lipid, starch, phenol [13-16].

### **Results**

All the three plants viz. *C. ternatea*, *G. ulmifolia*, *M. indica* were evaluated quantitatively for the analysis of total soluble sugars, protein, phenol, starch, lipid.

**Table-1: Concentration of primary metabolites of *Clitoria ternatea*, *Guazuma ulmifolia*, *Madhuca indica*.(mg/gdw)**

Experiments	<i>Clitoria ternatea</i>			<i>Guazuma ulmifolia</i>			<i>Madhuca indica</i>		
	Root	Stem	Leaf	Root	Stem	Leaf	Root	Stem	Leaf
<b>Sugar</b>	102±0.59	112±0.30	120±0.35	104±0.48	116±0.35	129±0.49	108±0.71	114±0.27	126±0.58
<b>Starch</b>	42±0.35	53±0.47	26±0.40	39±0.49	48±0.13	29±0.23	38±0.37	54±0.49	23±0.75
<b>Protein</b>	21±0.49	39±0.13	58±0.48	26±0.27	34±0.49	67±0.47	28±0.36	43±0.35	64±0.62
<b>Phenol</b>	43±0.13	37±0.56	18±0.35	41±0.49	29±0.59	20±0.27	46±0.47	32±0.49	21±0.37
<b>Lipid</b>	41±0.14	18±0.35	16±0.40	42±0.70	22±0.35	10±0.47	38±0.34	23±0.49	13±0.27

*mg/gdw =milligram per gram dry weight*

## Discussion

In recent times, focus on plant research has increased all over the world and a large body of evidence has collected to show immense potential of medicinal plants used in various traditional systems. Plants are rich sources of high value metabolites like proteins, phenols, sugars, starch and lipids are useful in flavouring, fragrances, insecticides, sweeteners and natural dyes [17]. 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. The highest amount of soluble sugar was observed in leaf of *G. ulmifolia*, 129.0 mg/gdw., which can be used in various inventive compositions as dietary supplements.

Starch is the most important reserve polysaccharide which is composed of glucose units formed photo synthetically but either used in metabolic processes or transformed into reserves starch and stored in different plant parts [18]. The highest content of starch was observed in stem of *M. indica* i.e. 54.0 mg/gdw.

Total levels of Protein were found to be higher in leaf of *G. ulmifolia* i.e. 67.0 mg/gdw. Proteins are the beginners and builders of biochemical reactions. These are the integral part of protoplasm vary in their content from plant to plant which is dependent on the growth & differentiation of plants [19].

In the root of *M. indica*, maximum amount of phenol was observed i.e. 46.0 mg/gdw. Phenols are water soluble substances and with sugar many forms glycosides, thus located in the cell vacuoles. These compounds play an important role in the precursor of toxic substances and role in the growth regulation and development of plants [20].

The total levels of lipid were found to be higher in root of *G. ulmifolia* i.e. 42.0 mg/gdw. Lipids are the supporters and storage molecules of cells. These are greasy materials which play important cellular structures. Lipids are being used by industry as highly stable lubricant and as a renewable source of fuel [21].

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