

Research Article

BIOCHEMICAL ESTIMATION OF PRIMARY METABOLITES FROM PONGAMIA PINNATA (L.): AN IMPORTANT BIODIESEL PLANT

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ABSTRACT

Pongamia pinnata (L.) Pierre (Family:-Fabaceae), popularly known as "Karanj" or "Karanja" in Hindi, and Indian beech in English, is a medium-sized glabrous tree. The goal of research work is to estimate primary metabolites such as sugar, starch, protein, lipid, phenol, ascorbic acid and amino acid which are present in different plant parts of *Pongamia pinnata*. The highest amount of starch (81.90mg/gdw), protein (24.0mg/gdw) and ascorbic acid (3.02mg/gdw) was observed in roots, soluble sugar (45.0mg/gdw), phenol (0.76mg/gdw), and amino acids (10.0mg/gdw) in leaf, lipids (358mg/gdw) in seeds. Similarly lowest amount of phenol (0.20mg/gdw) was observed in root, sugar (14.0mg/gdw) and ascorbic acid (1.06mg/gdw) in stem, starch (16.20mg/gdw), lipid (58.0mg/gdw) and protein (4.20mg/gdw) in leaf, amino acid (2.80mg/gdw) in seeds.

Keywords: *Pongamia pinnata*, Primary metabolites, Sugar, Starch, Lipid, Protein, Phenol, Amino acid, Ascorbic acid.

INTRODUCTION

India is endowed with a rich wealth of medicinal plants. India recognizes more than 2500 plant species which have medicinal values¹. Plants are the source of many bioactive compounds.

Primary metabolites are responsible for growth and development of plant. They are primarily used as industrial raw materials, food or food additives.

Pongamia pinnata, locally known as karanja, is a mangrove plant belonging to the family Fabaceae. It is a medium size glabrous tree with a short bole and attaining a height of around 18 meter and its habitat is in the littoral regions of south-east Asia, Australia and Fiji^{2,3}. Traditionally its bark is used in pile; leave are effective as medicated bath and rheumatic pains; and the seeds are used in hypertension, bronchitis, whooping cough, skin diseases and rheumatic arthritis⁴⁻⁶. Roots are used for cleaning gums, teeth, and ulcers also effective in gonorrhoea^{7,8}. Flowers used for diabetes. In ayurveda and unani medicine, used as anti inflammatory, anti-plasmodial, anti-noneceptive, anti hyperglycemic, anti lipoxidative, antidiarrheal, anti-ulcer, anti-hyper ammonic and antioxidant.

Primary metabolites are of prime importance and essentially required for growth of plants for example; sugar, protein, lipids, starch. Many primary metabolites act as precursors of pharmacologically active metabolites. The present study deals with the study of primary metabolites present in *pongamia pinnata*.

MATERIALS AND METHODS

For the quantitative estimation of primary metabolites different protocols were used. Roots, stems, Leaves and seeds of the mature plant were collected, washed with

distilled water, shade dried and powdered. The powder was used for analysis of carbohydrate⁹, protein¹⁰, lipid¹¹, starch⁹, phenol¹², ascorbic acid¹³, amino acid¹⁴ of the *Pongamia pinnata*.

RESULTS AND DISCUSSION

All the plant parts of *Pongamia pinnata* were evaluated quantitatively for the analysis of total soluble sugars, starch, protein, phenol, lipid, amino acid and ascorbic acid.

A primary metabolite is directly involved in the normal growth, development, and reproduction. Plants are rich sources of high value metabolites like proteins, phenols, sugars, starch, lipids, amino acids and ascorbic acids are useful in flavoring, fragrances, insecticides, sweeteners and natural dyes¹⁵.

In the present study, biochemical estimation of primary metabolites in different parts of *Pongamia pinnata* has been undertaken. The results are present in table-1.

Quantitative estimation of sugar shows that content of sugar is more in leaf i.e. 45.00mg/gdw and minimum amount of sugar i.e. 14.00mg/gdw in stem (Fig. 1). Plant sugars can be used as artificial sweeteners and they can even help diabetics by supporting the body in its rebuilding¹⁶.

Starch is biodegradable and renewable in nature. They are increasingly being considered as an eco-friendly alternative to the use of synthetic additives in many other products, including plastics, detergents, pharmaceutical tablets, pesticides, cosmetics and even oil-drilling fluids¹⁷. The highest amount of starch was observed in root i.e. 81.90mg/gdw and minimum amount was observed in leaf i.e. 16.20mg/gdw (Fig. 2).



Table 1: Estimation of primary metabolites in different part of *Pongamia pinnata* (L.) Pierre. (mg/gdw)

Experiments Plant Parts	Sugar	Starch	Protein	Phenol	Lipid	Amino acid	Ascorbic acid
Root	33.00	81.90	24.00	0.20	108	05.40	03.02
Stem	14.00	40.50	04.40	0.24	73.00	04.60	01.06
Leaf	45.00	16.20	04.20	0.76	58.00	10.00	02.56
Seed	23.00	54.90	06.00	0.64	358	02.80	02.30

Mg/gdw = milli gram per gram dry weight

Figure 1: Soluble sugar concentration mg/gdw of *Pongamia pinnata*

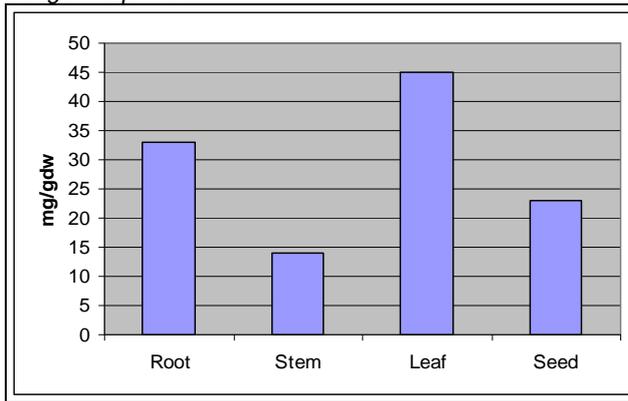


Figure 4: Phenol concentration mg/gdw of *Pongamia pinnata*

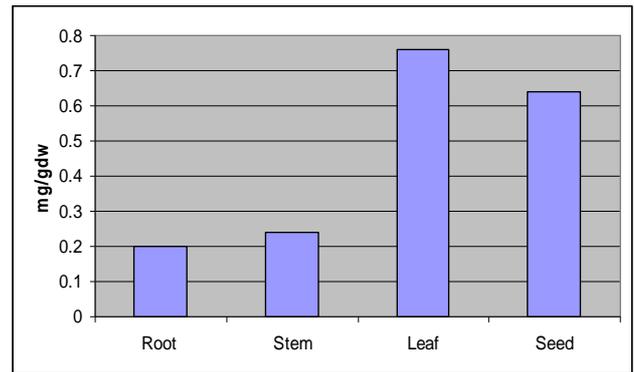


Figure 2: Starch concentration mg/gdw of *Pongamia pinnata*

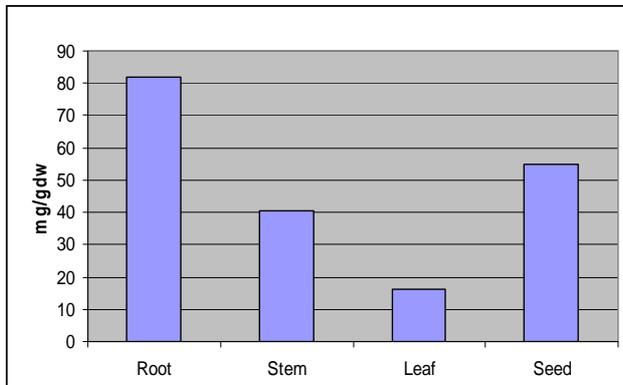


Figure 5: Lipid concentration mg/gdw of *Pongamia pinnata*

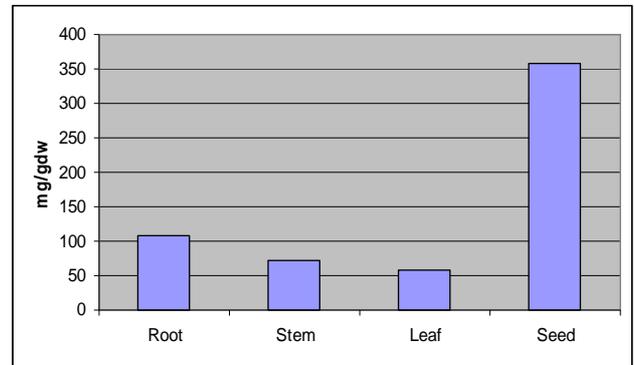


Figure 3: Protein concentration mg/gdw of *Pongamia pinnata*

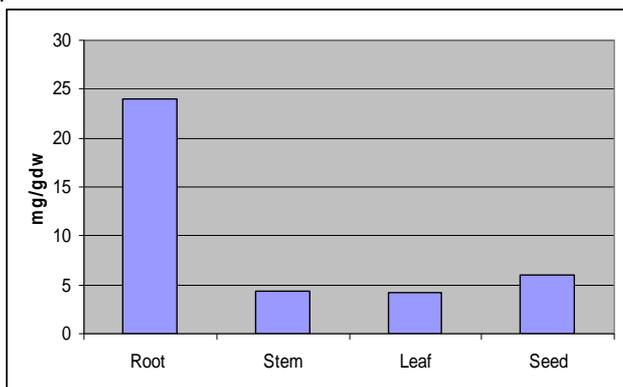


Figure 6: Amino acid concentration mg/gdw of *Pongamia pinnata*

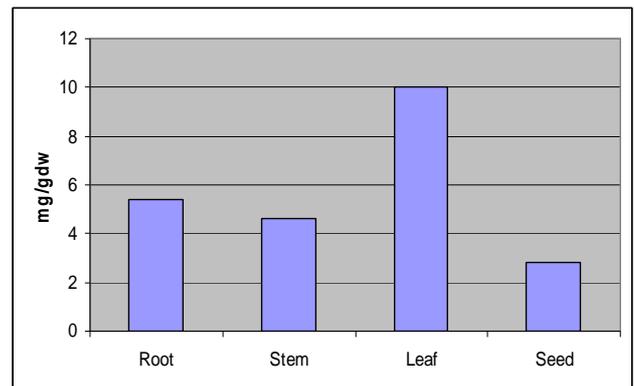
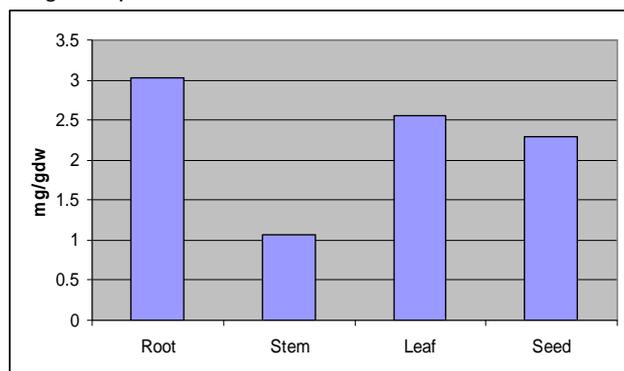


Figure 7: Ascorbic acid concentration mg/gdw of *Pongamia pinnata*

Proteins are the primary components of living things. The presence of higher protein level in the plant points towards their possible increase food value or that a protein base bioactive compound could also be isolated in future¹⁸. Total levels of protein were found to be higher in root i.e. 24.00mg/gdw and lower amount in leaf i.e. 4.20mg/gdw (Fig. 3)

Total levels of phenols were found to be higher in leaf i.e. 0.76mg/gdw and lower amount in root i.e. 0.20mg/gdw (Fig. 4). The higher amount of phenols is important in the regulation of plant growth, development and diseases resistance. It can be used as fungicide, pesticides, an antiseptic, disinfectant and in the manufacture of resins, explosives, plastics, detergents and pharmaceutical substances.

The total levels of lipid were found to be higher in seed i.e. 358mg/gdw and lower in leaf i.e. 58.00mg/gdw (Fig. 5). The higher amount of plant lipid can be used as essential oils, spice oleoresins and natural food colors. With a strong foundation in research and development, plant lipids have developed products that work with diverse requirements, be it culinary, medicinal or cosmetic¹⁹.

Amino acids are critical to life, and have many functions in metabolism. Amino acids are very important in nutrition. These are commonly used in food technology and industry. The maximum amount of amino acid i.e. 10.00mg/gdw was observed in the leaves of *Pongamia pinnata* and minimum amount was observed in seed i.e. 2.80mg/gdw (Fig. 6). Very often in plants during diseases conditions, the free amino acid composition exhibits a change and hence, the measurement of the total free amino acids gives the physiological and health status of the plants²⁰.

Ascorbic acid (vitamin C) is a familiar molecule because of its dietary significance, most aspects of its metabolism and some aspects of its function in plants are very poorly understood²¹. Total levels of ascorbic acid were found to be higher in root i.e. 3.02mg/gdw and minimum in stem i.e. 1.06mg/gdw (Fig. 7).

CONCLUSION

We quantify that *Pongamia pinnata* contain many primary metabolites like carbohydrates, proteins, phenols, lipids, amino acids and ascorbic acids. Highest amount of soluble sugar were found to be higher in leaves of *Pongamia pinnata* i.e. 45.00mg/gdw., starch in root i.e. 81.90mg/gdw., lipids in seed i.e. 358mg/gdw., proteins in root i.e. 24.00mg/gdw., phenol in leaf i.e. 0.76mg/gdw., amino acids in leaf i.e. 10.99mg/gdw and ascorbic acid in root i.e. 3.02mg/gdw. These results are suggestive of primary bioactive compound of commercially importance and may result in great interest in plants pharmaceuticals. Primary metabolites analysis is necessary for knowing the nutritional potential of plants and them also from the precursors for the synthesis of secondary metabolites²².

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