E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; 7(1): 96-99
Received: 02-10-2023
Accepted: 04-11-2023

Islam A
Subject Matter Specialist (Community Science), Krishi Vigyan Kendra, Nagaon, Assam Agricultural University, Naogaon. Assam, India

Bhattacharyya R
Rtd. Professor, Department of Food Science and Nutrition, Assam Agricultural University, Jorhat, Assam, India

Rahman SW
Department of Agricultural Biotechnology, Assam Agricultural University, Jorhat, Assam, India

Banik B
Principal, School of Pharmaceutical Science and Technology, Kanuwamari, Nagaon, Assam, India

Rahman N
Assistant Horticulturist, AICRP on Floriculture, AAU-HRS, Kahikuchi, Guwahati, Assam, India

Islam M
Subject Matter Specialist (Animal Science), Krishi Vigyan Kendra, Kokrajhar, Assam Agricultural University, Gossaigaon, Assam India

Corresponding Author:
Islam A
Subject Matter Specialist (Community Science), Krishi Vigyan Kendra, Nagaon, Assam Agricultural University, Naogaon. Assam, India

Evaluation of physico-chemical properties of *Simarouba glauca* leaf powder

Islam A, Bhattacharyya R, Rahman SW, Banik B, Rahman N and Islam M

DOI: https://doi.org/10.33545/2618060X.2024.v7.i1b.193

Abstract
Medicinal plants have been of age long remedies for human diseases because they contain components of therapeutic value due to presence of different essential vitamins and minerals in its. Present study was conducted on evaluation of different phyto-chemical properties of *Simarouba glauca* leaf powder extract.in the study different standard method were used. Result showed presence of different types of vitamins and other proximate content. *Simarouba glauca* leaf powder contained 9.01±0.26 per cent moisture, 12.42±0.33 per protein, 4.33±0.09 per cent fat, 27.95±0.51 per cent fibre, 3.29±0.67 per cent of ash, 39.81±0.14 per cent carbohydrate, 90.99±0.26 per cent dry matter, 0.71±0.02 mg/100 gm thiamine, 0.42±0.12 mg/100 gm riboflavin, 1.59±0.18 mg/100 gm niacin, 22.1±0.17 mg/100 gm and 5.01±0.09 mg/100 gm vitamin A respectively.

Keywords: *Simarouba glauca*, leaf, vitamin, phyto-chemical, powder

1. Introduction
Medicinal plants have been of age long remedies for human diseases because they contain components of therapeutic value (Nostro *et al.*, 2000) [19]. In the ancient era, these plants were mainly used by the rural population due to abundance in its availability and were used as local healers popularly known by various healing practices such as vaidya, samhita, ayurveda, unnani etc. According to World Health Organization, 80% of world's population mainly counts on traditional medicines for health care. Plant products have been a part of phyto medicines since time immemorial (Ayangla *et al*., 2016 and Lokhande *et al*., 2019) [6, 16]. There are about 21,000 species of plants that are used for medicinal purposes and detected as having a therapeutic significance (NHPI, 2021) [18]. Out of 3895 economically significant plant species reported from North east India, nearly 7.34% are used as wild vegetables, fruits and ethno-medicine (Baruah *et al.*, 2015) [7].
Medicinal plants possess essential food components such as carbohydrates, protein and fat. These components are important for the human body's requirements and they are used in different physiological, metabolic, and morphological activities (Radha *et al.*, 2021 and Cheeke, 2009) [22, 9]. Natural plant-derived products are used in medications, nutritional supplements, and in different healthcare products. Due to gradual geo-physical changes in the local topography, a large portion of the world population is facing various lifestyle diseases like cardiovascular diseases, diabetes, cancer, intra-ventricular conduction disturbances, degenerative as well as age related diseases, which have resulted in a sharp increase in the health care budgets. As a result it becomes necessity to study in details about various phytochemical properties of *Simarouba glauca* leaf powder.
Simarouba glauca, commonly known as 'Laxmitaru' or 'Paradise tree' belongs to the family Simaroubaceae which is poly-gamo-dioecious and is a versatile multipurpose evergreen tree having a height of 7-15 m with tap root system. This plant is well known for its different types of medicinal and pharmacological properties (Awate *et al.*, 2014) [5]. The bark and leaf extracts is well known for its different types of pharmacological properties Ramesh *et al.*, 2017) [23]. In view of the renewed interest in *Simarouba glauca* and its several biological activities, it has become imperative to evaluate the various phytochemical properties of *Simarouba glauca* leaf extract in details and its bioactivities.

2. Materials and Methods

2.1 Collection and identification of plant sample

Fresh and matured leaves of *Simarouba glauca* were collected from Assam Agricultural University, Jorhat, Assam, India, in April 2017. The plant sample was identified and authenticate by Professor, Dr. Ranjit Bhattacharyya, Department of Horticulture, Assam agricultural University, Jorhat, Assam, India.

2.2 Preparation of samples for chemical analysis

2.2.1 Drying of fresh leaves for analysis

Matured leaves of *Simarouba glauca* were separated, washed thoroughly under the running tap water, drained, spread over trays (~2 mm bed thickness) and dried in a Tray Dryer (Mevish Tray Dryer, Model: GMP, MOC: S.S.304, HP: 0.5) at 40 °C, up 10% moisture content (Prajapati *et al.*, 2018 and Manasa *et al.*, 2019) [28, 17]. The dried leaves were then homogenized in a grinder (Bajaj Mixer Grinder, Model: GX10 DLX, 410038) to fine powder and passed through the sieve (Coarse size 40 mm) (Abdullah, *et al.* 2018) [1] and stored in high density polyethylene (HDPE) air tight container (Capacity: 1500 ml) for further use.

2.2.2 Sequential extraction of *Simarouba glauca* leaf powder adopting Antony *et al.*, 2016 [2] method

In 300 ml of solvent (Chloroform, ethanol, methanol and water, according to its increasing order of polarity) and 60 gm of dry powder was placed in soxhlet extractor. Extraction was carried out for 3hrs and 9 cycles at room temperature. Extracts of dark green colour was obtained. The solvent extracts were evaporated using rotary evaporator (Roteva Equiptronics - Rota evaporator, Model: 8763.RD0.000, 1200 Watts) and the semisolid extract was then kept in sterile bottles, under refrigerated conditions, until further use. The percentage yield of *S. glauca* extracts were calculated using the weight/weight formula.

2.2.3. Estimation of Nutrient Composition

The SG leaf powder sample was subjected to proximate analysis using standard reference protocols of AOAC (2010) and the average values of three replications were reported in percentage wet basis (% wb). The moisture content, fibre content and total mineral (ash) content was estimated as per the A.O.A.C. (2010) procedure where as protein content was determined by Micro-Kjeldahl method. Total fat was estimated following Soxhlet method. Total carbohydrate was determined by difference method (Calculation: 100 - (Moisture + protein+ crude fat + fiber + ash). Total solids/dry matter was calculated by deducting percentage moisture from 100.Estimation of dry matter was calculated by deducting percentage moisture from 100. Thiamine and Riboflavin, was estimated by the method of Okwu (2004), Niacin by the method of AOAC (1987) [3], Vitamin C (ascorbic acid) by the method of Loeffler and Ponting (1942) [15], Vitamin A (carotenoid content) by Rodriguez-Amaya (1999) [25] method.

3. Results and Discussion

The nutritional significance of plant species is measured by their content of carbohydrates, proteins, fibre, fats, vitamins, minerals, and water, which are responsible for growth in flora and fauna species.

3.1 Nutritional profile of the *Simarouba glauca* leaf powder

The nutritional compositions of *Simarouba glauca* leaf powder has been analysed and nutrients present in it like moisture, protein, fat, fibre, ash, carbohydrates and dry matter of the leaves were studied and the results are presented in Table 1.

Moisture

Moisture determination is one of the most important and most widely used measurements in the processing and testing of foods. In the present study, the *Simarouba glauca* leaf powder contained 9.01±0.26 per cent moisture. It was found to be in accordance with the study of Manasa *et al.*, 2019 [17] on proximate and phytochemical analysis of an anticancerous *Simarouba glauca* leaves. Study by Shafiqi *et al.* in 2019 [26] on nutritional status of *Simarouba glauca* detoxified oil cake reported similar findings as the moisture content in *Simarouba glauca* oil cake was found to be 6.99 per cent.

Protein

The proximate content of protein was found to be 12.42±0.33 per cent in the present study. Manasa *et al.* (2019) [17] on proximate and phytochemical analysis of an anti-cancerous *Simarouba glauca* leaves reported similar findings.

Fat

The fat content in the *Simarouba glauca* leaf powder was found to be 4.33±0.09 per cent. Manasa *et al.* (2019) [17] claimed and confirmed the presence of fat in 4.53 per cent in the leaves of *Simarouba glauca. Friday et al.* (2011) in their experiment on *Ceiba pentandra* leaves found the fat content to be 4.35 per cent.

Fibre

The proximate composition of fibre was found to be 27.95±0.51 per cent in the leaf powder of *Simarouba glauca*. Similar literature on nutritional status of *Simarouba glauca* detoxified oil cake by Shafiqi *et al.* (2019) [26]. Literature on proximate and phytochemical analysis of an anti-cancerous *Simarouba glauca* leaves by Manasa *et al.* (2019) [17] provide similar findings showing presence of 28.49±0.54 per cent of fibre in the leaves.

Ash

The leaf powder of *Simarouba glauca* was found to contain 3.29±0.67 per cent of ash. Shafiqi *et al.* in 2019 [26] in their study on nutritional status of *Simarouba glauca* detoxified oil cake, found the presence of ash to be 3.57 per cent. The ash content as confirmed by Manasa *et al.* (2019) [17] was 3.86±0.69 per cent in their experimental study on leaf powder of *Simarouba glauca*.

Carbohydrate

The carbohydrate content was 39.81±0.14 per cent in leaf powder of *Simarouba glauca* according to the present study. Study by Shafiqi *et al.* (2019) [26] on nutritional status of *Simarouba glauca* detoxified oil cake determined the carbohydrate content as 30.49 per cent. Manasa *et al.* (2019) [17] reported that the carbohydrate content of the shade dried leaves of *Simarouba glauca* was 40.52 per cent which is in accordance with the present results.

Dry Matter

The proximate composition of total dry matter was found to be 90.99±0.26 per cent which is in accordance with the findings of Manasa *et al.*, 2019 [14], who reported 90 per cent of dry matter content in *Simarouba glauca* dried leaf powder.

3.2 Estimation of vitamin content of *Simarouba glauca* leaf powder

Simarouba glauca leaf powder showed the presence of ascorbic acid, vitamin A, riboflavin, niacin and thiamine. Table 2 shows

the different vitamin concentration contained in *Simarouba glauca* leaves.

Thiamine

It was observed that the thiamin content of the leaf powder of *Simarouba glauca* was 0.71±0.02 mg/100 gm. Previous study by Ramesh *et al.* in 2017 concluded that 0.64±0.05 mg/100 gm of thiamine was present in the leaves of the same plant. The thiamine content of *Ipomoea aquatica* was found to be 0.45 mg/100 gm as stated by Datta *et al.* (2019) [10]. In *Nepeta hindostana*, it was found to be 0.48 mg/100 gm as obtained by Koche in 2011.

Thiamine, also called vitamin B_1, plays a role in several biological processes and is therefore an important vitamin for the body. The deficiency of this vitamin is a critical issue because it is still under diagnosed and is associated with high morbidity and mortality (Polegato *et al.*, 2019) [21].

Riboflavin

The riboflavin content of the leave powder of *Simarouba glauca* was 0.42±0.12 mg/100 gm. This finding was in accordance with the results cited by Ramesh *et al.* (2017) [23] where the riboflavin was 0.38±0.03 mg/100 gm in the leaves of the same plant. Similar results were obtained by Datta *et al.* (2019) [10] where the riboflavin content in *Achyranthes aspera* and *Oldenlandia corymbosa* were 0.38 and 0.47 mg/100 gm respectively.

Riboflavin has a major role in the prevention of a wide array of health diseases like migraine, anemia, cancer, hyperglycemia, hypertension, diabetes mellitus, and oxidative stress directly or indirectly. Its deficiency has profound effect on iron absorption, metabolism of tryptophan, mitochondrial dysfunction, gastrointestinal tract, brain dysfunction, and metabolism of other vitamins as well as is associated with skin disorders. Toxicological and photosensitizing properties of riboflavin make it suitable for biological use, such as virus inactivation, excellent photosensitizer, and promising adjuvant in chemo radiotherapy in cancer treatment (Thakur *et al.*, 2017) [24].

Niacin

In the present study, the niacin content in the *Simarouba glauca* leaf powder was found to be 1.59±0.18 mg/100 gm which can be supported by the findings of Ramesh *et al.* (2017) [23] where they cited 1.65 mg/100 gm of niacin in the *Simarouba glauca* leaf powder. Koche in 2011 [14] stated that the Niacin content in *Nepeta hindostana* was found to be 1.39 mg/100 gm which is similar to the findings of the present investigation

Niacins are precursors of the coenzymes nicotinamide adenine dinucleotide and nicotinamide adenine dinucleotide phosphate, which play an important role in metabolism. Its deficiency is apparent in conditions of poverty, malnutrition, chronic alcoholism psychosis, and some types of tumor. When supplemented at pharmacological level, niacin compounds provide potential health benefits like combating cardiovascular disease, diabetes, osteoarthritis, neurological problems, and skin diseases (Caballero *et al.*, 2015) [8].

Ascorbic acid

The ascorbic acid was determined in the present study and its presence was found to be 22.1±0.17 mg/100 gm of the leaf powder of the *Simarouba glauca* plant. Previous literature of Ramesh *et al.* (2017) [23] also proved the presence of ascorbic acid as 22.94 mg/100 gm of the *Simarouba glauca* leaf powder. Also the ascorbic acid content of *Moringa oleifera* was found to be 17.3 mg/100 gm in a study conducted by Gopalakrishnan *et al.* in 2016. In *Nepeta hindostana*, the ascorbic acid content was estimated to be 25.20 mg/100 gm which is similar with the present finding (Koche, 2011) [14].

High concentrations of L-ascorbic acid are characteristic of plant tissues. Ascorbate is one of the most important vitamins in the human diet, being obtained largely from vegetables, fruit, and other plant material. Green leaves may contain as much ascorbate as chlorophyll. The presence of such a remarkable amount of ascorbate may suggest considerable metabolic significance, particularly if the amount is related to biological importance.

Lack of ascorbic acid impairs the normal formation of intercellular substances in the body *viz*., collagen, and bone matrix and tooth dentine. The striking patho-physiological change resulting from this defect includes the weakening of the endothelial walls of the capillaries due to reduction in the amount of intercellular substances. Therefore, the clinical manifestations of scurvy hemorrhage from mucous membrane of the mouth and gastrointestinal tract, anemia, pains in the joins, liver ailment can be related to the association of ascorbic acid. This function of ascorbic acid can also be accounts for its requirement in normal wound healing (Shils, 1990) [27]. So it has been proved that the availability of ascorbic acid in *Simarouba glauca* can be used as herbal medicine in future for the treatment of various ailments.

It was observed in the leaf powder of *Simarouba glauca* that among the B complex vitamins, niacin concentration was highest followed by thiamine and significant amounts of riboflavin. Vitamin A content had the moderate value and ascorbic acid (vitamin C) having the highest concentration of 22.1±0.17 mg/100 gm.

Vitamin A

From the present study, the Vitamin A content in the leaf powder of *Simarouba glauca* was found to be 5.01±0.09 mg/100 gm which resembles the findings of Gurupriya *et al.* (2017) [13] which was 4.42±0.15 mg/100 gm of the *Simarouba glauca* leaf powder.

Vitamin A from food is stored in the liver until required by the body and is bound to protein before being transported to where it is needed. It is essential for many physiological processes, including maintaining the integrity and function of all surface tissues (Epithelia): for example, the skin, the lining of the respiratory tract, the gut, the bladder, the inner ear and the eye. Vitamin A supports the daily replacement of skin cells and ensures that tissues such as the conjunctiva are able to produce mucous and provide a barrier to infection (Gilbert, 2013) [12].

Table 1: Nutrient composition of *Simarouba glauca* leaf powder

Particulars	Leaf Powder (%)
Moisture content (%)	9.01±0.26
Protein (%)	12.42±0.33
Fat (%)	4.33±0.09
Fibre (%)	27.95±0.51
Ash (%)	3.29±0.67
Carbohydrates (%)	39.81±0.14
Dry matter (%)	90.99±0.26

Values are expressed as Mean± SE for triplicates

Table 2: Vitamin content of *Simarouba glauca* leaf powder

Vitamins	Leaf Powder(mg/100gm)
Thiamine	0.71±0.02
Riboflavin	0.42±0.12
Niacin	1.59±0.18
Ascorbic acid	22.1±0.17
Vitamin -A	5.01±0.09

Values are expressed as Mean± SE for triplicates

4. Conclusion

Based on the present study it can be concluded that *Simarouba glauca* leaf powder extract.in the study showed presence of different types of vitamins and other proximate content which are essential for human body and can be used as source of different vitamins and minerals. *Simarouba glauca* leaf powder contained 9.01±0.26 per cent moisture, 12.42±0.33 per protein, 4.33±0.09 per cent fat, 27.95±0.51 per cent fibre, 3.29±0.67 per cent of ash, 39.81±0.14 per cent carbohydrate, 90.99±0.26 per cent dry matter, 0.71±0.02 mg/100 gm thiamine, 0.42±0.12 mg/100 gm riboflavin, 1.59±0.18 mg/100 gm niacin, 22.1±0.17 mg/100 gm and 5.01±0.09 mg/100 gm vitamin A respectively.

5. Reference

1. Abdullah NT, Koneri R, Jha DK. Nephrotoxicity by using *Gentamicin* in rats and screening of *Simarouba glauca* extract for its nephroprotective activity. Int. J Pharm Sci. Rev Res. 2018;51(1):182-186.
2. Antony J, Thomas A, Gnanasekaran D, Elizabeth HS. Review Study on Pharmacological Importance of *Simarouba glauca*. Int. J New Tech. Res. 2016;2(10):59-62.
3. AOAC. Vitamins and other nutrients. Official Methods of Analysis of the Association of Official Analytical Chemists. 14th Edition (William S, ed.). AOAC. Virginia; c1987. p. 838-841.
4. AOAC. Official methods of analysis, 18th edn, Association of Official Analytical Chemists. Gaithersburg. MD. USA. 2000.
5. Awate PD, Patil MS, Gaikwad DK. Alleviation of oxidative damage by exogenous application of plant growth regulators on medicinally important oil yielding plant *Simarouba glauca* DC. Under water stress conditions. Indian J Appl. Res. 2014;4(6):36-37.
6. Ayangla NW, Singh N, Kumar A. Phytochemical analysis of plant species of genus *Zanthoxylum*. Int. J Med Pharma Sci. 2016;6(1):1-8.
7. Baruah CC, Bora M, Saikia BN, Hazarika M, Misri J, Barua IC. Nutritional evaluation of few selected medicinal plants of North Eastern region. Int. J Pharm Bio Sci. 2015;6(3):539-547.
8. Caballero B, Finglas PM, Toldrá F. *Niacin*. Encyclopedia of Food and Health. Elsevier. Book chapter; c2015.
9. Cheeke P. Applications of saponins as feed additives in poultry production. In Proceedings of the 20th Australian Poultry Science Symposium, Sydney, Australia; c2009. p. 9–11.
10. Datta S, Sinha BK, Bhattacharjee S, Seal T. Nutritional composition, mineral content, antioxidant activity and quantitative estimation of water-soluble vitamins and phenolics by RPHPLC in some lesser-used wild edible plants. Elsev. Heliy. 2019;5:1431.
11. Friday T, James O, Olusegun O, Gabriel A. Investigations on the nutritional and medicinal potentials of *Ceiba pentandra* leaf: A common vegetable in Nigeria. Int. J Plant Physiol Biochem. 2011;3(6):95-101.
12. Gilbert C. What is *vitamin A* and why do we need it? Community Eve Health. 2013;26(84):65.
13. Gurupriya S, Cathrine L, Ramesh J. Qualitative and quantitative phytochemical analysis of *Simarouba glauca* leaf extract. Int. J Res. App Sc. Eng. Tech. 2017;5:475-479.
14. Koche D. Trace element analysis and vitamins from an Indian medicinal plant *Nepeta hindostana* (ROTH) haines. Int. J Pharm. Sci. 2011;3(2):53-54.
15. Loeffler HJ, Ponting JD. Ascorbic acid, a rapid determination in fresh, frozen or dehydrated fruits and vegetables. Indian Engg. Chem. Anal Edn. 1942;14:846-48.
16. Lokhande P, Kharche A, Wagh SG, Manithe D, Harke SN. Immune-boosting superfood supplement from natural resources. J Pharmacognosy Phytochemistry. 2019;8(5):2108-2113.
17. Manasa M, Palanimuthu V, Darshan MB, Suresha KB, Munishamanna KB. Proximate and phytochemical analysis of an anti-cancerous *Simarouba glauca* leaves. J Pharmacognosy Phytochemistry. 2019;8(3):4224-4227.
18. National Health Portal of India (NHPI). 2021.
19. Nostro A, Germanò MP, Angelo VD, Marino A, Cannatelli MA. Extraction methods and bioautography for evaluation of medicinal plant antimicrobial activity. Lett. App Microbio. 2000;30:379-384.
20. Okwu DE. Phytochemicals and vitamin content of indigenous spices of Southeastern Nigeria. J Sustain Agric Environ. 2004;6(1):30-37.
21. Polegato BF, Pereira AG, Azevedo PS, Costa NA, Zornoff LAM, Paiva SAR. Role of *thiamin* in health and disease. Nut. Clin. Pract. 2019;34(5):1–7.
22. Radha R, Chauhan P, Puri S, Sharma AK, Pundir A. A study of wild medicinal plants used in Nargu Wildlife Sanctuary of district Mandi in Himachal Pradesh. India. J Appl. Pharm Sci. 2021;11:135–144.
23. Ramesh J, Gurupriya S, Cathrine L. GC-MS analysis and antioxidant activity of *Simarouba glauca* leaf extract. Int. J Adv. Res. Sci. Eng. 2017;6(10):445-452.
24. Thakur K, Tomar SK, Singh AK, Mandal S, Arora S. Riboflavin and health: A review of recent human research. Crit. Rev. Food Sci. Nutr. 2017;57(17):3650-3660.
25. Rodriguez-Amaya DB. A guide to carotenoid analysis in foods. Harv plus hand for carot. Anal. Washington, D.C; c1999. p. 35-36.
26. Shafiqi S, Prasanna KT, Gowda B, Kumar RK. Nutritional status of *Simarouba glauca* detoxified oil cake with respect to some author citation. Int. J App. Res. 2019;5(6):417-419.
27. Shils ME. In Brown ML (Ed) Present knowledge of Nutrition, 6th eds. Washington DC. International life science institute, Nutrition foundation; c1990. p. 224-232.
28. Patel HH, Prajapati P. Study and analysis of decision tree-based classification algorithms. Int. J Comput. Sci. Eng. 2018;6(10):74-78.