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Comparison of Phytochemical and Biochemical Profiling of Two Widely Consumed Succulent Bamboo Shoot Variety of Assam

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A B S T R A C T

Bamboo shoots one of the widely varied and indigenous growth of North East India is still not completely explored. The various phytochemicals /secondary metabolites present in succulent bamboo shoots come with great health benefits. Keeping that in view the preliminary work on two most widely consumed bamboo shoot in Assam has been done. The results found are quite promising with high amount of phytochemicals and necessary biochemicals. Further research on those extracts with GCMS, FTIR and various bioinformatic tools are highly recommendable in this aspect.

***Key words*:** Phytochemicals, Biochemical tests, Nutritional value, Health benefits, Bioinformatics techniques

Bamboo is intricately associated with humans from times immemorial. It belongs to the family Poacea and is widely distributed and grows wild in the fields and mountains from the temperate zone of Japan to the tropical zone of India [1]. Bamboo shoots are young, new canes that are generally 8-12 inches long, taper to one end and grow extraordinarily. Bamboo shoots have a long history of being used as a source of both food and medicine in China and Southeast Asia [2]. Modern research has revealed that bamboo shoots have a number of health benefits: improving appetite and digestion, weight loss, curing cardiovascular diseases, antioxidant activities and anti-inflammatory effects [3]. Bamboo shoots, both fresh and fermented, are a good source of phytosterols that are the precursors of many pharmaceutically active steroids found in plants [4].

The young and tender bamboo plant is utilized as one of the food items in many countries [5]. It is consumed in dried, canned, boiled, fermented or medicinal forms. In Manipur, a state located in the north eastern part of India, bamboo shoot is consumed as fresh or fermented form, locally called Soibum [6]. It has become obvious that the local food stuffs will play increasing role in the food, nutrition and health security of the rural people. As popular as this vegetable is in Manipur, there is still paucity of information on the phytochemical constituents and antimicrobial activity of Soibum [7-8]. Hence the present study was carried out to evaluate the phytochemical constituents of Soibum (fermented *Bambusa balcooa* shoots). FT-IR analysis was done to support the qualitative results. Further, the antimicrobial potential of the methanolic extract was evaluated against pathogen.

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METHODS AND MATERIALS

The succulent bamboo shoots were collected from local market area of Guwahati. The samples include fresh succulent bamboo shoots and bottled bamboo shoots without preservatives. Those were sun dried. The dried plant sample was ground in powdered form and stored in an air tight container.

Extracting process

Methanol extract: 40gm of air-dried extract powder was taken in 350ml of methanol in Soxhlet apparatus and then the extract was allowed to evaporate till dryness. The dried extract was then stored in refrigerator for further use.

Ethanol extract: 40gm of air-dried extract powder was taken in 350ml of methanol in Soxhlet apparatus and then the extract was allowed to evaporate till dryness. The dried extract was then stored in refrigerator for further use.

Phytochemical tests

Qualitative analysis of phytochemicals

All the extracts of bamboo shoots were tested chemically for detection of various metabolites viz.

flavonoids, resins, diterpens, amino acids, phenolic compounds, tannins, etc.

Test for flavonoids

Alkaline reagent test: Extract was treated with few drops of sodium hydroxide solution. Formation of intense yellow colour which becomes colourless on addition of dilute acid, indicate flavonoids presence.

Test for resins

Acetone-water test: In a test tube, extracts were taken and mixed with acetone the small amount of water added and shaken. Appearance of turbidity indicated the presence of resins.

Test for diterpens

Extracts were dissolved in water and treated with 3-4 drops of copper acetate solution. Formation of bright green colour indicated the presence of diterpens.

Test for phenolic compounds

Lead acetate test: 50 mg extract was dissolved in 5ml distilled water. Added 3ml of 10% lead acetate solution to the solution. A bulky white precipitate indicates the presence of phenolic compounds.

Test for amino acids

Ninhydrin test: 2 ml of aqueous filtrate was taken and add 2 drops of ninhydrin solution (70 mg of ninhydrin in 200 ml of acetone) was added. A development of characteristics purple colour indicated the presence of amino acids.

Biochemical tests

Test for reducing sugar

Fehling test: 1ml of sample in dry test tube. 1ml of distilled water in another test tube as control. Added 1ml of Fehling's reagent (A and B) to all the test tubes. Keep in boiling water bath and observe it for few minutes. If red precipitate is developed then it indicates the presence of reducing sugar.

Benedict test: 1ml of extract was added of Benedict's reagent, the solution was then heated to boiling. The change in colour confirms the presence of reducing sugar.

Molish test: 2ml of sample is taken in a test tube.2-3 drops of molish reagent is added in the sample and mix it. Now add slowly concentrated sulphuric acid in sloping the test tube by its slides without mixing vigorously so that it will get time to react and will form a layer.

Test for proteins

Biuret test: Take a cleaned test tube and add sample to it and add 2ml of sodium hydroxide and 5-6 drops of copper sulphate solution to it and shake the test tube gently to mix the ingredients thoroughly and allow the mixture to stand for 4-5 minutes. Bluish purple colour indicates the presence of proteins.

Xanthopoetic test: Take a clean and dried test tube and sample in it and add few drops of concentrated sulphuric acid and shake well and heat the test in a bunseen burner, if yellow precipitate observed then it indicates the presence of proteins.

Ninhydrin test: Take a cleaned and dried test tube and add sample to it and add 1-2ml of ninhydrin solution to it and shake it will and boil the mixture and observe the change, if deep purple or deep blue appears it indicates the presence of proteins.

Precipitation reaction: 1ml of sample solution is added and few drops of acetone are added drop by drop. If white precipitate was observed at the top of test tube indicates the presence of proteins.

Trong acid precipitate by coagulation test: 5ml of sample solution added to it and upper part of the sample is heated in the test tube and few drops of acetic acid is added. Coagulation of protein on the upper part indicates the presence of proteins.

Denaturation and coagulation: 2ml of sample solution are added and few drops of sulphuric acid added on the side of the test tube.

Test for lipids

Solubility test: 3ml of solvents is taken in each test tube and 5 drops of sample is added to them. For water and ethanol, it is insoluble and for chloroform and ether. It is soluble and hence the given solution is lipid.

RESULTS AND DISCUSSION

From the above tests performed in laboratory conditions, it has been observed that phytochemicals such as diterpenes, flavonoid, tannins, terpenoids and phenolic compounds are present whereas glycosides and resins are absent (Table 1).

Table 1 Showing various phytochemical tests

Name of the test done	Methanol extract	Ethanol extract
Resins test	-	-
Diterpenes test	+	+
Flavonoid test	+	+
Phenolic compounds test	+	+
Tannins test	+	+
Terpenoids test	+	+
Glycosides test	-	-

Table 2 Qualitative tests for carbohydrate

Test performed	Results		Remarks
	Sample 1	Sample 2	
Fehling's test	-	-	Negative
Benedict's test	+	+	Positive
Molish test	+	+	Positive

From the tests performed for qualitative presence of carbohydrates shows the presence of carbohydrates and the data is depicted in (Table 2).

The results for protein qualitative tests are also found positive signifying the presence of protein in the test samples (Table 3).

Table 3 Qualitative tests for proteins

Test performed	Results		Remarks
	Sample 1	Sample 2	
Biuret test	+	+	Positive
Xanthoproteic test	+	+	positive
Ninhydrin test	-	+	Positive
Precipitation reaction	+	+	Positive
Strong acid precipitate protein by coagulation test	+	+	Positive
Denaturation and coagulation	+	+	Positive

Table 4 Qualitative tests for lipids

Test performed	Results		Remarks
	Sample 1	Sample 2	
Solubility test	+	+	Positive

Lipid solubility Test performed shows results of presence of lipids in the samples (Table 4).

North East India is one of the biggest repositories of *Bamboo* asset in the nation (India). Screening of the different varieties is required for improvement of bundle of practices for their mass duplication. Scientific mode of utilization of the bamboo resources [9]. The study performed with the species locally available and most widely consumed bamboo shoots shows the presence of certain important biochemical as well as phytochemicals which are beneficial for health. Phytochemicals / Secondary metabolites once thought to be waste are now being focused for their health beneficial mechanisms. These are expressed in numerous combinations all through the plant starting from the leaves, roots, shoots, bark, at different stages of growth such as seedling till the mature tree [10]. The tests performed are of the preliminary level which can be widely demonstrated if carried on further. In our study, resins were found to be negative [11]. However, phytochemicals such as diterpenes, flavonoid, tannins, terpenoids and phenolic compounds are present similar to the previously described [12]. For carbohydrate tests, we found positive results in Molish and Benedicts tests signifying the presence of carbohydrate, however absence of Fehling's test shows the absence of reducing sugar in our extract. Similarly for Proteins and Lipid the qualifying tests results shows the presence of both the biochemicals in our extracts. Animal study could not be done with our experiments which gives us a view that prominent scientific data can be obtained by undergoing animal modelling which includes techniques such as TEM, GCMS, FTIR [13]. Among all one of the several objectives of the mission was to increase the coverage of area, both in forest and non-forest areas with appropriate varieties [14-15].

CONCLUSION

Bamboo shoots contain various nutrient components such as, proteins, carbohydrates, minerals, dietary fibre, fat, sugar, vitamins, amino acids and inorganic salts. They contain 17 amino acids, out of 8 which are most essential for the human body. The presence of various phytochemicals/secondary metabolites available in the succulent shoot of bamboo are of great health benefit as such they are helpful in maintaining normal blood pressure and other required protocols in human body. North East Bamboo varieties are yet to be explored completely and thus their importance and extraction of the medicinal properties are also left to be utilized properly. These efficiency and nutritional health benefits can be further studied using various advanced technology such as TEM, SEM, FTIR and also various bioinformatics tools and websites for its full implementation into a common man's plate and also for a rise in economic status globally.

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