

Biochemical, Organoleptic and Antimicrobial Assessment of Elephant Foot Yam (*Amorphophallus paeoniifolius*)

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Abstract: Elephant foot yam or *Amorphophallus paeoniifolius* is a tuber having extensive curative and digestive properties which belongs to the family Araceae, cultivated in western and southern states of India. Scientific evidence has suggested that elephant foot yam has high amount of dietary fiber, starch, carbohydrate, protein, and minute amounts of sugars. It also has significant amount of calcium and adequate amounts of sodium, potassium and vitamin C. The study of elephant foot yam becomes very significant as it has several medicinal benefits and is widely used in Indian medicine including Ayurveda. It has been found to contain anti-diabetic, analgesic, anti-bacterial, antifungal, anthelmintic properties, besides it has also found to have anticancerous properties. The corm is prescribed in bronchitis, asthma, abdominal pain, dysentery, splenomegaly, piles, elephantiasis, rheumatic swellings.

To further elucidate the literature of elephant foot yam the study was carried out. The proximate analysis of Elephant foot yam sample collected from Kerala was performed. The results aided to obtain a biochemical profile of the tuber. An edible product of yam was developed and the data obtained following sensory evaluation was analyzed statistically to determine its acceptability among the population. Antimicrobial assessment of the sample was also carried out.

Keywords: analgesic, anthelmintic, biochemical, sensory evaluation, tuber

I. Introduction

The study on a tuber like elephant foot yam helps to achieve the researchers endeavour to explore the biochemical significance of the crop which is inexpensive. Any substance that may be considered a food or a part of a food that provides medicinal and nutritional benefits including prevention and treatment of diseases can be termed as a nutraceutical. Elephant Foot yam has proven to possess immensely high amount of nutritional benefits as well as therapeutic properties.

Elephant Foot Yam also called Indian Yam is an aroid plant which is making its way towards nutraceuticals. Being a rich source of dietary fiber and having low glycemic index makes it a rich food for treatment of heart ailments as well as diabetes. It is also shown to have high amount of omega fatty acids which regulates the good cholesterol level in the body. It is low in fat and is only shown to have the essential fatty acids thus helps in reducing the risks of obesity and diseases associated with it.

Indian Yam also proves to have laxative properties thus helps in curing constipation as well as used in the treatment of piles. Besides it also has significant amount of minerals and vitamins but is free of any heavy metals. Most importantly it has proved to have high amount of antimicrobial activity which makes it a curative crop. It shows the presence of an important molecule called Diosgenin which has anticancerous properties. Thus it has a great scope for nutraceuticals. The experimental studies were carried out to explore the nutritional significance of elephant foot yam.

II. Materials And Methods:

1. Sample procurement: Sample was collected from Shornur market in Kerala. The analysis of the most popular tuber grown in humid regions like Kerala i.e *Amorphophallus paeoniifolius* (Elephant Foot yam) has been executed for proximate principles like, carbohydrates, proteins, minerals, starch, Crude Fibers, and Vitamins that were performed using standard biochemical methods. Sensory evaluation was also carried out to analyze the acceptance of the product developed from Elephant Foot Yam.

2. Preparation of Samples:

Extract: Elephant Foot yam extract was prepared by grinding 1gram of yam sample with distilled water and straining the filtrate. The filtrate obtained was diluted using distilled water upto 50ml. This extract was used to estimate the macronutrients like carbohydrate, protein, as well as Vitamin C.

Ash Solution: Ashing of 5grams of Yam sample was done by following standard protocol method by incineration and the ash thus obtained was diluted to 50ml with distilled water. The ash solution thus obtained was used for the mineral estimations.

The following proximate principles were estimated by performing the experiments named as under:

3.Moisture Content: 5g of elephant foot yam sample was kept in the oven at 110°C for 45 mins till the entire moisture is removed. The loss in weight determines the moisture content in the sample.

4.Carbohydrates by Anthrone method: For estimation of total carbohydrate yam extract was hydrolyzed using conc. Sulphuric acid and Anthrone reagent was added in each tube and tubes were heated in boiling water. The amount of total Carbohydrate was obtained by standard protocol of Anthrone method colorimetrically at 630nm.

5.Protein by Folin-Lowry method: Protein content was estimated by treating the prepared dilutions of yam extract and treating them with alkaline copper sulphate and Folin-Ciocalteau reagent and reacted for 30 minutes and estimated colorimetrically at 660nm.

6.Fat extraction by Solvent Extraction method: 1gm of sample of concentrated ammonia solution concentrated HCL25 ml of solvent ether or diethyl ether and 25 ml of petroleum ether (40-60 C). dry the residual fat in the oven at 98-100C for 1 hour to obtain total fat in the sample. Thin Layer Chromatography Method was used to separate the oils obtained from the extracted fats.

7.Starch Isolation and characterization of sugar using Osazone test: 50 grams of yam sample is chopped and ground finely in ice cold water.The filtrate is kept in icebath such that starch settles down.The filtrate is decanted and washings are given and the residue is washed with alcohol and ether to obtain pure residue of starch.

A pinch of yam starch was dissolved in hot water. 1ml of 2N HCl was added to it and the mixture was kept in a water bath for 30 minutes for complete hydrolysis of the starch molecules. 2ml of the hydrolysate was treated with 2ml of freshly prepared Diphenylhydrazine reagent and allowed to react in a water bath for 30 minutes. Osazones were obtained which were observed microscopically under 450X magnification.

8.Reducing Sugars by Benedicts Method: The yam extract was used to estimate the total amount of reducing sugars volumetrically using Benedict's method.

9.Calcium by EDTA: Calcium is estimated by using EDTA volumetrically by using Eriochrome Black t as indicator.

10.Iron by Wong's Method: Iron was estimated from ash solution using standard protocol of Wong's method colorimetrically at 470nm.

11.Phosphorous by Fiske-Subbarow Method: Phosphorous was estimated from ash solution using standard protocol of Fiske-Subbarow's Method colorimetrically at 660nm.

12.Potassium by Flame photometry : Potassium content was estimated from ash solution using standard protocol of Flame photometry method colorimetrically.

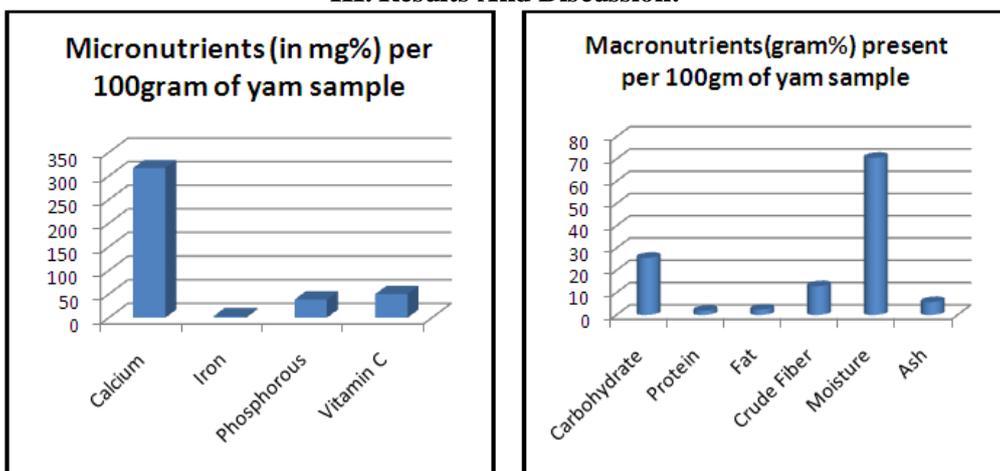
13.Sodium by Flame Photometry : Sodium content was estimated from ash solution using standard protocol of Flame photometry method colorimetrically.

14.Vitamin C by Dichlorophenol indophenols blue: Vitamin C was estimated from the yam extract solution by using standard protocol of 2-6 dichlorophenol indophenol blue dye method also called Harris-Ray method

15.Antibacterial activity of Elephant Foot Yam : Antibacterial property of yam extract was tested on different variants of bacterial species namely E.coli, K. pneumoniae , S. aureus, B. subtilis by studying the zone of inhibition.

16.Sensory evaluation: A sensory evaluation was performed with 2 samples as follows:Sample A:Yam nuggets made of yam sample of Maharashtra and Sample B: Yam nuggets made of yam sample of Kerala. A questionnaire was prepared and given to a panel of 47 semi trained members and biostatistical analysis of data obtained was carried out.

III. Results And Discussion:

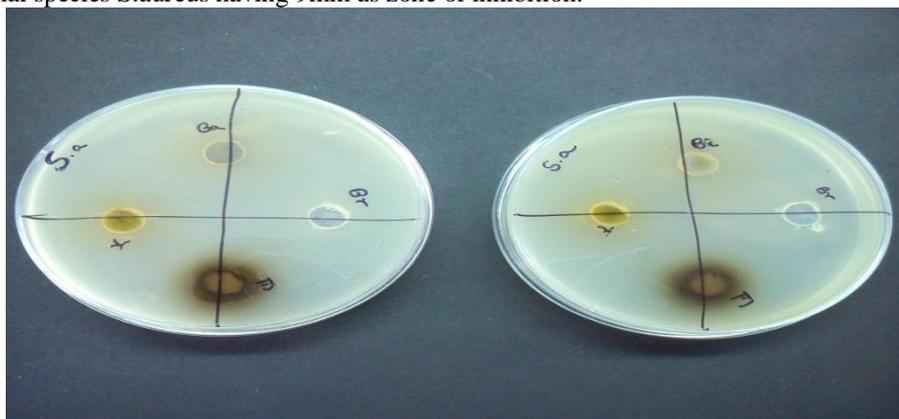


1. Proximate analysis:

From the experiments performed the results showed that elephant foot yam has significantly high amount of moisture content i.e 70.535g% .It was shown to have considerable amount of ash 5.743g% which is an important parameter to estimate the amount of minerals. Being a tuber it evidently has high amount of carbohydrate 25.638g% and adequate amount of protein 1.8448g%. The essential fatty acid content in yam was shown to be 2.436g%. It also has noteworthy presence of Vitamin C 50.085mg%. Besides it also shows presence of vital minerals Calcium 316.9mg% , Iron 3.5939mg% , Phosphorous 38.403mg% , Sodium 3.23×10^4 ppm , Potassium 6×10^4 ppm in significant amounts.

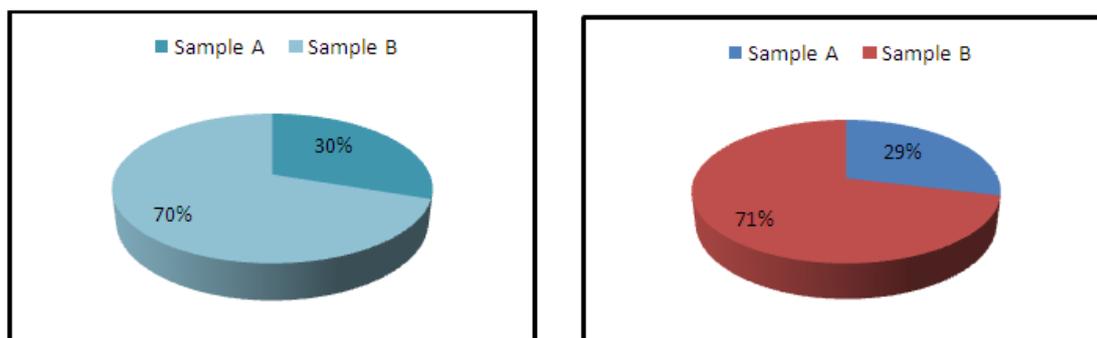
2. Antimicrobial activity:

Amongst the four variants of bacterial species, yam extract was shown to have moderate activity against bacterial species *S.aureus* having 9mm as zone of inhibition.



3. Sensory Evaluation:

After biostatistical analysis of the questionnaire filled by the panelists during the sensory evaluation procedure, the following results were obtained:



70% of the panelists preferred to purchase Sample B and 30% preferred to purchase Sample A if available in the market. 71% of the panelists preferred Sample B over Sample A.

IV. Conclusion:

From the results it is evident that elephant foot yam is a highly nutritious tuber which has appreciably high amount of vital micro nutrients and macronutrients. Antibacterial properties and other vital nutritional components like dietary fiber and essential fatty acids makes it a potent curative food for preventing various diseases. The study proves the dietary significance of the corn.

V. Future Prospectives:

The study and characterization of phytochemicals like saponins, alkaloids, and coumarins in elephant foot yam can be carried out for discovering potential nutraceuticals. Further, the peel of this species of yam is rich in antitoxic compounds, which can be explored as potential toxin chelating agents. The fermented corn is rich in inulin-like polysaccharides which has potential prebiotic properties. This beneficial aspect needs to be explored. Thus the scope of developing novel medicines from natural source can be emphasized.

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