

# Utilization of Plantain Stem – Pseudo Stem of Banana Tree (*Musa Cavendish*)

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**Abstract**—This present study is about use of pseudostem of banana tree (*Musa cavendish*). After banana harvesting, the pseudostems are cut and left in the fields. In order to add value to banana plantation, the pseudostem could be processed into products. Although studies have shown that the cellulose fiber has suitable features to industry, the yield is low because pseudo stem has about 90% of water. This research presents the Utilization of plantain stem by sweetening with jaggery. The variations of the plantain stem juice and with jaggery solution were analyzed for physicochemical properties such as moisture, total solids, pH, TSS, Moisture content, total ash content. Moisture content was determined following the oven method. Total solids content was estimated by deducting percentage moisture from 100. pH was measured using a digital glass electrode pH meter, TSS of the variations were determined by using a digital hand Refractometer and results were expressed in °Brix. Mineral analysis of iron, potassium, Calcium phosphorous and magnesium contents were determined by titration method.

## 1. INTRODUCTION

Banana is the second largest produced fruit after citrus, contributing about 16% of the world's total fruit production. Banana stem has no use after harvesting the fruit, the banana stem has fiber it is also a rich source of potassium and vitamin B6 which helps in the production of insulin and hemoglobin. Eating banana stem once a week keeps blood pressure in control. Plantain stem juice has been reported to have excellent therapeutic efficiency such as dissolving pre formed stones and preventing stones in urinary bladder. It has also been found to contain condensed tannins and pectin which have antihelminthic<sup>1</sup> and hypoglycemic<sup>2</sup> properties respectively. Jaggery acts as a cleansing agent for our blood and purifies it. As jaggery has natural cleansing properties, it also helps get rid of digestion problems. A piece of jaggery every day can make your body free from all toxins. It contains 0.6%-1.0% minerals<sup>12</sup>; important among them are iron, calcium (0.4%), magnesium and phosphorous (0.045%). Jaggery also contains reducing sugars including glucose and fructose (10-15%), protein (0.25%), and fat (0.05%). Incidence of less diabetes is reported in jaggery consuming areas compared to sugar consuming areas. The preventive action of

jaggery on smoke-induced lung lesions suggests the potential of jaggery as protective agent for workers in industry in smoky environments. Magnesium found in jaggery strengthens the nervous system and potassium conserve the acid balance in the cells and combats acids and acetones. Jaggery is very rich in iron and prevents anemia. Jaggery supplements the requirement of iron and calcium in women and children and also increases vitality in men and help in digestion. The micronutrients present in jaggery have antitoxic and anticarcinogenic properties. Its dietary intake can prevent the atmospheric pollution related toxicity and the incidence of lung cancer.



Cardamom is referred to as the Queen of spices and is popularly referred to as cardamom. Apart from its aromatic fragrance used for flavoring foods, cardamom uses range from it being a digestive system tonic to an essential oil in aroma therapy. Cardamom fights against gas. It helps to relieve gas and heart burn. Cardamom gives instant relief from the headache. Cardamom is useful for the protection against heat stroke. Cardamom helps in the stimulation and regulation process of discharge of gastric juices and balances stomach acids. Cardamom helps greatly to cure teeth gum and tooth infections. Cardamom supports the detoxification process of the body and helps to filter the entire body. Cardamom is useful in the problems of urinating. It helps those suffering from stomach cramps.

<sup>1</sup> antihelminthics are drugs that expel parasitic worms and other internal parasites from the body by either stunning or killing them and without causing significant damage to the host.

<sup>2</sup> Hypoglycemic : significant cholesterol and triglyceride lowering action

## 2. MATERIALS AND METHODS

### 2.1 Extracting plantain stem juice and preparation of product

Plantain stem was washed, cleaned the green part of the stem is removed by peeling its white inner portion was cut into smaller pieces and blanched at 65 °C and juice was extracted by mechanical crushing followed by filtration, lemon juice was added in small quantities so as to avoid browning of juice. the blanching process made extraction process easy and increased the quantity of juice obtained. Obtained juice was subjected to sterilization. This process prevented the juice to browning reaction. Jaggery solution was prepared with jaggery and hot water at a proportion of 4:7(w/v). the juice was prepared in different variations (Table 1) along with pure standard of plantain stem juice. Cardamom is added to all variations in minute quantities for flavouring.

Table 1

Ingredients	S1	S2	S3	S4	S5	S6
Plantain juice	100%	70%	60%	50%	40%	30%
jaggery	-	30%	40%	50%	60%	70%

### 2.2 Physicochemical analysis

The variations of the plantain stem juice and jaggery solution were analyzed for physicochemical properties such as moisture, total solids, pH, TSS, Moisture content, total ash content. Moisture content was determined following the oven method. Total solids content was estimated by deducting percentage moisture from 100. pH was measured using a digital glass electrode pH meter, TSS of the variations were determined by using a digital hand Refractometer and results were expressed in °Brix

### 2.3 Nutrient analysis

All the variations were subjected to nutrient analysis. Estimation of carbohydrate was carried out by the gravimetric method. Protein estimation was carried out by Kjeldahl method. Calcium, Phosphorus and iron were estimated by the method of Atomic absorption spectrophotometry

### 2.4 Sensory analysis and overall acceptability

The sensory analysis was carried out for all the variations by a panel of 30 members. The panel members were introduced to the sensory score card and briefed on the characteristic organoleptic properties to be rated. Scoring was done using 9 point hedonic scale, for colour, flavour, taste, mouth feel and overall acceptability, where 1 meant 'liked extremely' and 9 meant 'disliked extremely'. Samples were served chill in transparent glass cup

## 3. RESULTS AND DISCUSSION

### 3.1 Physicochemical analysis

There was a considerable increase in pH as the proportion of jaggery increased in the product. The pH of the crush

variations ranged between 4.93- 6.09. The pH values (Table 2) obtained for the product were compared with the pH of vegetable juices which is between 4 and 6. Thus, it can be concluded that jaggery has a major influence on the pH of the crush when compared to plantain stem juice. Presence of jaggery content increased the viscosity of beverage. Higher proportions of jaggery in product improved the textural property of the product. The amount of total sugars ranged between 12 and 28% of the total composition of the variations. There was a considerable increase in the amount of reducing sugars with the increase in the proportion of jaggery.

There is an decrease in the moisture content by 28% in variation S6, in comparison with variation S1. Jaggery incorporation influenced the percentage of total solids in the crush when compared to standard plantain stem crush (S1). Sugar and organic acids are the major constituents of soluble substances TSS and pH of beverage are extremely important parameters which decide the quality of the Beverage. The total soluble solids among the variations of blended crush ranged between 8-20° Brix approximately. The TSS of the different variations was significantly influenced by the volume of jaggery incorporated

## 4. PHYSICOCHEMICAL PROPERTIES OF PRODUCT

Table 2

Parameter	s1	s2	s3	s4	s5	s6
Moisture%	87.4	75.4	71.4	67.4	63.4	59.4
Total solids%	12.6	24.6	28.6	32.6	36.6	40.6
pH	4.93	5.43	5.59	5.76	5.93	6.09
T.S.S (°Brix)	-	8.73	11.89	14.76	17.96	20.89
Total sugar	-	12	16	20	24	28
Ash%	0.104	0.162	0.182	0.202	0.221	0.241



### 3.2 Sensory analysis

#### 3.2.1 Overall acceptance

The overall acceptability scores of the different variations (Table 3) indicated that S4 (50% plantain stem (juice) incorporation was most preferred. Greater incorporation of plantain stem juice decreased the overall acceptability of the product. The scores revealed that equal proportion of stem juice and jaggery (1:1) is most acceptable.

### 3.2.2 Colour

Colours were rated best for S6 variation and least for pure plantain stem juice (S1) by the sensory panel (Table 3). Sensory ratings for colour of the blended crush increased with increasing proportions of jaggery.

### 3.2.3 Flavour

The flavor scores of the different variations in table 3 show that variation S5 has higher acceptability thus indicating that the flavour of jaggery predominated over the flavour of plantain stem juice.

### 3.2.4 Body

The body of the product was considerably affected by the proportion of plantain stem juice which was not as viscous as jaggery solution. Variation with 70% Jaggery solution (S6) scored the highest acceptance for body (3.18) when compared to the other variations (S2-S5). The body of the different variations also had a positive correlation with the overall acceptability scores and was significantly affected by the proportion of jaggery in the product.

### 3.2.5 Taste

Taste of the proportion was influenced by the volume of jaggery in them respective of the proportion of plantain stem juice. Proportion where plantain stem juice and jaggery solution are in 1:1 ratio is preferred. Taste is directly proportional to the Overall acceptability.

S	body	color	flavor	taste	Overall acceptability
S1	4.56 ±1.01	4± 0.90	4.31 ±0.21	4.75± 0.34	3.56 ± 0.36
S2	4.125± 0.73	3.93± 0.23	3.75 ±0.34	3.125± 1.02	3.25 ± 0.10
S3	3.93 ± 0.45	3.68 ±0.54	3.75 ±0.32	2.81± 0.56	3.25 ±0.35
S4	3.81 ±0.37	3.68± 0.43	3.43 ±0.65	2.65 ±0.76	2.75 ±0.2
S5	3.40 ±1.09	3.62 ±0.33	2.81 ± 0.46	2.75 ± 0.35	3 ±0.91
S6	3.18 ±0.5	3.43± 0.21	3.06 ±0.78	3 ± 0.86	2.86±0.35

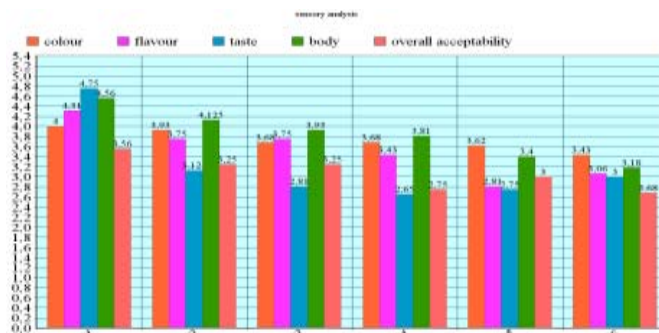
S1(100%S); S2(70%S+30%J) ;S3(60%S+40J) ;S4(50%+50%) ;S5(40%S+%60J) ;S6(30S%+70J)

S- Stem juice J -jaggery solution

## 5. CONCLUSION

Thus, it can be concluded that plantain stem juice and Jaggery make a good beverage as they complement each other in terms of nutritive value ensuring good Utilization of plantain stem. Plantain stem juice with high moisture content, when taken with jaggery tends to have better physicochemical characteristics. Jaggery improved the Viscosity, Nutritional

properties of the beverage. Sensory analysis indicated that all variations were acceptable. Thus, it can be concluded that the formulated product is an ideal low cost blended beverage as the value addition of plantain stem juice with jaggery can bring the Utilization of Plantain stem. The nutritional and organoleptic quality of the product is highly acceptable. Plantain stem juice is rich in bioactive components and it is quite convincing that the value addition will not only enhance the nutritive value but also the antioxidant properties and therapeutic efficacy of the beverage. It is to be noted that at present the major area of plantain stem utilization is in paper industry and other fibre industry. Hence, this formulation will be a new avenue for plantain stem utilization.



## REFERENCES

- [1] R. Gomathy, N. R. Vijayalekshmi And P. A. Kurup Hypoglycemic action of the pectin present in the juice of the inflorescence stalk of plantain (*Musa sapientum*)—Mechanism of action
- [2] Pisha, Fruits and vegetables containing compounds that demonstrate pharmacological activity in humans, *Eco MedPlant Res*, 1994, 6, 189-233
- [3] Usha Ravi\*, Lakshmi Menon and G Gomathy: Development and quality assessment of value added plantain stem juice incorporated with grape juice- Indian Journal of Natural Products and Resources
- [4] Development Of Value Added Products From Banana Pseudostem By Navsari Agricultural University, Navsari
- [5] The Gud (Jaggery) “purifies the blood, prevents rheumatic afflictions and disorders of bile has nutritive properties of high order.” (Sushruta Samhita, Chapter 45, Sloka 146
- [6] Viscosity Increases In Concentrated Sugar Solutions And Molasses Due To Dextrans By G. L. Geronimos And P. F. Greenfield from Department of Chemical Engineering, University, of Queensland.