Study on the Physico-Chemical Characteristics of Value Added Banana Products

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Abstract— *The present study evaluated physico-chemical and sensorial qualities of value added banana products. Unripe fruits of Cavendish variety were processed for making banana flour. Value added products like dough, chapatti and banana kheer were prepared from banana flour. Rice and basin flour were also used in chappati. Unripe banana fruit, banana flour and their products were analysed for pH, titratable acidity, moisture (%), TSS (Brix) and vitamin C. The results showed that the maximum pH (7.68) and TSS (26.30 brix) recorded from the kheer, However, Ash (0.86%) and vitamin C (18.3mg/100gm) were observed highest in chapatti prepared from banana and rice flours as compared to chappati prepared from banana flour only (12.54). Unripe banana fruits had maximum percentage of moisture (72.08%) in comparison to banana products. The minimum pH (6.79) and titratable acidity (0.02) were observed from the unripe banana fruits. While, banana flour had minimum moisture (7.49%). Minimum TSS (5.30) were recorded in chappati prepared from mixture of banana-rice flour and banana-basin flour. The results shows that processing of banana for value added products alter the physico-chemical qualities of banana.*

Keywords— Banana flour, chapati, milk, rice flour,Physico-chemical.

I. INTRODUCTION

The banana is one of the most popular fruit among all the fruits. It is leading not only in production but also consume on a large scale in the world. The banana is very delicious in taste and ranking first with production rate of 25 percent [1]. Ripen banana has 5 to 10 days of shelf life after harvesting. It is a soft and delicate fruit which make it susceptible to diseases and injury when transported to the markets for utilization[2]. Human consumption of banana fruit was increasing day by day, by cultivating the fruit on large scale and exploring potential of converting banana into cash crop by developing products of commercial interest is one way of solving this problem. In developed countries 40 – 50 % of the annual agricultural produce is converted into value added commodities[3]. So in such situation it's more important to convert banana into valuable products having high nutritional value and to fulfill the consumer demand and avoiding its spoilage [4].

The banana is well known fruit in the whole word, so it is most important to utilize the fruit when banana is unripe procedures to make by products (banana flour) like edible cookies [5], bread and eatable films [6, 7]. Conversion of banana into powder in immature stage[8], which possess thickening and culinary properties that is most similar to that of starch [9]. The banana is mostly consumed in Malaysia, Japan, China and some other Asian countries[10]. Flour of banana and their byproducts with highly nutritive value is very useful for domestic purposes. Banana flour consists of sugar and high energy content which are easy to convert it into food products requiring solubility and sweetness [11].

Commercially the banana flour production is not well known; therefore the banana producing natation industries is gaining popularity [12]. The banana pulp was also processes to make banana flour, but high Quality control measures, budgets and manpower is required, physical qualities must be studies For analyzing of chemical qualities and nutritional qualities of flour for this purpose fruit must be analyze [13, 14]. When banana is not mature fully its conversion into flour has major source of

fiber, starch, total starch and minerals (P, Mg, K, and Ca). When banana was converted to flour it has the potential to use in bakery products[15].

Keeping in view the above facts and figures, the present experiment was designed to study the physico-chemical qualities of value added banana products.

II. MATERIALS AND METHODS

Fruits of Cavendish Banana variety were collected from near local orchard of Tandojam and brought to the laboratory. Unripe Fresh and good quality banana fruit of Cavendish variety was randomly selected, washed and cut into separate finger pieces. After that banana was peeled off manually and cut into 3 mm even portions. These sliced bananas were then dipped into 5% ascorbic acid solution for 10 minutes to increase the color of the final product. The pieces were dehydrated in a drier for about 8-9 hours at 60^0C.Then, these dried pieces were taken into the juicer blender for making flour. Then flour was filled in the white polyethylene bags for preparing value added products. The dough 250g was made by mixing individual samples (treatments) with unripe banana flour (T_1) banana flour (T_2) chapatti basin flour and banana flour (T_3) chapatti banana flour and rice flour (T_4) kheer banana flour and cow milk (T_5) banana flour with pre-arranged amount of water for three minutes in mixer and was allowed to rest for 20 minutes before making dough balls. Dough pieces were curved and rolled to make a uniform thickness. Chapattis were prepared by mixing 50.0 g banana flour, 3 g oil, 50.0 g rice flour, 50.0 gram (chick pea) flour and kneaded with water with pinch of salt. Kheer was prepared by taking 15g of banana flour and was boiled in one litter cow milk with 30 g of sugar. The value added products were observed for TSS (^{0}Brix),pH, titratable acidity %, Vit C content, ash content (%) and moisture content (%) were observed with the following formulas:

$$\text{Titratable acidity} = \frac{1/10 \times \text{Eq. Wt. of acid} \times \text{Normality of NaOH} \times \text{titer}}{10}$$

$$\text{Vit C (mg/100g)} = \frac{\text{Titrex Dye factors x Volume made up}}{\text{Volume of filtrate taken x volume of sample}}$$

$$\text{Ash content (\%)} = \frac{\text{Weight of ashed sample} \times 100}{\text{Weight of fresh sample}}$$

$$\text{Moisture content \%} = \frac{\text{Weight of fresh sample} - \text{weigh to fried sample}}{\text{Weight of fresh sample}} \times 100\%$$

III. RESULTS AND DISCUSSION

3.1 Results

The results regarding physico-chemical characteristics of banana flour and its products were significant at 5% level of significance (**Table** 1-6). Maximum titratable acidity (0.56) was recorded in chapatti (banana flour mixed with basin flour) (**Table**.1), while the minimum observation was recorded in unripe banana flour (0.25%) the remaining results were statistically non-significant (P<0.05); banana flour and rice flour (0.31), banana flour and basin flour (0.46) banana flour and milk banana flour and milk making banana kheer (0.56). The results of pH of unripe banana flour and its products banana kheer, chapatti (banana flour and rice flour, banana flour and basin flour), has been presented in **Table**. 2. The results showed that maximum (7.68) pH was observed in kheer however minimum pH (6.79%) was found in banana flour. There were statistically significant (P> 0.05) differences in pH of unripe banana flour and its products. Results pertaining to maximum (72.0%) moisture % (Table. 3) was observed in unripe banana fruit followed by chapatti prepared by mixing with rice flour (59.1%) and kheer banana flour and milk (36.3%) minimum moisture% was recorded in banana flour (7.49) followed by chapatti prepared by mixing banana flour with basin flour (25.2). Ash % had maximum value (0.86%) recorded from chapatti (banana flour and rice flour followed by kheer (0.73), while the difference among other treatments remained non-significant (**Table**. 4) .The lowest Ash % was observed under treatment containing only banana flour (0.25) followed by unripe banana fruits (0.55).banana kheer was perceived maximum 26.3% TSS (°Brix) further results (**Table**. 5) revealed thatunripe banana fruits had 6.1 TSS (°Brix) minimum (4.83) TSS (°Brix) was recorded under treatment containing chapatti prepared by adding rice flour with banana flour followed by chapatti with basin flour (5.82). so the results were non-significant (*P< 0.05*) among banana flour chapatti with basin and chapatti with rice flour. However, the results of kheer was significant (P>0.05) with other treatments. The results pertaining to Vitamin-C had non- significant (*P< 0.05*) value for treatments banana flour

(12.54) and chapatti (banana flour and basin flour) (12.8). The maximum Vitamin-C were obtained under treatment containing chapatti prepared with banana flour and rice flour (18.3) followed by unripe banana fruit (17.5). So chapatti prepared with rice flour had significant (*P> 0.05*) (**Table**. 6).

TABLE 1

TITRATABLE ACIDITY OF UNRIPE BANANA FLOUR CHAPATTI AND ITS PRODUCTS

Treatments	R-I	R-II	R-III	Mean
$T_{1=}$ Unripe banana fruits	0.25	0.27	0.25	0.25 ^{D}
$T_{2=}$ Banana flour	0.31	0.33	0.32	0.32 ^{B}
$T_{3=}$ Banana flour and Gram flour (chapatti)	0.46	0.44	0.48	0.46 ^{A}
$T_{4=}$ Banana flour and Rice flour (chapatti)	0.3	0.29	0.33	0.31 ^{CD}
$T_{5=}$ Kheer (Banana flour, Sugar and milk)	0.56	0.58	0.55	0.56^{C}

TABLE 2

PH OF UNRIPE BANANA FLOUR CHAPATTI AND ITS PRODUCTS

Treatments	R-I	R-II	R-III	Mean
$T_{1=}$ Unripe banana fruits	6.82	6.81	6.75	6.79 ^{E}
$T_{2=}$ Banana flour	6.97	6.99	6.92	6.96 ^{D}
$T_{3=}$ Banana flour and Gram flour (chapatti)	7.09	7.10	7.11	7.1 ^{B}
$T_{4=}$ Banana flour and Rice flour(chapatti)	7.05	7.06	7.03	7.04 ^{C}
$T_{5=}$ Kheer (Banana flour, Sugar and milk)	7.67	7.69	7.69	7.68 ^{A}

TABLE 3

MOISTURE (%) CONTENT OF UNRIPE BANANA FLOUR AND ITS PRODUCTS

Treatments	R-I	R-II	R-III	Mean
$T_{1=}$ Unripe banana fruits	72.3	71.9	72.0	72.0 ^{A}
$T_{2=}$ Banana flour	6.30	7.10	9.08	7.49 ^{E}
$T_{3=}$ Banana flour and Gram flour (chapatti)	24.7	26.0	25.0	25.2 ^{D}
$T_{4=}$ Banana flour and Rice flour (chapatti)	58.0	60.3	59.0	59.1 ^{B}
$T_{5=}$ Kheer (Banana flour, Sugar and milk	32.8	40.0	36.0	36.3 ^{C}

TABLE 4

ASH (%) OF UNRIPE BANANA FLOUR AND ITS PRODUCTS

Treatments	R-I	R-II	R-III	Mean
$T_{1=}$ Unripe banana fruits	1.09	0.96	0.88	0.97 ^{A}
$T_{2=}$ Banana flour	0.25	0.26	0.24	0.25 ^{E}
$T_{3=}$ Banana flour and flour(Gram chapatti)	0.55	0.54	0.56	0.55 ^{D}
$T_{4=}$ Banana flour and Rice flour (chapatti)	0.86	0.85	0.87	0.86 ^{B}
$T_{5=}$ Kheer (Banana flour, Sugar and milk)	0.72	0.73	0.75	0.73 ^{C}

TABLE 5

TOTAL SOLUBLE SOLIDS (^{O}BRIX) OF UNRIPE BANANA AND ITS PRODUCTS

Treatments	R-I	R-II	R-III	Mean
$T_{1=}$ Unripe banana fruits	6.05	6.40	6.07	6.17 ^{B}
$T_{2=}$ Banana flour	5.32	4.81	4.37	4.83 ^{C}
$T_{3=}$ Banana flour and flour Gram (chapatti)	6.53	5.14	5.82	5.83 ^{C}
$T_{4=}$ Banana flour and Rice flour (chapatti)	5.34	5.01	5.67	5.34 ^{C}
$T_{5=}$ Kheer (Banana flour, Sugar and milk)	25.5	26.9	26.4	26.3 ^{A}

TABLE 6
VITAMIN C CONTENT OF UNRIPE BANANA ITS PRODUCTS

Treatments	R-I	R-II	R-III	Mean
$T_{1=}$ Unripe banana fruits	17.4	18.0	17.2	17.5 ^{A}
$T_{2=}$ Banana flour	12.4	12.6	12.5	12.5 ^{C}
$T_{3=}$ Banana flour and Gram flour (chapatti)	13.4	12.0	13.0	12.8 ^{A}
$T_{4=}$ Banana flour and Rice flour (chapatti)	18.8	17.6	18.6	18.3 ^{A}
$T_{5=}$ Kheer (Banana flour, Sugar and milk)	14.8	14.8	14.7	15.7^{B}

3.2 Discussion

The study showed that the physico-chemical characteristics of banana flour with different products prepared from it were significant. The flour was creamy white in color scattered with small black spot which presented banana flour. This flour was used in preparing different products. Physico-chemical composition of the flour and products has been compared. The low value was mainly low carbohydrates present in unripe banana flour, while addition of rice and milk might have increased the carbohydrates and protein content of the products due to which ash percentage increased. While moisture % was maximum in fresh unripe bananas sample (72%) which decreased after processing into flour (7%) as freshly harvested bananas might had accumulated more moisture, and during flour development most of the moisture has been evaporated, therefore, it contained low moisture % when banana flour was mixed with rice moisture % increased up to 59.1% but when milk was added it reduced (36.3%) due to more evaporation during treatment. Result, pertaining to pH revealed that fresh banana while all the products had almost neutral pH (7.11, 7.04, and 7.68). This revealed that treatment response to pH was non–significant due to presence of more carbohydrates, fats and proteins that neutralized the acidic behavior of flour.TSS was found maximum in banana kheer sample (26.3^{o}Brix) followed by fresh unripen banana (6.1^{o}Brix), while among other treatments TSS was low. This might be due to the presence of more carbohydrates and sugars in milk and fresh unripen bananas form increased TSS (Brix) [16, 17]. Results pertaining to Vitamin –C were observed significant in T4 (18.3) as banana flour was mixed with rice flour due to which Vit-C increased. T1 was followed by T4 in term of maximum Vitamin–C (17.5). T1 had only unripened banana in a fresh form, which might be the results of increasing Vitamin–C content. The maximum content of Vitamin–C in unripe banana and its products [18, 19]. Average starch content drop from 70-80 % in the pre-climacteric period and less than 1% in the climacteric period [20].

IV. CONCLUSION

The mixing of unripe banana flour with rice flour and basin flour significantly influenced the chemical composition of unripe banana flour, chapatti quality as well as water absorption percentage. Based on the physical chemical properties the chapatti prepared from the unripe banana flour with basin flour and with rice flour and banana kheer contained highest moisture percentage, ash percentage, vitamin C, total soluble solids, pH and titratable acidity. However, more research work should be done in to preparation of different banana products for value addition. There is still not much research about the use of green banana in products, but available data suggest it might be an innovative strategy with many benefits to the food industry and consumers.

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