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Effect of Supplementation with Jackfruit and Pineapple Juice for Fermentation of Banana Pseudo-Stem Core Juice

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ABSTRACT

The study was undertaken to assess the effect of supplementation of Jackfruit and pineapple juice for fermentation of banana pseudo-stem core juice using yeast (Saccharomyces ellipsoideus, NCIM-3200) and lactic acid bacteria (Lactobacillus plantarum, MTCC 6161). The result indicated that yeast fermented pseudo-stem core juice blended with jackfruit juice and pineapple juices showed maximum reduction in TSS, pH, reducing sugar and total sugar with the highest alcohol (6.60%) and overall acceptability (14.75/20.0). LAB fermented pseudo-stem core juice blended with both jackfruit and pineapple juice was observed with highest lactic acid bacterial counts and titrable acidity (0.83%) compared to other LAB fermented treatments.

Keywords: *Banana pseudo-stem core juice, Jackfruit juice, Pineapple juice, Saccharomyces ellipsoideus, Lactobacillus plantarum.*

INTRODUCTION

Banana pseudo-stem is a trunk made of tightly packed overlapped leaf sheath. The inner fibrous core of pseudo stem is rich in fiber, potassium and Vitamin B6. It is also used in development of a sport drink and provides many health benefits such as preventing kidney stones, treating diarrhea, dysentery, diabetes (Ghani, (2003), pain & snakebite (Coe & Anderson, 2005) and also found to possess antioxidant activity (Krishna & Vijayalakshmi, 2005). However, after the harvest of banana crop, pseudo-stem is considered to be absolute waste. At present only 2 per cent of pseudo-stem is processed and remaining is dumped as waste in most of the states, ultimately causing environmental problems. In addition, farmers are spending about Rs. 8000 to 10000/ ha for the disposal of pseudo-stem (Anonymous, 2011).

The development of fermented beverages / products in food industry has gained more importance for the last two decades. The term fermentation was used for the production of wine in early days, but at present it encompasses the foods made by the application of microorganisms including lactic acid bacteria (LAB) and yeast.

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Lactic acid fermentation is one of the oldest methods of preserving fruits and vegetables which contributes desirable physical and flavour characteristics. Shriniketan (2017) studied on optimization of different fermentation factors for the development of quality fermented beverages from banana pseudo-stem core juice using yeast and lactic acid bacteria.

There is high scope for the production of quality fermented product which contains symbiotic effects from banana pseudo-stem core. In pseudo-stem, the sugar content is very low; hence it is required to add an external source of sugar to facilitate the fermentative activity of both bacteria and yeasts. For this purpose the raw materials rich in nutrients like sugars, proteins, minerals, vitamins and carbohydrates are blended to improve the quality with respect to flavour, chemical characters and nutrient content through yeast and LAB fermentation.

In the present study, sugar and nutrient rich fruits like jackfruit juice and pineapple juices are explored by blending 20 per cent juice with centre core juice for quality and nutritional improvement of fermented banana pseudo-stem centre core juice beverage.

MATERIALS AND METHODS

The experiments on fermentation of banana pseudo stem core juice blending with fruit juices like jackfruit and pineapple juices by yeast (*Saccharomyces cerevisiae* var.*ellipsoideus*) and Lactic acid bacteria (*Lactobacillus plantarum*) for quality and nutritional improvement of the pseudo-stem core juice were conducted. The experiment set up consisted of 9 treatments with 3 replications under CRD design.

	Treatments
	T1: Pseudo-Stem Core Juice (PSCJ) control
Yeast fermentation	T2: PSCJ + *Saccharomyces cerevisiae* var. *ellipsoideus*
	T3: PSCJ + 20 % jackfruit juice + *S. cerevisiae* var. *ellipsoideus*
	T4: PSCJ + 20 % pineapple juice + *S. cerevisiae* var. *ellipsoideus*
	T5: PSCJ + 20 % jackfruit juice + 20 % pineapple juice + *S. cerevisiae* var. *ellipsoideus*
LAB fermentation	T6: PSCJ + LAB (*Lactobacillus plantarum*)
	T7: PSCJ + 20 % jackfruit juice + LAB (*Lactobacillus plantarum*)
	T8: PSCJ + 20 % pineapple juice + LAB (*Lactobacillus plantarum*)
	T9: PSCJ + 20 % jackfruit juice + 20 % pineapple juice + LAB (*Lactobacillus plantarum*)

Collection of Banana Pseudo - Stem and preparation of Pseudo-stem core Juice:

Banana pseudo-stems required for the experiment were collected from the Department of Horticulture, University of Agricultural Sciences, GKVK, Bengaluru. The procedure for the preparation of banana pseudo-stem core juice was followed as per Bornare and Khan (2015). The selected core was cut into pieces and grounded in grinder / mixer to get pulp. Juice was extracted and was further mixed with sugar and water and pasteurized. Further, juice was used for the studies for fermentation by blending with jackfruit and pineapple juice using yeast and lactic acid bacteria for quality and nutritional improvement of the pseudo-stem core juice.

Preparation of jackfruit and pineapple blended pseudo-stem core juice:

The jackfruit blended pseudo-stem core juice was prepared by blending 35 per cent extracted pseudo-stem core juice with 20 ml of extracted jackfruit juice, 15 per cent cane sugar and dissolved in 30 ml water. The TSS of blended mixture was adjusted to 20 ºBrix for yeast and 16 ºBrix for LAB fermentation by adding cane sugar. Prepared mixture was subjected for pasteurization and allowed it for cooling.

Similarly, pineapple blended pseudo-stem core juice was prepared by blending of 35 per cent extracted pseudo-stem core juice with 20 ml of extracted pineapple juice, 15 per cent cane sugar and dissolved in 30 ml water. The TSS of blended mixture was adjusted to 20 ºBrix for yeast and 16 ºBrix for LAB fermentation by adding cane sugar. Prepared mixture was subjected for pasteurization and allowed it for cooling.

The jackfruit and pineapple juice blended pseudo-stem core juice was prepared by blending of 35 per cent extracted pseudo-stem core juice with 20 ml of extracted jackfruit juice, 20 ml of extracted pineapple juice, 15 per cent cane sugar and dissolved in 10 ml water. The TSS of blended mixture was adjusted to 20 ºBrix for yeast and 16 ºBrix for LAB fermentation by adding cane sugar. Prepared mixture was subjected for pasteurization and allowed it for cooling.

Preparation of yeast and LAB starter cultures:

The purified and authenticated yeast culture *Saccharomyces cerevisiae* var. *ellipsoideus* (NCIM-3200) was transferred to 250 ml conical flask containing 100 ml of yeast extract peptone dextrose broth (YEPDA). The inoculated flask was kept overnight at 26 - 28°C for growth and the same was used for inoculation at 5 per cent (v/v).

Similarly, the purified and authenticated lactic acid bacteria (LAB) viz., *Lactobacillus plantarum* (MTCC- 6161) was transferred to 250 ml conical flask containing 100 ml of MRS broth. The inoculated flask was kept overnight at 35°C for growth and the same was used for inoculation at 5 per cent (v/v).

Biochemical and sensory analysis:

The biochemical analysis of the fermented blended pseudo-stem core juice by yeast and lactic acid bacteria as influenced by blending with honey and whey were analyzed as per the standard procedures for pH, total soluble solids, titrable acidity, total sugars, reducing sugars, Vitamin C and alcohol estimation.

The pH of the yeast and LAB fermented blended pseudo-stem core juice sample was analyzed using digital pH meter (Digital pH meter type MK-VI). Standard buffer solutions of pH 4.0, 7.0 and 9.2 were used to calibrate the instrument. Total Soluble Solids (TSS) of the fermented samples of different treatments were measured with the help of "ERMA" hand refract meter having a range of 0 to 35^{0}Brix at room temperature. One drop of each sample was placed on the prism of refractometer and noted the value coinciding the shadow. Titrable acidity of the samples was determined as per the procedure followed by Srivastava and Kumar (1993). Alcohol content was estimated calorimetrically as described by Caputi et al. (1968).

The assessment of microbial population of the fermented samples was done by employing standard plate count method and the results were expressed in terms of colony forming units/ ml of the sample (cfu/ ml). The developed fermented beverages from core juice were evaluated by selected five panel members. Hedonic scale of 20 scores was considered to evaluate the product based on the appearance, color, aroma, taste and acceptability. The data obtained from the experiments were subjected to statistical analysis to evaluate treatment effects. Analysis was carried out by completely randomized design using WASP -1 tool. Critical difference values were used tolocate significant mean difference.

RESULTS AND DISCUSSION

Table 1 shows the effect of supplementation with jackfruit and pineapple juice on changes in pH, TSS and titrable acidity of the fermented pseudo-stems core juice.

pH: The initial pH of banana pseudo-stem core juice was 5.22. Fermentation of pseudo-stem core juices with and without blending by yeast had resulted in decrease in pH which ranged between 4.0 and 3.90 and the reduction was not significantly different from each other. However, the highest reduction of pH was observed in yeast fermented pseudo-stem core juice blended with pineapple juice (T4). The pH of wines depends upon the acids and sugar contents in the fruits which influences on

fermentation. Pseudo-stem core juice blended pineapple juice showed a pH 3.90 indicating that organic acids present in the fruits effects the final pH and increase in acidity. Yeast fermented juices showed reduction in pH mainly due to the conversion of sugars to alcohol and acids and these results supports the work of Soni et al. (2009) in amla fermented beverage.

The maximum pH reduction was found in lactic acid bacteria fermented with and without blended pseudo-stem core juices which ranged 4.68 to 3.59. Among LAB fermented beverage least pH (3.59) was observed in treatment with fermented juice blended with both pineapple and jackfruit juices (T9) and it was on par with fermented pseudo-stem core juice blended with pineapple juice (T8- 3.61). LAB fermented blended beverages (T7, T8 and T9) were significantly different from without blending treatment (T6). The result indicated that blending substrate jackfruit juice and pineapple juice has influenced the pH reduction of LAB fermented pseudo-stem core juice. The reduction in pH of fermented juices was due to the production organic acids as metabolite after fermentation. The findings are similar to the study conducted by Kumar et al. (2013) in probioticated fruit juices by *Lactobacillus casei.*

TSS: The initial TSS for yeast fermentation was 20.0 °Brix. After 6 days of fermentation by yeast, significant reduction in TSS content was observed in fermented pseudo-stem core juices that ranged from 6.65 to 7.67 °Brix (Table 1). There was a significant difference in TSS reduction between treatments with and without blending. However, highest reduction of TSS (6.65 °Brix) was observed in Yeast fermented pseudo-stem core juice blended with jackfruit and pineapple juice (T5). Utilization of sugars by the yeasts in juice resulted in reduction of TSS in fermented beverages. This could be due to fermentation efficiency and sugar conversion capacity by the yeast which was also reported by Vyas and Kochhar (1993) in apricot fermented beverage. The initial TSS of the pseudo-stem core juice for LAB fermentation was 16.0 °Brix. After 6 days of fermentation, the change in TSS (°Brix) of the fermented pseudo-stem core juice varied from 13.83 - 14.83 °Brix between treatments. The least TSS (13.83 °Brix) content was observed in the treatment T9 followed by treatment T7 (14.17 °Brix). These treatments were on par with each other and significantly different from fermented beverage without blending (T6). Kumar et al. (2013) also reported the TSS reduction in probioticated fruit juice by *Lactobacillus casei* that ranged between 11 to 6 °Brix.

Titrable acidity: Table 1 shows the effect of supplementation and fermentation on titrable acidity of yeast and LAB fermented pseudo-stem core juice. The initial titrable acidity of the pseudo-stem core juice was 0.03 %. Yeast fermented pseudo-stem core juice with and without blended showed significant increase in titrable acidity that varied from 0.30 to 0.41%. The titrable acidity increased significantly between with and without supplementation. The highest titrable acidity (0.41%) was recorded in yeast fermented pseudo-stem core juice blended with pineapple juice alone (T4) and supplemented with both jackfruit and pineapple juices (T5). This indicated that pineapple juice blend influenced the acidity of yeast fermented beverages. These results are in line with the observation made by Nandagopal and Nair (2013) in yeast fermented beverages from ginger and Indian gooseberry. Similarly, reported by Shukla (2013) in the probiotic fermentation of whey and pineapple juice blend. LAB fermented blended pseudo-stem core beverages recorded highest titrable acidity in terms of lactic acid compared to yeast fermented beverage. In LAB fermented beverage, there were significant differences in titrable acidity between fermented beverages with and without blending. Highest titrable acidity (0.83%) was observed in LAB fermented pseudo-stem core juice blended with both Jackfruit and pineapple juice (T9). These results clearly indicate that yeast and LAB fermentation of blended pseudo-stem core beverages enhanced the Titrable acidity

significantly and blended fruit juice influenced this enhancement. Yoon et al. (2005) reported the production of acids (0.56%) in LAB fermented beet juice after 3days of fermentation using *Lactobacillus plantarum*.

Changes in reducing sugar, total sugars and alcohol content of yeast and LAB fermented pseudo-stem core juices as influence by supplementing with jackfruit and pineapple juice is presented in Table 2.

Reducing sugar and Total sugar (%): LAB fermented pseudo-stem core juice without supplementation (T6) recorded least reducing sugar and total sugar (3.09 and 6.56 %) respectively followed by supplementation of pineapple juice (T8) recorded 3.26 and 9.14 % respectively which significantly differ from an initial value (T1) and other supplemented treatments of T7 and T8. Reduction in reducing sugar content was also seen in the study conducted by Sasi Kumar et al. (2015) in probioticated fruit juices (ranged between 3.1 to 5.5 %).

The yeast fermented pseudo-stem core juice supplemented with jackfruit and pineapple juice (T5) was recorded with the least total sugar and reducing sugar content of 6.56 % and 3.89 % respectively while, the highest total sugar content was recorded in treatment T2 without blending (9.36%). The lower levels of utilization by yeast indicated the reduced efficiency of fermentation. This may be due to presence of fructose in the additional fruit juices. Sowalsky and Noble (1998) reported that production of strong yellow wine, which has 11-14% alcohol by volume, was due to the high fermentable sugar content (85g/l) and monosaccharides (sugars) are converted into ethanol and carbon dioxide leading to reduction of total sugars in fermented beverage.

Alcohol (%): The alcohol in the yeast fermented beverage is an important constituent in determining the quality of fermented beverage (Table 2). The alcohol content of yeast fermented with and without blended pseudo-stem core juices ranged between 5.48 to 6.60% between treatments. There was significant difference in alcohol content between with and without blended pseudo-stem core juices. However, highest alcohol production (6.60%) was observed in yeast fermented beverage blended with jackfruit and pineapple juice (T9). The result indicated that combine blending of jackfruit and pineapple juice influence the alcohol production. This may be due to the availability of monosaccharide (fructose) from fruit juices which could be easily degraded by yeast and converted it into alcohol. Soibam et al. (2016) reported that alcohol per cent of yeast fermented watermelon and sugarcane juice blends ranged between 9.6 and 9.9 %. The negligible content of alcohol in LAB fermented with and without pseudo-stem core juices ranged between 0.19 and 0.28% between treatments. There was no significant difference in alcohol content between these treatments. Small amount of alcohol production was seen during LAB fermentation due the heterofermentative nature of the inoculum added.

Effect of supplementation with jackfruit and pineapple juice on vitamin C and microbial counts of yeast and LAB fermented pseudo-stem core is presented in Table 3.

Vitamin C: The results showed that the yeast fermented pseudo-stem core juice supplemented with jackfruit and pineapple juice (T5) showed highest vitamin C (0.48 mg / 100 ml) followed by treatment T4 supplemented with pineapple juice only (0.36 mg/100ml). Supplementation of pineapple juice and jackfruit juice has influenced on enhancement of vitamin C content in yeast fermented juices. Similarly, LAB fermented pseudo-stem core juice supplemented with jackfruit and pineapple juice (T9) showed highest vitamin C (0.70 mg/ 100 ml) followed by treatment T8 supplemented with pineapple juice only (0.66 mg/100ml) (Table 8). Combine effect of LAB fermentation and supplementation of fruits juices has influenced on improvement of vitamin C content in fermented juices. Similar results were reported by Marica et al. (2007) in beet root juice and carrot juice.

Yeast and LAB population: The yeast and LAB population in the fermented pseudo-stem core juice as influenced by supplemented with jackfruit and pineapple juice is presented in Table 3.

The highest level of yeast population ($7.0x10^4$ cfu/ml) was recorded in the treatment supplemented with jackfruit juice only (T3) followed by treatment (T4) blended with pineapple juice only ($4.0x10^4$cfu/ml). Maragatham and Panneerselvam (2011) reported that papaya wine after 7days of fermentation was recorded with 10^5 cfu/ml yeast count. The highest level of LAB population was recorded in treatment (T9) blended with both pineapple and jackfruit juices ($3.7x10^7$cfu/ml) followed by treatment (T8) blended with pineapple juice only ($1.1x 10^7$cfu/ml). The result clearly indicates that blending of fruits juices influence the yeast and LAB population in fermented pseudo-stem core juice. Similar results were reported by Khatoon and Gupta (2015) in sugarcane and sweetlime juices and reported that LAB fermented sugarcane and sweet lime juices recorded10^8 cfu/ml of counts and sugaracane and sweet lime juice supplemented with 5% and 10% whey performed the best fermentation in terms of higher viability.

Sensory Attributes: The results revealed that mean scores of yeast and LAB fermented blended pseudo-stem core beverage with respect to all sensory attributes of color, appearance, aroma, body, acidity, flavor, quality etc recorded highest scores compared to without blending treatments. (Table 4)

The results clearly indicated that the pseudo-stem core juice supplemented with jackfruit juice fermented by yeast (T3) showed highest organoleptic scores with respect to color/appearance, taste, aroma, astringency, flavor general quality and over all acceptability (14.0/20.0) when compared to other treatments and highly acceptable for consumption. Similarly, the pseudo-stem core juice supplemented with jackfruit juice and pineapple juice fermented by lactic acid bacteria (T9) showed highest organoleptic scores with respect to color/appearance, taste, aroma, astringency, flavor general quality and over all acceptability (14.50/20.0) and highly acceptable for consumption when compared to other treatments. Addition of sugar rich fruit juices may be helping in modulating acidity as well as alcohol production and creating sweetness for higher acceptability for blended beverages. These findings are similar to the results of Latha et al. (2014) reported in yeast and LAB fermented kokum juice blended with sweet potato. Sasi Kumar (2015) reported that blended whey and aloe vera juice fermented by lactic acid bacteria showed highest sensory scores with respect to overall acceptability.

Table 1: Effect of supplementation with Jackfruit Juice and Pineapple Juices on pH, TSS and Titrable Acidity of Fermented Pseudo-Stem Core Juice

Treatments		TSS (Brix^o)	pH	Titrable acidity (%)
	T1- PSCJ (Control)	20.00^a	5.22^a	0.03^g
Yeast Fermentation	T2- PSCJ + Yeast	7.67^d	4.00^d	0.37^e
	T3- PSCJ + Jackfruit juice (20%) + Yeast	6.67^e	4.00^d	0.30^f
	T4- PSCJ + Pineapple juice (20%) + Yeast	6.83^e	3.90^d	0.41^d
	T5- PSCJ+ Jackfruit juice (20%) + Pineapple juice (20%) + Yeast	6.65^e	3.91^d	0.41^d
LAB Fermentation	T6- PSCJ + LAB	14.83^b	4.28^c	0.36^e
	T7-PSCJ + Jackfruit juice (20%) + LAB	14.17^c	4.68^b	0.59^c
	T8- PSCJ + Pineapple juice (20%) + LAB	14.67^b	3.61^e	0.62^b
	T9- PSCJ + Jackfruit juice (20%) + Pineapple juice (20%) + LAB	13.83^c	3.59^e	0.83^a

NOTE: Initial TSS maintained: Yeast Fermentation – 20 ^{o}Brix, LAB Fermentation – 16 ^{o}Brix
Yeast - *Saccharomyces cerevisiae* var. *ellipsoideus* (NCIM-3200), LAB - *Lactobacillus plantarum* (MTCC- 6161)

Table 2: Changes in Alcohol, Reducing sugar and Total sugar contents in Fermented Pseudo-Stem Core Juices as influenced by blending with Jackfruit and Pineapple juice

Treatments		Reducing sugar (%)	Total sugar (%)	Alcohol (%)
	T1- PSCJ (Control)	9.01[a]	17.09[a]	0[f]
Yeast Fermentation	T2- PSCJ + Yeast	4.98[c]	9.36[c]	5.48[d]
	T3- PSCJ + Jackfruit juice (20%) + Yeast	6.03[b]	8.13[d]	5.81[c]
	T4- PSCJ + Pineapple juice (20%) + Yeast	5.68[b]	7.79[d]	5.95[b]
	T5- PSCJ+ Jackfruit juice (20%) + Pineapple juice (20%) + Yeast	3.89[e]	6.56[e]	6.60[a]
LAB Fermentation	T6- PSCJ + LAB	3.09[f]	8.89[c]	0.28[e]
	T7-PSCJ + Jackfruit juice (20%) + LAB	4.39[d]	9.14[c]	0.19[e]
	T8- PSCJ + Pineapple juice (20%) + LAB	3.26[f]	10.62[b]	0.23[e]
	T9- PSCJ + Jackfruit juice (20%) + Pineapple juice (20%) + LAB	5.68[b]	10.78[b]	0.24[e]

NOTE: Initial TSS maintained: Yeast Fermentation – 20 ºBrix, LAB Fermentation – 16 ºBrix
Yeast - *Saccharomyces cerevisiae* var. *ellipsoideus* (NCIM-3200), LAB - *Lactobacillus plantarum* (MTCC- 6161)

Table 3: Effect of supplementation with Jackfruit and Pineapple juice on Vitamin C and microbial counts of Fermented Pseudo-Stem Core Juices

Treatments		Vitamin c (mg/ 100ml)	Yeast/LAB counts (CFU/ml)
	T1- PSCJ (Control)	0.10 [i]	1.0 $x10^2$ / 1.6$x10^2$
Yeast Fermentation	T2- PSCJ + Yeast	0.16 [h]	8.0 $x10^3$
	T3- PSCJ + Jackfruit juice (20%) + Yeast	0.29 [g]	7.0 $x10^4$
	T4- PSCJ + Pineapple juice (20%) + Yeast	0.36 [f]	4.0 $x10^4$
	T5- PSCJ+ Jackfruit juice (20%) + Pineapple juice (20%) + Yeast	0.48[d]	2.0 $x10^4$
LAB Fermentation	T6- PSCJ + LAB	0.41 [e]	7.5x 10^4
	T7-PSCJ + Jackfruit juice (20%) + LAB	0.59[c]	4.0 $x10^5$
	T8- PSCJ + Pineapple juice (20%) + LAB	0.66 [b]	1.1$x10^7$
	T9- PSCJ + Jackfruit juice (20%) + Pineapple juice (20%) + LAB	0.70 [a]	3.7$x10^7$

NOTE: Initial TSS maintained: Yeast Fermentation – 20 ºBrix, LAB Fermentation – 16 ºBrix
Yeast - *Saccharomyces cerevisiae* var. *ellipsoideus* (NCIM-3200), LAB - *Lactobacillus plantarum* (MTCC- 6161)

Table 4: Sensory Attributes of Fermented Jackfruit and Pineapple juice blended Pseudo-Stem Core Juices (20 points hedonic scale)

Treatments		Appearance (2)	Colour (2)	Aroma (2)	Bouquet (2)	Acidity (2)	Sweetness (2)	Body (2)	Astringency (2)	Flavour (2)	Quality (2)	Overall acceptability (20)
	T1	1.50	1.00	1.25	1.00	1.00	1.00	1.00	1.00	1.25	1.25	11.25
Yeast Fermentation	T2	1.50	1.50	1.75	1.25	1.25	1.50	1.25	1.00	1.50	1.25	13.75
	T3	1.50	1.50	1.50	1.25	1.50	1.50	1.50	1.00	1.25	1.50	14.00
	T4	1.25	1.25	1.25	1.00	1.25	1.25	1.25	1.25	1.25	1.50	12.50
	T5	1.50	1.50	1.75	1.25	1.25	1.50	1.50	1.25	1.50	1.75	14.75
LAB Fermentation	T6	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	10.00
	T7	1.25	1.25	1.25	1.00	1.50	1.25	1.00	1.25	1.25	1.25	12.25
	T8	1.25	1.25	1.25	1.25	1.00	1.25	1.00	1.25	1.25	1.25	12.00
	T9	1.50	1.50	1.50	1.50	1.50	1.25	1.25	1.50	1.50	1.50	14.50

NOTE:
T1- PSCJ (Control)
T2- PSCJ + Yeast
T3- PSCJ + Jackfruit juice (20%) + Yeast
T4- PSCJ + Pineapple juice (20%) + Yeast
T5- PSCJ + Jackfruit juice (20%) + Pineapple juice (20%) + Yeast
T6 - PSCJ + LAB
T7-PSCJ +Jackfruit juice (20%) + LAB
T8- PSCJ + Pineapple juice (20%) + LAB
T9- PSCJ + Jackfruit juice (20%) + Pineapple juice (20%) + LAB

- Initial TSS maintained : Yeast Fermentation – 20 ºBrix
  LAB Fermentation – 16 ºBrix
- Yeast - *Saccharomyces cerevisiae* var. *ellipsoideus* (NCIM-3200)
- LAB - *Lactobacillus plantarum* (MTCC- 6161)

CONCLUSION

Banana Pseudostem core is highly nutrition and could be explored to develop value added products. In the present study alcoholic beverage developed from yeast fermentation of banana pseudostem core juice blended with both jackfruit (20%) and pineapple juice (20%) showed good biochemical and sensory properties with highest alcohol content. Also, the Probiotic drink developed from banana pseudo stem core juice blended with both jackfruit (20%) and pineapple juice (20%) showed highest lactic acid bacterial population with good sensory and biochemical properties characteristics.

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