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Development of preservation by processing technologies of BAU kul

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Abstract

This study reports on processing of jam, jelly and chutney from BAU kul and assessing the products shelf life and food value. This study was conducted in the laboratory of the Department of Food Technology and Rural Industries, Bangladesh Agricultural University, Mymensingh. The fruits were collected from the local market and the pulp was extracted and analyzed for proximate composition. The proximate analysis of BAU kul pulp showed 86.12% moisture, 19.00% TSS, 06.04% reducing sugar, 15.16 % non-reducing sugar, 21.20% total sugar, 01.35% ash, 04.50P^H, 00.44% acidity and 65mg/100g vitamin C. A total three types of products each with 3 different formulations were prepared and packed in appropriate packaging for storage studies. Products were stored at room temperatures and change their physical and chemical condition during storage was observed at an interval of 30 days for a period of four months. A taste panel consisting 10 panelists studied the acceptability of the samples. The consumer's preferences were measured by statistical analysis of the scores obtained from the responses of the taste panel. Among the samples jam of (TSS – 65.50%, pectin – 0.5%, P^H – 3.10), jelly of (TSS – 66.50%, pectin 0.5% and P^H – 3.15) and chutney of (TSS – 65.5%, P^H – 3.20) were awarded the highest scores by the panelists.

Keywords: BAU-Kul, Acidity, Vitamic-C, Pectin,Sugar, Na-Benzoate

Introduction

The bar or jujube (*Zizyphus mauritiana* Lamk, 2n = 48) belonging to the family *Rhamnaceae* is the most hardy fruit tree cultivated all over Bangladesh and India (Singh, 1979) and also one of the most ancient common fruits of India (Yamdagni, 1985). It is commonly known as 'boroi' or 'kul' in Bangladesh and is one of the important fruits of Bangladesh. Some of the xerophytic characters and its ability to withstand drought makes it as "king of fruit's of arids". There is about 1214.57 hectares of land under ber trees with a total production of 224000 m ton and yield (184.43 t/ha) in Bangladesh (BBS, 2006). The cultivated varieties in Bangladesh are BAU Kul, Apple Kul, BARI Kul-2, Narikeli, Dhaka-90, etc.

The BAU Kul resemble small apple in flavour and appearance and the pulp is mealy and sweet. It has a thin, edible skin surrounding whitish flesh of sweet, agreeable flavor. The fully mature fruit is entirely red. Shortly after becoming fully red, the fruit begins to soften and wrinkle. At this stage the flesh is crisp and sweet, reminiscent of an apple. Under dry conditions BAU Kul lose moisture, shrivel and become spongy inside. Ripe fruit can be preserved by sun drying and may be powdered for out of season purposes.

There appears to be considerable opportunities for expending production of BAU kul to meet increasing domestic demand. Especially in char land it is produced large quantities and mostly wasted due to the lack of proper processing and preservation. Only a small portion of BAU Kul is processed and preserved by housewives and small processors traditional like sun drying and pickle processing.

Bangladesh cannot use high technology, sophisticated machineries and equipment, skilled manpower and large capital investment for modern food processing industries as in developed countries. Therefore it is important to develop and use low level appropriate technology for processing and preservation of jam, jelly and chutney made from BAU Kul. If it is processed and commercially exploited, the benefits would include improvement in average firm incomes and improved nutrition among consumers as it contains appreciable quantities of vitamin C and carotene. Principal constraints to the growth in supply of fruits in the country include post-harvest losses (an average of 26%) due to inadequate packaging, transportation and storage and lack of familiarity with good post-harvest practices or processing.

Therefore, the scope of utilizing BAU Kul remains bright in Bangladesh. Development of varieties of products like jam, jelly and chutney utilizing local produces is critically important for expanding the country's developing food industries. With the above points into consideration the present study has been designed to achieve the following objectives: i) Assessing composition of BAU kul determined, ii) Formulation and processing of Jam, Jelly and chutney finalized, iii) Shelf-life of the processed products evaluated, iv) Sensory attribute of the processed products assessed.

Materials and Methods

The fresh green BAU kul collected from the local market. The other materials used in the study were food-grade chemicals and preservatives, sugar, spices, packaging materials etc.

Extraction of BAU kul pulp and juice

The fully mature fresh healthy BAU kul were washed thoroughly with potable water. After that, the flesh by knife for discarding seed. Water was added equal to the weight of the flesh and blended by blender for preparation of pulp. The pulp was sieved through stainless steel sieve for extraction of juice.

Chemical analysis of BAU kul pulp

Vacuum oven drying method described by Endel Karmas (1980) was used for determining moisture where the temperature was maintained at 70°C and pressure 50-100 mg of Hg. The acidity was determined by titration using standard sodium hydroxide solution and expressed as anhydrous citric acid and P^H was measured by a P^H meter. The ascorbic acid content in the products was estimated by titrimetric method summarized by Rangana & Bajaj (1979) using 2-6, dichlorophenol dye. AOAC (2004) method was used to determine the ash content of the products.

Formulation of BAU kul different products

The product prepared from BAU kul with different formulations were coded as;
Jam: A_1 A_2 A_3, Jelly: B_1 B_2 B_3, Chutney: C_1 C_2 C_3
The formulations of different products was shown in the Table 1, 2, 3

Table 1. Formulations of BAU kul Jam

Ingredients	A_1	A_2	A_3
BAU kul pulp (gm)	450	450	450
Sugar (gm)	550	550	550
Pectin (%)	1.5	1.0	0.50
Citric Acid(gm)	5	5	5
KMS (ppm)	300	300	300

Table 2.Formulations of BAU kul Jelly

Ingredients	B_1	B_2	B_3
BAU kul juice (gm)	450	450	450
Sugar (gm)	550	550	550
Pectin (%)	1.5	1.0	0.50
Citric Acid(gm)	5	5	5
KMS (ppm)	300	300	300

Table 3. Formulations of BAU kul Chutney

Ingredients	C_1	C_2	C_3
BAU kul(kg)	1	1	1
Sugar (gm)	750	750	750
Kismis (gm)	150	150	150
Ginger (gm)	50	50	50
Garlic (gm)	50	50	50
Cumin powder (gm)	5	5	5
Pachforon (gm)	10	10	10
Joyetri & Joyfal (gm)	3	3	3
Posto dana (gm)	5	5	5
Chilli Powder (gm)	3	3	3
Salt (gm)	30	30	30
Vinegar (ml)	250	250	250
Mustard oil(ml)	125	125	125
Citric Acid (gm)	3	4	5

Processing of BAU kul Jam/Jelly: Selected jujubes and BAU kul were weighed and washed thoroughly in cold water. Cut the washed fruits with a stainless steel knife into small pieces. Extracted pulp (Fig. 1) from fruit was adjusted the pH by addition of citric acid or sodium hydroxide. Strained the mass through a course cloth to separate the extract, took one more extract and mix them. Kept the mixed extract in deep a container and after settling, carefully decant the extract. The pectin was mixed in 3 proportions 0.5, 1.0 and 1.5% with sugar thoroughly. The martial was cooked the mixed juice till its TSS reached 65% (tested by Refractometer). The cooking temperature maintained at 104-105°C. Added Citric Acid and KMS and cooled. The finished products poured into clear dry sterilized glass jars.

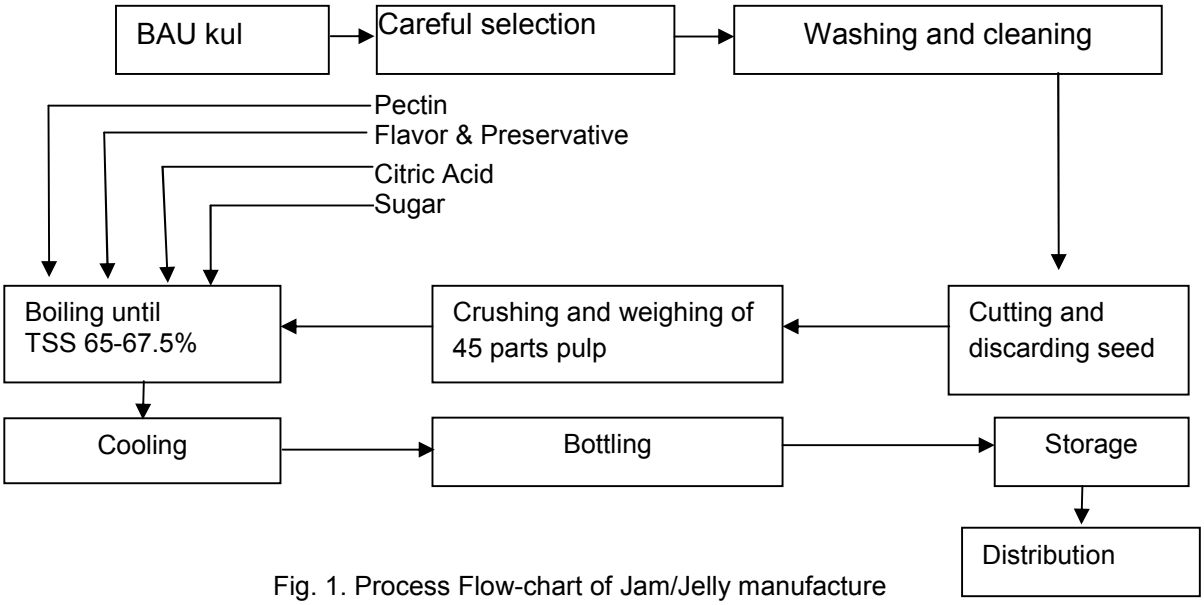

Fig. 1. Process Flow-chart of Jam/Jelly manufacture

Processing of BAU kul Chutney

Selected fresh BAU kul were weighed and washed them thoroughly in cold water. Cut the washed fruits with a stainless steel knife into small pieces. The pieces were mixed with tamarind, sugar, salt, spices, Ginger, Garlic, Cumin Powder, Pachforon, Joyetri & Joyfal, Postodana, Chilli powder. The mustard oil was heated to boiling and the pulp mixture was added into it. After heating few minutes vinegar was added into it. The heating was continued until the mixture became brown in colour and TSS reached 60%. After that citric acid and KMS were added at three different proportions in the finished products. Finally the soft brown mass was filled hot in glass jars and immediately capped. The process flow diagram for manufacturing of pickle is shown in Fig 2.

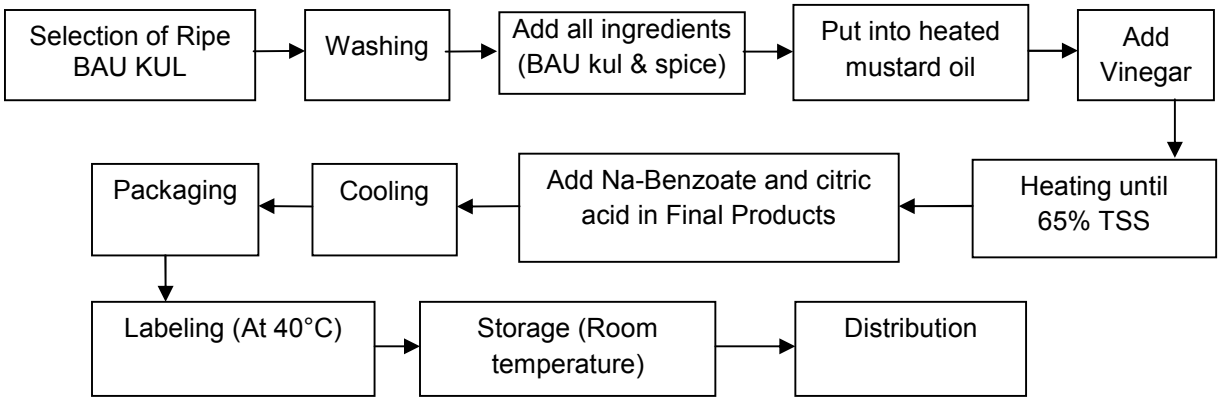

Fig. 2. Process Flow-chart for Chutney manufacture

The required ingredients for different types of BAU kul chutney are shown in Table 3. Selection of fresh mature BAU kul after that weight and wash them thoroughly in cold water. Cut the washed fruits with a stainless steel knife into small pieces. The pieces are mixed with sugar, salt spices like kismis, ginger, garlic, cumin powder, pachforon, joyetri & joyfal, posto dana, chilli powder. The mustard oil was heated to boiling and the pulp mixture was added into it. After heating few minutes vinegar is added into it. The heating was continued until the mixture became brown in colour and T.S.S. reached 65%. After that citric acid was added three different proportions in the finished products. Finally the soft brown mass was filled hot in glass jars and capped immediately.

Chemical analysis

The wheat and sweet potato flours and the prepared instant noodles were analyzed for moisture, protein, fat, ash, crude fiber, starch content, peroxide value, and free fatty acid value by AOAC (2004) method. The total carbohydrates were calculated by approximation i.e. by subtracting the measured protein, moisture, fat and ash from 100 (Srivastava & Sanjeev, 2002).

$$\%\text{Moisture} = \frac{\text{Loss in weight}}{\text{Weight of sample}} \times 100 \backslash$$

$$\%\text{Ash} = \frac{\text{Weight of residue}}{\text{Weight of sample}} \times 100$$

$$\%\text{Nitrogen} = \frac{W(T_s - T_b) \times \text{N of acid} \times \text{meq. of } N_2}{\text{Weight of sample (gm)}} \times 100$$

Where,
T_s = Titre volume of the sample (ml)
T_b = Titre volume of the blank (ml)
Meq. of N_2 = 0.014
Therefore,
% Protein = % Nitrogen $\times$ 6.25

$$\%\text{Crude fat} = \frac{\text{Weight of fat-soluble material}}{\text{Weight of sample}} \times 100$$

$$\%\text{Titrable acidity} = \frac{T \times N \times V_1 \times E}{V_2 \times W \times 1000} \times 100$$

Where, T = Titre, N = Normality of NaOH, V_1 = Volume made up, E = Equivalent weight of acid, V_2 = Volume of sample taken for estimation, W = Weight of sample

$$\text{mg of vitamin C per 100g sample} = \frac{T \times D \times V_1}{V_2 \times W} \times 100$$

Where, T = Titre , D = Dye factor, V_1 = Volume made up, V_2 = Aliquot of extract taken for estimation, W = Weight of sample taken for estimation

$$\%\text{Reducing sugar} = \frac{F \times D \times 100}{T \times W \times 100}$$

Where, F = Fehling's Factor, D = Dilution,T = Titre, W = Weight of sample
% Non-reducing sugar = % Invert sugar - % Reducing sugar
% Total sugar = % Reducing sugar + % Non-reducing sugar

Sensory Evaluation

Sensory evaluation of all the formulated BAU kul Jam, Jelly and Chutney was done by taste testing panel. The taste testing panel was made up with of 10 test panelists. They were asked to evaluate, color, flavor, sweetness, sourness, stickiness, thickness and overall acceptability by a scoring rate on a 9 point hedonic scale. The scale was arranged such that: 9 = Like extremely; 8= Like very much; 7= Like moderately; 6= Like slightly; 5= Neither like nor dislike; 4= Dislike slightly; 3 = Dislike moderately; 2 = Dislike very much; 1 = Dislike extremely. The preference deference was evaluated by statistical analysis of the data for variance and consequently Duncan's Multiple Range Test (DMRT).

Storage studies

Processed BAU kul Jam, Jelly and Chutney were stored at ambient temperature (27°C to 34°C) for a period of 4 months and quality parameters were assessed. During storage the changes in TSS, acidity, P^H, color, flavor, texture/turbidity and vitamin C and visual fungal growth were observed. The analyses of the parameters were done according to standard analytical methods summarized by AOAC (2004) and Rangana (1994).

Results and Discussion

Composition of BAU kul pulp

The composition of fresh BAU kul pulps such as moisture, ash, protein, fat, P^H TSS, reducing sugar, non-reducing sugar, total sugar, acidity and vitamin-C content have shown in Table 4.

Table 4.Chemical Composition of raw BAU kul

Components/Parameters	BAU kul
Moisture (%)	86.12
Ash (%)	01.35
Protein (%)	00.80
Fat (%)	00.10
P^H	04.50
Acidity (%)	00.44
Vitamin – C (mg/100gm)	65.00
TSS (%)	19.00
Reducing sugar (%)	04.04
Non-reducing sugar (%)	10.15
Total sugar (%)	14.19

Table 4 shows that Chemical composition of BAU kul pulps such as moisture, ash, protein, fat, P^H Acidity, vitamin-C, TSS reducing sugar, non-reducing sugar, total sugar are86.12, 01.35,0.80,0.10, 04.50, 00.44, 65.00, 19.00, 04.04, 10.15, 14.19comply with the result of Islam *et al.*(2004). Islam *et al.*(2004)reported that TSS, Acidity, P^H was 18.5,0.40 and 4.12 respectively

Composition of BAU kul products

Vitamin C content in BAU kul pulp was found to be good compared to other citrus fruits. It was further reduced in jellies, jams and chutney prepared from BAU kul pulp because most of the ascorbic acid present in the pulp was destroyed during long heating at high temperature. This destruction was probably attributed due to neutralization of acid during inversion of sugars in juice and also resulted an increasing in reducing sugar content in jams, jellies and chutney. The average results are presented in Table 5.

Table 5 Proximate Composition of BAU kul products

Components	BAU kul Jam	BAU kul Jelly	BAU kul Chutney
Moisture (%)	30.79	29.10	33.56
Ash (%)	00.38	00.37	04.01
Acidity (%)	01.00	01.00	01.15
P^H	03.10	03.15	03.20
Reducing sugar (%)	11.85	14.11	14.99
Non-reducing sugar (%)	48. 50	51.50	47.41
Total sugar (%)	60.35	65.61	62.40
TSS (%)	65.50	66.50	65.10

In the above Table-5 shows that the value of P^H ,TSS and Total sugar is comply Desrosier (1977) study. Desrosier (1977) reported that gel formation occurs only with a certain range of hydrogen ion concentration (P^H) the optimum acidity figure for jelly being P^H value 3.2. The jelly strength decrease rapidly with an increase in P^H value. Beyond P^H 3.4 no gel formation occurs at the usual soluble solid range. The optimum concentration of soluble solid is about 67.5%. It is, however possible to make jellies with high content of pectin and acid, containing less than 60% sugar. Too high quality of pectin necessary to form jelly depends largely on the quality of pectin. Only one percent should be sufficient to produce a firm jelly.

Storage Studies of BAU kul Products

Processed BAU kul jam, jelly and chutney, were stored at ambient temperature (27°C to 34°C) for a period of 4 months and quality parameters were assessed. During storage the changes in TSS, acidity, P^H, color, flavor, texture/turbidity and vitamin-C and visual fungal growth were observed. The analyses of the parameters were done according to standard analytical methods summarized by AOAC (2004) and Rangana (1994). Results are presented in Table 6, 7 and 8.

Table 6. Storage Studies of BAU kul Jam

Storage period (Month)	Sample Code	Observation			TSS (%)	Acidity	P^H	Remarks
		Color	Flavor	Turbity				
0	A_1	Brown	Fresh	Opaque	65.50	1.00	3.10	Good
	A_2	Brown	Fresh	Opaque	65.50	1.00	3.10	Good
	A_3	Brown	Fresh	Opaque	65.50	1.00	3.10	Good
1	A_1	Brown	Fresh	Opaque	65.50	1.00	3.10	Good
	A_2	Brown	Fresh	Opaque	65.50	1.00	3.10	Good
	A_3	Light brown	Fresh	Opaque	65.50	1.15	2.80	Fair
2	A_1	Brown	Fresh	Opaque	65.50	1.12	2.80	Good
	A_2	Brown	Fresh	Opaque	65.50	1.11	2.80	Good
	A_3	Light brown	Off flavor	Opaque	65.50	1.20	2.50	Fair
3	A_1	Brown	Good	Opaque	65.50	1.20	2.75	Good
	A_2	Brown	Good	Opaque	65.50	1.20	2.75	Good
	A_3	Pale	Off flavor	Opaque	65.50	1.40	2.40	Not good
4	A_1	Brown	Good	Opaque	65.50	1.25	2.60	Good
	A_2	Brown	Good	Opaque	65.50	1.25	2.60	Good
	A_3	Pale	Off flavor	Opaque	65.50	1.50	2.20	Spoiled

Table 7. Storage Studies of BAU kul Jelly

Storage period (Month)	Sample Code	Observation			TSS (%)	Acidity	P^H	Remarks
		Color	Flavor	Turbidity				
0	B_1	Brown	Fresh	Clear	66.50	1.00	3.15	Good
	B_2	Brown	Fresh	Clear	66.50	1.00	3.15	Good
	B_3	Brown	Fresh	Clear	66.50	1.00	3.15	Good
1	B_1	Brown	Fresh	Clear	66.50	1.00	3.15	Good
	B_2	Brown	Fresh	Clear	66.50	1.00	2.92	Good
	B_3	Light brown	Fresh	Clear	66.50	1.15	2.80	Fair
2	B_1	Brown	Fresh	Clear	66.50	1.12	2.90	Good
	B_2	Brown	Fresh	Clear	66.50	1.11	2.91	Good
	B_3	Light brown	Off flavor	Opaque	66.50	1.20	2.50	Fair
3	B_1	Brown	Good	Clear	66.50	1.20	2.75	Good
	B_2	Brown	Good	Clear	66.50	1.20	2.75	Good
	B_3	Pale	Off flavor	Opaque	66.50	1.40	2.40	Not good
4	B_1	Brown	Good	Clear	66.50	1.25	2.60	Good
	B_2	Brown	Good	Clear	66.50	1.25	2.60	Good
	B_3	Pale	Off flavor	Opaque	66.50	1.50	2.20	Spoiled

Table 8. Storage Studies of BAU kul Chutney

Storage period (Month)	Sample Code	Observation			TSS (%)	Acidity	P^H	Remarks
		Color	Flavor	Texture				
0	B_1	Brown	Fresh	Clear	66.50	1.00	3.20	Good
	B_2	Brown	Fresh	Clear	66.50	1.00	3.20	Good
	B_3	Brown	Fresh	Clear	66.50	1.00	3.20	Good
1	B_1	Brown	Fresh	Clear	66.50	1.00	3.20	Good
	B_2	Brown	Fresh	Clear	66.50	1.00	2.92	Good
	B_3	Light brown	Fresh	Clear	66.50	1.15	2.80	Fair
2	B_1	Brown	Fresh	Clear	66.50	1.12	2.90	Good
	B_2	Brown	Fresh	Clear	66.50	1.11	2.91	Good
	B_3	Light brown	Off flavor	Opaque	66.50	1.20	2.50	Fair
3	B_1	Brown	Good	Clear	66.50	1.20	2.75	Good
	B_2	Brown	Good	Clear	66.50	1.20	2.75	Good
	B_3	Pale	Off flavor	Opaque	66.50	1.40	2.40	Not good
4	B_1	Brown	Good	Clear	66.50	1.25	2.60	Good
	B_2	Brown	Good	Clear	66.50	1.25	2.60	Good
	B_3	Pale	Off flavor	Opaque	66.50	1.50	2.20	Spoiled

Sensory Evaluation

A panel of 10 judges tested the color flavor, texture and overall acceptability of the BAU kul products like jam, jelly and chutney manufactured with variable ingredients and the mean scores are presented in Table 9, Table 10 and Table 11.

BAU Kul Jam

Ten judges evaluated the color, flavor, texture and overall acceptability of three samples. Analysis of variance was carried out for color preferences and the results revealed that there were significant ($p<0.05$) differences in color acceptability since the calculated F-value (19.18) was greater than the tabulated F-value (3.55). The results showed in Table 9 that A_3 and A_1 were equally acceptable at 0.05% level of statistical significance. Samples A_2 and A_3 were equally preferable in respect flavor and the score for these two was 7.50 out of 9. In case of texture and overall acceptability preference among the samples, the results showed in that A_3 was the most preferred sample than other samples.

Table 9. Duncan's Multiple Range Test (DMRT) for Color, Flavor, Texture and Overall Acceptability of BAU kul Jam

Parameters	Product type	Orginal order of mean	Product type	Ranked order of mean	LSD Value	P (at α)	Error mean square
Color	A_1	7.2^a	A_3	7.3^a	0.569	0.05	0.367
	A_2	5.8^b	A_1	7.2^a			
	A_3	7.3^a	A_2	5.8^b			
Flavor	A_1	6.3^b	A_2	7.5^a	0.691	0.05	0.541
	A_2	7.5^a	A_3	7.5^a			
	A_3	7.5^a	A_1	6.3^b			
Texture	A_1	5.7^b	A_3	7.8^a	0.618	0.05	0.433
	A_2	6.1^b	A_2	6.1^b			
	A_3	7.8^a	A_1	5.7^b			
Overall Acceptability	A_1	6.4^b	A_3	7.2^a	0.646	0.05	0.474
	A_2	6.0^b	A_1	6.4^b			
	A_3	7.2^a	A_2	6.0^b			

Where, Error degrees of freedom =18, No. of judges = 10

-The means with same superscripts within a column are not significantly different at $p<0.05$

-A_1 was processed by 1.5% pectin, A_2 was processed by 1.0% pectin and A_3 was processed by 0.50% pectin.

BAU kul Jelly

Analysis of variance was carried out for color preferences and the results revealed that there were no significant ($p>0.05$) differences in color acceptability. The results showed in Table 10 that B_1 was the most preferred one followed by B_2 and B_3 in respect to color preferences. In case of flavor and overall acceptability preference among the samples and the results showed that B_3 was the most preferred one. In case of texture preference among the samples, analysis of variance (ANOVA) showed that there was no significant difference for texture preferences between B_1 and B_3.

Table 10. Duncan's Multiple Range Test (DMRT) for Color, Flavor, Texture and Overall Acceptability of BAU kul Jelly

Parameters	Product type	Original order of mean	Product type	Ranked order of mean	LSD Value	P (at α)	Error mean square
Color	B_1	6.20 [a]	B_1	6.20 [a]	0.732	0.05	0.607
	B_2	5.80 [b]	B_2	5.80 [b]			
	B_3	5.80 [b]	B_3	5.80 [b]			
Flavor	B_1	5.80 [b]	B_3	6.90 [a]	0.730	0.05	0.604
	B_2	5.10 [b]	B_1	5.80 [b]			
	B_3	6.90 [a]	B_2	5.10 [b]			
Texture	B_1	7.20 [a]	B_1	7.20 [a]	0.495	0.05	0.278
	B_2	5.70 [b]	B_3	7.20 [a]			
	B_3	7.20 [a]	B_2	5.70 [b]			
Overall Acceptability	B_1	6.80 [a]	B_3	7.10 [a]	0.782	0.05	0.693
	B_2	5.70 [b]	B_1	6.80 [a]			
	B_3	7.10 [a]	B_2	5.70 [b]			

Where, Error degrees of freedom =18, No. of judges = 10
-B_1, was processed by 1.5% pectin, B_2 was processed by 1.0% pectin and B_3 was processed by 0.50% pectin.

BAU kul chutney

As shown in Table 11 that was no significant difference for color, flavor and overall acceptability preference among the samples a two-way analysis of variance (ANOVA) was carried out and the results showed that C_1 was the most preferred one. In case of texture preference among the samples, analysis of variance (ANOVA) showed that C_3 was the most preferred sample than other samples.

Table 11. Duncan's Multiple Range Test (DMRT) for Color, Flavor, Texture and Overall Acceptability of BAU kul Chutney

Parameters	Product type	Original order of mean	Product type	Ranked order of mean	LSD Value	P (at α)	Error mean square
Color	C_1	7.50 [a]	C_1	7.50 [a]	0.934	0.05	0.989
	C_2	6.40 [b]	C_2	6.40 [b]			
	C_3	5.80 [b]	C_3	5.80 [b]			
Flavor	C_1	6.90 [a]	C_1	6.90 [a]	0.714	0.05	0.578
	C_2	6.10 [b]	C_2	6.10 [b]			
	C_3	6.10 [b]	C_3	6.10 [b]			
Texture	C_1	6.80 [a]	C_3	7.30 [a]	0.628	0.05	0.448
	C_2	5.60 [b]	C_1	6.80 [a]			
	C_3	7.30 [a]	C_2	5.60 [b]			
Overall Acceptability	C_1	7.60 [a]	C_1	7.60 [a]	0.846	0.05	0.811
	C_2	5.70 [b]	C_3	7.20 [a]			
	C_3	7.20 [a]	C_2	5.70 [b]			

Where, Error degrees of freedom =18, No. of judges = 10
- C_1 was processed by 3gm citric acid, C_2 was processed by 4gm citric acid and C_3 was processed by 5gm citric acid.

Conclusion

This work was initiated to characterize the product prepared from different percentage of pectin for jam and jelly of BAU Kul. Three samples of jam and jelly were processed incorporating of 1.5%, 1.0% and 0.5% pectin and analyzed the physical, chemical and organoleptic characteristics. The amount of sugar and preservative gradually reduced to establish the effect of the suitability of chutney preparation. The Physical chemical analysis shows that reduce the pectin percentage reduce the stability of storage. Simultaneously reduce the sugar and not used preservative loss the storage stability. Moreover BAU kul is a good source of nutrients as well as its product jam, jelly and chutney. In addition, the BAU kul products has a great commercial value to reduce the poverty by developed food industry.

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