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Sensory Attributes of Pork Pickle Incorporated with Fermented Bamboo Shoot

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ABSTRACT

This study was conducted to evaluate the organoleptic quality of pork pickles prepared by replacing vinegar with fermented bamboo shoot (FBS) at different levels (50% and 100% replacement). Organoleptic evaluation of the products revealed that all the products were equally acceptable as no significant differences were observed, however, pork pickle with FBS powder and extract were preferred more compared to FBS extract. The costs of FBS incorporated pickle products were found to be lower than the control product. Based on the above study, it can be concluded that FBS products can be used to replace the conventional chemical preservative in pork pickle which are cheaper, organoleptically tastier and highly acceptable. There is high prospect of using these natural indigenous products commercially in manufacturing pork pickle in India.

Key words : *Fermented bamboo shoot, Organoleptic evaluation, Pork pickle, Sensory attributes*

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INTRODUCTION

India is passing through a phase of accelerated industrialization. There is an increased demand for processed, wholesome and nutritious ready-to-eat food products (Pal 1990). Meat and meat products are an indispensable part of the human diet. Today, meat and meat products available in the market are no longer limited to traditional items, many of the products are fully cooked and ready to consume where as others are in the form of ready to cook at home (Xiong and Mikel 2005). These 'easy to serve' and 'ready to eat' convenience or fast foods are delicious, nutritious and if required easy to carry home.

Pickling is one of the methods commonly practiced in preserving fruits and vegetables for human consumption and could be a suitable method for preservation of avian and animal products like egg and meat (Pal 1990). There is tremendous scope for research and development of recipes and technologies for indigenous meat products such as pickle and other meat products (Chatterjee 1987). Meat pickle is a value added, ready to eat, highly acceptable convenience processed meat product. Meat pickles taste like meat gravy and can be used as side dish with main food and go well with Indian preparations like Idli, Dosa, Chapati, Paratha, Roti and Bread etc. Pickles are appetizers and referred to as ready to eat food products prepared by the use of edible organic acids mainly vinegar and/or edible oil, table salt, sugar, spices and condiments (Kumar 1985).

Bamboo shoots are young, new canes that are harvested for food before they are two weeks old or one-foot tall (Das and Puzari 2007). They are consumed as vegetables, pickles, salads and in various other forms in several countries (Christine and Wetterwald 1992; NMBA: National Mission on Bamboo Applications 2008). According to Seventh World Bamboo Congress (SWBC 2004), in India there are about 136 bamboo species distributed in 75 genera. Among these 25 species are of edible type and are consumedby tribal communities. Species such as *Dendrocalamusgiganteus, D. hamiltonii, Bamboosabalcooa, B. bambos, B. tulda, B. polymorpha, B. vulgaris, Melocannabaccifera* etc. are considered as best in the world for producing edible shoots, which have distinct sweet taste in the raw state (Das and Puzari 2007; NMBA 2008). Various reports indicated that FBS extract (Kharicha) was being used by the tribal people for preserving meat products since time immemorial (Hakasama 1991, Sarangthem and Singh 2003). Kharicha not only offers the antibacterial activities but also enhances the taste and nutritional values of the end product (Borpuzari *et al*. 1996; Hazarika *et al*. 2008). The viability and stability of the newly developed product in the competitive food product market is utmost important from entrepreneur point of view as it is largely depended upon the sensory qualities and cost of the final product. Thus, the present study was undertaken to determine the acceptance of the pork pickle incorporated with fermented bamboo shoot products on the basis of organoleptic evaluation.

MATERIALS AND METHODS

The pork pickles with different fermented bamboo shoot products were prepared as per the method described by Chavhan *et al*. (2013). Soft succulent bamboo shoots were

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collected from local markets and blades were peeled off from the shoots. After slicing, the bamboo shoots were minced by hand mincer having plate with pore size 4 mm in a diameter and exposed to sunlight in covered glass container for about 21 days for fermentation. Raw extract was first separated from the fermented bamboo shoot with the help of muslin cloth by pressing and filtered through Whatman filter paper No. 1 to get the clean extract. The bamboo shoot extract was stored in a clean glass bottle at 4 ± 1^0C until further use.

To prepare the bamboo shoot paste, the fermented sliced bamboo shoot was ground at high speed for 3 min with the help of a mechanical mixer grinder viz. Philips HL7600 Mixer Grinder and packed in clean, dry glass bottle and preserved at 4 ± 1^0C until further use.

The fermented bamboo shoot powder was prepared by drying the product in a mechanical drier at 60.0±2°C for 6-8 hours until a dried brown coloured mass was obtained. The fine powder was made by grinding in a mechanical grinder at a high speed for 3 min. The bamboo shoot powder was then packed in a clean, dry, food grade plastic bottle and placed in a cool and dry place for further use.

Fresh cuts of pig slaughtered at the age of 7-8 months preferably from ham region of the carcass were collected just after slaughter in food grade polythene bags.The pork was deboned, skinned and excessive fat and connective tissues were trimmed off and washed and stored at 4 ± 1^0C until further use. The formulations and the final pickle ingredients as mentioned in Table 1 were selected after conducting the preliminary trials.

The deboned pork was cut into small cubes of suitable size (½ cm to 1cm). The pork cubes were cleaned, trimmed and then marinated by dry method with 4% salt at room temperature. The cuts were pressure cooked at 15 lb pressure for 5-6 min and after cooking, the gravy was separated from the cubes. The cooked pork pieces were fried in mustard oil until the pieces developed brown colour. The spices were also fried in mustard oil for 2-3 min. The gravy was added in fried pork pieces and mixed properly. Measured amount of fermented bamboo shoot products were added with or without vinegar at 50% and 100% level on mild heat and mixed well. The pickle products were packed in clean, dry, food grade plastic bottle of 200 gm capacity, sealed, airtight and stored at room temperature. Before sealing, care was taken to cover the pickle ingredients with a layer of oil so as to prevent its exposure to air. The pickle products were kept for maturation for one weak (7 days) at room temperature.

A total of six batches of each of the pork products were prepared and subjected to following studies. The method adopted for organoleptic evaluation (Specialized panel) was as described by Bratzler (1971). Pork pickle samples were evaluated by serving to a semi-trained panel of 8 members of different age groups and sexes. Panel members were allowed to sit in a well-ventilated room with adequate light. A clean glass of drinking water was offered to each member for rinsing the mouth before and after taking each product. They were neither informed about the identity of the products nor allowed any conversation or discussion among themselves during the evaluation process. All the samples were evaluated for appearance, flavour, juiciness and overall-acceptability by using 9-point hedonic scale where, nine points indicated extremely desirable and score one indicated extremely undesirable.

Consumer panel study was conducted in and around Greater Khanapara area of Guwahati city by distributing 200 gm of pork pickles to each individual consumer irrespective of their education, income, caste and social background. A questionnaire was also supplied along with the packets so as to receive the detail feedback on the sensory quality of the products. Around 120 packets along with questionnaires were distributed among the consumers. The questionnaires were collected and the data were assessed. The comments and suggestions of consumer panel members were recorded.

For effective marketing of the products, the determination of the cost is essential. The price of the product was determined by calculating the basic cost of pork and other non-meat ingredients (i.e. bamboo shoot, spices, chemicals) and other expenditure like cost of water, electricity, labour, processing and packaging etc. were also considered to determine the cost of the products. The price of the products was determined by calculating the basic cost of pork, non-meat ingredients and other processing costs. Standard methods as outlined by Steel and Torrie (1960) were followed to analyze the data.

RESULTS AND DISCUSSION

The results pertaining to sensory attributes of the pork pickle products evaluated by specialized panel members (Table 1) revealed that the panelists liked all the products equally as no significant differences were recorded among the average scores of the products. The scores offered for appearance, flavour, juiciness and overall acceptability for different pickle samples were found to be in between moderately desirable to desirable. However, the flavour and juiciness of the pork pickles with 100% fermented bamboo shoot extract and the appearance of sample with 100% fermented bamboo shoot powder was comparatively better than the control and other samples. The brownish colour of the dry FBS powder imparted favourable appearance in the final product. This finding may be exploited while preparing pork pickle with FBS. Thus, there is likelihood of using FBS extract as flavour and juiciness enhancer in meat pickles. The higher scores for overall

acceptability for the products number II (Pork pickle with 100% F.B.S. extract) and VI (Pork pickle with 100% F.B.S. powder) reveal the fact that the panelists liked the pork pickles incorporated with FBS extract and powder compared to FBS paste. These findings are in agreement with the findings of Changmai *et al*.(2008).

Organoleptic evaluation of pork pickles was conducted by consumer sensory panel to assess the overall acceptance of the pork pickles covering a large group of general consumers in the market (Table 2). Out of the total consumers, 77.75 percent opined that the products' appearance was appealing and the product with 100% FBS powder was rated as the best. More than 80 percent consumers liked the flavour of pickle products and the products were rated as agreeable. As compared to control product with other products, it was found that the consumers preferred the products with FBS extract and FBS powder. Juiciness scores were also better for FBS incorporated products than the control product.

Table 1: Effect of incorporation of different levels of FBS products on organoleptic evaluation (mean±SE) of pork pickles (Specialized panel method)

Sensory attributes	Treatments						
	Control	I	II	III	IV	V	VI
Appearance	7.16±0.19	7.30±0.12	7.55±0.22	7.17±0.09	7.05±0.24	7.35±0.06	7.80±0.16
Flavour	7.23±0.13	7.28±0.14	7.73±0.11	7.20±0.14	7.45±0.21	7.10±0.16	7.65±0.15
Juiciness	7.20±0.12	7.24±0.05	7.36±0.06	7.10±0.23	7.14±0.12	7.20±0.21	7.21±0.12
Overall acceptability	7.30±0.14	7.23±0.11	7.50±0.14	7.12±0.16	7.11±0.21	7.17±0.14	7.52±0.15

n=6 for each treatment; Control: Pork pickle with 100% vinegar
I: Pork pickle with 50% vinegar + 50% F.B.S. extract II : Pork pickle with 100% F.B.S. extract
III: Pork pickle with 50% vinegar + 50% F.B.S. paste IV : Pork pickle with 100% F.B.S. paste
V: Pork pickle with 50% vinegar + 50% F.B.S. powder VI : Pork pickle with 100% F.B.S. powder

Table 2: Consumer panel study on quality attributes of pork pickles incorporated with FBS products

Quality attributes	Treatments							
	Control	I	II	III	IV	V	VI	Total
Appearance								Consumers (%)
Highly appealing	1.00	1.40	1.90	1.00	0.00	1.70	2.45	9.45
Appealing	11.13	10.97	11.50	10.90	11.00	10.90	11.35	77.75
Not appealing	1.22	1.81	1.35	1.88	2.83	2.17	1.54	12.80
Flavour								
Highly agreeable	1.12	1.32	2.00	1.09	1.48	1.45	2.03	10.49
Agreeable	11.00	11.60	11.59	11.14	11.53	11.52	11.78	80.16
Not so agreeable	2.30	1.21	0.49	1.52	1.79	1.64	0.40	9.35
Juiciness								
More	7.88	8.48	9.36	8.65	9.50	8.22	8.90	60.99
Less	7.22	5.81	5.25	5.64	3.25	6.40	5.44	39.01
Amount of salt								
Low	1.04	0.74	0.47	0.81	0.65	0.42	0.26	4.39
High	3.36	4.06	4.74	3.67	3.73	4.40	6.44	30.40
Sufficient	9.88	9.49	9.08	9.81	9.9	9.47	7.58	65.21
Additional Spices								
Required	3.17	2.84	2.50	3.39	3.55	4.53	4.12	24.10
Not required	11.20	11.44	11.69	10.90	10.74	9.76	10.17	75.90
Price of the product								
High	2.55	2.3	1.54	1.95	1.18	2.6	2.9	15.02
Low	11.95	11.68	12.65	12.34	12.84	11.62	11.9	84.98

n=6 for each treatment; Control: Pork pickle with 100% vinegar
I: Pork pickle with 50% vinegar + 50% F.B.S. extract II : Pork pickle with 100% F.B.S. extract
III: Pork pickle with 50% vinegar + 50% F.B.S. paste IV : Pork pickle with 100% F.B.S. paste
V: Pork pickle with 50% vinegar + 50% F.B.S. powder VI : Pork pickle with 100% F.B.S. powder

The results indicated that the salt content of the products, which account for 65.21 percent, 30.4 percent and 4.39 percent consumers were rated as "sufficient", "high" and "low" respectively. About 75.9 percent consumers recommended that additional spices were not required while 24.1 percent consumers expressed the need of additional spices. To standardize the actual salt and spices requirement suitable for all the consumers' further studies may be undertaken. Almost 85 percent consumers were stated that the price was low. In general the products with 100% FBS powder and with 100% FBS extract were preferred more than the 100% paste.

Effect of incorporation of different FBS products at different levels on the cost of pork pickles is presented in Table 3. Considering the cost of deboned pork, non-meat ingredients, preservatives, processing, labour, water, electricity etc., the cost of the product was found to be about Rs. 149.65/Kg, 147.40/Kg, 146.38/Kg, 149.67/Kg, 144.74/Kg, 171.08/Kg and 182.00/Kg for control, product-I, II, III, IV, V and VI respectively. Here profit margin @ 20% has been included. The processing costs were varies from control to treated samples due to the cost of electricity required to make the fermented bamboo shoot paste and powder.

Table 3: Effect of incorporation of different levels of bamboo shoot products on the cost of pork pickles

Ingredients	Products with Cost (Rs./kg)						
	Control	I	II	III	IV	V	VI
Deboned pork	150.00	150.00	150.00	150.00	150.00	150.00	150.00
Non-meat ingredients	58.34	58.34	58.34	58.34	58.34	58.34	58.34
Vinegar	9.00	3.50	-	3.50	-	3.50	-
F.B.S. extract	-	3.30	6.60	-	-	-	-
F.B.S. paste	-	-	-	2.77	5.54	-	-
F.B.S. powder	-	-	-	-	-	3.53	7.06
Processing cost (labour, water, electricity etc.)	10.00	10.00	10.00	20.00	20.00	30.00	30.00
	227.34	225.14	224.94	234.61	233.88	245.37	245.40
Total product obtained (g)	1823	1833	1844	1881	1939	1721	1618
Estimated cost of pork pickle production (Rs./Kg)	124.71	122.83	121.98	124.73	120.62	142.57	151.67
Estimated cost of pork pickle production with 20% profit (Rs./Kg)	149.65	147.40	146.38	149.67	144.74	171.08	182.00

Control: Pork pickle with 100% vinegar
I: Pork pickle with 50% vinegar + 50% F.B.S. extract
II : Pork pickle with 100% F.B.S. extract
III: Pork pickle with 50% vinegar + 50% F.B.S. paste
IV : Pork pickle with 100% F.B.S. paste
V: Pork pickle with 50% vinegar + 50% F.B.S. powder
VI : Pork pickle with 100% F.B.S. powder

While some of the pork products marketed in Guwahati city were surveyed and the cost of the products was also recorded. It is found that newly developed pork pickles were much lower than these products. Thus, there is high prospect of commercial exploitation of these products by any entrepreneur in India especially in Guwahati and other towns and cities of North Eastern Region.

CONCLUSION

Based on the findings of the above study, this can be concluded that the pork pickles incorporating different fermented bamboo shoot products *viz*. extract, paste and powder could be developed and marketed which are cheaper, organoleptically tastier and highly acceptable among the consumers of North Eastern Region of the country.

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