

PROCESSING AND PRESERVATION OF OKRA PICKLE

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ABSTRACT

The fresh okras were analyzed for proximate composition whereas the developed pickles were analyzed for proximate composition, microbiological status, sensory attributes and overall storage stability of the pickles. The proximate composition fresh okra was moisture 87.5%, ash 0.89%, total solid 18%, vitamin-C 11.1 mg/100g. According to the processing method, the compositions of developed pickles were different. The range of moisture content varied from 59.28% to 69.20% for pickle in sugar, oil and combination of both. Since sugar and salt were used, resulting losses in moisture content were observed in all the samples. Vitamin-C content was decreased or lost by oxidation and heat following first-order kinetics which states that concentration has exponential relationship with time. The microbiological studies revealed that total viable counts (bacteria) were high in pickles which was processed in sugar and low which was processed in oil and oil-sugar mixed, respectively. The acceptability of processed pickles was organoleptically evaluated by the panelists using 1-9 hedonic scale assigned marks for colour, flavour, texture and overall acceptability. The test score indicated that among three samples, the pickle which was processed in sugar and oil mixed (sample-3) was the most acceptable. Storage studies were carried out for up to six months at room temperature (27°C-33°C) at an interval of 1 month up to first 2 months and at an interval of 2 months for the consecutive 4 months. The result showed that moisture content decreased slightly with time. All the pickles became softer with the passing of time.

Key Words: Okra pickle, Processing, Preservation

INTRODUCTION

Okra (*Hibiscus esculentus*), also known as gumbo, banya, bindi, bhindi, bamies, and ladies' fingers; is a member of the cotton (Mallow) family. It is grown well in South America, West Indies, and India; used in soups and stews. Okra is a rich source of vitamin C, calcium, carotene, vitamin B₁, and foliates, contains dietary fibre.

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Bangladesh is predominantly an Agricultural country where agriculture contributes about 23.5 % of GDP (BBS, 2006 and Handbook Agricultural Statistics, MoA). Vegetables are considered as one of the most important groups of dietary food crops due to their higher nutritive value, and yield. In Bangladesh daily per capita availability of vegetables excluding tuber crops is only 52 g against the required amount of 200 g (Ali, K. *et al.*, 1992). About 24,230 metric tons of okra is produced from 7152 hectares of land per year in Bangladesh, (BARI, 2010). About 90% of the total okra is produced within four months (May to August) only. The farmers have to sell their vegetables with low price at the harvesting time due to lack of processing and preservation knowledge. But if we can apply the proper technology to preserve these vegetables, we can ensure to supply these vegetables throughout the year. It can help the nation to get rid from malnutrition as well as the farmers can be benefited financially.

There are a number of methods for the preservation of perishable items. Pickling is one of them. Though the preservation of vegetables and fruits in pickled form began as a household art. At present most of the world's supply of pickles is produced in commercial plants.

When any food (fruits, vegetables, fish or meat) is preserved by natural salt or vinegar or oil or spices, then the processed food is called pickles. Pickles are widely acceptable and usable food item in Bangladesh as well as over the world.

Pickling with the help of vinegar and oil has been practice from time immemorial in this country. If these preservatives are used in proper proportions the pickles can be retained for 10-15 years without spoilage. In modern days pickles are prepared with salt, oil, vinegar, mixture of salt and spices (Srivastava *et al.*, 2002)

A number of fruits and vegetables are preserved in vinegar, e.g. mango, garlic, chillies etc the vinegar in which these things are preserved should contain good percentage of acetic acid. These can also be preserved in 5% acetic acid solution (Binsted *et al.*, 1962).

Pickles are generally consumed by every one whether a child or old, a labor, or a rich man. The pickle makes the dish or food taste better. The pickle generally acts as appetizer. The assimilation of gastric is better thereby improving the digestion. Various types of fruits and vegetables are used in the preparation of pickles with high export potential, it is necessary to manufacture these products as per the stipulated standards. The popular common pickles manufactured by various industries and available in our market are mango pickle, olive pickle, garlic pickle, brinjal pickle, mixed fruit and so on. But the qualities of these pickles are of question.

Therefore, the study was undertaken to assess the proximate composition of fresh okra and okra pickles, processing of okra pickles with different recipes, to study the self life in two different temperatures (room and refrigeration) and to assess the overall acceptability of the processed pickles.

MATERIALS AND METHODS

The study was conducted in the laboratory of the Department of Food Processing and Preservation, Department of Food Engineering and Technology and the Department of Food Science and Nutrition under the Faculty of Agro-Industrial and Food Process Engineering, Hajee Mohammad Danesh Science and Technology University, Dinajpur, Bangladesh.

The Okra and other raw materials were collected from local market. The glass bottles and other chemicals required for processing of products were used from the laboratory. Fresh okra had washed thoroughly and these were cut into small pieces up to 0.5-1 inch. Then the okra was blanching at 75°C for 15 minutes. After proper processing they were filled into glass jars and pieces of okra was become soft and turned into light brown.

The experiment was conducted with 3 (three) samples which are as follows :

Sample-1 (101) : Okra pickle with oil and sugar mixed based.

Sample-2 (202) : Okra pickle with sugar based.

Sample-3 (303) : Okra pickle with oil based.

Table 1. Different recipes of okra pickles

Ingredients	Sample-1 (101) (g)	Sample-2 (202) (g)	Sample-3 (303) (g)
Okra (Ladies finger)	500	500	500
Garlic	150	500	150
Ginger	150	50	150
Turmeric	10	-	10
Red chili powder	15	10	15
Joyfall	5	-	5
Sugar	250	500	-
Methi	3	-	3
Postadana	15	-	15
Mustard oil	350	-	350
Mustard seed	5	-	5
Cumin	5	-	5
Vinegar	75 ml	150 ml	75 ml
Sodium Benzoate	0.5	0.5	0.5
Spices	-	10	-

Chemical analysis

The raw and processed samples were analyzed for their moisture, ash, titrable acidity, pH, total soluble solids and vitamin-C. All the determinations were done in triplicate and the results were expressed as mean value as per methods of AOAC (1984).

Microbiological examination

For total viable count of microorganism present in okra pickles, standard plate count method was followed according to the method described in "Recommended method for the microbiological examination of food" American Public Health Association (1967).

Sensory evaluation

The consumer's acceptability of developed pickles was evaluated by a taste-testing panel. The hedonic rating test was used to determine this acceptability. The panelists were selected from the teachers and students of the faculty of Agro-Industrial and Food Process Engineering, Hajee Mohammad Danesh Science and Technology, Dinajpur. Samples were served to the panelists and were asked to assign appropriate score for characteristics colour, flavour, texture and overall acceptability of processed okra pickles.

The scale was arranged such that:

9 = Like extremely, 8 = Like very much, 7 = like moderately, 6 =like slightly, 5 = Neither like or dislike, 4 = Dislike slightly, 3 = Dislike moderately, 2 = Dislike very much and 1 = Dislike extremely.

The results were evaluated by Analysis of variance and Duncan's New Multiple Range Test Procedures of the Statistical Analysis System (SAS, 1985).

Storage studies:

The pickles were stored at room temperature. The different parameters of assessing the deterioration of the products were observed at a regular interval of 1 month up to two months and at an interval of two months for the next four months. The colour, flavour, texture, moisture content, acidity and visual fungal growth etc. were observed up to the whole storage periods.

RESULTS AND DISCUSSION

The experiment was conducted to determine the effective means of processing and preservation of okra in the time when it is available to use at the off-season when price is significantly higher than the growing season. The study is also to investigate the cost analyses on home made processing industry.

Table 2. Chemical composition of fresh okra and okra pickles

Sample code	Moisture content (%)	Total solid (%)	Ash (%)	Fat (%)	Vitamin C (mg/100g)
Fresh okra	87.5	18	0.89	0.2	11.1
101	62.35	32.2	1.7	2	2.20
202	69.20	25.5	1.65	0.2	2.01
303	59.28	29.4	1.8	5	2.50

The moisture, protein, fat, carbohydrates, ash and vitamin C in fresh okra was found 89.6%, 1.9%, 0.2%, 6.4%, 0.92% and 13 mg/100g respectively (Srivastava *et al.* 2002). The percentage of moisture, ash, acidity and vitamin C were observed in the present study the result were very close to those reported by Srivastava *et al.* (2002). The chemical composition of okra pickles varies to a little bit depending on the media at which okra are processing. This may also differ due to climatic condition, growing season, intercultural operations involved, varieties and stage of maturity as well.

Very few literatures are available on composition of fresh okra and okra pickles. So it is very difficult to compare the proximate composition of the fresh and the processed products.

Microbiological study of shelf-stable lemon pickles

This study was performed by standard plate count (S.P.C) method. The total viable bacterial load was not uniform. The total bacteria were counted as total number of bacteria per gm of sample. The total no. of viable bacteria was counted by multiplying the colony forming unit (cfu) with dilution number. The total numbers of viable bacteria in different samples at different storage period and variation of bacterial load in different okra pickles sample 303 showed minimum count and sample 202 showed maximum count.

Desrosier (1977) reported that pickle products would deteriorate quickly. In general, protection is necessary against the action of moulds, which metabolize the acid developed, paving the way for the advance of other microorganisms. In cold storage fermented and pickled foods could be expected to remain stable for several months.

The covering oil and sugar as well as salt prevent microbial contamination. Usha Rani *et al.* (1992) found that the safe moisture content in mango pickles to be as high as 61.0% which is closed to the result obtained for okra pickles. Lower moisture content means higher amounts of nutrients. This fruit contains an appreciable amount of ascorbic acid (41 mg/100g) which is very important for proper nourishment and maintenance on healthy teeth.

Sensory evaluation of Okra pickles

The mean scores for colour, flavour, texture and overall acceptability of okra pickles are presented in Table 3.

Table 3. Mean sensory score of okra pickle

Sample code	Sensory attributes			
	Colour	Flavour	Texture	Overall acceptability
101	8.0 ^a	8.10 ^a	7.80 ^a	8.10 ^a
202	6.5 ^b	6.20 ^c	7.70 ^a	6.90 ^b
303	7.5 ^a	6.30 ^b	7.50 ^a	6.30 ^b

Sample means having the same letter suffix do not differ at 5% ($P < 0.05$) level of statistical significance.

A two-way analysis of variance (ANOVA) was carried out for colour preference and result revealed that there was slightly significant ($P > 0.05$) difference in colour acceptability among all the samples. As shown in table mean scores suffixed for sample 202 is the lowest value than others. So this indicates that the colour of sample 101 and 303 are more acceptable than other.

Storage studies of okra pickles

Three different samples of each pickle were used for storage studies at room temperature (27°C - 33°C) from 0-5 months. The effect of storage time (0, 1, 2, 4 and 5 months) on physical properties such as colour, flavour and texture of the pickles were studied and resented as Table 4.

Table 4. Storage Studies of okra pickles

Storage period (month)	Sample code	Colour	Flavour	Texture	Visual fungal growth	Remarks
0	101	No change	No off flavour	Firm	No growth	Good
	202	No change	No off flavour	Firm	Do	Good
	303	No change	No off flavour	Firm	Do	Good
1	101	No change	No off flavour	Slightly soft	Do	Good
	202	No change	Off flavour	Slightly soft	Do	Good
	303	No change	No off flavour	Slightly soft	Do	Good
2	101	No change	No off flavour	Soft	Do	Good
	202	Change	Off flavour	Slightly soft	Do	Good
	303	No change	No off flavour	Soft	Do	Good
3	101	No change	No off flavour	Soft	Slightly growth	Good
	202	Change	Off flavour	Slightly soft	Do	Slightly spoiled
	303	No change	No off flavour	Soft	Do	Good
Storage period	Sample code	Colour	Flavour	Texture	Visual fungal growth	Remarks
4	101	No change	No off flavour	Extremely soft	Slightly growth	Good
	202	Change	Off flavour	Slightly soft	Excessive growth	Spoiled
	303	No change	No off flavour	Extremely soft	Slightly growth	Slightly spoiled
5	101	No change	No off flavour	Extremely soft	Slightly growth	Good
	202	Change	Off flavour	Slightly soft	Excessive growth	Spoiled
	303	No change	No off flavour	Extremely soft	Slightly growth	Slightly spoiled

Kumar (1985) reported that pickles would be assessed after six months storage in jars for keeping quality, taste and flavor. The pickles became soft after three months, but otherwise remained satisfactory up to 6 months of storage.

Cost analysis

Table 5. Cost analysis of okra pickle production

Item	Price in (Tk)	Item	Price in (Tk)
Okra (200g)	1	Electricity (1 units)	3
Mustered oil (75 ml)	8	Labour (1 hour)	5
Chemicals	4	Packaging	3
Spices	4	Fixed cost (40% of total cost)	12.5
Total			40.50

The cost per bottle (100g) of okra pickle is Tk. 20.25, but the cost per bottle will be lower when it was produced in large scale. The production cost of okra pickle depends on market value of raw material and proper management.

CONCLUSION

Okras are mainly used as vegetables but like other developed countries they may be turned to delicious and salad crops. During growing season farmers are bound to sell their produce at a very low price. But if farmers can preserve their produce by effective and economic way, they will be able to get proper price and encouraged to maximize production. Processing and preservation by pickling may be used for large scale and small industries. Commercial and home scale processing by pickling may also be effective. Thus, a large number of skilled and semi-skilled, even unskilled persons would be employed in the relevant industries, which will help to remove unemployment problem of our country. Processed products can be sold at high price in off-season in both local and foreign exchange which will enrich our national economy. Furthermore, since farmer would get proper price for their produce, productivity would be increased and sustained.

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