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QUALITY EVALUATION OF INDIAN GOOSEBERRY (*EMBLICA OFFIDNALIS* GAERTN.) BASED TRADITIONAL PICKLE '*KARINELLIKKA*'

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Abstract

Karinellikka, an Indian gooseberry based product similar to pickle can be prepared with natural ingredients and have excellent nutritional as well as storage qualities. *Karinellikka* had the total carbohydrate content of 12.88 per cent. *Karinellikka* contain high amount of Vitamin C (165.65mg). Unlike other pickle like products, *Karinellikka* is low in sodium (2.28 mg/100g) but high in potassium (172.5mg/100g). *Karinellikka* stored in poly ethane laminated aluminium packing (PLM) retained sensory qualities and prolonged the shelf life of the product up to 5 months. The total microbial count of *Karinellikka* was considerably less upto 3 months in all the three packaging materials and under two storage conditions. *Karinellikka* can be prepared with natural ingredients and can be marketed without any artificial ingredients or preservatives. *Karinellikka* an Indian gooseberry based preserved food can be substituted for commercial pickles and have potential to be marketed as a natural product.

Key words: Indian gooseberry, *karinellikka*, traditional foods, pickles, organoleptic qualities

1. INTRODUCTION

Traditional foods, originated from ancestral kitchens are developed through ages, invented, modified, utilised and evolved to improve nutritional and social wellbeing of the people around the world. As an impact of this dietary transition, traditional foods are progressively replaced by globalised food culture and many traditional food preparations are on the verge of being lost. The substitution of traditional foods with novel range of commercial products has created serious health and socio economic problems in community (1). Indian gooseberry is one of the prestigious herbs that prevent aging and promote longevity. *Emblica officinalis* (Indian gooseberry) enjoys a hallowed position in Ayurveda -an Indian indegenous system of medicine. Indian gooseberry is one of the richest sources of Vitamin C and it contains 576 mg per 100 g (2). In addition to this potent antioxidant, several active tannoid principles have been identified which appear to account for its health benefits (3&4). Indian gooseberry has been reported to possess expectorant, purgative, spasmolytic, antibacterial, hypoglycemic (5 & 6). Pickles are products that add spice to meals and snacks are very popular all over the world. It also plays the role of appetizer and some dishes is are incomplete without pickle. Pickle serve as food flavorings adding desired piquancy through combined action of fruit acid, salt and condiments (7).Pickle production has become highly commercialized now and profit oriented production is a prime concern for human health. *Karinellikka* is an endangered traditional preserved food of Central Kerala. *Karinellikka* is an Indian gooseberry based product similar to pickle which can be prepared with natural ingredients and have excellent nutritional as well as storage qualities. As the skill and the knowledge on the preparation of *Karinellikka* have been unknown to the young generation, this has become an endangered traditional product. Hence the present study documented the traditional method of *Karinellikka* preparation and evaluated its organoleptic nutritional and storage qualities.

2. MATERIALS AND METHODS

Focus group interviews were conducted among aged persons and general information regarding the method of preparation and the ingredients used were collected. *Karinellikka* was identified as an endangered foods item based on a rating scale implemented among traditional food experts. Based on traditional knowledge, the method of preparation was documented and *Karinellikka* was prepared using the methodology collected from skilled experts.

Documented protocol of *Karinellikka*

Ingredients

Indian gooseberry	:	1kg
Garlic	:	20g
Turmeric powder	:	3 tsp
Pepper powder	:	2 tsp
Red chilly(deseeded)	:	20g
Salt	:	200g
Gingelly oil	:	10ml

Method of preparation

1. Wash Indian gooseberry and drain water
2. Add salt and sprinkle water and boil over earthen ware hearth for ten minutes
3. Repeat boiling for two to three days
4. Add spice powders and crushed garlic and red chilly
5. Sprinkle water, boil for ten minutes
6. Repeat boiling for two to three days
7. When Indian gooseberry gets darken and water got evaporated, add gingelly oil and pack

In the replicated food sample, analysis for nutrients like moisture, total carbohydrates, protein, fat, fibre, calcium, iron, sodium, potassium, and vitamin C were carries out using standard procedures. All analysis was carried out in triplicate samples and the amount of each constituent is expressed in 100g of foods on Fresh Weight Basis (FWB). Organoleptic qualities of the replicated traditional foods were conducted using nine point hedonic scale with a panel of 10 selected judges (8).

Karinellikka was packed in polyethylene bags (250 gauges) (PE), polyethylene lined laminated aluminum pouches (PLM), and also in PET jars (PT) and stored under ambient conditions or ambient as well as refrigerated conditions. The organoleptic evaluation and microbial enumeration of the replicated foods packed in different packaging materials were conducted at frequent intervals. The total plate count of fungi, bacteria and yeast in the replicated traditional foods packed in different packaging materials and stored under ambient and refrigerated conditions at specified intervals were enumerated by routine procedure of serial dilution and plate count method (10). Nutrient agar medium, potato dextrose medium and YPS medium were used for estimating

the count of bacteria, fungi and yeast respectively. The dilution used for bacteria was 10^{-5} and for fungi and yeast the dilution used was 10^{-3}. pH of the food and beverages was determined using pH meter.

Statistical analysis was done using Kendall's Coefficient of Concordance (W) and Friedman's test which expresses the degree of association among the ten judges for each product under study.

3. RESULTS AND DISCUSSION

3.1. Nutritional qualities of *Karinellika*

Moisture content in the product was 40.55 per cent. *Karinellikka* had the total carbohydrate content of 12.88 per cent. It was low in protein (0.56 %) and trace fat content was observed. *Karinellikka* showed maximum crude fibre content of 3.6 per cent in which Indian gooseberry was used as the basic ingredient. A fibre content of 3.10 per cent was observed in fresh Indian gooseberry (2). *Karinellikka*, an Indian gooseberry based product with considerable amount of vitamin C, retained much of the vitamin C even after prolonged heat processing. Retention of much of the vitamin C even after processing in different Indian gooseberry based products (2&12). The retention of vitamin C in Indian gooseberry based products might be due to the polyphenolic substances present in Indian gooseberry. The retention of ascorbic acid with the addition of 24% NaCl was 55%, followed by 37% with red chillies, fenugreek, turmeric; 32% with the addition of pepper, sugar and 26% with mustard and asafetida in Indian gooseberry pickle was reported (13). When all the spices and salt were added together, the retention was much higher (73%) than those with individual spices. This preserved food has fairly good amounts of calcium (32.24mg/100g) and iron (1.2mg/100 g). Unlike other pickle like products, *Karinellikka* is low in sodium (2.28 mg/100g) but high in potassium (172.5mg/100g).The nutritional qualities of *Karinellikka* presented in Table.1.

Table 1. Nutritional qualities of *Karinellikka*

Nutrients	**Amount present %)**
Moisture (%)	40.55
Total carbohydrates (g)	12.88
Protein (g)	0.56
Fat (g)	0.05
Fibre (g)	3.6
Calcium (mg)	32.24
Iron (mg)	1.24
Sodium (mg)	2.28
Potassium (mg)	172.5
Vitamin C (mg)	165.65

3.2 Organoleptic qualities of *Karinellikka* during storage

Karinellikka was packed in PE, PLM and PT and stored under ambient and refrigerated conditions for a period of six months and evaluated organoleptically at monthly intervals up to six months. The mean scores for appearance, colour, flavour, texture and taste of *Karinellikka* stored under ambient conditions (Table 2) decreased gradually during storage. Among the different packaging materials used to pack *Karinelikka*, the highest score for appearance (6.12), colour (5.5) flavour (6) texture (6.2) and taste (5.31) was obtained for *Karinellikka* packed in PLM under ambient storage conditions at the end of storage. A study (13) reported that spices add colour and flavor to pickles as they contain essential oils and active principles. Under refrigerated conditions (Table 2) maximum score for appearance (5.94), flavour (5.43), texture (5.34) and taste (5.5) was obtained for *Karinellikka* packed in PLM. For colour, the product stored both in PE and PLM obtained the maximum score of 5.17. *Karinellikka* packed and kept under ambient and refrigerated

conditions had an overall acceptability in the range of 5.14 to 6.33 and 4.11 to 5.3 respectively at the end of the storage with the maximum in *Karinellikka* packed in PLM in both storage conditions.

Table. 2. Overall acceptability score of *Karinellikka* during storage

Storage conditions	TP \ PS	1st MAS	2nd MAS	3rd MAS	4th MAS	5th MAS	6th MAS
Ambient	PE	7.75 (1.95)	7.65 (2.75)	7.33 (2.17)	5.33 (1.45)	5.33 (1.45)	5.14 (1.55)
	PLM	7.79 (2.5)	7.22 (1.70)	7.2 (2)	6.41 (2.70)	6.33 (1.85)	6 (2.1)
	PT	7.72 (2)	7.26 (2.15)	6.81 (1.8)	6.3 (1.83)	6.3 (1.91)	5.26 (1.75)
	Kendall's W[a]	0.005	0.112	0.448*	0.494*	0.512*	0.489*
	Percentage of Significance	94.9	32.5	1.1	0.7	0.03	0.01
Refrigerated	PE	7.51 (1.85)	7.66 (2.10)	7.46 (2.10)	5.33 (1.50)	5.11 (1.95)	4.11 (1.55)
	PLM	7.67 (2)	7.75 (2.10)	7.69 (2.30)	6.37 (2.35)	5.53 (2.35)	5.3 (2.35)
	PT	7.73 (2.15)	6.93 (1.80)	6.91 (1.60)	6.25 (2.15)	5.11 (1.72)	4.64 (2.10)
	Kendall's W[a]	0.06	0.044	0.371*	0.321*	0.172*	0.197*
	Percentage of Significance	54.9	63	2.4	8.5	17.9	13.9

TP: Type of packing PS: Period of storage
*indicate significance Figures in parenthesis are mean rank scores

Karinellikka packed in PE, PLM and PT and kept under ambient conditions obtained the mean rank scores of 1.55, 2.1 and 1.75 respectively at the end of the storage period. This indicates the order of priority among the judges on the overall acceptability of the product. Under refrigerated conditions, also *Karinellikka* packed in PLM showed maximum mean ranks scores (2.35) at the end of the storage period. The sensory qualities of *Karinellikka* packed in PLM and stored under ambient conditions were found to be high with respect to colour, flavor and taste at the end of storage. The product stored under ambient conditions had its characteristics flavour and taste at the end of storage. Indian gooseberry products stored under the ambient temperature was

found to be more acceptable than compared to refrigerated candy (2). During the initial months of storage much agreement among judges was not observed and so it is inferred that the product in different types of packaging did not have much difference in all aspects of organoleptic observation. In line with this study, Indian gooseberry candy packed in polyethene bags were least acceptable (2). The author also indicated that glass bottle is superior to polypropylene bag and poly propylene containers in preserving various quality attributes of Indian gooseberry products.

3.3 Storage qualities of *Karinellikka*

Karinellikka was stored under ambient and refrigerated conditions for a period of six months and microbial enumeration was conducted at monthly intervals for a period of six months. The pH of *karinellikka* was also noted during storage. The results are given in Table 3.

Initially, the pH of *Karinellikka* was found to be 2.66 which retained till first month of storage under refrigerated condition in *Karinellikka* packed in PLM and PT. Under ambient storage conditions the pH decreased to 2.64 in PLM and PT. During the second, third, fourth, fifth and sixth months of storage, the pH gradually decreased in *Karinellikka* stored both under ambient and refrigerated conditions in all the three packaging materials. At the end of storage, the pH decreased to 2.02 and 2.38 (PE), 2.32 and 2.41(PLM) and 2.12 and 2.35 (PT) under ambient and refrigerated conditions respectively.

Table 3. Total microbial count of *Karinellikka* during storage

(Ambient and refrigerated conditions)

Period of storage	Type of packing			Microbial population (cfu g^{-1})					
		pH		Bacteria ($x10^5$)		Fungi ($x10^3$)		Yeast ($x10^3$)	
		A	R	A	R	A	R	A	R
Initial		2.66	2.66	-	-	-	-	-	-
1st MAS	PE	2.66	2.64	2	1.5	-	-	-	-
	PLM	2.64	2.66	1.5	-	-	-	-	-
	PT	2.64	2.66	1	1	-	-	-	-
2nd MAS	PE	2.63	2.63	2	2	-	-	-	-
	PLM	2.64	2.65	2	1	-	-	-	-
	PT	2.61	2.65	2.5	1	-	-	-	-
3rd MAS	PE	2.51	2.61	4	2.5	-	-	-	-
	PLM	2.52	2.63	3.5	2	-	-	-	-
	PT	2.57	2.64	4.5	2.5	-	-	-	-

4th MAS	PE	2.38	2.58	7.5	2.5	4.5	-	-	-
	PLM	2.41	2.61	5.5	3	3	-	-	-
	PT	2.42	2.6	5	2.5	2	-	-	-
5th MAS	PE	2.33	2.48	18.5	10.5	55	1.5	3	2
	PLM	2.41	2.54	8.5	15.5	21.5	1	1.5	1
	PT	2.38	2.51	14.5	13	37	2	1.5	2
6th MAS	PE	2.02	2.38	33	21	70	3.5	6.5	3.5
	PLM	2.32	2.41	15.5	16.5	54	2.5	2	2
	PT	2.12	2.35	19	19.5	72.5	2	3.5	3

A- Ambient R- Refrigerated MAS: Month after storage

Initially, the bacterial count of *Karinellikka* was found to be zero and after first month of storage bacterial count increased to 2 x 10^5 cfu g^{-1} (PE), 1.5 x 10^5 cfu g^{-1} (PLM) and 1x 10^5 cfu g^{-1}(PT) under ambient condition and 1.5 x 10^5 cfu g^{-1} (PE), 0 (PLM) and 1 x 10^5 cfu g^{-1} (PT) under refrigerated condition. Bitter components and pungency helps to inhibit the growth of micro organisms, provides anaerobic environment and salt draws out water from microbes by osmotic displacement (13). Spices have preservative action on pickles. The bacterial count gradually increased during the storage period and after second and third months of storage the count varied from 5 to 7.5 x 10^5 cfu g^{-1} and 2.5 to 3 x 10^5cfu g^{-1} under ambient and refrigerated conditions respectively. The mean rank scores obtained for bacterial count was significant during fifth month of storage both in ambient and refrigerated storage conditions and the order of perishability varied in different packages during different stages of observation (Table.4).

The fungal count was found to be zero initially and up to third month of storage. During the fourth month *Karinellikka* stored under ambient condition had a fungal count of 4.5 x 10^3 cfu g^{-1} (PE), 3 x 10^3 cfu g^{-1} (PLM) and 2 x 10^3 cfu g^{-1} (PT). Fungal count was not observed during the fourth month of storage also in *Karinellikka* packed in PE, PLM and PT and stored under refrigerated conditions. At the end of storage the fungal count further increased under ambient and refrigerated conditions.

The yeast count was fund to be zero in *Karinellikka* packed in three packaging materials and stored under ambient and refrigerated conditions till fourth month of storage. During the fifth and sixth months of storage, the yeast count varied from 1.5 to 3 and 2 to 6.5 x 10^3 cfu g^{-1} under ambient conditions and 1 to 2 and 2 to 3.5 x 10^3 cfu g^{-1} under refrigerated conditions. The total microbial count of *Karinellikka* was considerably less upto 3 months in all the three packaging

materials and two storage conditions. The preparation of *Karinellikka* involved repeated boiling for 20 minutes daily and it lasted for a week. This repeated high temperature processing might be the reason for the absence of microbial flora during the initial stages. The presence of fungi was observed after 4th month in *Karinellikka* packed in different packaging and stored under ambient conditions. Pickles due to their low pH are spoiled by molds, yeasts and aciduric bacteria like *Acetobacter* and *lactic acid* bacteria (14).

The mean rank scores obtained for *Karinellikka* for bacteria, fungi and yeast on the basis of Friedman's test are presented in Table 5.

Table 4. Mean rank scores of *Karinellikka* during storage for bacteria

PS / TP	1st MAS		2nd MAS		3rd MAS		4th MAS		5th MAS		6th MAS	
	A	R	A	R	A	R	A	R	A	R	A	R
PE	2.25	2.75	1.75	3	2	2.25	3	1.75	3	1	2.75	2.5
PLM	2.25	1	1.75	1.5	1.25	1.5	1.75	2.5	1.5	3.5	1.5	1.5
PT	1.5	2.25	2.5	1.5	2.75	2.25	1.25	1.75	1.5	2	2.25	2
Friedman's statistics	100	3.7*	2	4*	3*	1.5	3.71	2.74	4.24*	4.25*	4.65*	100
Percentage of significance	60.7	15.6	36.8	13.5	22.3	60.7	35.6	36.8	11.5	13.5	13.74	60

*indicate significance MAS: Month after storage A: Ambient R: Refrigerated

TP: Type of packing PS: Period of storage

Table 5. Mean rank scores of *Karinellikka* during storage for fungi and yeast

	Microbial population of fungi (cfu g^{-1})						Microbial population of yeast (cfu g^{-1})			
PS / TP	4th MAS		5th MAS		6th MAS		5th MAS	6th MAS	5th MAS	6th MAS
	A	R	A	R	A	R	A	R	A	R
PE	3	1.75	3.75	2.25	2.25	2.50	3	2.50	3	2.5
PLM	1.75	2.5	1.5	1.25	1	2.25	1.5	1.25	1.5	1.50
PT	1.25	1.75	2.50	2.25	3.25	1.50	1.5	2.25	1.5	2
Friedman's statistics	3.7	100	3.50*	3	4*	100	3*	2	3*	100
Percentage of significance	15.6	60.7	18.5	22.3	13.5	60.7	22.3	36.8	22.3	60.7

*indicate significance MAS: Month after storage

A: Ambient R: Refrigerated TP: Type of packing PS: Period of storage

At the end of the storage period the mean rank scores obtained for fungi and yeast count in *Karinellikka* under ambient condition was found to be significant and the order of perishability in terms of fungi and yeast growth varied in different packages.

Karinellikka the Indian gooseberry based product similar to pickle can be prepared with natural ingredients and have excellent nutritional as well as storage qualities. *Karinellikka* had low total carbohydrate content and trace amount of little fat content was observed. *Karinellikka* showed maximum crude fibre content of 3.6 per cent. Unlike other pickle like products, *Karinellikka* is low in sodium (2.28 mg/100g) but high in potassium (165.65mg/100g). *Karinellikka* packed and kept under ambient and refrigerated conditions had an overall acceptability in the range of 5.14 to 6.33 and 4.11 to 5.3 respectively at the end of the storage with the maximum in *Karinellikka* packed in PLM in both storage conditions. The total microbial count of *Karinellikka* was considerably less upto 3 months in all the three packaging materials and two storage conditions. *Karinellikka* stored in Poly ethane Laminated aluminium packing was found to be prolonging the shelf life of the product up to 5 months. The product can be prepared with natural ingredients and can be marketed without any artificial ingredients or preservatives. *Karinellikka* an Indian gooseberry based preserved food can be substituted for commercial pickles have potential to be marketed as a cent percent natural product.

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