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Standardization and storage study of Carrot (*Daucus carota* L.) Pickle

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Abstract

This research focuses on the standardization, physicochemical analysis, sensory evaluation, and storage stability of carrot (*Daucus carota* L.) pickle. Three treatment formulations (T1, T2, and T3) with varying carrot proportions were prepared and analyzed. Among these, Treatment T3 (700g carrot + 400g ingredients) demonstrated superior sensory characteristics, particularly in terms of taste, texture, and overall acceptability. The carrot pickle exhibited moderate acidity (0.797%), low pH (4.43), and a high energy value (472.88 kcal), with favourable levels of protein, fat, and carbohydrates. During a 3-month storage period, the product retained good sensory qualities with no visible fungal growth until the end of the second month. These findings highlight the potential of carrot pickle as a nutritionally rich, shelf-stable, and commercially viable value-added product.

Keywords: Carrot pickle, Standardization, Sensory evaluation, Storage stability, Physicochemical analysis

Introduction

Carrot (*Daucus carota* L.) are important winter vegetables cultivated widely for their palatability, nutritional composition, and processing potential. Carrot, a cool-season root crop, is extensively grown across temperate and tropical regions, with India being a prominent producer. It is consumed in diverse forms—raw, cooked, juiced, or pickled—and is a rich source of beta-carotene, dietary fiber, potassium, and calcium. Its high vitamin A content supports vision health, while its diuretic properties contribute to urinary regulation. The crop's suitability for preservation methods, including drying, freezing, and pickling, enhances its utility in value-added food products. Given the rising consumer demand for health-oriented, shelf-stable products, vegetable pickles are gaining attention due to their extended shelf life and enhanced sensory characteristics. Carrot owing to their nutritional content and texture, serve as ideal raw materials for pickle preparation. However, to ensure consistent product quality and consumer acceptability, standardization of formulation and assessment of storage stability are essential. The present study aims to develop and standardize pickles from carrot, evaluate their proximate and sensory qualities, and assess changes during storage. The findings are expected to aid in optimizing processing techniques and promoting safe, high-quality products suitable for commercial application.

Material and Methods

Sample Procurement

Fresh, healthy Asian varieties of carrots, along with ingredients such as ginger, spices, oil, salt, and vinegar, were sourced from the local market in Sultanpur. Analytical-grade chemicals and equipment were obtained from the Department of Horticulture, Faculty of Agriculture, KNIPSS, Faridipur, Sultanpur.

Physicochemical Analysis

Moisture content was determined using a hot air oven; titrable acidity was assessed via standard titration methods; pH was measured using a universal indicator. All analyses adhered to AOAC (2000) protocols.

Organoleptic Evaluation

Pickles were assessed for sensory attributes—appearance, colour, flavour, aftertaste, texture, and overall acceptability—by a panel of 10 semi-trained academic staff members. Evaluations employed a 9-point Hedonic scale, where 9 indicated “like extremely.” Sensory scores were documented on standardized scorecards. Notably, organoleptic quality declined over storage, with acceptable quality maintained up to 3 months.

Statistical Analysis

The sensory evaluation data for different carrot pickle treatments (T_1 , T_2 , T_3) were analyzed using Completely Randomized Design (CRD). Analysis of variance (ANOVA) was conducted to determine the statistical significance of variation among treatments. The results revealed that the differences in colour, flavour, appearance, texture, taste, and overall acceptability were statistically significant ($p < 0.05$) to highly significant ($p < 0.01$).

The F-values ranged from 3.76 to 9.63, indicating notable treatment effects on sensory parameters. The Critical Difference (CD) at 5% level confirmed that Treatment T_3 significantly outperformed others, especially in taste, texture, and overall acceptability. Thus, the statistical results validate the superior formulation and acceptability of carrot pickle under treatment T_3 .

Formation of Carrot pickle

Pickle prepared with Incorporation varying levels of Carrot was investigated. The formation was made by varying levels of Carrot, ginger, salt, oil, vinegar, and Spices viz - 55.56:44.44, 60:40 and 63.64:37.36 percent respectively and data given are illustrated in Table.

Table 1: Ingredients Used for the Preparation of Carrot Pickle under Different Treatments

Ingredients	T_0	T_1	T_2	T_3
Cauliflower	700g	—	—	—
Carrot	37.5g	37.5g	37.5g	37.5g
Ginger	62.5g	62.5g	62.5g	62.5g
Salt	62.5g	62.5g	62.5g	62.5g
Mustard seed	20g	20g	20g	20g
Fenugreek powder	20g	20g	20g	20g
Red chilli powder	20g	20g	20g	20g
Turmeric powder	25g	25g	25g	25g
Coriander powder	2.5g	2.5g	2.5g	2.5g
Asafoetida powder	150g	150g	150g	150g
Edible Oil	150g	150g	150g	150g
Vinegar	25g	25g	25g	25g

Where

T_1 = 500g Carrots + 400g other ingredients,

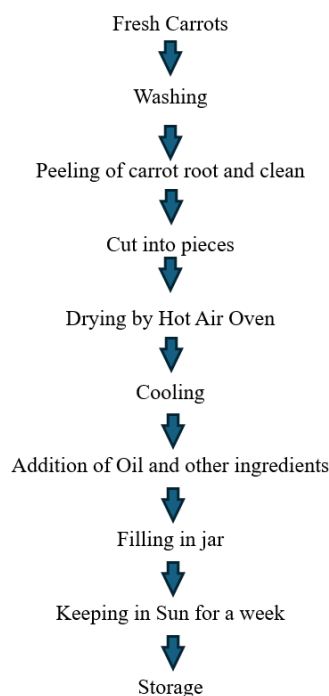
T_2 = 600g Carrots + 400g other ingredients,

T_3 = 700g Carrots + 400g other ingredients.

Preparation process

Carrots were peeled and cut into 2-2.5 cm pieces, washed thoroughly. Ginger was also cut and made into a paste. The vegetables were then dried in a hot air oven at 100°C for 5 minutes. Carrot (T_1 , T_2 , T_3) treatments prepared and mixing with edible mustard oil, ginger paste, salt, spices, vinegar, and other required ingredients were added in measured quantities. The mixtures were packed into jars and kept under sunlight for 7 days, followed by storage at optimum room temperature for preservation.

Flow chart of prepare carrot pickle



Result and Discussion

Table 2: Physical properties of Carrot pickle

Parameter	Carrot
Colour	Orange
Length	3.5 - 4 cm
Width	0.72 - 0.80 cm

It concludes that colour of Carrot pickle was Orange. And length and width of Carrot was 3.5-4cm, 0.72-0.80cm. Which was determined using Vernier Caliper.

Table 3: Chemical properties of Carrot Pickle

Parameter	Sample T_3
pH	4.43±0.04
Acidity	0.797±0.06
Ash	4.05±0.10
Moisture	88.8±0.05
Fat	6.59±0.04
Protein	2.28±0.08
Carbohydrate	48.32±0.10
Energy value	472.88

Table 4: Storage study of Carrot Pickle

Sample periods (month)	Sample	Colour	Flavour	Texture	Fungal Growth	Remarks
0	Carrot pickle	No change	No off flavour	Firm	No growth	Good
1	Carrot pickle	No change	No off flavour	Slightly soft	No growth	Good
2	Carrot pickle	No change	No off flavour	Soft	No growth	Good
3	Carrot pickle	No change	No off flavour	Extremely Soft	No growth	Good

Carrot sample was used for storage studies at room temperature (27°C - 33°C) for 0 to 3 months. The effect of storage time (0, 1, 2, 3 month) on physical properties such

as colour, flavour and texture of the pickles were studied and represented. Carrot pickle would be assessed after 3 months storage in Jars for keeping quality, taste and flavour. The pickle become extremely soft after three month and No visual Fungal Growth but after three month later growth of Fungal is slightly visualised.

Table 5: Sensory evaluation of Carrot pickle

Sample	Colour	Flavour	Appearance	Texture	Taste	Overall acceptability
Control	8	8	8	8	8	8
T1	6	7	7	7.8	7	6.5
T2	7	7.5	7.5	7.8	7.5	7.8
T3	8	8	7.8	7.9	8	7.9

As evident in sensory evaluation the colour score were higher for the sample T₃ The Texture and taste score were 7.9 and 8 higher than T₁ and T₂ sample. The appearance score of sample T₂ and T₃ is higher than T₁ sample. Overall Acceptability of T₃ is more acceptable than sample T₂ and T₁ sample.

Conclusion

The present study successfully standardized carrot pickle using varying proportions of carrot with ginger, spices, salt, oil, and vinegar. Among the formulations, Treatment T₃ (700g carrot with 400g other ingredients) was found to be the most acceptable based on its superior sensory scores and nutritional profile. It recorded the highest overall acceptability and maintained stable pH, acidity, and energy value during storage. Statistical analysis confirmed significant differences among treatments, with T₃ showing highly significant ($p < 0.01$) improvements in taste, texture, and overall acceptability, supported by notable F-values ranging from 3.76 to 9.63. Storage studies over 3 months demonstrated that the pickle retained acceptable quality and showed no fungal growth until the third month, suggesting good shelf stability. These results validate the potential of carrot pickle as a nutritious and stable processed product with commercial applicability in the food industry.

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