

Formulation and Quality evaluation of Vegetable and Herb based Ice Popsicle

V.Vijayalakshmi¹, R.Vijayavahini²

¹Student, Department of Home Science, Food science Nutrition and Dietetics, ShrimathiDevkunvarNanalal Bhatt Vaishnavcollege for women

²Assistant professor, Department of Home Science – Food Science Nutrition & Dietetics, ShrimathiDevkunvarNanalalBhatt Vaishnav College for women

vijiviji2125@gmail.com, bavi2vahi@gmail.com

ABSTRACT

The popsicle-type edible ice cream is consumed worldwide for its sensory properties. An ice Popsicle is a frozen water dessert on a stick that is colored and flavored. It is made by freezing colored, flavored water around a stick. Vegetables are considered in dietary guidance because of their high concentrations of dietary fiber, vitamins, minerals, especially electrolytes; and more recently phytochemicals, especially antioxidants. The aim of the present study was to formulate Popsicle with natural vegetable (carrot/beetroot) and herb (basil leaves/mint) extract along with the addition of immune boosters (turmeric/ginger) and brown sugar without the addition of artificial color and flavoring agent. Two variation of vegetable (carrot/beetroot) and herb extract (mint/basil leaf) based ice Popsicle will be formulated with addition of chia seed, brown sugar, turmeric and ginger extract. The vegetable and herb based ice popsicle were evaluated for organoleptic characteristics, physical properties (pH, total soluble solids, titratable acidity and melting rate), proximate composition (energy, protein, carbohydrate, ash, moisture, vitamin A and vitamin C), shelf life study and microbial analysis. The present study concludes that the vegetable and herb based ice Popsicle were nutritionally a better product than the commercially available popsicles as it is formulated with natural ingredients.

KEYWORDS: Popsicle, vegetable and herbs, Microbial analysis, Proximate analysis, Antioxidant and physical properties.

INTRODUCTION

The freezer pops are also known as ice pops, popsicles, ice lollies and paletas and are included in the class of edible ices. A Popsicle is one of the varieties of ice cream that consists of a frozen sweet block, which can be made from fruit juices or other sweet beverages. It is usually rectangular or cylindrical shape with a stick that runs vertically with a free extension of the solidified block at one of its ends. Popsicles prepared with fruit-based ingredients are considered nutritious due to their vitamin and mineral

contents (da Silva et al., 2020). In general, Popsicles and the conventional ice creams are marketed in various forms such as conventional ones, light, fat-free, and low sugar content (Granato et al., 2018). Popsicle is generally made up of artificially color, flavoring agents, preservatives and white sugar with no nutritive value. Popsicles are globally appreciated as refreshing foods by both adults and kids, especially in tropical countries with many beaches and ancient culture. It is also easy to make and low cost (Balthazar et al., 2017). Therefore, it can be used as an ideal medium to deliver micronutrients and immune nutrients. Immunity refers to the body's ability to prevent the invasion of pathogens. Immune boosting foods strengthen the body against infections. In general, the vegetable and herb extracts are rich in vitamins, minerals and also possess strong antioxidant and anti-inflammatory properties. Therefore, this study aims to formulate ice popsicle with natural vegetable (carrot/beetroot) and herb (basil leaves/mint) extract along with the addition of immune boosters (turmeric/ginger/lime) and brown sugar without addition of artificial color and flavoring agent.

OBJECTIVES

1. To select and procure the raw ingredients needed for the development of the vegetable and herb based ice popsicle.
2. To formulate vegetable and herb extract based ice popsicle.
3. To evaluate the physical properties and nutrition composition of the vegetable and herb based ice popsicle.
4. To assess the microbial and sensory attributes of the vegetable and herb extract based ice popsicle.

METHODOLOGY

Ethical Clearance

The study protocol was reviewed and approved by the Independent Institutional Ethics Committee of SDNB Vaishnav College for Women, Chennai (Ethical clearance No. SDNBVC/HSC/IHEC/2020/22).

Selection and Procurement

Beetroot, carrot, turmeric, ginger, lime, mint and basil leaves were procured from local market and brown sugar, chia seeds from super market.

Pre-Preparation of Ice Popsicle

Extraction of Juice from Selected Ingredients

The selected ingredients such as beetroot, carrot, Ginger, Mint leaves, Basil leaves was washed thoroughly in running tap water to remove the dirt, later blended separately in domestic blender. The obtained puree was filtered using a muslin cloth to remove the residue and the juice of the selected ingredients are extracted.

Soaking of Chia Seeds

Chia seeds were added to the Popsicle at the end stage to improve its nutritive value and for making it more appealing. So, chia seeds were soaked in warm water for ten minutes before the preparation of the Popsicle and was be added to the end product.

TABLE-1 DIFFERENT VARIATIONS OF SAMPLE WITH MEASURED INGREDIENTS

S.NO	SAMPLE	VARIATION 1 (BMP)	VARIATION 2 (CBP)
1.	Beetroot	50 ml	-
2.	Carrot	-	50 ml
3.	Mint	20ml	-
4.	Basil	-	20 ml
5.	Turmeric	5 gm	5 gm
6.	Lime	5ml	5ml
7.	Chia seeds	3 gm	3 gm
8.	Ginger	2 gm	2 gm
9.	Brown sugar	20 gm	20gm

BMP – Beetroot Mint Popsicle; CBP – Carrot Basil Popsicle

Extracted carrot, beetroot, mint leaves, basil leaves, ginger and lime juice were added in two varying ratios in separate popsicle mold for the preparation of ice popsicle and a fixed amount of brown sugar, turmeric, chia seeds were added to the extracted juices and stirred well. Further, the formulated ice popsicle was filled into popsicle mold and kept at refrigerated temperature (4° C) for 12 hours.

QUALITY EVALUATION

Sensory Evaluation

Sensory evaluation is one of the criteria for analyzing the acceptability of any food product by

means of senses like sight, smell, touch, taste and hearing. The sensory evaluation for the formulated vegetable and herb ice popsicle was carried out to evaluate the acceptability on the basis of appearance, taste, flavor, texture and overall acceptability using nine-point hedonic scale method with 10 semi trained panel members. Based on the results of sensory evaluation, any one of the variations will be selected for further analysis.

Physiochemical Properties

The physical and sensory qualities of vegetable and herb based ice Popsicle create impact towards the consumer's perception and acceptance of an ice Popsicle. The physical properties of ice Popsicle such as pH, titratable acidity, total solids and melting rate.

Nutritional Composition

The formulated ice popsicle was analyzed for energy, carbohydrate, protein, fat and vitamin C by standard AOAC methods (2012).

Microbial Analysis

The growths of microbes are analyzed for formulated ice Popsicle, using total plate count and yeast and mould count.

RESULT AND DISCUSSION

The vegetable and herbs incorporated ice Popsicle were formulated in two variations as given in Table 1. The formulated both the variation of ice Popsicle was subjected to organoleptic evaluation, and the Popsicle that was given most average scores will be selected for further evaluation of nutrient content and microbial analysis.

Sensory Evaluation of Formulated Popsicle

The results of sensory evaluation of formulated two variation is exhibited in the Table 2

Table - 2 Sensory Evaluation of Formulated Popsicle

S.NO	VARIATION	COLOR	FLAVOR	TEXTURE	APPEARANCE	TASTE	OVERALL ACCEPTABILITY
1.	V1 (BMP)	6.4±0.48	6.3±0.64	6.6±0.66	6.9±0.7	6.4±0.8	6.7±0.60
2.	V2 (CBP)	7.8±0.78	8.1±0.6	7.9±0.8	7.8±0.74	8.1±0.53	8.0 ±0.6

BMP-Beetroot Mint Popsicle; CBP-Carrot Basil Popsicle

. The mean sensory score for color of the carrot-based popsicle V2 (7.8 ± 0.78) had higher value when compared with other variation. The highest mean color score was obtained by V2 (7.8 ± 0.7) variation whereas the lowest mean color score was scored by variation of popsicle formulated with beetroot extract. From the data obtained from sensory evaluation is given in the table 2 it is clearly evident that V1 (6.4 ± 0.8) variation of ice popsicle scored least score for taste when compared to the V2 (8.1 ± 0.53). The results showed that variation V2 was superior in the flavor with the mean score of 8.1 ± 0.6 when compared to popsicle formulated with beetroot extract. Therefore, from the results it can be concluded that the ice popsicle formulated with carrot and basil extract scored maximum score so it was further subjected to quality analysis.

Physiochemical Properties of Selected CBP Ice Popsicle

Table - 3 Physiochemical Properties of Selected CBP Ice Popsice

S.No	Physical Properties	CBP Popsicle
1.	pH	6.28
2.	Titratable acidity (%)	0.32
3.	Total solids unit (%)	9.76
4.	Melting rate (g/min)	0.46

In this current investigation, the pH of the carrot basil ice Popsicle was found to be 6.28 ± 0.01 . The observation made by Martins, (2018) who has formulated the whey based ice popsicle also reported similar pH value (6.2). The acidity of the food products is a consequence of their formulation, including the amount and type of ingredients, additives and preservatives used (Tyl, 2017). The titratable acidity in carrot basil ice popsicle (CBP) was found to be $0.32 \pm 0.04\%$ whereas, the titratable acidity of the herbal extract incorporated popsicles reported in the previous research work has 0.28% (Santos et al., 2020).

The total solid is a measurement of the liquid solution that includes the combination of the total soluble solids and the undissolved substances present in the solution (Shakuntala et al., 2017). The total solid content of the formulated carrot-basil ice popsicle was found to be $9.7 \pm 1.36\%$ whereas, the total solids of the whey-based ice popsicle reported in the previous research work has 15.2 % of total solids (Martins et al., 2018). The melting rate is defined as amount of dripped loss divided by melting time. The meltdown properties of ice cream, Popsicle and frozen dessert may also play a role towards the sensory

aspects of the product (Muse & Hartel, 2004). In the current investigation the data from results revealed that the melt down value of carrot based ice popsicle was found to be $0.46 \pm 0.04\%$ and the previous research work whey based ice popsicle was found to be 0.52% for melt down property of ice cream (Martins et al., 2018).

Nutrient Analysis of Carrot Basil Ice Popsicle

The nutrient analysis of ice popsicle such as energy, protein, carbohydrates, vitamin A and vitamin C was performed. The results of Nutrient analysis of Carrot Basil Ice Popsicle are exhibited in the table IV

Table - 4 Nutrient Analysis of Carrot Basil Ice Popsicle

S.No	Nutrient	Values
1.	Moisture (%)	90.0 ± 0.60
2.	Ash (%)	0.76 ± 0.07
3.	Energy (kcal)	33.2 ± 0.70
4.	Protein (g)	1.77 ± 0.05
5.	Carbohydrate (g)	7.69 ± 0.75
6.	Vitamin A (μg)	0.76 ± 0.02
7.	Vitamin C (mg)	3.48 ± 1.14

From the table 4, it can be inferred that, the moisture content is the quality of water combined in a food material. Water, the most abundant substance in nearly all food, plays an important role in the food system. Even pure substances such as sugar and salt contain a small amount of water absorbed on the surface of the crystal. In the current study, moisture content of carrot basil ice popsicle was found to be $90 \pm 0.60\%$ whereas, the moisture content of the carrot ice lolly reported in the previous research work was found to be $76.9\% - 82.5\%$ per 100g (Agrawal & Prasad, 2011). Ash analysis is used to determine the total mineral content available in the food. It is the inorganic residue after all organic components of a food sample are burnt (Jiang, 2014). In the current investigation, ash content of carrot basil ice popsicle (CBP) was found to be $0.76 \pm 0.07\%$ per 100g, whereas, the ash content of whey based ice popsicle reported in the previous research work was found to be 0.47% per 100g (Martins et al., 2018). The high amount of ash content reflected in this research work could be attributed to the addition of mineral rich vegetable, herbs and chia seeds.

The energy content of the carrot basil ice Popsicle was found to be 33.2 ± 0.70 kcal per 100g and the previous research work on whey based ice popsicle was found to be 58.9 kcal per 100g (Martins et al., 2018). The variation in the energy content could be attributed to the difference in the ingredients utilized to formulate the popsicle. It is clearly evident from the results that the formulated ice popsicle

was low in calories and therefore ideal for people suffering from obesity. The carbohydrate content of the formulated carrot basil ice popsicle was found to be 7.69 ± 0.75 g whereas, the carbohydrate of the carrot ice popsicle reported in the previous research work was 17.5g (Agrawal & Prasad, 2011). While comparing the present study with Agrawal & Prasad, (2011) the carbohydrate content was found to be minimal as very few ingredients which is rich in carbohydrate such as carrot extract and brown sugar was selected for the study.

The protein content of carrot basil ice popsicle was found to be 1.77 ± 0.05 g of per 100g whereas, the protein content of the carrot ice lolly reported in the previous research work was 0.63g (Agrawal & Prasad, 2011). The reason for increase in protein content of the formulated ice Popsicle could be attributed to the addition of protein rich chia seeds.

The carrot basil ice popsicle (CBP) with incorporation of carrot and basil leaves had 3.48 ± 1.14 mg of vitamin C per 100g whereas, for the whey-based watermelon ice popsicle possessed 0.35mg of vitamin C (Martins et al., 2018) which was found to be less than the current investigation. The appreciable quality of vitamin C content observed in formulated ice Popsicle could be attributed to addition of carrot and lemon extracts. The vitamin A content of the formulated carrot basil ice Popsicle (CBP) with the incorporation of carrot and basil leaves was found to possess 0.50 ± 0.02 of vitamin A content. As minimal quantity of the carrot and basil extract was utilized for the formulation of the Popsicle, has resulted in less value of Vitamin A content in the Popsicle.

Microbial Analysis of Formulated Popsicle

Table - 5 Microbial Analysis of Formulated Popsicle

S.No	Variation II (CBP)	Total Plate Count (Cfu/G)	Yeast And Mould Count (Cfu/G)
1.	Carrot basil ice Popsicle	5.3×10^3	1.2×10^1

The Table 5, reveals the results of the microbial analysis of the ice popsicle. The total bacterial count for the developed ice Popsicle was found to be 5.3×10^3 cfu/g. The maximum bacterial load permitted for ice popsicle are 14.20×10^7 as suggested by (Sector, 2020). Hence it can be concluded that the growth of bacterial count was within the acceptable limit, which could be attributed to good hygienic condition practiced during preparation of ice popsicle. Yeasts are the class of fungi that requires a warm

and moist environment and a food source to grow. The yeast and mouldcount of formulated ice popsicle in the current study was found to be 1.2×10^1 cfu/g.

CONCLUSION

The present study was intended to formulate vegetable and herb-based ice Popsicle which is rich in vitamin and other vital nutrients. The blending of carrot extract and basil leaves along with incorporation of chia seeds not only enriches quality and nutrition but also offers to develop a better product since no preservatives were added to it. All ingredients used such as carrot, ginger, basil leaves, turmeric, brown sugar and chia seeds are proved to possess many health benefits such as fighting diseases, boosting immunity, maintaining skin health, improving digestion and promoting longevity.

REFERENCES

- Agrawal, S., & Prasad, R.(2011). SENSORY AND NUTRITIONAL CHARACTERISTICS OF ICELOLLY WITH CARROT FLAVOUR. 1(6).
- Balthazar, C. F., Silva, H. L. A., Vieira, A. H., Neto, R. P. C., Cappato, L. P., Coimbra, P. T., ... and Cruz, A. G. 2017. Assessing the effects of different prebiotic dietary oligosaccharides in sheep milk ice cream. Food Research International 91: 38-46.
- da Silva, J. M., Klososki, S. J., Silva, R., Raices, R. S. L., Silva, M. C., Freitas, M. Q., ... and Pimentel, T. C. 2020. Passion fruit-flavored ice cream processed with water-soluble extract of rice by-product: what is the impact of the addition of different prebiotic components? LWT 128: article ID 109472
- Granato, D., Mocan, A., and Câmara, J.S. (2020a). Is a higher ingestion of phenolic compounds the best dietary strategy? A scientific opinion on the deleterious effects of polyphenols in vivo. Trends Food Sci. Tech. 98: 162–166.
- Jiang, B. (2014). Food Safety : Food Analysis Technologies / Techniques. 3. <https://doi.org/10.1016/B978-0-444-52512-3.00052-8>
- Kanbakan, U. &Çon, Ahmet&Ayar, Ahmet. (2004). Determination of microbiological contamination sources during ice cream production in Denizli, Turkey. Food Control. 15.
- Martins, C. P. C., Ferreira, M. V. S., Esmerino, E. A., Moraes, J., Pimentel, T. C., Rocha, R. S., Freitas, M. Q., Santos, J. S., Ranadheera, C. S., Rosa, L. S., Teodoro, A. J., Mathias, S. P., Silva, M. C., Raices, R. S. L.,

Couto, S. R. M., Granato, D., & Cruz, A. G. (2018). Chemical, sensory, and functional properties of whey-based popsicles manufactured with watermelon juice concentrated at different temperatures. *Food Chemistry*, 255(February), 58–66.

Muse, M. R., & Hartel, R. W. (2004). Ice cream structural elements that affect melting rate and hardness. *Journal of Dairy Science*, 87(1), 1–10.

Santos, J. S., Leal, A. S., Escher, G. B., Cruz, A. G., Cruz, T. M., Hellström, J., Pihlava, J., & Granato, D. (2020). Effects of an herbal extract composed of white tea, roasted yerba mate and fermented rooibos on the antioxidant activity and sensory properties of popsicles manufactured with different protein sources. 84–94.

Sector, M. (2020). Effect of kefir biomass on nutritional, microbiological, and sensory properties of mango-based popsicles. 27(June), 536–545.

Shakuntala Manay. N & Shadaksharaswamy. M (2017). “Foods, Facts & Principles”. New Age International Publishers. 3rd Revised Edition.