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FUNCTIONAL ICE CREAM USING STEVIA LEAVES EXTRACT AS ASUGAR SUBSTITUTE (STUDY THE EFFECT OF STEVIA LEAVES EXTRACT ADDITION ON THE PROPERTIES OF ICE CREAM)

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ABSTRACT

Background and Objective: The importance of the research comes by providing a natural sweetener, which is stevia, and the possibility of its inclusion in food processing, thus contributing to increasing healthy options for consumers, in addition to the importance and nutritional value of this plant, which is represented by its containment of antioxidants, minerals, and other substances that contribute to reducing the spread of diseases such as diabetes, cardiovascular diseases, dental caries, and many others. **Methods:** Stevia leaves were collected from a nursery in Banias, Tartous, Syria. The leaves were cleaned and then dried at room temperature Then it was ground using a Silver Crest laboratory mill The powder was kept in airtight jars at room temperature until the tests were carried out Skimmed milk powder of New Zealand origin was also used vanilla flavourVegetable butter Hussein Al-Nasser Emulsifier E-472 CMC Installer **Results**: The sensory quality of each of the flavor, color and texture was affected by the addition of stevia leaf extract, as the samples to which the least quantity (10.15) ml was added excelled compared to those in which it was added,Total acidity, pH and percentage of fat were not affected by the addition of the extract in the processed ice cream. **Conclusion:** The addition of Stevia leaves extract to Ice cream can enhance its flavor and aroma, making it more appealing toconsumers. The antioxidant properties of the extract can also help extend the shelf life of the dairy product by preventing oxidation and spoilage. Overall, incorporating Damask rose flower extract into dairy production can provide numerous health benefits andadd value to the final product.

KEYWORDS: Stevia, aqueous extract, milky ice cream, sweeteners.

INTRODUCTION

Milky ice cream is one of the products that are in great demand in the summer among many segments of society, and some of them love it in the winter because it melts quickly and they enjoy eating it, especially as it contains energy-gaining ingredients that the human body needs in this season. A colored substance may be added to .this, in addition to the introduction of air bubbles to the mixture during its freezing (Issa and colleagues, 1997).

Sweeteners are considered among the most important factors in consumer acceptance, due to their significant effect on the freezing point, viscosity, and maintaining a homogeneous texture. (Marshall and Arbukle, 1996).

In fact, a wide range of sweeteners are used in the manufacture of milky ice cream for economic and rheological reasons, and sucrose is the most widely used type of these sweeteners. However, there are many concerns about its use as one of the causes of high blood sugar index, obesity, diabetes, high blood pressure, ischemic heart disease and dental caries (Aliha et al., 2013), so in recent decades, artificial sweeteners have been proposed to replace sucrose, but a variety of safety issues related to it have also been raised, such as Causing cancer and interfering with some vascular or metabolic diseases. Thus, many attempts have focused on the use of natural sweeteners in food processing (Mahan and Escott-Stump, 2013) In our research, we aimed to use Stevia rebaudiana Bertoni leaf extract as a natural sugar substitute in the manufacture of milky ice cream, as stevia is a natural substitute grown in many parts of

Brazil, Paraguay, Central America, Thailand, Korea, China and India and has gained increasing industrial and scientific interest in the past twenty years as. a suitable food substitute for sucrose and artificial sweeteners (Soejarto et al., 1983: Lemus-Mondaca et al., 2012) Stevia leaves are the source of steviol glycosides diterpenes and the sweetness imparted to stevia is due to: Stevioside (4-13%) Rebaudioside-A(2-4%),Dulcoside A (0.7-0.4%) Rebaudioside-C(1-2%), With other less abundant species such as Rebaudioside-F, B Steviolbioside-c (Lemus-Mundacaet al., 2012) The metabolism of Steviol glycosides occurs in the human body in the intestine, as many studies conducted on humans in vivo and in vitro confirmed that the b-glycosidic bonds present in Stevioside and rebaudioside-A make them unable to be hydrolyzed by digestive enzymes in the digestive tract of the human body, while they reach the colon intact to be hydrolyzed to Steviol through microbial metabolism mediated by bacteria of the genus Bacteroide to be further absorbed in the colon (Younes et al., 2020).

MATERIALS AND METHODS

Hydroextraction

The sweetening and effective compounds were extracted from the ground stevia leaves using water according to (Muthusamy and Munai et al., 2009). The ground leaves were mixed with water at a ratio of 20:1 (v/w) at a temperature of 40 °C for an hour and in three replicates and placed in a shaking water bath, after which the crude extract containing the sweetening compounds was filtered through Whatman No.4 filter paper and stored at the refrigerator temperature. until use steps to making milk ice cream

First: Composition and preparation of the mixture: The liquid materials are placed first in the double-walled pasteurization basin, and the mixing and heating process begins directly, then dry materials such as sugar, powdered. milk, stabilizers, and emulsifiers are added before the temperature reaches 50°C

Second: Pasteurization: It is a very necessary process. In addition to killing pathogenic bacteria, it helps to dissolve and homogenize the components of the mixture. The mixture is pasteurized by one of the well-known pasteurization methods, and it performs the following functions The mixture is free of pathogenic bacteria Dissolve the solid components of the mixture Improve taste, texture and texture.

Third: the homogenization of the mixture The main purpose of the homogenization is to make a stable, uniform and homogeneous emulsion by dividing the fat globules into very small granules in order to ensure their uniform distribution in the mixture and to prevent the separation of the fat from freezing the mixture as well as obtaining a soft texture and improving the ability to whip and .using a smaller amount of stabilizers, and the homogenization is done at a temperature of 63-77 °C

Fourth: Cooling the mixture: The mixture is cooled immediately after pasteurization and homogenization to 1-4 °C and remains at this temperature until it is time to freeze. This cooling process helps stop the activity of bacteria and form a .suitable viscosity. Surface coolers are more common

Fifth: Aging the mixture: Experiments have shown that aging the mixtures for a period ranging between 4 and 6 hours:is sufficient to give the desired effects, and the changes that occur to the mixture during aging Hardening of the fat granules Giving an opportunity for the stabilized materials, especially gelatin, to dissolve, swell, and absorb water -The nature of milk proteins changes as they help to reach a gelatinous texture. The viscosity of the mixture is greatly increased The aging process improves the smoothness of texture, texture, melting resistance, increases yield, and shortens the time required for whipping

Sixth: Freezing the mix: The process of freezing the mix is considered one of the most important steps, as the quality of the final product depends on it. The freezing process is divided into two stages Putting the mixture in the freezing device after adding the appropriate amount of the coloring matter and the flavoring - material and subjecting it to a low temperature with continuous stirring and whisking to introduce air and form small ice crystals and obtain a soft texture building and a suitable final result When the mixture is partially frozen so that it becomes a suitable consistency, it is taken out of the freezer and placed - in containers of different sizes that are transported directly to the freezing rooms with low temperatures, where the. hardening process takes place without resorting to mixing Rapid freezing is essential to obtain a soft product because ice crystals that form quickly are smaller than those that form slowly, so it is desirable to perform the freezing process in devices that can complete the process quicklyDairy ice cream includes a complex physiochemical system consisting mainly of air cells distributed regularly in the liquid medium containing ice crystals, solidified fat granules, lactose crystals, milk proteins, binding materials, salts and insoluble sugars present in the form of a real solution

Seventh: Packaging: The milky ice cream must be packed as soon as it leaves the freezer in suitable containers to giveit the desired shape and size in order to facilitate its handling during the solidification, distribution and marketing operations.

Eighth: Hardening or tempering process The milky ice cream is packed after leaving the freezer in containers and then sent to the hardening room where it is in a semi-solid form and between half and two-thirds of the ice water is in a liquid form that is not frozen and the freezing. continues without shaking until it reaches a temperature of -18°C

Ninth: Storage and Marketing Ice cream can be marketed immediately after it has been hardened and can be stored for a week or two at most .Storage temperature between 18-23°C below zeroWhen transported to sales outlets, it must be transported quickly in refrigerated cars, whose temperature is similar to the storage temperature of the seller. (Issa et al., 1997).

The ice cream was made according to the following parameters First treatment (T1) adding 10 ml of aqueous extract of stevia leaves The second treatment (T2) Adding 15 ml of aqueous extract of stevia leaves Third treatment (T3) adding 20 ml of aqueous extract of stevia leaves The standard sample without the addition of the extract (sucrose).

Chemical tests

Acidity: It is calculated as a percentage of lactic acid by itration with 0.1 sodium hydroxide as stated in (Dahle and colleagues, 1930) because if the acidity of milky ices exceeds 0.25% as a maximum estimated as lactic acid, this is evidence of its spoilage according to the Syrian standard specification for milky ices No. 624/1988

Melting of milky ice cream: This test is important to know the extent of the resistance of milky ices to melting in the mouth according to the Syrian Standard No. 624/1988 by using 50 g of milky ices, freezing them and placing them in a pre-weighed cup. Then the melted milky ices mass was collected, weighed, and the reading was recorded every 5 minutes for 60 minutes. The samples were placed in an incubator at a temperature of 35 °C, and the test was carried out (Almprese and colleagues, 2002)

Air ratio: It was calculated according to the following law: According to (Arbuckle, 1986) Weight of a box filled with ice cream/weight of a box filled with water* 100

Total solids content: calculated as stated in (A.O.A.C,2008)The sensory evaluation was conducted to test the flavour, texture, color, appearance and resistance to melting of the milky ice cream, where a committee consisting of 10 people tested the previous criteria. Usually 10 degrees are given .for flavor, 5 degrees for texture, and 5 degrees for color and appearance, according to (Patel, 2008).

Statistical analysis

The analysis was carried out with three replications, and the results were recorded in the form of arithmetic means and. standard deviation (SD ± mean) for the studied items The results were analyzed according to a simple random block design and Tukey's test was conducted to determine. the significant differences between the means at the 0.05 level of significance The statistical program SPSS was used.

RESULTS

Table for sensory evaluation for processed ice cream.

Sensory adjective	Brand	Standard sample	Treatment		
			T1	T2	T3
flavor	10	8.80 ± 0.04^{ac}	7.71 ± 0.03^{c}	7.63 ± 0.01^{c}	4.96 ± 0.04^{bc}
texture	5	4.80 ± 0.04^{a}	4.74 ± 0.06^{c}	$3.52\pm0.02c$	3.33 ± 0.03^{ac}
Color andappearance	5	4.83 ± 0.02^{ac}	3.76 ± 0.01^{a}	3.70 ± 0.02^{c}	2.42 ± 0.04^{bc}

The table shows that there are significant differences ($p<0.05$) between the samples in all traits, and it is noted that the first and second concentration obtained the highest sensory evaluation scores in all traits, while the third concentration took the lowest evaluation scores in all traits. Fairly low flavor rating. Also, the results are consistent with what was mentioned by (Özdemir et al., 2003) that increasing the amount of stevia added to milk ice cream samples led to a decrease in the sensory quality.

Table for pH and Total acidity for processed ice cream.

The components	Standardsample	Treatment		
		T3	T2	T1
PH	6.76 ± 0.16^{a}	6.69 ± 0.04^{a}	6.71 ± 0.15^{a}	6.74 ± 0.19^{a}
Total Acidity	0.19 ± 0.01^{a}	0.18 ± 0.00^{a}	0.18 ± 0.00^{a}	0.18 ± 0.00^{a}

We note from the table that there are no significant differences ($p<0.05$) between the samples in the degree of pH, while a slight (non-significant) increase in the percentage of total acidity due to the presence of organic acids and dissolved plant materials in the extract, and both remained within the normal limits indicated by Standard Specification No. 624/1988, which is 0.25% as a maximum PH = 6.3, and the results agree with what he mentioned (Ozdemir et al., 2003).

Table for solid matter% and air ratio% for processed ice cream.

The components	Standardsample	Treatment		
		T3	T2	T1
Solid matter%	29.98±.42[a]	21.93±.53[c]	26.24±.71[bc]	28.16±.92[bc]
Air ratio%	77.37±.69[ac]	88.56±.25[bc]	86.92±1.35[c]	85.77±.57[c]

We note from the table that there are significant differences between the samples, and we find that the solid matterdecreases with the increase in the amount of extract added, as it was the lowest percentage in the sample T3, and this result is consistent with (Alizadeh et al., 2014), as for the percentage of air, it increased with the increase in the amount of extract, because the amount of added sugar is low and therefore the percentage of bound water will decrease, including an increase in the number of ice crystals formed, and due to the presence of an inverse relationship between the percentage of air and the total solid matter of milk ices, and this is indicated by (Hartel et al. , 2003). The solid matter in milky ice cream has the most important role in texture and volume, and therefore the decrease in the percentage of solid matter, including soluble matter, will negatively affect the consistency and consumer acceptance (Tharp and Young, 2008). Therefore, soluble solids must be added if we add steva as a sweetener.

REFERENCES

1. Issa, Mohsen; Mansour, Ahmed; Harfoush, Mohsen. Basics of Milk Production and Processing, Directorate of Books and Publications, Tishreen University, SyriaUniversity, Faculty of Agriculture, 1997.
2. Marshall, R. T.and Arbuckle, W. S. "Ice cream",5th Edition. Chapman and Hall. New York, 1996; 8-90.
3. Aliha,J. M. M; Asgari, F; Khayeri, M; Ramazani, Z; Faragzadegan and Javaheri, g. Effects on Blood Glucose control and adherence to Treatment in Type2 Diabetes patients.Internation Journal of Preventive Medicine, 2013; (4): 797-802.
4. Mahan,L. K. and Escott-Stump, S. Krause,s Food and Nutrition Therapy."12th Edition, Saunders,St. Louis, 2013; 764-809.
5. Chroho,M; Bouymajane,A; Majdoub,O; Cacciola,F; Mondello,L; Aazza,M; Zair,T; Bouissane,L Phenolic Composition, Antioxidant and Antibacterial Activities of Extract from Flowers of Rosa damascena from Morocco. Separations, 2022; 9: 247.
6. Soejarto, D.; Compadre, D; Medon, C. M.; Kamath, p. J.and Kinghorn, A. D. Potential sweetening agents of plant origin.II. Field search for sweet-tasting Stevia species. Economic Botany, 1983; 37(1): 71-79.
7. Gasmalla, M; Khadir, Kh; Musa, A; Aboshora, W; Zhao, W Evaluation of some physicochemical parameters of three commercial milk products. PAK. J. Food Sci., 2013; 23(2): 2013: 62-65 ISSN: 2226-5899.
8. Lemus-Mondaca, R.;Vega-Galvez, A; Zura-Bravo, L.and Ah-Hen, K. Stevia rebaudiana Bertoni,source of a high-potency natural sweetener:A comprehensive review on the biochemical. Nutritional and functional aspects. Food chemistry, 2012; 132(3): 1121-1132.
9. Younes, M.; Aquilina, G; Engel, K. H; Fowler, P; Frutos Fernandez, M. J;Fűrst, P; Gűrtler, R; Gunder-Remy, U; Husoy, T.; Manaco, M; Mennes, w; Moldeus, P; Passamonti, S; Shah, R.; Waalkens – Berrdsen, I.; Wòlfle, D.; Wright, M; Degen, G; Giarola, A; Rincon, A. M. and castle, L. Saftey of prposed amendment of the specification for steviol glycosides (E 920) as afood additive: toexpand list of steviol glycosides to all identified in the leaves of Stevia RebaudianaBertoni. EFSA Journal, 2020; 18(4): e06106.
10. Kheirkhahan, a; Ghavami b; Sharifanc,a. Chemical Composition, Antioxidant Activity and Antimicrobial Effect of Rosa damascena Mill. Essential Oil Against Staphylococcus aureus, Escherichia coli and Salmonella typhi. Journal of Food Biosciences and Technology, 2020; 10(2): 63-74.
11. Dahle, C. D. Budge w. K .andKeith, J. I. Relation between titatable acidity and hydrogen ion concentration of ice cream mixes. Journal of Dairy Science, 1930; 8(6): 417-423
12. Labban,L ;Thallaj,N The medicinal and pharmacological properties of Damascene Rose (*Rosa damascena*): A review. International Journal of Herbal Medicine, 2020; 8(2): 33-37.
13. Alamprese, C; Foschino, R; Rossi, M; pompei,C.andSavani, L. Survival of Lactobacillus johnsonii La1 and influence of its addition in retailed-manufactured ice cream produce with differentsuger and fat concentrational.Diary Journal, 2002; (12):201-208.
14. Radwan, Tharwat; Mahfouz, Hafiz; Nassour, Mazen Phenotypic characterization of some varieties of the Damascene rose (Rosa Damascena) spread in Lattakia Governorate. Syrian Journal of Agricultural Research, 2020; 7(3): 8-22.
15. Arbuckle, W. S. Ice cream. 4thedn, Connecticut: AVI publishing, 54-78pp.Sepahpour, S; Selamat, J; Abdul Manap, M.Y; Khatib, A; Abdull Razis, A.F Comparative Analysis of Chemical Composition, Antioxidant Activity and Quantitative Characterization of Some Phenolic Compounds in Selected Herbs and Spices in Different Solvent Extraction Systems. Molecules, 2018; 23: 402. [CrossRef] [PubMed].
16. A.O.A.C. offical Methods of Analysis 18thed. Association of Official analytical Chemists

International Arligton, Virginia, USA, 2008.
17. Patel, A. A. Sensory and Related Techniques for Evaluation of Dairy Food, Garg F. C., Sensory Attributes of Ice cream, Diary Technology Division NDRI, Karnal, 2008; 33-39.
18. Wang, R; He, R; Li, Z; Lin, X; Wang, L HPLC-Q-Orbitrap-MS/MS Phenolic Profiles and Biological Activities of Extracts from Roxburgh Rose (Rosa roxburghii Tratt.) Leaves. Arab. J. Chem, 2021; 14: 103257._42.
19. Abdel-Hameed, E.-S.S.; Bazaid, S.A.; Salman, M.S. Characterization of the Phytochemical Constituents of Taif Rose and Its Antioxidant and Anticancer Activities. BioMed Res. Int., 2013; 2013: 345465.
20. Ozdmir, C; Dagdemir, E; Celik, S; Ozdmir, S. An alternative ice cream production for diabetic patients. Milchwissenschaft, 2003; 58(3/4):164-166.
21. Alizadeh, M; Lalabadi, M. A; Kheirouvris, S. Impact of using stevia on physicochemical sensory rheology and glycemic index of soft ice cream. Food Science and nutrition, 2014; 390-396.
22. Hartel, R. W., Muse, M. A. and sofigan, A. Effects of structural attributes on hardness and melting rate of ice cream. Proceedings of the 2nd IDF International symposium on Ice Cream, Thessoliniki,Greece, 2003; 124-139.
23. Tharp, B. w; Forrest, B; Swan, C; Dunning, L. and Hilmoe, M. Basic factors affecting ice cream melthdwon. In Buchheim, W.(Eds). Ice cream, International Dairy federation Special, 1998; 9803: 54-64.