

Development of Functional Ice Cream by the Incorporation of Oat Milk & Beetroot

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ABSTRACT

In the ongoing year, individuals' inclination towards smart dieting and nutritious nourishment has been expanded because of which ventures have begun to get ready nourishment which is low in fat, included sugars, liberated from destructive additives, are sound and supplement thick, for example, utilitarian food sources that gives taste alongside medical advantages. Oats have been associated with the wellbeing guarantee properties to the utilization of β -glucans 6, 7 and are significant wellsprings of β - glucans. In recent days, the interest of Oats in research and business consideration has been become predominantly because of its high healthy benefit. Oats are a rich wellspring of cancer prevention agent, nutrient E (tocopherols), phytic corrosive, phenolic corrosive and avenanthramides. Oat milk is less expensive and a larger number of supplements thick than dairy animals' milk and furthermore a decent option of cow milk. We can supplant cow milk with gOat milk in dairy items and can get more supplements and furthermore great physiochemical properties of nourishment items. We can likewise utilize Oat milk alongside cow milk to make useful dairy items. Thusly, we get advantages of both dairy and vegetable-based milk. The beetroot has a red shading color which originates from the high power of betalains and metabolites from phenolic auxiliary part gathering. Betalains are utilized as normal colorants, as a result of their uncountable medical advantages for people, principally because of their cancer prevention agent and calming benefits. The most unmistakable sort of betalains found in beetroot are beta-cyanins and beta-xanthins. The point of this examination is to get ready useful frozen yogurt that is wealthy in calcium and iron and helps calcium and iron lacking patients to conquer these infections and decrease fatty utilization. Dessert (icecream) is set up with various grouping of Oat milk supplanted by entire milk (25%, half, and 75%) and furthermore various convergences of beetroot puree were included. 3 preliminaries were directed for useful frozen yogurt. A control test is set up from entire milk as it were. The impacts of Oat milk and beetroot on healthful properties, physiochemical properties and sensorial properties of frozen yogurt were inspected by utilizing melt down, invade, photochemical screening, fat substance, SNF substance, pH and furthermore, the sensorial examination was likewise led. Test that contain half entire milk and half Oat milk were best among all since it had smooth surface, no ice gems advancement, greater consistency and higher h purchaser's adequacy.

Keywords: Phenolic acid; ice cream; betalains; phytochemicals; Oat milk; beetroot pigments

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INTRODUCTION

The liquid of white color having milk proteins, fats, lactose, vitamins and minerals which is the product of mammary glands produce by mature female mammals when the birth of child is occur and also serve it as a food for their child is mainly called as milk (Guétouache-et-al (2014). The lactose sugar in milk is hard to digest and it may result in GIT disorders like dysentery and production of gas. The glucose and galactose are end products of lactose when digested. The cardiovascular diseases are also causes by non-skimmed milk product which contain more amounts of saturated fats. If more amount of milk is consumed by young ones, then it will result in deficiencies of other nutrients like iron, vitamin e. Due to the higher population rate, the demand of plant-based milk alternatives has been significantly increasing all over the world. The consequence of consuming cow's milk includes lactose intolerance, milk allergies and cholesterol problem. Nowadays, consumers are greatly influenced due to cow milk allergies, lactose intolerance, calorie concerns, and hypercholesterolemia and vegan diets while choosing cow milk alternatives. Plant based milk alternatives is a growing trend which functions as a cheap alternative to poor frugal group of developing countries and in areas, where cow milk supply is inadequate [1-5].

Oats are known as nutritious and wholesome grains which are a rich source of soluble fiber and dense nutrients. Independent of nutritionally rich grains, it also has several physiological benefits like beneficially outcome on diminishing hyperglycemia, hyperinsulinemia, hypercholesterolemia and several other advantages. Oats are excellent source of different β -glucan, arabinoxylans and cellulose. It contains incredibly high amount of protein, lipids (unsaturated fatty acids), vitamins, antioxidants, phenolic compounds, antioxidants and minerals. The primary part of the physiological effects of Oat soluble fibre is because of the elevation of viscosity (Wani et al. UJP 2014). The beetroot has high red color which comes from the high intensity of betalains and metabolites from phenolic secondary part group. Many food industries use betalains as natural colorants, and also gains more importance due to high amount of health benefits for humans, mainly due to their antioxidant and anti-inflammatory benefits. Some other benefits are the lipid peroxidation inhibition, high objection to the oxidation of low-density lipoprotein and chemo-preventive effects [6-10].

In the recent years, people preference towards healthy eating and nutritious food has been increased due to which industries started to prepare foods which are low in fat, added sugar, harmful preservatives and are healthy and nutrients dense such as functional food that give taste along with health benefits. Ice cream and frozen dessert is one of the food that people take as a snack, also eat in joy and happiness, sometimes in depression to feel good, to satisfy their cravings for sweet and cold as ice cream give huge pleasure in hot days which make people's mood refreshing. Ice cream made from dairy ingredients is not acceptable for all the people because of vegetarianism, lactose intolerance and high fat content and less nutritional value. People are heading toward non-dairy ice creams which are getting very popular these days. These mainly contain vegetable milk that is of soy and coconut milk. But, also other vegetable

milk that are cashew milk, Oat milk, rice milk etc can be use. In dairy products substitute of cow milk or milk alternative non-dairy milk can be used to increase nutritional value of ice cream and make it more nutritious. We can also use blend of both vegetable milk and cow milk to get all the characteristic properties of ice cream along with different taste, higher nutritional value, improved physiological properties and satisfy consumer's needs. According to 2004 U.S. production, ice cream accounts for the largest share (60%) of the frozen dessert market (international dairy foods association, 2005). Main aim is to prepare functional ice cream that is rich in nutrients and has delicious taste and less expensive by using blend of cow milk and Oat milk along with beetroot to get the nutritional benefits of all natural products and do chemical, physical, statistical and sensorial analysis [11].

MATERIAL AND METHODS

Material

Fresh cow milk, Oats, whipped cream, sugar, condensed milk, vanilla essence and beetroot were purchased from local grocery market [12].

Preparation of Oat milk:

Oats (100g) were washed with distilled water and soak in 11 water overnight for 14 hours at room temperature. Then the water is drained off and Oats were blended with 100ml of water by using blender at low speed then the blended Oats pass through cheesecloth and after that it heated for 10 minutes at 80 °C. Cool down Oat milk at room temperature and then place it in refrigerator prior making of ice cream [13].

Preparation of beetroot puree:

Take beetroot of normal size wash it thrice with tap water and boil it in water for 10 minutes after boiling let it cool and peel it off then crush it into chunks and add some water by using cheesecloth extract juice from the chunks and separate some chunks to add during ice cream preparation [14].

Preparation of ice cream

Ice cream was prepared from blend of 50% whole milk and 50% Oat milk. First milk is added into pan and let it boil when bubbles start to appear sugar is added and cook it till sugar is dissolved when sugar completely get dissolved then place it at room temperature to cool down then add beetroot juice, puree and whipping cream in it and then the ice cream mixture is churned by using beater after that place ice cream mixture to freezer -10 degree centigrade after 6 hours again do churning of ice cream and put it to freezer for 24 hours [15].

Oat milk testing

Oat milk chemical, physical and sensorial analysis was done. In chemical analysis phytochemical screening (by AOAC) flavanoids, carbohydrates, reducing sugars, saponins, phytosterol, tannins, terpenoids, titrable acidity test were performed as shown in table

1. In physical analysis moisture content, ash content determined by AOAC method ,consistency through Consistometer, pH using pH meter, total solids by lactometer, viscosity through Brookfield viscometer also milk analyzer was also used to determine the chemical composition of milk, and pH were determined by using digital pH meter.

Determination of milk composition by milk analyzer

Initially the milk analyzer was calibrated. Sample was poured in the beaker and placed in the analyzer. Readings were then estimated in the milk analyzer as shown in table 2 [16].

Ice cream testing

Ice cream was tested for its chemical, physical and sensorial properties. In chemical analysis phytochemical screening performed (by AOAC) flavanoids, carbohydrates, reducing sugars, saponins, phytosterol, tannins, terpenoids, titratable acidity test were determined. In quantitative testing moisture content, ash content, (AOAC method) consistency through consistometer, viscosity through Brookfield viscometer and pH were determined by using digital pH meter. The fat content of ice cream was determined by FAO method. Over run test also performed on ice cream. Sample in a 50 ml of beaker and weigh it. Note the frozen ice cream weight as M2.. Now take same volume of melted ice cream and weigh it also. Note it as M1. Calculate the amount of overrun of an ice cream by using the formula [17].

The meltdown test was performed on an ice cream sample. The 10gm of frozen ice cream was placed on a sieve of mesh size 40. The sieve was being suspended over a weighing balance that contains a petri dish on it. The mass of the ice cream sample was being recorded that drains from the sieve with respect to time. The melt down test was being performed at room temperature (Santana, Rebiro, & Iguti, 2011)[18].

Sensory evaluation and statistical analysis

Sensory analysis was done by 20 panelists. Panelist evaluate the sample flavor, taste, texture aroma and overall acceptability by using hedonic scale of 10 points as shown in figure 5 and gave scoring according to what they perceive through their senses and then the collected data was statistically analyzed by using Anova one-way test that shows that the sample have high consumers acceptability as shown in Table 5 [19].

Table1: Phytochemical screenings of Oat milk and ice cream.

| CHEMICAL CONSTITUENTS | TESTS | RESULTS | |
|-----------------------|-----------------|----------|-----------|
| | | Oat milk | Ice cream |
| Reducing sugars | Fehling's test | + | - |
| Phenolic compound | Ferric chloride | + | - |
| | Lead acetate | - | +++ |

| | | | |
|--------------|------------------|----|---|
| Saponins | Foam test | - | - |
| | Forth test | - | - |
| Phytosterols | Salkowski | - | - |
| Terpenoids | Salkowski | - | - |
| Tannins | | ++ | - |
| Flavonoids | Ferric chloride | + | + |
| | Lead acetate | - | - |
| | Alkaline reagent | - | - |
| | | | |
| Carbohydrate | | + | - |

+ Low positivity, ++: moderate positivity, +++:high positivity

Table2: Chemical analysis of Milk.

| | |
|----------------|--------|
| Fat | 1.20% |
| Protein | 1.40% |
| Solids | 4% |
| Density | 14.20% |
| Salt | 0.30% |
| Freezing point | 0.24% |

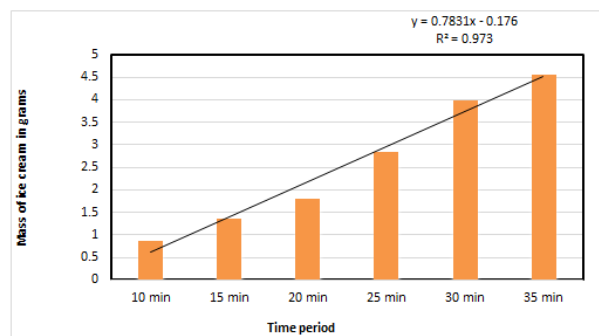


Figure1: Melt down test of Ice-cream.

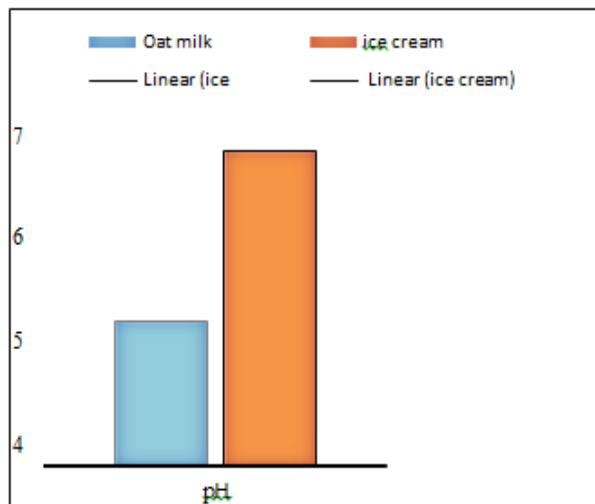


Figure2: pH of Oats milk and Ice-cream milk sample.

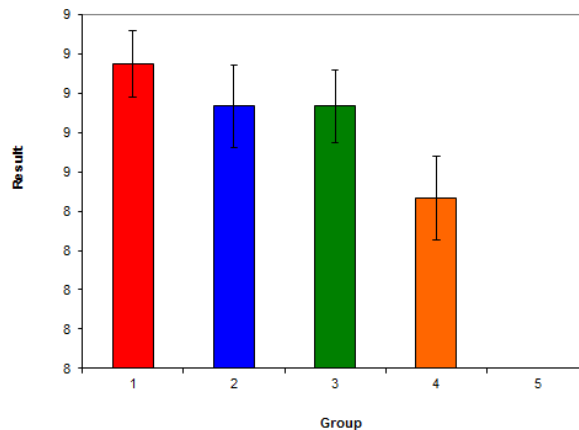


Figure5: Sensory evaluation for functional dairy Ice cream.

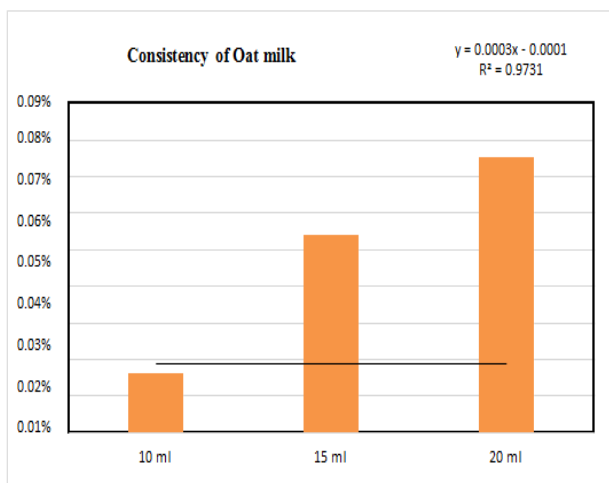


Figure3: Consistency of tested Oat milk sample.

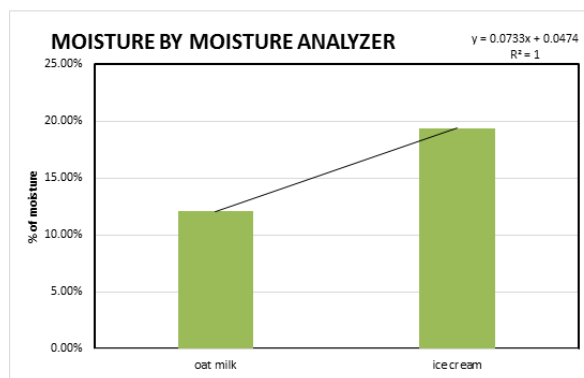


Figure6: Moisture analysis of Oat milk and Ice cream.

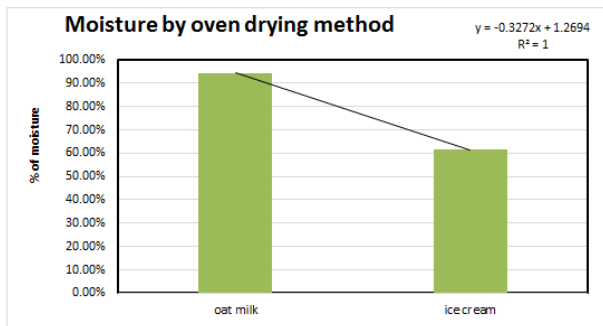


Figure7: Moisture analysis of Oat milk and Ice cream.

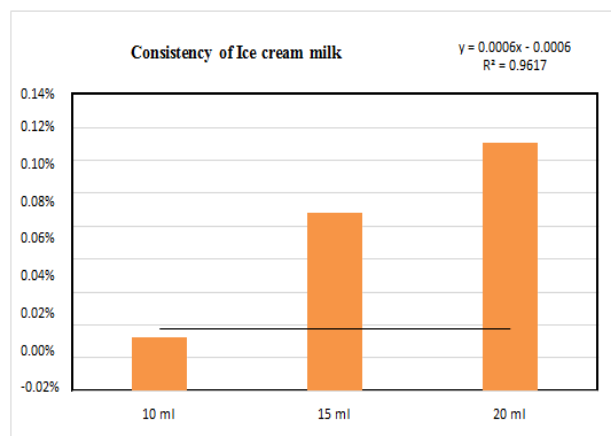


Figure4: Consistency of tested Ice-cream milk sample.

DISCUSSION

The titrable acidity of Oat milk was found 0.018% while the titrable acidity of ice cream was found to be 0.405 %. Acidity of ice cream is higher than Oat milk because of the presence of higher concentration of lactic acid. Due to the highest acidity of Oat milk, so it directly affects the acidity of ice cream as showed in Table 2 [20].

The moisture loss by moisture analyzer was 12.70 % from the Oat milk and 19.40% from the ice cream. By oven drying method, the Oat milk has moisture % of about 94.22 % while the ice cream has moisture % around 61.5%. In comparison, the

moisture % of ice cream was higher than Oat milk in moisture analyzer. However, moisture % of Oat milk was higher than ice cream in oven drying method as shown in figure 8 and 7. The ash content is basically an inorganic residue obtained after the removal of water and organic matter by heating the sample at very high temperature in the presence of any oxidizing agent. The ash content actually measures the amount of mineral in the food. The ash content of Oat milk was calculated to be 0.72%. While, the ash content of ice cream was calculated to be 9.34%. The ash content of normal ice cream which is prepared from 100% whole milk is around 1.28%. This concludes that the Oat milk based ice cream has significantly much higher minerals than the normal market ice creams. The pH of Oat milk was 3.07 i.e. highly acidic. While, the pH of Oat milk based ice cream was found to be 6.66 i.e. slightly acidic as shown in figure 3. The pH of normal ice cream is around 7.0 i.e. neutral. The pH has a significant impact on the flavor perceptions of the product. The change in pH might be due to the biochemical changes and compositional changes during the storage time period [21].

The consistency is actually the flow rate which can be defined as the distance per unit time. The flow rate was determined in 10ml, 15ml and 20ml samples of each Oat milk and ice cream. In both Oat milk and ice cream sample, it was shown that the flow rate increases as the amount of sample increases. This relation has been shown in figure 3 and 4. Viscosity is basically the resistance to flow which is usually measured in milli Pascal second (mPa.s). Temperature is the main factor which greatly influences the viscosity. By determining the viscosity, we can also determine the creaming, freezing rate, air incorporation and flowing properties of the ice cream comparison between viscosities of the Oat milk which was found to be 14.44 mPa.s with the viscosity of Oat milk-based ice cream which was 38.24 mPa.s [22].

The Oat milk and the Oat milk based ice cream samples were analyzed for their total solids by using lactometer. The total solids in Oat milk are found to be 5.93% while total solids in ice cream were found to be 38.5. According to researches the standard amount of total solids in ice cream is around 29.99 to 48.66 which are similar to our calculated value of total solids in functional ice cream so it means there is no significant effect of using Oat milk. The overrun test was performed on the ice cream sample. The overrun % of the ice cream made from 100% whole milk was 53.51 %. However, the overrun % of the functional ice cream was calculated to be 16.961%. The major difference between the two was because of the difference in air incorporation. The functional ice cream has less air incorporated in it which leads to the heaviness of the ice cream. The main reason for less air incorporation was the addition of Oat milk in ice cream which results in the less over run % of ice cream [23].

Meltdown test was performed to show the resistance of the ice cream against melting. This property of the ice cream aids in determining the quality of the ice cream. Because the incorporated air raises the volume and thus makes the final shape of the ice cream. Meltdown also helps to know about the firmness of the ice cream at time of consumption. The meltdown value is measured as the time period which is

required to liquefy a specific amount of the ice cream at the room temperature. About 10gm of ice cream was placed on a 40-mesh size sieve and the mass which drained off from the sieve was measured. The rate of melting was calculated at 25 ± 2 °C during the 35 minutes' time period. Results in Figure 2 show that as the time interval increases, the mass of ice cream that drains off from the sieve also increases. The fat content was determined by the standard Gerber method. Fat content of Oat-based ice cream was calculated to be around 8.64% while normal ice cream typically contains 10-16% fat. The Oat milk-based ice cream has considerably less fat content than the other ice creams in the market. The lower fat content is a major advantage which can be used to market this ice cream. Sensory analysis was performed by 20 panelists by hedonic scale of 10 points and panelist score the sample according to what they perceive through their senses the data is collected and statistically analyzed by using Anova one-way test in figure 3 that indicates our sample have high consumers acceptability [24].

CONCLUSION

Grain based Oat milk frozen yogurt was arranged effectively by Oat milk arranged from Oats that are accessible economically. Beetroot used in the ice cream provide appealing color and also nutritional values as it fights anemia therefore no artificial color was added in ice cream the fat content of the ice cream was less than the commercially available ice cream because of Oat milk which is rich in fibers and phytochemicals and has less fat content Frozen yogurt gets shoppers acknowledgment in light of its tasty flavor and originality. Oat milk is wealthy in calcium that forestalls calcium inadequacy and satisfies day by day needs of calcium. Oat milk dessert(ice cream) have potential for commercialization since Oat milk is more affordable nondairy milk as contrast with the other nondairy milk present in showcase the creation cost of nondairy frozen yogurt will be less so the market cost of the dessert (ice cream) will likewise be less so clients will be increasingly intrigued to get it. Individuals experiencing lactose narrow mindedness and weight chopping down dairy and fat from their eating routine will assist them with enjoying heavenly frozen yogurt without settling on their taste buds.

The explanation of fusing Oat milk in dessert (ice cream) is that solidified nourishment showcase is the main high gross market. The fundamental reason for utilizing beetroot that is vegetable in frozen yogurt is to give characteristic hues and medical advantages. Oat milk and beetroot fills in as center fixings and increment the dietary benefit and give more medical advantages as contrast with the dessert (ice-cream) present in showcase just as frozen yogurt is something which nearly individuals from all age likes.

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