

Development Of Ice Cream From Plum Fruit By Incorporating Plum Puree

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Ice Cream is a delicious, delicate and nutritious food which is prepared by buffalo milk, sugar, stabilizer, emulsifier and fruit pulp or puree. Plum fruit has various health effects like relieving constipation, improving heart health and also bone health. The present investigation was carried out to develop plum ice cream with milk, plum puree and sugar. Plum ice cream was prepared by incorporating plum puree at various proportions at 10% (T₁), 15%(T₂), 20%(T₃), 25%(T₄) with ice cream base. The present study revealed that, on the basis of sensory evaluation the T₃ sample was the best treatment and most acceptable. T₃ sample was prepared from 20% plum puree and 80% ice cream mix. The best sample has an overall acceptability score of 8.62. T₃ sample has 44.23±0.032% Total solids, 5.83±0.015% Ash content, 13.23±0.03% Fat content, 4.95±0.043% Protein content, 0.276±0.012% Titratable acidity, 6.18±0.015 pH, 52.4±0.26% Overrun% and 30.31±0.25% ice cream melted in 30 min. T₃ sample of plum ice cream has a shelf life of 28 days at a freezing temperature of -18°C.

Key Words: Plum, Ice Cream, Puree, Milk, pH.

Introduction

India is the second largest milk producer and production of milk was 230.58 MT during the year 2022 to 2023. Milk and milk products are healthy and nutritious for human health. Unless otherwise specified in regulations, milk is the typical mammary secretion obtained after the whole milking of a healthy milch animal without its addition or extraction, and it must be colostrum free. FSSAI (2011) newer value-added dairy products are continuously being

explored for development by the Indian dairy sector. For vegetarians, milk is a high-protein foodstuff and a wholesome produce.

Because it includes abundant amounts of minerals, proteins and vitamins like phosphorus and calcium, ice cream is regarded as one of the healthiest dairy products. Deosarkar et al., (2016) Popular worldwide, ice cream is a tasty, delicate, and nourishing dish that appeals to people of all ages. A pasteurized combination of components, including milk products, stabilizers, sugar, emulsifiers, flavouring compounds, and water, is frozen and then aerated to create it. FSSAI (2011)

According to international industry analysts, ice cream is driving development in the worldwide market for new dairy products as customers come to view the category as more of a year-round, daily family item. As the industry shifts toward luxury goods, it is anticipated that more and more flavors will be introduced to the worldwide market for ice cream. Soukoulis et al., (2009)

According to FSSAI standards, ice cream should not contain less than 10% of fat, 36% of total solids and 3.5% of protein content.

Plums are a significant source of substances that affect human health and stop a lot of diseases from happening. It has a wealth of bioactive compounds like flavanols, phenolic acids, anthocyanin's, carotenoids, organic acids, fiber, tannins, aromatic substances, minerals enzymes and vitamins (K, A, B & C). Additionally, plum reduces blood pressure, blood sugar, Alzheimer's disease, muscle degeneration, heart disease, lung and oral cancer, improves memory, strengthens bones, controls digestive system function, and more. Plums' inclusion in dairy products in the form of extract, plum, powder or dried chunks. Birwal et al., (2017)

Plum is a genus *Prunus*, a member of the Rosaceae family and the Prunoideae subfamily. Cultivating plums dates back to ancient times, maybe longer than cultivating any other fruit outside apples. Anonymous, (2004) Plum is one of the most crucial stone fruit crops of the word. The well-known stone fruits peach, cherry, and apricot are also included in plums. Although plums come in over 2000 varieties, only a small percentage of them are commercially significant. Among them the most common are *prunus salicina* (Japanese plum) and *prunus domestica* (European plum). Somogai (2005)

Materials & Methods

The present study entitled “Development of Ice Cream from Plum Fruit by Incorporating Plum Puree” was carried out in Department of Food Technology at D Y Patil Agriculture and Technical University, Talsande, Kolhapur in 2024.

Material

Procurement of raw material

All ingredients required for Plum ice cream preparation, i.e plum, milk, SMP, sugar, stabilizer, emulsifier, were procured from the local market of kolhapur. *Prunus Domestica* L. Variety of plum was used for preparation of plum ice cream.

Utensils and equipment.

All utensils and equipments required for ice cream preparation i.e stainless steel container, stirrer, grinder, weighing balance, refrigerator, glasswares like petri plates, beaker, conical flask, stirrer, pH meter, incubator, chemicals like potassium sulphate, copper sulphate,

sulphuric acid, boric acid, hydrochloric acid, phenolphthalein indicator, methyl red indicator, bromocresol indicator, autoclave, hot air oven, etc, were used and procured from Department of Food Technology, D Y Patil Agriculture and Technical University, Talsande, Kolhapur.

Methodology

Preparation of Ice Cream.

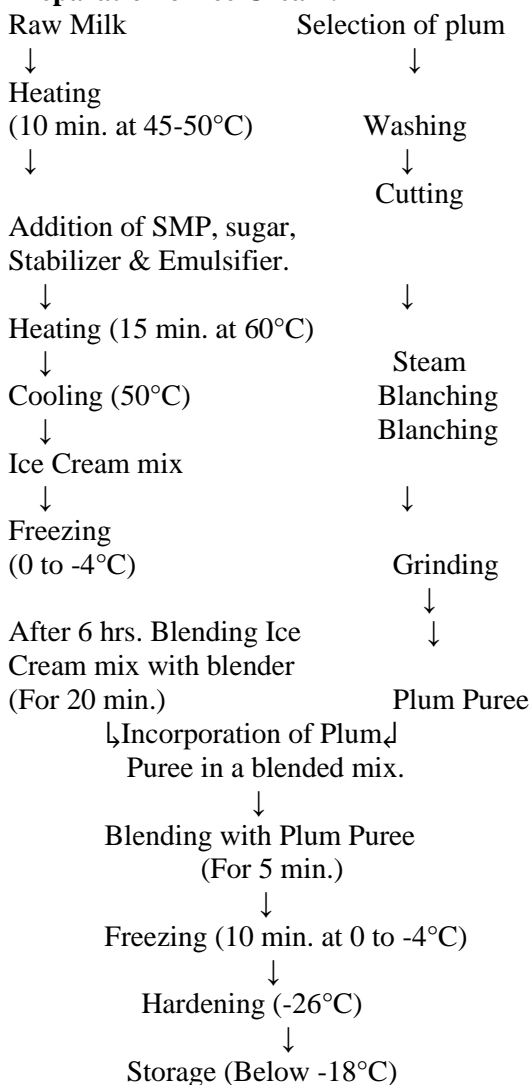


Fig. 1: Flow chart for preparation of plum ice cream.

Process Optimization

Ice cream base was prepared by using milk, SMP, sugar, stabilizer and emulsifier. Formulation was done by serum point method calculation i. e 1 kg of ice cream mix into a direct expansion of type batch freezer. Marshall et al., (2003) All those ingredients are mixed in a stainless steel

container and placed for heating. Heating process is carried out at 60°C for 25 to 30 minutes. After that, the mix was cooled at room temperature then placed in a deep freezer for -5°C for 5 to 6 hrs. After the freezing process the frozen ice cream base was whipped by a whipping/blending machine of 400W. In blended ice cream base plum puree was incorporated which was prepared by steam blanching process and grinded into paste. After incorporating plum puree in the ice cream base, it was blended/whipped for 5 minutes. Sample was packed in an airtight container and then ice cream was placed in deep freezing for 6 to 8 hours at -27°C and then stored at -18°C.

Table 1: Formulation of plum ice cream.

Sample	Plum Puree (%)	Ice Cream mix (%)
T ₀	0	100
T ₁	10	90
T ₂	15	85
T ₃	20	80
T ₄	25	75

Plum puree was optimized and incorporated in the ice cream mix. The treatments are shown in table 1 and explained below.

T₀ sample kept as a control sample without addition of plum puree.

T₁ sample contains 10% plum puree and incorporated in 90% ice cream mix.

T₂ sample contains 15% plum puree and incorporated in 85% ice cream mix.

T₃ sample contains 20% plum puree and 80% ice cream mix.

T₄ sample contains 25% plum puree and 75% ice cream mix.

Sensory Evaluation:

Sensory evaluation of plum ice cream was carried out by semi trained judges from the Department of Food Technology, D Y Patil Agriculture and Technical University, Talsande, Kolhapur. By using 9 point hedonic scale as per procedure reported by Stone and Sidel (2004).

Physicochemical Analysis:

Total solids, protein, ash, fat, pH and titratable acidity were analyzed by following standard methods as explained in A.O.A.C (2001). Overrun percentage of plum ice cream was analyzed by using a method determined by marshall et al., (2003) Melting rate of plum ice cream was analyzed by using a method reported by agrawal et al., (2015)

Statistical analysis:

Mean values of physicochemical analysis under research carried out from replica samples of three replications were used to statistical analysis as per the analysis variance (ANOVA) by using Completely Randomized Design (CRD) as explained by Cochran and Cox (1967) and

sensory evaluation data was analyzed by Randomized Block Design (RBD) as demonstrated by Mahony (1985).

Results & Discussion

The results derived during study are presented in following headings:

Chemical analysis of buffalo milk.

Table 2: Milk chemical composition

Nutrients	Value
Moisture	83.09±0.162%
Ash	0.71±0.005%
Protein	4.57±0.037%
Fat	6.50±0.026%
pH	6.78±0.030

***Each value is the average of three replicas.**

Table 2 reveals the chemical composition of milk, which contains 83.09±0.162% moisture, 0.71±0.005% ash, 4.57±0.037% protein, 6.50±0.026% fat, and 6.78±0.030 pH. Similar results observed by De (2015), chemical constituents of Buffalo milk was 84.2% of moisture, 0.8% of ash, 3.9% of protein and 6.6% of fat.

Chemical analysis of plum fruit.

Table 3: Plum chemical composition

Nutrients	Value
Moisture	84.51±0.291%
Ash	8.68±0.023%
Protein	0.61±0.005%
Fat	8.11±0.055%
pH	3.81±0.01
Acidity	0.62±0.01%

***Each value is the average of three replicas.**

Table 3 shows the chemical composition of plum fruit which contains $84.51 \pm 0.291\%$ moisture, $8.68 \pm 0.23\%$ ash, $0.61 \pm 0.005\%$ protein, $8.11 \pm 0.055\%$ fat, 3.81 ± 0.01 pH and $0.62 \pm 0.01\%$ acidity.

Similar results observed by Celik et al., (2017) and Singh et al., (2019).

Sensory Evaluation:

Sensor analysis was done by semi trained judges of Department of Food Technology, D Y Patil Agriculture and Technical University, Talsande, Kolhapur.

Sensory analysis of best treatment and control sample was described in Table 4.

Table 4: Sensory Analysis of Plum Ice Cream.

	T₀ (Control)	T₃
Appearance	7	7.82
Flavour	6.25	8.01
Texture	6.5	8
Mouthfeel	6.43	8.31
Overall acceptability	6.37	8.62

In sensory analysis the highest score for all parameters was recorded for the T₃ sample and lowest was recorded for the T₀ (control) sample. Due to the highest score T₃ sample was finalized as the best treatment. T₃ sample got 7.82 rating for appearance, 8.01 rating for flavor, 8 rating for texture, 8.31 rating for mouthfeel and 8.62 rating for overall acceptability. Judges from panels like T₃ sample more as compared to other samples as it contains 20% Plum puree. Due to an increase in plum puree than other samples, sour and sweet tastes impressed all judges and tasted better than other samples. Lowest rated sample was the T₀ (control) sample and it got a 7 rating for appearance, 6.25 rating for flavor, 6.5 rating for texture, 6.43 rating for mouthfeel and 6.37 rating for overall acceptability. As the T₀ sample does not contain plum puree and that's why it has only sweet taste which is average as per Judges.

The findings are in agreement with the results of Bajwa et al., (2003), Pawar et al., (2010), Patel et al., (2014) and Gaikwad et al., (2020)

Physicochemical analysis:

Table 5: Physicochemical analysis of ice cream.

Nutrients	T₀ (Control)	T₃
Total solids	$38.43 \pm 0.017\%$	$44.23 \pm 0.032\%$

Ash	5.14±0.005%	5.83±0.015%
Fat	10.67±0.02%	13.23±0.03
Protein	3.90±0.005%	4.95±0.043%
Titratable acidity	0.175±0.013%	0.276±0.012%
pH	6.80±0.015	6.18±0.015
Overrun%	50.43±0.56%	61.1±0.2%
Melting rate (%Ice cream melted in 30 min.)	32.81±0.33%	28.38±0.36%

***Each value is the average of three replicas.**

Table 5 presents the physicochemical analysis of the control sample and best acceptable sample (T₀&T₃). Nutrients are more in T₃ sample as compared to T₀ (Control) sample because of the addition of plum puree.

Similar results observed by Manoharan and Ramasamy (2012), Barot et. al., (2014), Patel et. al., (2014) and Sanjeeva et. al., (2023).

Conclusion

According to the results, it was concluded that the T₃ sample of ice cream was made with 20% plum puree, and 80%. Ice cream mix was best in all parameters and Aurora acceptability. Votriple, D, what's 7.68 penalties like teeth resemble most as it has maintained sweet-and-sour test, and its mixture was likely liked. Physicochemical properties of T₃ samples of plume ice cream were 44.23±0.15% of total solids, 5.83±0.015% of ash, 13.23±0.03% of fat, 4.95±0.043% of protein, 0.276±0.012% of titratable acidity and 6.18±0.015 pH, physical parameters were 61.1±0.2% overrun% and 28.38±0.36% melting rate. Normal ice cream contains less nutrients which are insufficient and due to optimizing plum puree the nutritional value increases and can fulfill the requirement of nutrients.

Conflict of interest

All authors declare that they have no conflict of interest.

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