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Development and cost estimation of whey protein isolate milk pudding with addition of sapota (*Manilkara zapota*) pulp

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Abstract
The objectives to optimize the process of making Pudding with addition of Sapota (*Manilkara zapota*) and Whey Protein Isolate to study about improvement of nutritional status and assess the physico-chemical and cost estimation of the developed pudding.
The experimental pudding was prepared using whole milk, sapota pulp and whey protein isolate with different combination of these ingredients. The study was conducted with 16 treatments combinations i.e. T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T13, T14, T15 & T16 which were replicated 5 times each. Products were evaluated for their content in carbs, protein, fat, ash, total solids, moisture, acidity, and anti-oxidant activity. The combination of the treatment T4 had the highest content in total carbohydrates (32.86). The largest amount of fat was found in the T13 therapy combination (6.18). The highest proportion of ash was found in treatment combination T12 (1.96). The treatment combination T13 included the largest percentage of moisture, while treatment combination T8 had the highest percentage of overall solids (45.57). The price of the product was calculated for various treatment combinations.

Keywords: Milk pudding, whey protein isolate, sapota pulp, cost estimation

Introduction
Milk pudding can be defined as a soft kind of cooked dish, commonly prepared with sugar, milk, fruits and stabilizers. Addition of fruits helps to render good flavour and increases its palatability and nutritive value. The starch used in the pudding formulation has an important role for providing essential properties of the product, imparting body and mouth feel. Pudding is semisolid in form, characterized by a sweet, nutty and pleasant flavour which is highly acceptable to the Indian palate. (Mudgal, 1989) [6]. The use of milk substitutes is mandatory for people suffering from lactose intolerance and milk allergies, but these ingredients have an effect on pudding structure and rheological behavior that has been little studied Alamprese *et al*. (2011) [1]. Milk pudding gains a lot of health benefits and nutritional value by adding dietary fiber. While dietary fiber has been shown to affect milk pudding's rheological behavior and textural qualities Zheng *et al*., (2017) [8]. Puddings are a popular option in the human diet because they are simple to digest and have a high caloric value Mihaylova *et al*., (2021) [5]
Sapota is identified as rich sources of antioxidants and copiously used to overcome oxidative stress. The fact behind the health beneficial property of sapota is the large number of nutraceutical phytochemicals that they contain, viz., polyphenols, carotenoids, sterols, saponins, terpenes and vitamins. Phytochemical components like phenolics, ascorbic acid and carotenoids may have direct influence over the radical-scavenging potential (MCCARTY 2004) [4]. Sapota or Sapodilla is a climacteric fruit consumed mainly for its sweet and deliciousness. Substantial quantity of vitamins, minerals, proteins, ascorbic acid, polyphenols, etc is present in sapota fruit. In particular, a rich variety of phenolic compounds (as sources of natural antioxidants) and flavonoids have attracted the attention of many researchers and practitioners toward this fruit. Sapota fruit is rich in polyphenol content and thus having high antioxidant activity, which could be isolated for addition into other products (Moo-Huchin *et al*. 2017) [10].
Whey protein isolate is the purest form of whey and is a complete protein. It contains all the essential amino acids that your body needs to repair muscle after a workout. Because essential amino acids are not made by our bodies we must look to food and supplements to get these

essential nutrients (idealfit.com July 2016).

Whey protein isolate (WPI) contains >90% protein on a dry weight basis. Microfiltration is used to remove excess lipid from sweet whey. Whey protein isolate is made from the permeate of the MF process; WPI can also be produced through ion exchange chromatography (Huffman 1996) [3].

Serum proteins (sometimes referred to as native whey protein) are separated by direct filtration of skim milk. Both ceramic and spiral-wound membranes can be used to separate casein and serum proteins with differing efficiencies (Zulewska *et al*., 2009) [9].

Whey proteins have a high amount of branched chain amino acids such as Lucien, isoleucine, and valine. These are also rich in the sulphur-containing amino acids cysteine and methionine, which enhance immune functions through their intracellular conversion to glutathione (Onwulata and Huth: 2008) [7].

Materials and Methods

The study was carried out at department of Dairy Technology, Warner College of Dairy Technology, Sam Higginbottom University of Agriculture, Technology, and Sciences, Prayagraj (Allahabad), Uttar Pradesh, Department of Dairy Technology (India).

Treatments Combinations

T_O = Whole milk + Sugar (Normal Milk Pudding)
T_1 = Whole milk+Sugar+2% WPI+2% SAPOTA
T_2 = Whole milk+Sugar+2% WPI+4% SAPOTA
T_3 = Whole milk+Sugar+2% WPI+6% SAPOTA
T_4 = Whole milk+Sugar+2% WPI+2% SAPOTA
T_5 = Whole milk+Sugar+4% WPI+2% SAPOTA
T_6 = Whole milk+Sugar+4% WPI+4% SAPOTA
T_7 = Whole milk+Sugar+4% WPI+6% SAPOTA
T_8 = Whole milk+Sugar+4% WPI+8% SAPOTA
T_9 = Whole milk+Sugar+6% WPI+2% SAPOTA
T_{10} = Whole milk+Sugar+6% WPI+4% SAPOTA
T_{11}= Whole milk+Sugar+6% WPI+6% SAPOTA
T_{12}= Whole milk+Sugar+6% WPI+8% S APOTA
T_{13} = Whole milk+Sugar+8% WPI+2% SAPOTA
T_{14} = Whole milk+Sugar+8% WPI+4% SAPOTA
T_{15} = Whole milk+Sugar+8% WPI+6% SAPOTA
T_{16} = Whole milk+Sugar+8% WPI+8% SAPOTA
*WPI=Whey Protein Isolate
Manufacturing of Milk Pudding

Plan of work

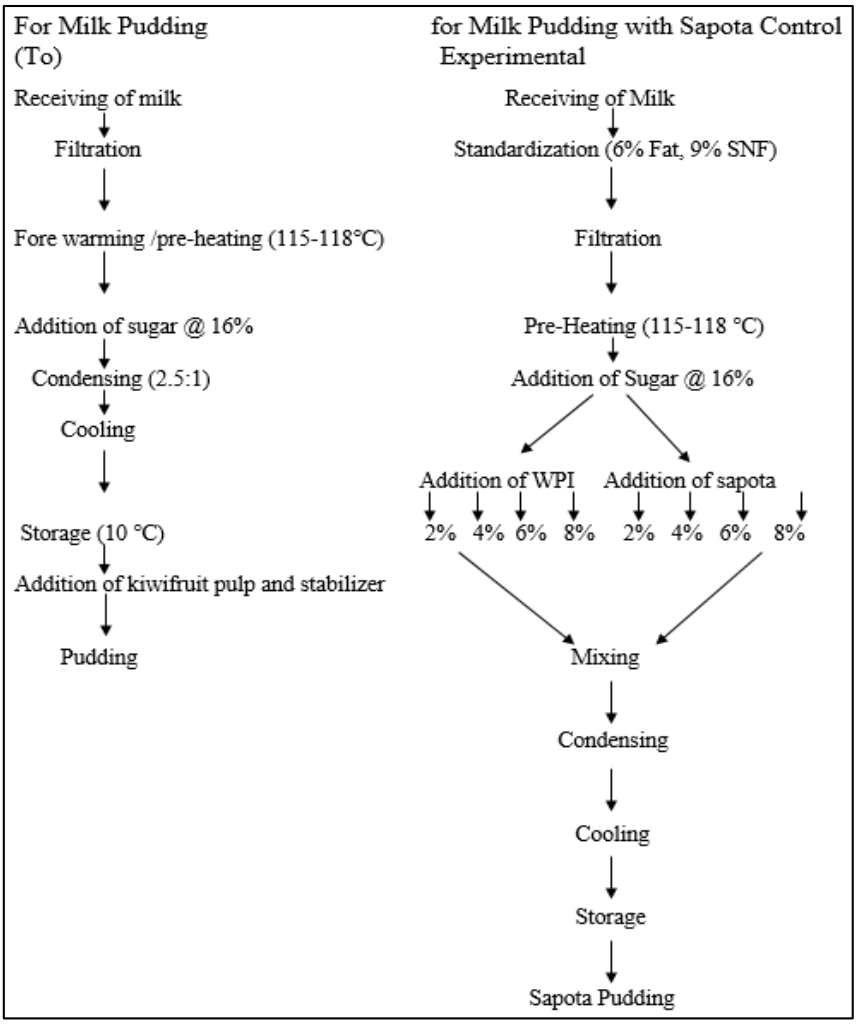

Fig 1: Flow Diagram for Manufacturing of Milk Pudding

Results and Discussions

The work was done in the laboratories of department of Warner College of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, U.P., India.

A. Physico-chemical Analysis of final developed product Pudding

Table 1: Table showing the Physico-chemical Analysis of final developed product pudding

Treatment	Carbohydrate Content	Protein Content	Fat Content	Ash Content	Total Solid	Moisture Content	Acidity	Antioxidant Activity
T1	31.42	5.2	6	1.732	44.348	55.65	0.22	0.0029
T2	31.83	5.21	5.95	1.86	44.848	55.15	0.2	0.00582
T3	32.2	5.22	5.85	1.89	45.16	54.84	0.19	0.0087
T4	32.86	5.23	5.504	1.94	45.53	54.47	0.17	0.01158
T5	29.68	7	6.1	1.74	44.52	55.48	0.19	0.003
T6	30.29	7.02	5.85	1.8	44.94	55.06	0.18	0.0057
T7	30.81	7.04	5.65	1.85	45.31	54.69	0.18	0.00882
T8	31.38	7.06	5.25	1.916	45.57	54.43	0.17	0.01158
T9	27.5	8.8	6.16	1.76	44.22	55.78	0.2	0.0029
T10	28.26	8.83	5.9	1.83	44.73	55.27	0.18	0.0059
T11	28.65	8.83	5.68	1.91	45.05	54.95	0.17	0.0087
T12	29.42	8.832	5.05	1.96	45.25	54.75	0.17	0.01158
T13	25.59	10.6	6.18	1.76	44.13	55.87	0.21	0.002742
T14	26.36	10.6	5.87	1.816	44.65	55.35	0.2	0.00582
T15	26.94	10.61	5.63	1.9	45.08	54.92	0.2	0.0087
T16	27.88	10.62	5.006	1.94	45.45	54.55	0.19	0.01158
F test	S	S	S	S	S	S	S	S
S.Ed. (±)	0.011	0.044	0.01	0.057	0.015	0.012	0.010	0.015
C.D.(P=0.05)	0.022	0.089	0.02	0.115	0.030	0.024	0.020	0.030

As shown in table no. 1 having data of each treatment with their replications, it indicates that the physico chemical properties of milk pudding.

1. Carbohydrates Content

The mean value of carbohydrate content of different treatments. Treatment T4 which mainly contains 8% sapota pulp, 2% whey protein isolate, 12% sugar, 78% milk is recorded to be the highest value of carbohydrate content which is 32.86% followed by treatments viz. T3, T2, T1, T8, T7, T6, T5, T12, T11, T10, T9, T16, T15, T14, and T13. The least carbohydrate value is recorded in Treatment T4. Sapota contains approximately 20% carbohydrate. So, the treatment having higher amount of sapota results the higher content of carbohydrate in experimental pudding. Whey protein isolate also contains approx. 3.5% of carbohydrate which is responsible for higher content of carbohydrate.

2. Protein Content

The mean value of protein content of different treatments. Treatment T16 which mainly contains 8% sapota pulp, 8% whey protein isolate, 12% sugar, 72% of milk is recorded to be the highest value of Protein content which is 32.86% followed by treatments viz. T15, T14, T13, T12, T11, T10, T9, T8, T7, T6, T5, T4, T3, T2, and T1. The least Protein value is recorded in Treatment T16. Whey protein isolate contains approx. 90% of Protein so, the treatment having higher amount of WPI results the higher content of Protein in experimental pudding which is responsible for higher content of Protein.

3. Fat Content

The mean value of fat content of different treatments. Treatment T16 which mainly contains 8% sapota pulp, 8% whey fat isolate, 12% sugar, 72% of milk is recorded to be the highest value of Fat content which is 6.18% followed by treatments viz. T15, T14, T13, T12, T11, T10, T9, T8, T7, T6, T5, T4, T3, T2, and T1. The least Fat value is recorded in Treatment T16.

4. Ash Content

The mean value of ash content of different treatments. Treatment T12 which mainly contains 8% sapota pulp, 6% whey ash isolate, 12% sugar, 74% of milk is recorded to be the highest value of Ash content which is 1.96% followed by treatments viz. T16, T4, T8, T11, T15, T3, T2, T7, T10, T14, T6, T9, T13, T5, and T1. The least Ash value is recorded in Treatment T1.

5. Total Solids

The mean value of total solids content of different treatments. Treatment T8 which mainly contains 8% sapota pulp, 4% whey total solids isolate, 12% sugar, 76% of milk is recorded to be the highest value of Total solids content which is 45.57% followed by treatments viz. T4, T16, T7, T12, T15, T3, T11, T6, T2, T10, T14, T5, T1, T9, and T13. The least Total solids value is recorded in Treatment T13

6. Moisture Content

The mean value of Moisture content of different treatments. Treatment T13 which mainly contains 2% sapota pulp, 8% whey Moisture content isolate, 12% sugar, 78% of milk is recorded to be the highest value of Moisture content which is 55.87% (T13). The least Moisture content value is recorded in Treatment T8

7. Acidity

The mean value of Acidity of different treatments. Treatment T1 which mainly contains 2% sapota pulp, 2% whey Acidity isolate, 12% sugar, 84% of milk is recorded to be the highest value of Acidity which is 0.22% (T1). The least Acidity value is recorded in Treatment T4, T8, T11 and T12.

8. Antioxidant activity

The mean value of Antioxidants activity of different treatments. Treatment T16 which mainly contains 2% sapota pulp, 2% whey isolate, 12% sugar, 84% of milk is recorded to be the highest value of Antioxidants activity which is 0.0115% (T4). The least Antioxidants activity value is recorded in Treatment T13.

B. Cost Estimation of Developed Product Pudding

Table 2: Table showing the cost estimation of milk pudding

Treatments	Milk Cost in Rs.	Sapota Pulp (gm)/ Cost in Rs.	Sugar (gm)/ Cost in Rs.	WPI Powder (gm)/ Cost in Rs.	Overall Expenses in Rs.	Total cost per gm of yield	Price of prepared sample in Rs/kg
T_1	11.6	2.4	4	3	21.00	0.39	390
T_2	11.6	4.8	4	3	23.40	0.42	418
T_3	11.6	7.2	4	3	25.80	0.45	444
T_4	11.6	9.6	4	3	28.20	0.48	478
T_5	11.6	2.4	4	6	24.00	0.44	440
T_6	11.6	4.8	4	6	26.40	0.47	470
T_7	11.6	7.2	4	6	28.80	0.51	510
T_8	11.6	9.6	4	6	31.20	0.54	540
T_9	11.6	2.4	4	9	27.00	0.49	490
T_{10}	11.6	4.8	4	9	29.40	0.51	510
T_{11}	11.6	7.2	4	9	31.80	0.55	550
T_{12}	11.6	9.6	4	9	34.20	0.61	610
T_{13}	11.6	2.4	4	12	30.00	0.54	540
T_{14}	11.6	4.8	4	12	32.40	0.57	570
T_{15}	11.6	7.2	4	12	34.80	0.61	610
T_{16}	11.6	9.6	4	12	37.20	0.66	660

Table No. 2 displays the cost analysis data and formulations. The cost of the final product included 20% of the expenses which were expended other than the total cost of the ingredients. The price of the ingredients in the experimental pudding affected the production costs, which varied. Additionally, the greatest mean cost was noted, it was noted in treatment T16 of the experimental pudding prepared with the combination of sapota fruit pulp and whey protein isolate which cost 660/kg. The overall acceptable sample T6 cost was 540/kg.

Conclusion

This study was concluded that the products were evaluated for their content in carbs, protein, fat, ash, total solids, moisture, acidity, and anti-oxidant activity. The combination of the treatment T4 had the highest content in total carbohydrates. The largest amount of fat was found in the T13 therapy combination. The highest proportion of ash was found in treatment combination T12. The treatment combination T13 included the largest percentage of moisture, while treatment combination T8 had the highest percentage of overall solids. The price of the product was calculated for various treatment combinations.

References

1. Alamprese C, Mariotti M. Effects of different milk substitutes on pasting, rheological and textural properties of puddings. LWT-Food Science and Technology. 2011;44(10):2019-2025.
2. IFT Press, Blackwell pub; c2008.
3. Huffman LM. Processing Whey Protein for Use as a Food Ingredient, Food Technology. 1996;50(2):4952.
4. Mccarty MF. Proposal for a dietary phytochemical index. Med. Hypotheses. 2004;63:813-817.
5. Mihaylova D, Popova A, Goranova Z, Petkova D, Doykina P, Lante A. The perspective of nectarine fruit as a sugar substituent in puddings prepared with corn and rice starch. Foods. 2021;10(11):2563.
6. Mudgal VD. The role of riverine buffaloes in small farm system in India. Proc. Int. Symp. Buffalo Genotypes for Small Farms in Asia. University of Pertanian, Malaysia. 1989, 1-19.
7. Onwulata CI, Huth PJ. editors. Whey processing, functionality & health benefits.
8. Zheng J, Wu J, Dai Y, Kan J, Zhang F. Influence of bamboo shoot dietary fiber on the rheological and textural properties of milk pudding. LWT. 2017;84:364-369.
9. Zulewska J, Newbold M, Barbano DM. Efficiency of serum protein removal from skim milk with ceramic and polymeric membranes at 50 °C. Journal of dairy science. 2009;92(4):1361-1377.
10. Can-Cauich CA, Sauri-Duch E, Betancur-Ancona D, Chel-Guerrero L, González-Aguilar GA, Cuevas-Glory LF, Pérez-Pacheco E, Moo-Huchin VM. Tropical fruit peel powders as functional ingredients: Evaluation of their bioactive compounds and antioxidant activity. Journal of functional foods. 2017 Oct 1;37:501-506.