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Evaluation of the quality and sensory attributes of chocolate under different trials

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Abstract

The Chocolate Confectionery Product developed in the study was Chocolate Filling with a view of cost effectiveness and not compromising with the quality aspects, the standardized formulation was concluded with future trials on its health benefits. Initially trials were performed to formulate with control. Several trials were performed and the standardized trial was used for further study. The sensory characteristics, sweetness, cocoa note, oily note, bake stability were evaluated. Sensory properties were evaluated using a nine point hedonic scale. In control required amount of skim milk powder and oil was standardized to formulate the control Chocolate filling. Next trial was performed to reduce the cost. For this purposes, skim milk powder was partially or completely replaced with sweet whey powder. With respect to control, in chocolate filling cost reduction was 3%. In later trials, Health indulgence was kept in view in which skim milk powder was completely replaced with Sweet whey powder and Whey protein concentrate in required ratio and further formulation was developed. Hence, the health indulgent recipe formulated for chocolate filling had 20% increases in protein content while maintaining the flavour and texture of the chocolate confectionery.

Keywords: Chocolate, Skim milk Powder, Sweet whey powder, Whey Protein Concentrate, cocoa powder, Caramel, Chocolate filling, Chocolate paste.

1. Introduction

Confectionery is a topic close to many people's hearts and its manufacture involves some interesting science (Edwards, (2000) [6]. Confectionery is normally divided into three classes: flour confectionery, chocolate confectionery, and sugar confectionery. Flour confectionery covers products that are made from flour and are baked. Chocolate confectionery consists of chocolate. Sugar confectionery covers the rest of confectionery.

The manufacture of confectionery is not a science based industry, as these products have traditionally been created by skilled confectioners working empirically. In fact, scientific understanding of the production process has only been acquired retroactively. Historically however, sugar confectionery has had technological synergies with the pharmaceutical industry, such as making sugar tablets and applying panned sugar coatings (Edwards, 2000) [6]. Confectionery products, in comparison with other foods, are generally stable and have relatively long shelf-lives. The high level of sugar present in confectionery products makes them less prone to microbiological spoilage. Therefore, physical and chemical changes, which lead to a deterioration of flavour, texture, colour or odour of the product, are the main causes of spoilage. However, the shelf-life of some confectionery products is shortened by the presence of ingredients that are inherently unstable, e.g. cream, making them prone to microbial spoilage.

The types of fats used, particularly in chocolate and chocolate-like (compound) coatings, were high in saturated fat in order to achieve the hard structure at ambient temperatures that is necessary for the product to be properly produced and satisfactorily consumed. The limitations imposed on chocolate formulations by legislation restrict the reductions in saturates that could be achieved. There are potentially greater possibilities for saturates reduction in coatings outside the scope of chocolate legislation. The greatest scope for saturates reduction in confectionery is in the fillings. The problems of increased oil migration become an issue. Ways of overcoming this while allowing a reduction in saturates are described. Confectionery fillings are products used in confectionery and baking industry containing approximately 30–40 g fat/100 g product. Due to the high fat content, they have considerable high caloric value. Therefore, there is a trend to decrease fat content in confectionery filling formulations. Vegetable fat was partially replaced by potato maltodextrin and specially derived waxy-maize

maltodextrin aqueous gels (15 and 20 g/100 g) in three different ratios (5, 10 and 15 g/100 g). The increase in the amount of fat reduction resulted in an increase in hardness and change in colour of the final product. According to sensory analysis performed by trained sensory panel as well as by measurements of product acceptance–preference performed by untrained panelists (consumers), confectionery filling with 5 g/100 g fat reduction had the highest scores. However, according to product acceptance–preference test, it was estimated that the final product with 15 g/100 g fat reduction was also sensory acceptable.

Objective

1. Study on costing of confectionery based product.
2. Formulating confectionery based product with keeping in view on cost effectiveness and health indulgence.
3. Trials and validation of the product based on the below formulations.

Materials and Methods

Procurement of Raw Materials

The raw ingredients for Chocolate Filling are Sugar (Nature Agro Foods), Aglupectin LA SX-22 (Silvateam, Italy), Canola oil (Jivo), Dextrose (Pioneer), Cocoa Powder (EDNA, Srilanka), Skim Milk Powder (Nova, India), Sweet whey powder (Bempressa, Poland), Modified Starch (E1442), Distilled Monoglycerides (Oleon), Salt, Preservatives Potassium sorbate (Pioneer), Chocolate Flavour (Dohler), Vanilla (IFF, US).

Process Flowchart

Disperse the Aglpectin LA-SX22 (1.3gm) in boiling water (14gm) under strong stir until homogeneous solution is obtained. Keep the solution at 85 °C.



Dry mix all the powders (Cocoa Powder (7gm), Sugar (33gm), Dextrose (3gm), SMP (2gm), Modified Starch (2gm), DMG (0.2), Salt (0.5), in the first stage and add into water in a jacketed heated tank and heat at 90 °C for 2 minutes.



Add pectin solution.



Add Palmolein (10gm) and mix it under high shear mixing using high shear mixer (RPM 3500, time 20 minutes).



Add preservatives (0.3gm) and flavors (0.02gm).



Fill the product around 80 °C.

Fig 1: Steps involved in manufacturing of Chocolate Filling

Sensory evaluation

Sensory evaluation (consumer analysis) was carried out by a 20 member untrained panel (10 males and 10 females) consisting of faculty and graduate students of the Laboratory of the company. Panelists were chosen using the following

criteria: ages between 22 and 60, non-smokers, without reported cases of food allergies who consume chocolate products regularly. Approximately 20 g of chocolate with hazelnuts was placed in small plastic containers coded with 3-digit random numbers and tightly capped. The samples were allowed to stand for 0.5 h prior to the evaluation to allow equilibration of volatiles in the headspace. Panelists were served a set of 5 treated samples along with a control sample (stored in glass jars at -18 °C); they were instructed to consume the whole sample and rinse their mouth with sparkling water (room temperature), in between sample evaluation. Sensory attributes evaluated included color, texture, odor and taste. Scoring was carried out on paper ballots using a 9 point hedonic scale where: 9= extremely like and 1= extremely dislike 1= very soft for evaluation of texture and 9=no difference compared to control and 1=product has turned completely white for evaluation of color. A score of 5 was taken as the lower limit of acceptability for color, texture odor and taste.

Color measurement

The color of chocolate with whole hazelnuts was measured using a Hunter Lab model DP-9000 optical sensor colorimeter (Hunter Associates Laboratory, Reston, VA, USA) and expressed as color L* (lightness), a* (redness) and b* (yellowness) values. Thirty five grams per sample were compressed into a cylindrical (base diameter 11.3 cm, height 2 cm) optical cell. Reflectance values were obtained using a 45 mm viewing aperture. The results reported (L*, a*, b*) are the mean of ten determinations.

Statistical analysis

Data were subjected to analysis of variance (ANOVA) using the software SPSS 16 for windows. Means and standard error were calculated, and, when F-values were significant at the pb0.05 level, mean differences were separated by the least significant difference procedure.

Results and Discussion

Scope: In this study, the Chocolate filling was formulated with a view point of cost effectiveness and also at the same time not compromising the with quality aspects. The standardized formulation was concluded with future trials on its health benefits.

Nutrient level

The nutrition values presented below are based on Lab testing.

Nutrient level	
Ingredient	Quantity (%)
Fat	10-15
Carbohydrates	45-60
Sugars	0-2
Dietary fiber	20-35
Protein	17-22
Calories per 100 g	200 Ca

Trial summary: Initially trials were performed to formulate with control. Several trials were performed and the standardized trial was used for further study. In control 2% of skim milk powder and 10% of canola oil was standardized to formulate the control Chocolate filling. Next trail was performed to reduce the cost. For this purposes, skim milk

powder was partially replaced with sweet whey powder. In later trials, Health indulgence was kept in view in which skim milk powder was completely replaced with Sweet whey

powder and whey protein concentrate in 1:1 ratio and further formulation was developed while maintaining the flavour and texture of the Chocolate filling.

Formulation

Trials (Chocolate Filling)					
Ingredients	Source	Cost Effective			Health Benefits
		Control (gm)	Trial 1 (gm)	Trial 2 (gm)	Trial 2 (gm)
Water (90C)		14	14	14	
Sugar	Nature Agro Foods	2	2	2	
Aglupectin LA SX-22	Silvateam, Italy	1.3	1.3	1.3	
Sugar	Nature Agro Foods	33	33	33	
Water (50C)		28.42	28.42	28.42	
Canola oil	Jivo	10	10	10	
Dextrose	Pioneer	3	3	3	
Cocoa powder (low fat)	EDNA Sri Lanka	7	7	7	
WPC	Meggle, Germany				1
SWP	Bempresa, Poland		1		1
SMP	Nova, India	2	1		
Modified Starch (E1442)	Ingedeon, US	2	2	2	
DMG	Oleon, UK	0.2	0.2	0.2	
Salt	Local vendor	0.5	0.5	0.5	
Preservative	Pioneer inorganic	0.08	0.08	0.08	
Flavor (Chocolate)	Flavoroma	1	1	1	
Flavor (Vanilla)	IFF, US	0.5	0.5	0.5	
Total		105	105	105	
Evaporation		5	5	5	
Total sum		100	100	100	
Cost Effectiveness (/kg)		67.48	65.88	71.48	

Formulation for Chocolate Filling (Control) and Cost effective recipe and health indulgent recipe

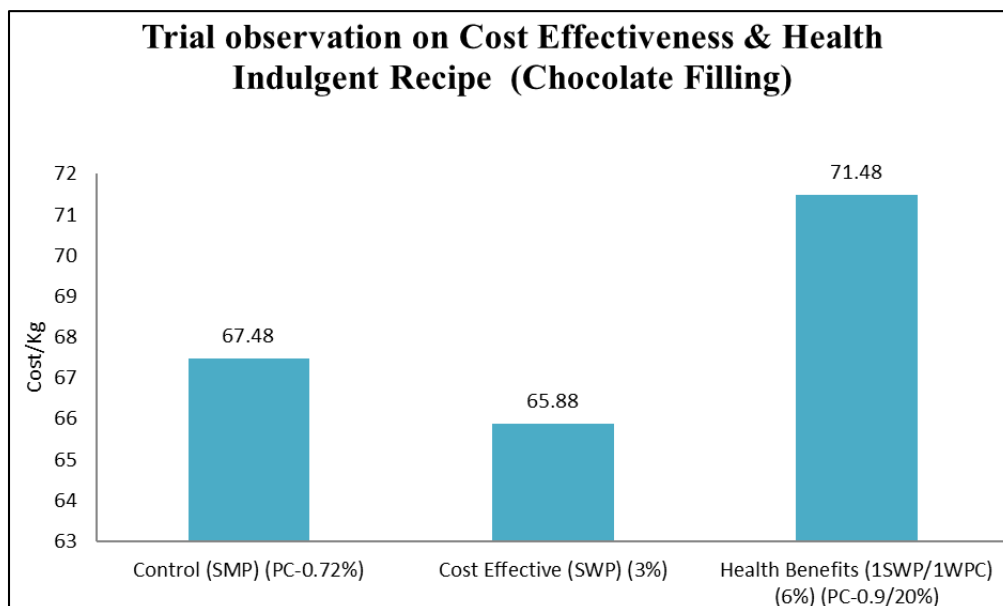


Fig 2: Trial observation on Cost Effectiveness & Health Indulgent Recipe (Chocolate Filling)

Control: the aim was to standardize the recipe, in which 2% of skim milk powder and 10% of canola oil was standardized to formulate the controlchocolate filling and it was observed that the product developed was of desired flavor and texture.

Trail 1: was performed to reduce the cost. For this purposes, skim milk powderwas partially replaced with sweet whey powder it was observed that the product developed was of desired flavor and texture.

Trial 2: Health indulgence was kept in view in which skim

milk powder was completely replaced with Sweet whey powder and whey protein concentrate in 1:1 ratio and further formulation was developed while maintaining the flavour and texture of the chocolate filling.

Way forward: In the future trials, the flavour can be enhanced by adding Hazelnut paste as well as we can increase the protein content by adding soy protein isolates, we can also add dietary fiber, antioxidant, artificial sweeteners (Aspartame) to reduce the calorie.

Observation

Table 2: Sensory observation for Chocolate Filling

Parameter	Control	Trial 1	Trial 2
Sweetness	Sweet	Sweet	Sweet
Cocoa note	Mild cocoa note	Mild cocoa note	Mild cocoa note
Oily note	No	No	No
Smoothness	Yes	Yes	Yes
Bake stability	Yes	Yes	Yes

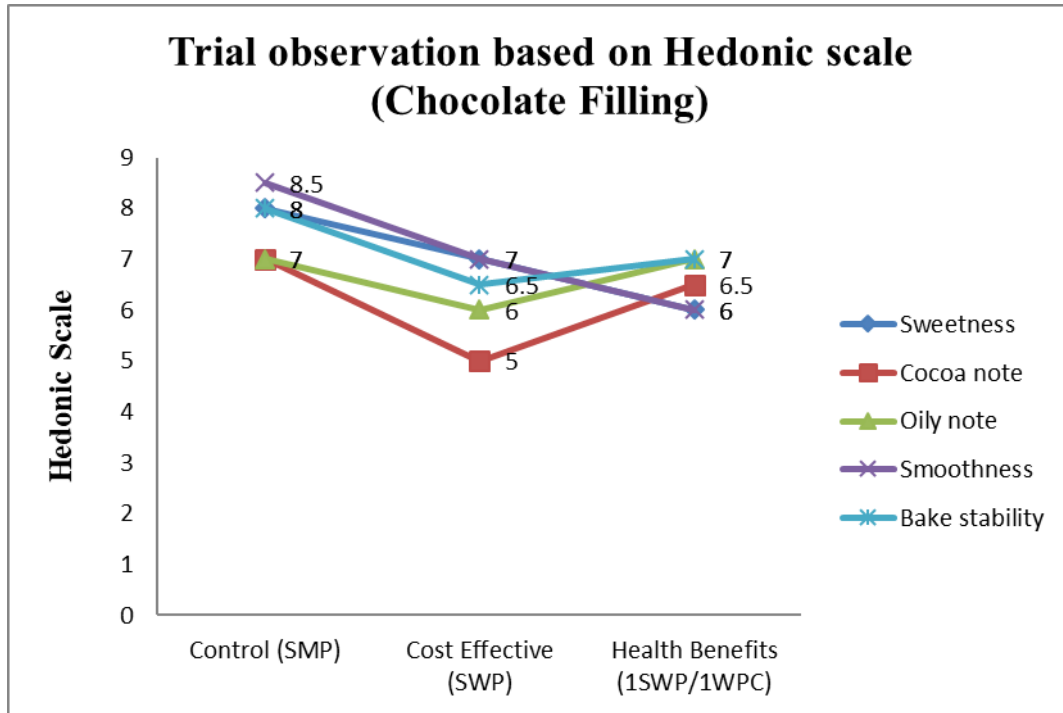


Fig 3: Trial observation based on Hedonic scale (Chocolate Filling)

Table 3: Sensory evaluation rating on Hedonic Scale

Sensory Evaluation			
Parameters	Control (SMP)	Cost Effective (SWP)	Health Benefits (1SWP/1WPC)
Sweetness	8	7	6
Cocoa note	7	5	6.5
Oily note	7	6	7
Smoothness	8.5	7	6
Bake stability	8	6.5	7

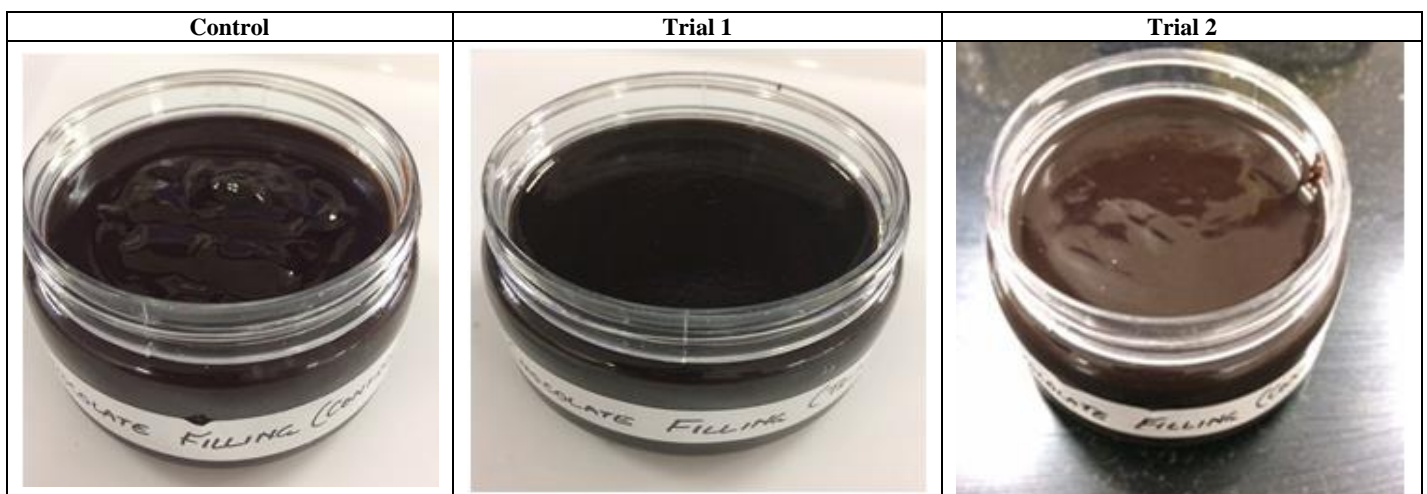


Fig 4: Chocolate Filling

Conclusions

The study concludes that Cocoa powder, Sweet whey powder, Whey protein concentrate, and soy protein isolates have good potential towards the development of innovative confectionery products with keeping in view of cost and quality. With respect to control, it was validated in chocolate filling the cost reduction was of 3% and health indulgent recipe formulated for chocolate filling has 20% increase in protein content.

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