

Studies on Preparation of Low Calorie Cake using Pearl Millet (Bajra) Maltodextrin

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Abstract

An experiment was conducted to develop low calorie food stuff like cake using carbohydrate-based fat replacers. Attempts have made to replace fat in cake by incorporation of pearl millet maltodextrin prepared by acid hydrolysis of pearl millet starch at the rate of 20, 30 and 40 %. It is recommended to adopt maltodextrin as fat replacer in cake formulation upto the extent of 30 % as it gives best results on the basis of organoleptic evaluation as compare to experimental control.

Keywords: Bajra; Low calorie cake; Maltodextrin; Sensory evaluation

Introduction

Food is a subject of vital interest to everyone in the world. According to recent survey a majority of consumers showed concerned regarding restrictions in limiting amount of high calorie and cholesterol in daily diet as higher intake of fat is linked with development of cardiovascular disease by American cancer society [1].

Fat replacer

With fat replacers, food manufacturers can create foods and beverages that are lower in fat and calories while maintaining the desirable qualities of fat. The fat replacers in use today, or those awaiting approval by FDA, are either carbohydrate, protein, or fat based. Many trademarks and registered names are used to market these products. Below is a list of fat replacers as they appear on ingredient labels and a description of how they are used in foods.

Carbohydrate-based fat replacers

Fat is not easily left out of food. Some carbohydrate based fat replacers are used as bulking agents to replace some of the volume lost when fat is omitted. Bulking agents are simply fillers that give structure and satiety (help make us feel full) to foods and beverages. A texture modifier changes the texture of a product to be more like fat. An emulsifier is used to prevent the separation of oil from water. Cellulose can replace some or all of the fat in dairy products, sauces, frozen desserts, and salad dressings. Finely ground micro particles of cellulose disperse throughout the food to provide a noncaloric network with the smoothness and flow properties similar to fat. Fiber-based products, such as guar gum, locust bean, xanthum gum, gum arabic, pectins, and carrageenan have virtually no calories. They provide a thickening or gelling effect and promote a creamy texture within the food. Gums can be used in reduced-calorie and fat-free salad dressings. They can also be used to reduce the fat content in formulated foods such as processed meats and desserts. Dextrin can replace all or some of the fat in such products as salad dressings, puddings, spreads, dairy foods, and frozen desserts. They provide four calories per gram of food. Most dextrans are derived from tapioca. Maltodextrins can be used as a fat replacer, texture modifier, or bulking agent in dairy products, salad dressings, spreads, sauces, baked goods, frostings, fillings, processed meat, and frozen desserts. Providing four calories per gram of food, most maltodextrins are derived from corn, potato,

tapioca, and wheat starches. Modified Food Starch is a reduced-calorie fat replacer, supplying one to four calories per gram of food. The ingredient is manufactured as a fine powder. When liquid is added, slurry is made and sheared to form a smooth, cream-like substance that has similar properties to shortening. Modified food starch can also be used as a bulking agent and texture modifier. It is used in combination with emulsifiers, proteins, gums, and other food starches to make dairy products, salad dressings, sauces, baked goods, fillings, frostings, condiments, processed meats, and frozen desserts. Polydextrose is a reduced-calorie fat replacer, supplying one calorie per gram of food. It can also be used as a bulking agent. Polydextrose contains minor amounts of sorbitol and citric acid and is used in baked goods, chewing gums, confections, salad dressings, gelatins, puddings, and frozen dairy desserts.

Protein-based fat replacers

Micro articulated protein is a reduced-calorie fat replacer, supplying one to two calories per gram. It is made from the whey in milk or egg protein and is manufactured similarly to modified food starch. It is found in dairy products, margarine, salad dressings, mayonnaise containing products, soups, sauces, and baked goods. Simplese is an example. Other protein-based fat replacers use a different process of formation or derive their protein from another source such as corn. Some blends of protein and carbohydrate fat replacers are used in baked goods and frozen desserts.

Fat-based fat replacers

Caprenin has the characteristics of cocoa butter and is used in many confections, including candy bars. It provides five calories per gram of food. Mono and diglyceride emulsifiers can be used with

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water to replace all or part of the shortening content in cake mixes, cookies, icings, and many vegetable dairy products. Emulsifiers, like fat, provide nine calories per gram of food; however, less is used and thus the product contains less fat and calories. New products being developed use a combination of fat and oil. Many of these products will contribute no calories, no cholesterol and no fat. They look, taste, and feel like fat but are metabolized like a carbohydrate. Because they are stable when heated they will be used in high-temperature products such as chips, snack foods, and baked goods as well as for frying. Over the next few years we can look forward to thousands of new products in the supermarket that use fat replacers. With more food options and variety, our efforts to eat healthier, lower-fat diets will be made easier

In search to offer consumers food which are lower in fat content, food technologists have developed several low calorie fat replacement and fat substitutes which functions like oil but less in calorie content. Fat replacers are mostly carbohydrate or protein based example Polydextrose, maltodextrin, starch derivatives, gums and mucilage and dietary fibres. They are used to replace fat in foods as they exhibit versatile sensory and textural properties e.g the cakes made with Potato Maltodextrin and emulsifier at either level of replacement were comparable to the control 10 per cent shortening cake by Soberzynska [2].

In the present investigations efforts have been made to prepare maltodextrin from pearl millet starch and its incorporation in cake in order to prepare low calorie cake. The usefulness of fat replacers was evaluated by sensory / organoleptic evaluation of low calorie cake by semitrained panelist using hedonic scale.

Material and Methods

Bajra (*Pennisetum American* var. ICTP-8203) grains were procured from NARP, (National Agriculture Research Project, M.A.U, and Aurangabad) and these grains were utilized for preparation of Starch.

Quality raw material required for preparation of Cake like Maida, fat, sugar, baking powder, eggs, vanilla essence etc. were procured from local market Parbhani.

Preparation of Maltodextrin (MD) prepared from Pearl Millet (Bajra) Starch (Figure 1).

Fortification of maltodextrin in cake

Low Calorie Cake was (Figure 2) prepared using recipe given by Susan Waring [3].

Maida	-	120 g
Sugar	-	120 g
Fat	-	90 g
Egg	-	2 no.
Baking Powder	-	2 g
Vanilla Essence	-	3 ml
Water	-	As required

All the dry ingredients i.e. flour, baking powder and maltodextrin (at the replacement level of 20, 30 and 40 per cent) mixed together and sieved cream fat and sugar are mixed till forming light color paste to this beaten egg is added, dry ingredients are added and mixed uniformly with milk or water to form proper dough. It is baked at 190 °C for 15-25 min. (Figure 2).

Preparation of Maltodextrin (MD) prepared from Pearl Millet (Bajra) Starch

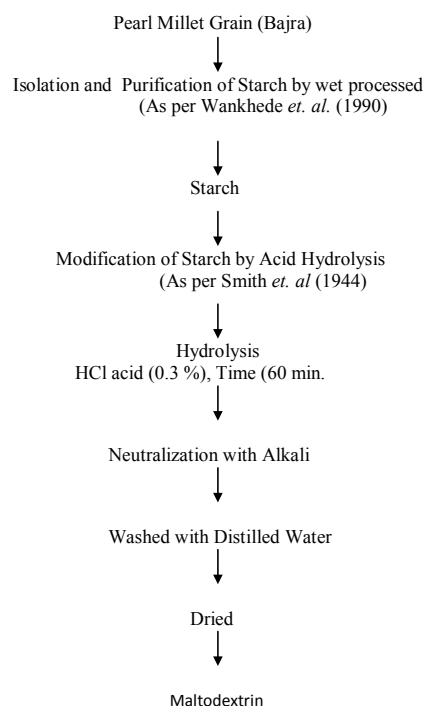


Figure 1: Acid Hydrolysis of Pearl Millet Starch to obtain Maltodextrin.

Results and Discussion

Preparation of starch and maltodextrin

In this investigation, the Starch was prepared by using Pearl Millet (Bajra) by wet milling process. The 24 hours soaking time, 750 ppm SO₂ at 50° C temperature resulted into highest yield of Starch (63.20 per cent).

Starch prepared from Pearl Millet (Bajra) was utilized for the preparation of maltodextrin using Hydrochloric acid Hydrolysis. It was observed that acid hydrolysis at 0.3 per cent for 60 min. resulted into highest yield Maltodextrin (95.40 per cent).

Preparation of low calorie cake

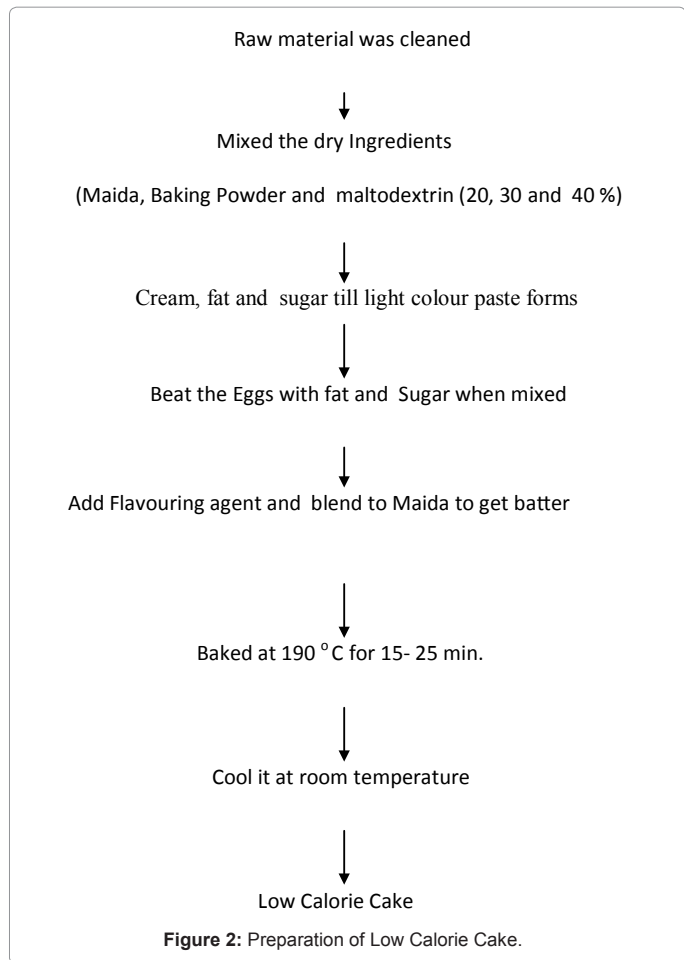
The prime objective of the present study was to assess use of Maltodextrin (Acid hydrolyzed as a fat replacer, in low calorie foods like cake. In this investigation Maltodextrin was incorporated during the preparation of cake at the rate of 20, 30 and 40 per cent.

Organoleptic evaluation of low calorie cake

The average sensory score of each attributes of low calorie cake prepared with incorporation of Maltodextrin at the rate of 20, 30 and 40 per cent and experimental control (without maltodextrin i.e full fat) was recorded in (Table 1).

The results of sensory evaluation of cake by semi trained panelist showed that the cake prepared using 30 per cent maltodextrin has secured the highest score for each sensory attributes as compared to the experimental control. The actual fat replacement in the finished product was 26.40 percent have used maltodextrin and other modified starches as fat replacer to obtain low calorie food stuffs successfully.

Evaluation of organoleptic attributes of the cakes for color, Flavor, texture, appearance, mouth feel and overall acceptability was done by a semitrained panel of judges. The panel of judges scored on a 9 point scale or Hedonic scale.



Sample Code	Color	Flavour	Appearance	Mouth feel	Overall Acceptability
EC	8.1	7.4	7.9	7.7	7.6
A	6.8	6.9	6.1	6.6	6.5
B	8.9	8.8	9.0	8.8	8.7
C	7.4	7.4	7.2	7.0	7.1

Samples
 EC = Experimental control (Full Fat)
 A = 20 per cent Maltodextrin as a fat replacer
 B = 30 per cent Maltodextrin as a fat replacer
 C = 40 per cent Maltodextrin as a fat replacer

Table 1: Sensory Evaluation of Low Calorie Cake.

Conclusion

Starch based fat replacer, fat extenders and combination systems are needed the substantiate the efficiency of those compounds in the specific fat reduction processing. Obtained product from new technologies needs not only enhanced quality but also more economical and less time-consuming.

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