



Evolving fat consumption pattern in Indian scenario - the need for fat replacers

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ABSTRACT

Obesity has been pointed as a major issue plaguing in the World. Currently the Indian community has more of overweight / obese, people with excess body fat, abdominal adiposity, increased subcutaneous and intra-abdominal fat, and deposition of fat in ectopic sites. Fat is still the number one nutritional concern for most people because the continuous consumption of fat may lead to certain major health disorders such as cardiovascular diseases, obesity, hypertension, some types of cancer, high blood cholesterol etc. Evidence suggests that lowering total energy intake along with a reduction in total fat intake can have a substantial impact on body weight and risk of chronic diseases. Thus, the fat replacers have opened the door for a new generation of reduced fat foods that have the taste and texture of the high fat foods that consumers enjoy, without unnecessary calories, cholesterol or fat. By considering the current issue prevailing in India, effort was taken to prepare a modified rice starch to replace fat in certain food products without affecting the taste, texture and flavor. Though 100 percent replacement of fat is impossible it is feasible to reduce the fat content to an acceptable level with the help of modified rice starch.

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Introduction

India which has already considered the diabetes capital of the World now appears headed towards gaining another dubious distinction of becoming the lifestyle related disease capital as well.¹

“In every region of the World, obesity doubled between 1980 and 2008”, today half a billion people (12% of the World’s population) are considered obese. In all parts of the world, including India, obese persons are at greater risk of diabetes, CVD and some cancers.²

Number of Estimated Cases of Coronary Heart Disease in India in 2000 was 27040912 with 14740808 in rural and 12300104 cases in urban India. In 2010 it was 22280577 cases in rural and 24688119 in urban regions. The statistics states that the likely number of cases in 2015 would be a total of 61522343 cases with 36092297 urban cases compared to 25430046 rural cases³.

Number of Estimated Cases of Diabetes in India 2000 was 25814117 with 9988262 in rural areas and 15825855 in urban areas. In 2010 it was 12227483 in rural areas and 25444482 in urban areas with total cases at a staggering 37671965, the estimated number for 2015 will see a steep increase for a total of 45809149 with 13201058 in rural regions of India and 32608091 from urban regions³.

The number of death due to diabetic was 109133 in 2004 with an estimated Years of Potential Life Lost-YLL of 1156822 and Disability Adjusted Life Years-DALY estimated at 2263163³.

Its prevalence is escalating at an alarming rate to epidemic proportions throughout the developed World. Furthermore, obesity is no longer just a concern for developed Countries, but is also becoming an increasing problem in many developing Countries. There are more than 250 million obese adults and about 1.1 billion overweight people Worldwide.

The quality of fats and oils in a diet, as well as the amount of salt consumed, the report says, can also have an influence on cardiovascular disease such as strokes and heart attacks. It is important that these measures are implemented on a large scale in Indian subcontinent where all forms of cardiovascular disease, hypertension, coronary heart disease and diabetes are rampant⁴.

Studies have found was that 36% of the population confessed to eating out regularly at fast food joints. They also proclaimed that their regular diet included junk food such as fries and colas. The World Bank has predicted that coronary heart disease will become the leading cause of premature death in India by 2015 and that the maximum number of diabetic patients in the world will be in India⁵.

Among carbohydrate polymers, starch is currently enjoying increased attention owing to its usefulness in different food products. Starches from various plant sources, such as wheat, maize, rice and potato have received extensive attention in relation to structural and physiochemical properties. Food starches are modified to obtain one or more of the following improvements in the functional properties such as to reduce viscosity, increase dispersion stability, increase gel formation and strength and to improve gelatinization property. It is also used to improve emulsification, viscosity, shelf stability, textures and appearance.⁶

Fat replacers are substances that take the place of all or some of the fat in a food and yet give the food a taste, texture and mouth feel similar to the original full fat food. When fat replacers are used in a food, they must replace the functions provided by fat, namely flavor, texture, mouth feel and volume while providing fewer calories. Fat in food products may be replaced by traditional technique such as substituting water or air or fat or by reformulating foods with lipid, protein or carbohydrate based ingredient commonly known as fat replacers.

Carbohydrate based fat replacers can provide up to 4 Kcal / g, but because they are often mixed with water, they typically provide only 1 – 3 Kcal / g and some provide zero calories. They are used mainly as thickeners and stabilizers and are typically used in a variety of foods, including dairy type products, frozen desserts, salad dressings, processed meats, baked goods, spreads, chewing gums and sweets. However, they are not suitable for use in foods that are fried. Often the fat substitute have calorie themselves, but because the calorie density of fat is more than twice that of protein or carbohydrate, replacement on an equal weight basis in an overall reduction in calories.⁷

Consumer interest in eating reduced fat or fat free foods has increased, as it is evidenced by the trend for more healthy foods. Yet, the per capita consumption of fats and oils has not decreased to meet the recommendations (less than 30 percent of a day's calories from fat) as given in the report on Nutrition and Health. This may be in part due to the fact that the function, flavor and mouth feel of fat has not been duplicated by a non-fat components in the diet.

The challenge has been to produce low fat variants with physical and sensory characteristics that resemble as closely as possible the full fat standard products to which people are accustomed.

Indians struggling with weight loss or maintenance issues would benefit by choosing reduced fat versions and can focus on consuming nutrient dense foods that are low in fat and sugars to lower total energy intake. Thus, the use of fat replacers, for reducing total fat and energy content of foods can potentially serve as one of the strategies by which these National problems can be solved.

Methodology

The broken rice was selected to enhance the removal of starch from it. The rice was cleaned, washed with water and was steeped in 0.3 percent caustic soda for 24 hours and washed with water to remove caustic soda. It was dried in hot air oven at 60 – 70⁰ C for 2 – 3 hours and grounded into powder, sieved and stored in air tight container.

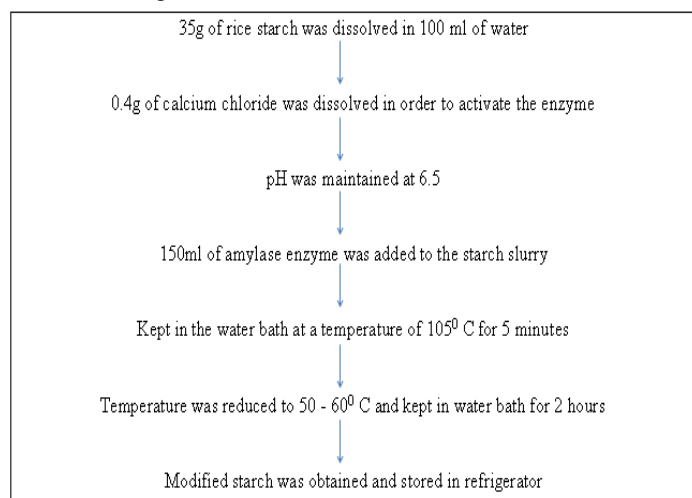


Fig: 1 Preparation of Modified Starch

From the prepared modified starch, 2 – 3 ml was taken separately before it is stored in refrigerator for the plating. The plating was carried out to ensure that there is no contamination of the growth of other organism. The plating was done with the help of nutrient agar medium as bacterial growth can be well visualized in this medium.

The fat replacers can be formulated in two forms namely powdered and crème form. For the study the crème form was

preferred as the crème form is often mixed with water, they provide only 1 – 2 Kcal / g and they contain 25 percent crystalline and 75 percent water. The powdered form of fat replacers provides up to 4 Kcal / g which is less than the calorie provided by the fat. The rice starch was selected out of other plant starches as they possess small size of starch granules that allows it to mimic fat so well. (Bennett, 1997)

The prepared modified starch was incorporated into various food products such as cakes, cookies, icing of cakes, custard, ice cream, mayonnaise and soups at different levels. The organoleptic evaluations were carried out with a panel of 20 members to test the acceptability of the prepared products.

Results and Discussion

The total carbohydrate content of the raw and modified starch was identified by using the Anthrone method. From the carbohydrate content, the calorie content was calculated and it is presented in Figure 2.

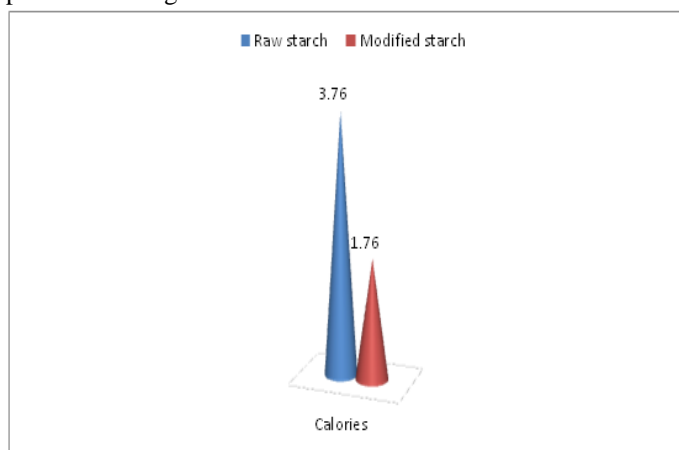


Fig 2: Calorie Content of the Raw and Modified Starch

In the present study the modified starch were incorporated at three different levels namely 15, 25 and 50 percent and compared with the standard product. In icings of cakes and mayonnaise, 15 percent levels of incorporation were highly accepted as it retains the texture, whereas in both 25 and 50 percent the texture was watery due to the addition of modified starch in the crème form. Even the soup at 15 percent level of incorporation was highly accepted as too much level of incorporation resulted in starchy taste. The taste and texture of the ice cream prepared at 15 percent level of incorporation was good. The custard was highly accepted at 25 percent level of incorporation as it possessed very less egg flavor and good texture.

The cakes and cookies were prepared with the modified starch at three different levels namely 25, 50 and 75 percent. The highest acceptability scores were given to 25 percent level incorporated products compared to other two higher levels of incorporation which resulted in harder texture.

The best accepted level of the recipes was selected to analyse the calorie and fat content. It was calculated from the raw ingredients, used for the preparation of 100g of the standardized recipes. The calorie and fat content of the standard and formulated recipes were presented in figure 3 and 4.

It was evident from the graph, approximately 10 – 50 percent levels of the calorie were reduced by the addition of starch at the acceptable level. “Fat replacers can be effective only if they lower the total calorie content of the food” based upon this statement it is evident that the modified starch can be used as fat replacers in many calorie dense foods without affecting the palatability of the product.

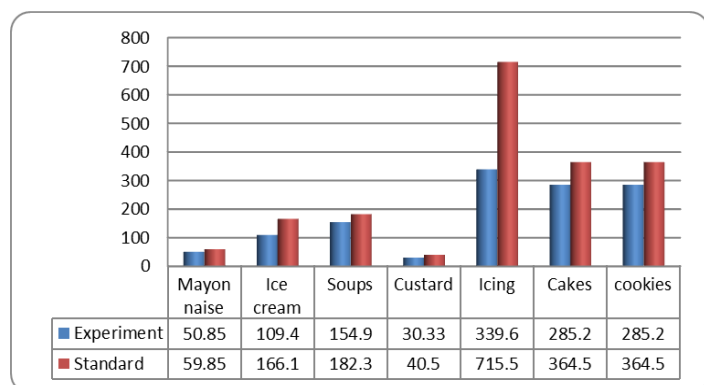


Fig: 3 Calorie content of Standard and Formulated Recipes

Similar to calorie content, the fat content of approximately 5 – 40 percent levels of the fat were reduced by the addition of starch at the acceptable level. From the graph we can conclude that the rice starch proves to be the best to incorporate in food products as it mimics the function of fat.

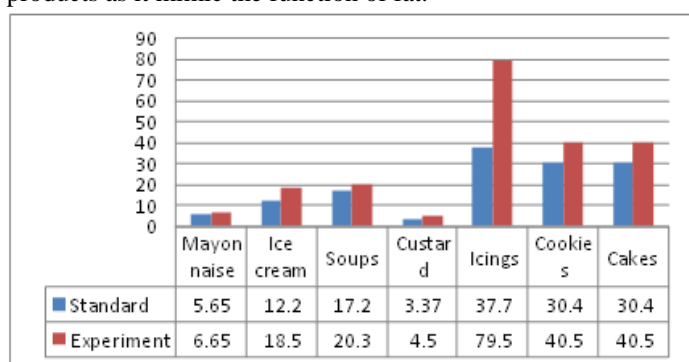


Fig: 4 Fat content of Standard and Formulated Recipes

Conclusion
The present study revealed that the modified starch has potential to be used in a wide range of food products as fat replacers since the simultaneous occurrence of over nutrition

and under nutrition indicates that adults in India are suffering from a dual burden of malnutrition. Only 52 percent of women and 57 percent of men are at a normal weight for their height. More than one-quarter of women in Punjab, Kerala, and Delhi are overweight or obese. Tamil Nadu and Goa also have a high prevalence of overweight and obesity (more than 20 percent). Since fat reduction is associated with changes in perceived product characteristics the incorporation of modified starch at below 25 percent level was highly acceptable. We can conclude that with the help of fat replacers, trans fat and caloric can be reduced in bakery and other food products. Thus fat replacers will help to develop good quality low fat and fat free variants to cater the needs of health conscious consumers and helps to gain market for low calorie bakery goods in the forthcoming years. The consumption of healthy foods and lifestyles will result in a significant increase in the health and nutrition knowledge and bring down the level on the obesity level of the Indian population.

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