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Preparation and quality assessment of fortified cookies by using wheat flour, flaxseed flour and carrot pomace

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Abstract

Bakery products are mainly prepared from wheat as its main ingredients. The present study was designed to develop fortified cookie using wheat flour blended with flaxseed flour and dried carrot pomace. Effects of fortification with 5% of carrot pomace and different levels of flaxseed flour were assessed on the nutritional and sensory quality of biscuit. The different formulations were T₀-(100:0:0), T₁-(85:10:05), T₂-(80:15:05), T₃-(75:20:05) in which the ratio is- wheat flour: flaxseed flour: carrot pomace. The samples were evaluated organoleptically by a group of five semi-trained panelists and rated the product using 9-point Hedonic scale. The samples of treatment T₂ containing 15% flaxseed flour was found the best in aspects of colour & appearance, flavor & taste and overall acceptability. T₁ sample containing 10% flaxseed flour was found to be best in body and texture. The chemical analysis result show that with the increase in the concentration of flaxseed flour, there was an increase in moisture, protein, fat, ash and crude fiber while there is decrease in the content of carbohydrate. Thus, compositing cookies with flaxseed flour and carrot pomace has proved to have improved nutritional properties as well as sensory attributes and it will help in increasing intake of protein, fats and fibers.

Keywords: Fortified cookies, wheat flour, flaxseed flour

1. Introduction

Cookies are chemically leavened product, also known as “biscuit”. Generally the term biscuit is used in the European countries and cookies in USA. Cookies are ideal for nutrients availability, palatability, compactness and convenience. They differ from other baked products like bread and cakes because of having low moisture content, comparatively free from microbial spoilage and long shelf life of the product.

Cookies hold an important position in snack food due to variety in tastes, crispiness and digestibility. They are ready to eat, convenient and inexpensive food products, containing digestive and dietary principles of vital importance. They are nutritive snacks produced from unpalatable dough that is transformed into appetizing product through the application of heat in the oven.

In making cookies, the principle ingredients are wheat flour, sugar, fat and water. These are mixed together with other ingredients (baking powder, skimmed milk, emulsifier and sodium metabisulphite) to form dough containing a well gluten developed network. The nature and quantity of ingredients used determine the quality of cookies. Several researchers have described the effect of major ingredients in biscuit dough systems and final product.

Soft wheat is the grain of choice for making cookies. However, production of good quality soft wheat is very limited and unevenly distributed globally. Moreover, refined wheat flour is low in protein (7-14%) and is deficient in essential amino acid such as lysine and certain other useful food component like dietary fiber. Therefore, compositing wheat flour with the locally available grains other than wheat and root crops has been reported to be desirable.

Among different amino acids, lysine is considered to the first limiting amino acid in cereal products. The gap between the protein requirement and supply can be abridged by amino acid fortification, uses of protein mixture (protein supplementation & complementation), genetic modification of food crops and identification and evaluation of underexploited sources.

Flaxseed, or Linseed (*Linum usitatissimum*), popularly known as Alsí, Jawas, Aksebija in Indian languages, is a blue flowering rabi crop and a member of family Linaceae. The seeds of the flax are tiny, smooth, flat and pointed at one end. Because of its link to good health flaxseed is rapidly becoming a new food in many diets. Flaxseed has used in the diets of the humans for thousands of years. The Babylonians cultivated flaxseed as early as 3,000 B.C.

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Flaxseed (*Linum usitatissimum*) is generally cultivated for linen fiber or for oil from its seeds which is also called as linseed oil. The flax has been used as a precious nutritional product and as a traditional medicine from ancient time. Flaxseed has an amino acid profile comparable to that of soybean flour and contains no gluten.

Flaxseed has been identified as a functional food, whose benefits to health are generally attributed to high concentration of lignins and linolenic acid (omega-3) lignins. The proximate composition of flaxseed indicates that it contains 30% protein, 35% lipids and 35% fiber; though it varies depending upon the seed variety, cropping year, cropping location and environment conditions. The protein content in flaxseed has been reported to range from 10.5% to 31% depending on environment and growing conditions.

The commercial utilization of flaxseed protein in food products depend on its functional properties before its incorporation in various food products. The improvement in a range of functional properties may be achieved either by genetic modification, chemical processing or physical treatment of the proteins. The functional properties of different proteins can be employed to figure out the fact that how flour proteins can be used to supplement, fortify, enrich or replace more expensive protein source which are used traditionally.

Flaxseed is one of those healthy ingredients that is easy to sneak into foods such as cookies, increasing the nutritional value. Flaxseed proteins have been assessed as techno-functional ingredients in many food formulations such as bakery products and pastries, meat emulsions, sauces and ice creams. Functional properties of flaxseed proteins including emulsifying and foaming ability and stability are comparable to those of other oilseed proteins. The advantage of flaxseed proteins compared to other vegetable proteins arises from their association with the mucilage, a co-product in flaxseed, which may enhance their proper-ties in food formulation.

Wheat (*Triticum aestivum*) is considered as the principal cereal grain produced, consumed and traded in the world. Wheat, rice, barley, corn and sorghum provide around 68% of the total world food supplies. Wheat grain is a staple food used to make flour for leavened, flat and steamed breads, biscuits, cookies, cakes, breakfast cereal, pasta, noodles, couscous and for fermentation to make beer, other alcoholic beverages, and biofuel.

Materials and Methods

The experimental studies on “Preparation and Quality Assessment of Fortified Cookies by Using Wheat, flaxseed flour and Dried Carrot Pomace” was carried out in the research lab, Warner college of Dairy Technology, Sam Higginbottom University of Agriculture Technology and Sciences Allahabad, U.P, India.

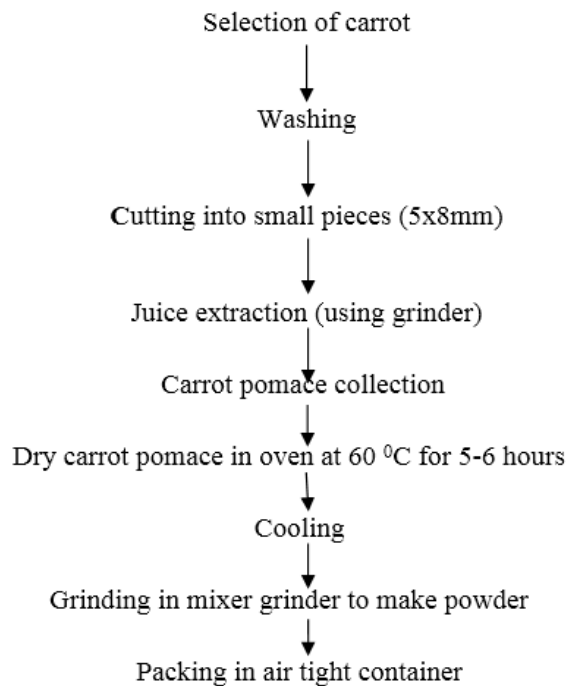
Materials

Procurement and collection of ingredients

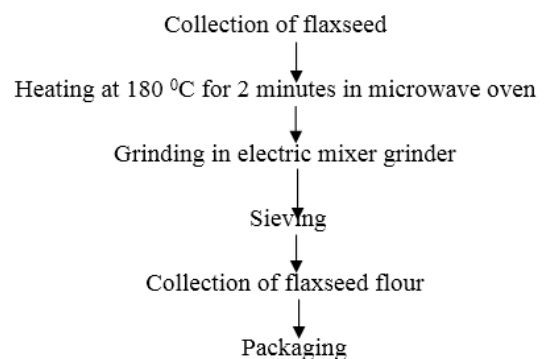
1. Fresh carrots free from blemishes were collected from local market.
2. Soft wheat flour was collected from local market in Allahabad.

3. Flaxseed was purchased from local market.
4. Other materials like butter, baking powder, sugar and milk powder was also collected from local market.

Flow chart for preparation of dry carrot pomace



Flow chart for preparation of flaxseed flour



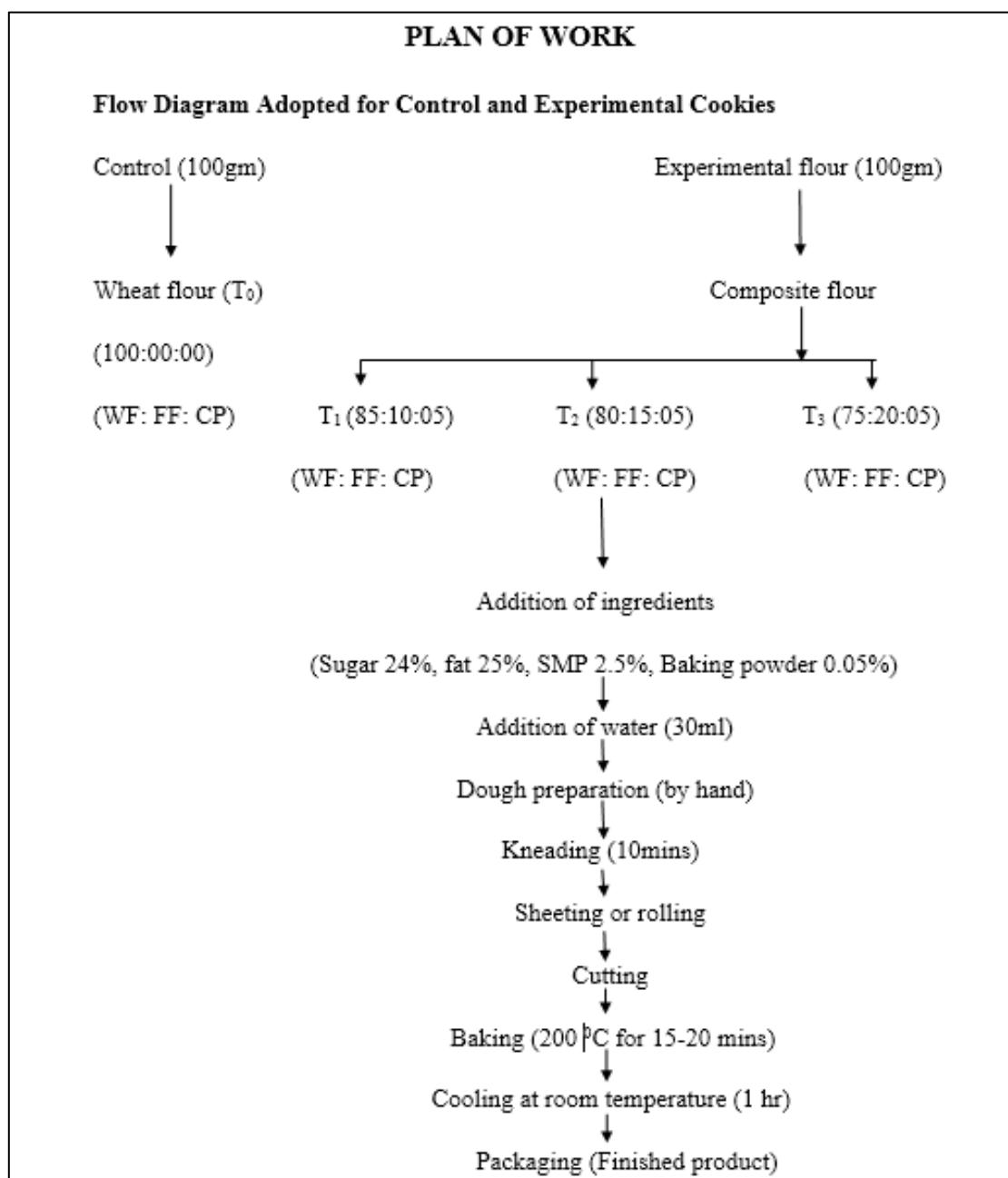
TREATMENTS

T₀- Cookies prepared by wheat flour. **(100:0:0)**

T₁- Cookies prepared by blending wheat flour with flaxseed and dry carrot pomace. **(85:10:05)**

T₂- Cookies prepared by blending wheat flour with flaxseed and dry carrot pomace. **(80:15:05)**

T₃- Cookies prepared by blending wheat flour with flaxseed and dry carrot pomace. **(75:20:05)**



Average of data obtain on different parameter of fortified cookies by using wheat flour, flaxseed flour and Dried carrot Pomace

S.no	Parameter	T ₀	T ₁	T ₂	T ₃
Chemical Analysis					
1	Fat%	17.35	21.04	22.7	24.93
2	Protein%	6.85	7.89	8.17	8.66
3	Carbohydrate%	69.95	63.45	60.82	57.23
4	Ash%	0.81	1.34	1.55	1.79
5	Moisture%	4.78	4.92	5.15	5.28
6	Crude fiber	0.27	1.36	1.72	2.13
Organoleptic Characteristics					
7	Colour&Appearance score	7.08	7.44	7.48	7.16
8	Flavour&taste score	7.20	7.40	7.88	7.64
9	Body&Texture score	7.0	7.42	7.32	6.84
10	Overall acceptability	7.20	7.60	7.85	7.1
Microbial Analysis					
11	Yeast&Mould	Nil	Nil	Nil	Nil
12	Coli form count	Nil	Nil	Nil	Nil

Result and Discussion

The different parameter of control and experimental fortified cookies Chemical parameter of fortified cookies.

Moisture

From the data on moisture test in fortified cookies sample of different treatments and control, the highest mean moisture percentage was recorded in the cookies sample of T₃ (5.28) followed by T₂ (5.15), T₁ (4.92) and T₀ (4.78). There was an increase in moisture content in the cookies sample with increase level of flaxseed flour.

The increasing trend of moisture content might be due to increasing fiber content in mixture. As fiber has water retaining property so moisture content increase respectively. There was significant difference between all the treatments which may be ascribed by the different levels of cookies.

Fat

From the data on fat test in fortified cookies samples of different treatments and control, the highest mean fat percentage was recorded in the cookies sample of T₃ (24.93)

followed by T₂ (22.7), T₁ (21.4) and T₀ (17.35).

There was significant difference between all the treatments which may be ascribed by the different levels of cookies.

Protein

From the data of protein estimation in fortified cookies sample of different treatments and control, the highest mean protein percentage was recorded in the cookies sample of T₃ (8.66) followed by T₂ (8.17), T₁ (7.89) and T₀ (6.85).

There was significant difference between all the treatments which may be ascribed by the different levels of cookies.

Ash

From the data on ash estimation in fortified cookies sample of different treatments and control, the highest mean ash percentage was recorded in the cookies sample of T₃ (1.79) followed by T₂ (1.55), T₁ (1.34) and T₀ (0.81). The increased ash content was due to high percentage of mineral content present in flaxseed flour.

There was significant difference between all the treatments which may be the different levels of cookies.

Carbohydrate

From the data on carbohydrate estimation in fortified cookies sample of different treatments and control, the highest mean carbohydrate percentage was recorded in the cookies sample of T₀ (69.95) followed by T₁ (63.45), T₂ (60.82) and T₃ (57.23).

There was significant difference between all the treatments which may be ascribed by the different level of cookies.

Crude fiber

From the data on crude fiber estimation in fortified cookies sample of different treatments and control, the highest mean crude percentage was recorded in cookies sample of T₃ (2.13) followed by T₂ (1.72), T₁ (1.36) and T₀ (0.27).

There was significant difference between all the treatments which may be ascribed by the different level of cookies.

Microbial parameter of fortified cookies

Coli form

It is evident from the data on coli form test in fortified cookies sample of different treatments and control was 100% negative. It shows the absence of gram- -negative bacteria which means that strict hygienic procedure was maintained during the preparation.

Yeast & Mould

It is evident from the data on Yeast & Mould test in fortified cookies sample of different treatments and control was 100% negative.

Organoleptic parameter of fortified cookies

Colour & appearance

From the data on colour & appearance test in fortified cookies sample of different treatments and control, the highest mean colour & appearance percentage was recorded in the cookies sample of T₂ (7.48) followed by T₁ (7.44), T₃ (7.16) and T₀ (7.08).

Flavour and taste

From the data flavour and taste in fortified cookies samples of different treatment and control, the highest mean flavor and taste percentage was recorded in the cookies sample of T₂ (7.88) followed by T₃ (7.64), T₁ (7.4) and T₀ (7.2).

Body & texture

From the data body & texture test in fortified cookies sample of different treatments and control, the highest mean body & texture percentage was recorded in the cookies sample of T₁ (7.42) followed by T₁ (7.32), T₀ (7.0) and T₃ (6.84).

Overall acceptability

From the data on overall acceptability test in fortified cookies samples of different treatments and control, the highest mean overall acceptability percentage was recorded in the cookies sample of T₂ (7.85) followed by T₁ (7.60), T₀ (7.20) and T₃ (7.10).

Conclusions

In view of experimental result obtained during the present investigation, it may be concluded that the sample of treatment T₂ containing 15% flaxseed flour was found the best in aspects of colour & appearance, flavor & taste and overall acceptability. T₁ sample containing 10% flaxseed flour was found to be best in body and texture. All the sample of were found to have good microbial quality, i.e., no Coli form and no yeast and mould count present during research of the fortified cookies.

It was found that the treatment T₃ containing 20% flaxseed flour was best in the chemical analysis as it contains the highest amount of proteins, fat, ash, crude fiber and lowest in carbohydrate content.

Therefore, it may be concluded that, there is a great scope of manufacturing cookies using flaxseed flour and carrot pomace as it is proved to have improved nutritional properties as well as sensory attributes and it will help in increasing intake of protein, fats and fibers.

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