

RESEARCH ARTICLE :

Whole wheat cookies fortified with composite mix— A novel food

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SUMMARY : Obesity is ultimate result of mechanized work culture results into cardiovascular problems, as it is said “*Let Food be thy medicine*” an attempt was carried out to prepare fiber rich cookies with goodness of proteins and minerals. The composite mix was formulated by mixture of raw banana powder and date seed powder (4:1). Described cookies are having benefits of whole wheat (bran, germ and endosperm), raw banana and date seed powder which work for health promotion and as functional food. Cookies were prepared in the proportion of 0, 5, 10 and 15% composite flour. The cookies were subjected to proximate analysis, organoleptic evaluation and statistical analysis (ANOVA). Resultant cookies are rich source of dietary fibre and protein. Results showed the decreasing trend for carbohydrates and calorie value. Organoleptic properties revealed that 10% level replacement of composite mix is acceptable.

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KEY WORDS :

Functional food,
Obesity, Novel food,
Dietary fibre, ANOVA

BACKGROUND AND OBJECTIVES

Cookies are known to be popular ready to eat snacks among all age groups (Farheena *et al.*, 2015). Described cookies are prepared from whole wheat and composite mix of raw banana and date seed powder. Raw material is selected on the basis of its nutritional importance to make the product a healthy snack.

Wheat (*T. aestivum*) is rich in synergist components, mineral salts, calcium, magnesium, potassium, sulfur, chlorine, arsenic, silicon, manganese, zinc, iodide, copper, vitamin B, and vitamin E. The seeds are helpful for treating gastrointestinal

conditions, skin ailments, respiratory diseases, and cardiovascular sicknesses. It is additionally known to help adjust cholesterol levels and ensure the heart functions (Pomeranz, 1988).

Raw banana (*Musa acuminata*), *Musa* spp. Its year round availability, affordability, varietal range, taste, nutritive and medicinal value makes it the favorite fruit among all strata of people. It has good export potential, banana constitutes a massive 33.41 per cent share in India’s fruit basket, in terms of quantity produced which was 29,725 tons in 2013-14 (Source: National Horticulture Board). Green banana flour includes a high total starch (73.4%), resistant starch (17.5%)

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and dietary fibre content (~14.5%). Due to the high content of these functional ingredients, regular consumption of green banana flour can be expected to confer beneficial health benefits for humans (Alkarkhi *et al.*, 2011 and Rodríguez-Ambriz *et al.*, 2008).

Date palm (*Phoenix dactylifera* L.) seeds contribute about 6-10% of total weight of date and 10-20% fibers (Sawaya *et al.*, 1984). Fibres are the solid insoluble part mainly composed of cellulose, hemicelluloses, and lignin. High intake of dietary fibers has been known to lower blood pressure risk improve insulin resistance in people with pre-diabetes and type 2 diabetes, and improve bowel regularity and gastrointestinal health (Clemens *et al.*, 2012). The nutritional value of date seed is based on the dietary fibre content, which makes it suitable for the development of fiber rich foods, such as bread, biscuits, and cakes; and dietary supplements (Almana and Mahmoud, 1994 and Larrauri *et al.*, 1995). In remote parts of the desert a coffee like beverage is sometimes prepared from date pits by roasting and grinding in a similar way as for coffee beans (W.H. Barreveld FAO agricultural services bulletin no. 101)

RESOURCES AND METHODS

Materials :

Whole wheat, raw banana, Dates, sugar, fat, salt, leavening agent, milk powder were purchased from local supermarket.

Methods :

Preparation of whole wheat flour :

Whole wheat flour was obtained by cleaning to evacuate soils, stones and different superfluous materials, processing the wheat grain to powder and sieving through a 0.35mm work sifter to acquire fine homogenized flour. The flour was packed in a cellophane bag and stored.

Preparation of raw banana flour (RBF) :

Raw bananas hands (stage 2 of ripening: all green) (Aurore *et al.*, 2009) were purchased from local market. Raw banana were peeled with hand peeler, even thin slices were prepared and treatment of 1% citric acid solution for 10 min, slices were dried in Tray Drier with air velocity 1.5 m/s at 60°C till it reaches to equilibrium moisture content.

Then dried slices were powdered in to mixer grinder

and sieved through 0.35 mm sieve and packed in LDPE bags and stored at dry condition.

Preparation of date seed powder (DSP) :

Dates were obtained from local market and seeds were separated. Seeds were dried at 60 °C in tray drier with air velocity 1.5m/s for 30-35 min and ground to make powder. Powder was stored in LDPE bag.

Preparation of composite mix :

Composite mix was prepared with blend of raw banana powder and date seed powder in the ratio of 4:1 (4 Part RBF and 1part DSP).

Preparation of cookies :

Whole wheat cookies were prepared and blend congaing composite mix powder in the range of 0, 5, 10 and 15 %.Dry Ingredients were sifted, all ingredients are mixed and converted into dough by kneading, moulding and shaping was carried out, cookies were baked into Oven at 150°C for about 25-30 min. Cookies were allowed to cool at room temperature and packed into LDPE bags and stored. Cookies were tested for proximate and sensory analysis in triplicate. The formulation of cookies is summarized in Table A.

Sample Proportion	S ₀	S ₁	S ₂	S ₃
Composite mix	0%	5%	10%	15%
Whole wheat flour	100%	95%	90%	85%
Total	100%	100%	100%	100%

where; S₀=Control, S₁= wheat flour: composite mix (95:5), S₂= wheat flour: composite mix (90:10), S₃= wheat flour: composite mix (85:15).

Evaluation of cookies :

Chemical analysis :

Moisture (Mettler Digital moisture analyzer), ash (method 08-01), protein (method 46-10), fat (method 30-10) and dietary fibre were determined as per the AACC (2000) method. Total carbohydrate = 100 – (fat + fibre + ash + protein). Energy (kcal) = 4.0 × protein (g) + 4.0 × carbohydrate (g) + 9.0 × fat (g) (Dhankhar, 2013).

Sensory analysis :

Cookies samples were subjected to panel members for sensory analysis on 10 point Hedonic scale for following quality parameters surface colour, texture, flavour, taste and overall acceptability.

Statistical analysis :

Proximate analysis and sensory analysis parameters were subjected to statistical analysis and the values were presented in terms of means \pm standard error (Steel and Torrie, 1980).

Physical evaluation of cookies :**Diameter :**

For the determination of the diameter, six cookies were placed edge to edge. The total diameter of the six cookies was measured in mm by using a ruler. The cookies were rotated at an angle of 90° for duplicate reading. This was repeated once more and average diameter was reported in millimeters (AACC, 2000).

Thickness :

To determine the thickness, six cookies were placed on top of one another. The total height was measured in millimeters with a ruler. The measurement was repeated thrice to get an average value and results were reported in mm (AACC, 2000).

Spread ratio :

Spread ratio was calculated as diameter (length) to thickness ratio (Dhankhar, 2013).

$$\text{Spread ratio} = \frac{\text{Diameter}}{\text{Thickness}}$$

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads and Table 1 to 3:

Proximate analysis :

Table 1 shows the moisture content, fat, ash, carbohydrate and energy values for formulations of cookies. Incorporation of date seed powder shown decreasing trend in the carbohydrate content to 55.86 % as compared to the control with 75.20%. This is due to date seed powder which is rich in fibre content. It can be concluded that as the level of composite mix increased in formula, the calorie value decreased in cookies

Table 1 : Proximate analysis of cookies formulations

Sample	%Moisture	%Fat	%Ash	%Carbohydrate	Energy (Kcal/100gm)
S ₀	9.35 \pm 0.01	1.20 \pm 0.00	1.40 \pm 0.00	75.20 \pm 0.02	360.20 \pm 0.00
S ₁	10.69 \pm 0.02	2.34 \pm 0.01	1.92 \pm 0.03	67.75 \pm 0.02	344.66 \pm 0.00
S ₂	12.00 \pm 0.00	4.48 \pm 0.04	2.44 \pm 0.02	61.30 \pm 0.05	342.32 \pm 0.01
S ₃	13.34 \pm 0.01	5.62 \pm 0.03	2.95 \pm 0.00	55.86 \pm 0.09	335.02 \pm 0.02

Values are mean \pm standard deviation of three independent determinations

Total carbohydrate = 100 - (fat + fibre + ash + protein)

Energy (kcal) = 4.0 \times protein (g) + 4.0 \times carbohydrate (g) + 9.0 \times fat (g)

Table 2 : Color analysis of cookie flour

Sample	L*	a*	b*
S ₀	83.00	1.74	12.90
S ₁	75.69	1.26	13.06
S ₂	64.68	-0.38	13.30
S ₃	56.50	-0.25	13.53

L*: lightness/darkness; \pm a*: red/blue; \pm b*: yellow/green. Values are mean \pm standard deviation of three independent determinations.

Table 3 : Sensory evaluation of cookies

Parameter	S ₀	S ₁	S ₂	S ₃
Colour	8.0 \pm 0.01	7.1 \pm 0.00	7.6 \pm 0.03	7.2 \pm 0.01
Aroma	6.5 \pm 0.02	6.7 \pm 0.02	7.5 \pm 0.02	5.6 \pm 0.00
Texture	7.7 \pm 0.03	6.6 \pm 0.02	7.5 \pm 0.01	4.8 \pm 0.05
Crispiness	7.2 \pm 0.08	6.6 \pm 0.03	7.5 \pm 0.05	5.4 \pm 0.04
Appearance	7.5 \pm 0.00	7.0 \pm 0.01	7.4 \pm 0.00	5.7 \pm 0.00
Mouth feel	6.7 \pm 0.00	7.0 \pm 0.08	7.4 \pm 0.01	5.4 \pm 0.00
Overall acceptance	7.2 \pm 0.06	7.0 \pm 0.06	7.6 \pm 0.06	5.4 \pm 0.02

Values are mean \pm standard deviation of three independent determinations

compared to control.

The protein content of fortified cookies ranged from 12.10% to 16.30% for S_0 to formulation S_3 , respectively (Fig. 1). The significant increase in protein content is due to the high protein content of whole wheat flour with addition of banana flour and date seed powder. Dietary fibre content also shown increasing trend which is higher than control sample. This increase is due to incorporation of date seed powder which is rich in dietary fibre. Increasing the percentage of date seed powder in flour protein and fibre content increased in the biscuit (El-Sharnouby *et al.*, 2012).

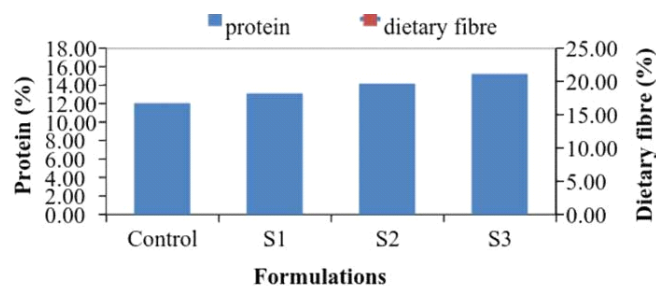


Fig. 1 : Protein and dietary fibre content of cookie formulation

Colour analysis :

The brightness (L) decreases as the concentration of the raw banana powder and date seed powder increases in wheat flour. The yellowness value (b) increased with incorporation of raw banana powder and date seed powder. The negative value (a) indicated presence of green pigments.

Sensory evaluation of cookies :

Market conditions are highly based upon the factor taste. Taste is a basic quality parameter which directly influence acceptance of product. It was found that cookies made by formulation S_2 had overall quality score 7.6 which is higher as compared to S_0 , indicating the proportion of composite mix increases the overall acceptance score decreases. Based on the above results it can be concluded that maximum 10% replacement of wheat flour with composite was produced the acceptable cookies. The data was analyzed for ANOVA. The analysis of variance (ANOVA) revealed that there was non-significant variation among the values of various sensory parameters. The values for F was found to be 2.34 and 28.59 for parameters and treatments,

respectively and values for C.D. (P=0.05) was 0.46 and for C.D. (P=0.01) 0.63 for treatments.

Physical analysis of cookies :

Spread ratio :

Cookie spread ratio is an important quality parameter, higher the spread ratio higher will be product yield. Spread ratio for control cookies was found to be 10.07 ± 0.07 where as for cookies of S_2 ; it was 8.67 ± 0.05 , which shows a decrease in spread ratio.

Conclusion :

Described cookies were studied for its nutritional as well as organoleptic properties from which it can be conclude that these cookies can be termed as functional food. It has broad sense of importance for person having obesity, high blood pressure and can be helpful to reduce risk of diabetes type-B. As these cookies contains high fibres.

From study it is revealed that 10% level replacement of composite mix is acceptable by organoleptic evaluation.

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