

Studies on development and quality evaluation of composite flour cookies

S. D. Katke, G.R. Pandhare and P.S. Patil

The present investigation focuses on standardization the process for composite flour (Oat and wheat flour) cookies and its quality evaluation. Cookies were fortified with oat flour at 0, 20, 40, 60, 80 and 100 per cent level of incorporation. The product prepared was evaluated for colour, flavour, taste, texture, appearance and overall acceptability using semi-trained panel members on 9 point hedonic rating. It can be concluded that the oat flour can be used successfully in preparation of cookies at the replacement level of 80 per cent and 100 per cent levels without any undesirable changes in physical, chemical and organoleptic attributes of cookies.

Key Words : Composite flour, Oat cookies, Composite flour cookies, Diabetic cookies

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INTRODUCTION

Baking industry in India is considered as one of the major industries in food processing. Baking products are gaining popularity as processed foods because of their availability, ready to eat convenience and reasonably good shelf life. Among the bakery products, cookies are most significant. Cookies are important food snacks for children and adults. Cookies hold an important position in snack foods due to variety in taste, crispiness and digestibility. Commercially available cookies are prepared from white flour that is nutritionally inferior to whole wheat flour (Hussain *et al.*, 2006). The word cookie is derived from

the Dutch word “koekje” or (informal) “koekie” which means little cake, and arrived in the English language through the Dutch in North America. Cookies are made in a wide variety of styles using an array of ingredients including sugars, spices, chocolate, butter, peanut butter, nuts or dried fruits. The softness of the cookie may depend on how long it is baked (Abdul Waheed *et al.*, 2010). “Cookie” is chemically leavened product also known as ‘biscuit’. Generally the term biscuit is used in the European countries and cookies in the USA. Biscuits and biscuit like products have been made eaten by man for centuries (Hosney, 1986). Oat it is rich source of dietary fibre after barley. More importantly, oats are high in soluble fibre, specifically β -glucan, which reduces blood cholesterol levels by increasing the excretion of bile in the body (Jenkins and Kendall, 2002). Food and drug administration has claimed that oat and oat products containing soluble fibres from foods such as oat bran, rolled oats, or oatmeal and whole oat flour, as part of a diet low in saturated fat and cholesterol, may reduce the risk of heart diseases. Hence, the new food guide pyramid

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lead to use diet based on a higher consumption of whole grains. Whole grain flour to reduce or lower the rate of heart disease and obesity, in the United States (Jenkins and Kendall, 2002). The nutritional composition of oat per 100g indicates, carbohydrate 66g, dietary fibre 11g, fat 7g, protein 17g, pantothenic acid (B5) 1.3 mg, iron, 5mg, magnesium 177 g and β -glucan 4g. In addition to this it is also a rich source of amino acids, B vitamins (such as thiamin, riboflavin, niacin and pantothenic acid) and many minerals (calcium, magnesium, phosphorus, potassium, sodium and iron) (Marquart and Coben, 2005). Besides being high in both soluble and insoluble fibre and a good source of essential fatty acids, protein, minerals and vitamins, the bran contains most of the antioxidants found in the oat groat kernel (Peterson, 2001). Antioxidants help in maintaining the stability of processed oat products and can stabilize oils and fats against rancidity (Peterson, 2001). The types of antioxidants oat bran contains include: tocopherols, tocotrienols, sterols, avenanthramides (unique to oats), p-hydroxybenoic acid, and vanillic acid. Therefore consumption of oat could be a significant dietary source for the above listed compounds (Chen *et al.*, 2004).

METHODOLOGY

Wheat flour, oat flour, sugar, fat, baking powder, ammonium bi-carbonate, sodium bi-carbonate and glucose were procured from local market.

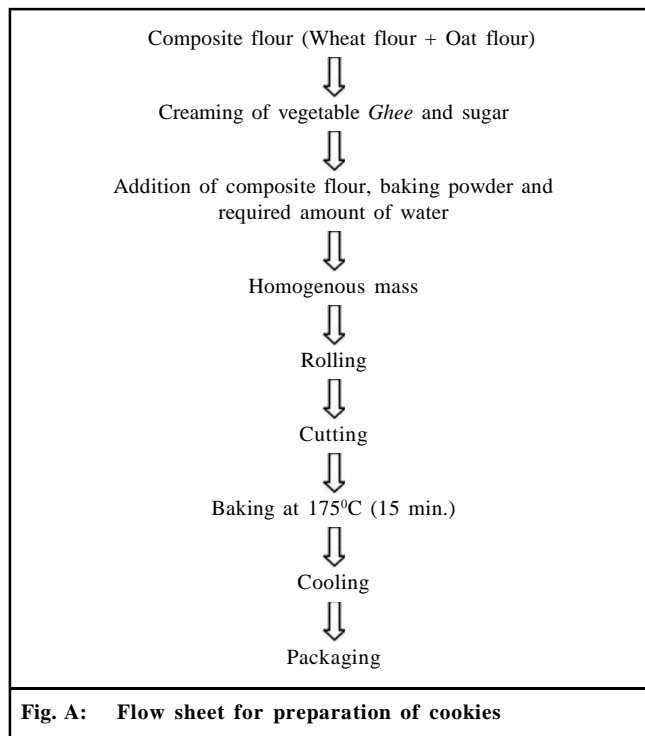
Preparation of composite flour:

Composite flour utilized in the preparation of oat and wheat flour cookies was prepared by the blending of an appropriate proportion of oat flour with wheat flour.

Samples	Wheat flour (%)	Oat flour (%)
S ₁	100	0
S ₂	80	20
S ₃	60	40
S ₄	40	60
S ₅	20	80
S ₆	0	100

Recipe formulation for composite flour cookies:

The oat and wheat flour cookies were prepared using the basic formula of Gaines and Tsen (1980) as under.



Ingredients	Quantity (g)
Flour	100
Sugar	35
Shortening	33
Salt	01
Glucose	01
Sodium bi-carbonate	0.25
Ammonium bi-carbonate	0.20
Water	As per requirement

OBSERVATIONS AND ASSESSMENT

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Physical properties of composite flour cookies:

Physical analysis of oat cookies is important from both consumers as well as manufactures point of view and it is desirable that cookies should retain their shape during baking. Oat and wheat flour cookies along with control were analyzed for physical characteristics including weight, diameter, thickness and spread factor and results are presented in Table 1.

It is evident from this table that weight of the cookies decreased progressively with increasing level of oat flour

supplementation. The control were having higher weight 10.80g (S₁) as compared to 100 per cent oat flour 10.75 (S₆). These results were in agreement with following composite cookies (Akpapunam and Darbe, 1994). It is evident from the table that effect of various treatments on width of cookies showed an increasing trend with the proportionate increase of oat flour supplementation. The results elucidated that cookies with 0 per cent oat flour (S₁) exhibits minimum diameter 4.20 cm, while maximum diameter was observed in cookies containing 100 per cent oat flour (S₆) 4.38 cm, followed by cookies containing 80 per cent oat flour (S₅) 4.32 cm.

The results pertaining to thickness of the cookies revealed decreasing trends with proportionate increase of oat flour in the composite cookies. The cookies with 0 per cent oat flour (S₁) and 20 per cent oat flour exhibited maximum thickness 0.82 cm, while minimum thickness *i.e.* 0.75 cm was observed in cookies with 100 per cent oat flour (S₆). Further it can be revealed from the Table 1 that there was an increasing trend in the spread ratio of cookies prepared from different treatments ranged from

53.20 to 58.50. The maximum top grain was found in cookies with 80 per cent oat flour (S₅) and cookies with 100 per cent oat flour (S₆) as compared to cookies with 0 per cent oat flour or control (S₁). The top grain was prominently observed in the sample contains 80 per cent oat flour (S₅) and 100 per cent oat flour (S₆).

Chemical composition of composite flour cookies:

The results of the proximate composition of the cookies contains different levels of oat flour are presented in the Table 2.

The results shows that cookies with 100 per cent oat flour (S₆) had the lowest moisture contents 3.35 per cent while cookies with 0 per cent oat flour (S₁) had more moisture contents 4.65 per cent. Ash content in a food substance indicates inorganic remains the organic matter has been burnt away. Ash content varied significantly from 1.50 to 1.60 per cent in oat fortified cookies. Addition of oat flour in composite cookies showed a significant effect on protein content of the final product. Cookies with 100 per cent oat flour (S₆) contains higher

Table 1: Physical properties of oat and wheat flour cookies

Sample	Weight (g)	Diameter (cm)	Thickness (cm)	Spread factor	Top grain
S ₁	10.80	4.20	0.82	53.20	Rare
S ₂	10.80	4.25	0.80	53.25	Rare
S ₃	10.79	4.28	0.78	55.00	Rare
S ₄	10.78	4.30	0.78	55.25	Moderate
S ₅	10.77	4.32	0.76	57.25	Most
S ₆	10.75	4.38	0.75	58.50	Most
Mean	10.79	4.30	0.77	55.37	---
S.E. ±	0.22	0.18	0.21	0.36	---
C.D. (P=0.05)	0.70	0.56	0.66	1.12	---

* Each value is an average of three determinations

Table 2 : Chemical composition of composite flour cookies

Sample	Moisture %	Ash %	Crude protein %	Crude fat %	Crude fibre %	Carbohydrate %
S ₁	4.65	1.50	9.35	21.55	1.45	61.60
S ₂	4.45	1.52	9.45	22.95	1.85	59.85
S ₃	4.15	1.51	10.52	22.98	2.25	59.65
S ₄	3.85	1.55	11.60	23.20	2.90	57.55
S ₅	3.50	1.56	12.85	23.25	3.05	54.90
S ₆	3.35	1.60	13.65	25.35	3.55	52.15
Mean	3.98	1.54	11.93	23.21	2.51	57.64
S.E. ±	0.023	0.023	1.39	0.022	0.022	0.024
C.D. (P=0.05)	0.071	0.072	4.27	0.069	0.068	0.075

* Each value is an average of three determinations

protein 13.65 per cent followed by cookies with 80 per cent oat flour (S_3) contains 12.85 per cent while cookies with 0 per cent oat flour or control, (S_1) contains 9.35 per cent. The results of the present investigation are in conformity with the findings of Wade (1998); Pasha *et al.* (2002) and Butt *et al.* (2004). The increase in fat content from 21.55 to 25.35 per cent in the final product with increase in percentage level of oat flour may be due to higher percentage of fat content in oatmeal used for fortification. Results of present research are in accordance with the finding of Mahmood *et al.* (2008). The means for crude fibre content of oat flour fortified cookies showed that fibre content increased with the increase in different levels of oat flour (0 to 100%) ranging from 1.45 to 3.55 per cent. The means for carbohydrate content of cookies showed that carbohydrate content decreased with increase in the different levels of oat flour ranging from 61.60 to 52.15 per cent. The decrease could be due to the low content of carbohydrate in the add oat

flour which agreed with the finding of Iwe (2003).

Sensory evaluation of composite flour cookies:

The prepared cookies were evaluated for its quality and sensory acceptability using 9 point hedonic scale. The cookies were evaluated with respect to colour, flavour, taste, texture, appearance and overall acceptability.

The sensory score is presented in Table 3. It can be revealed from Table 1 that there was increase in sensory score with the addition of oat flour in the product. Addition of oat flour improved flavour, taste, texture, appearance, overall acceptability of the final product.

There is no much change in color of the product by the addition of oat flour. The colour values ranged between 6.40 (S_1) to 6.55 (S_6). Flavour is main criteria that make the product to be liked or disliked. The data for flavour revealed that there was progressive increase in improvement of flavour from 7.75 (S_1) to 8.75 (S_6).

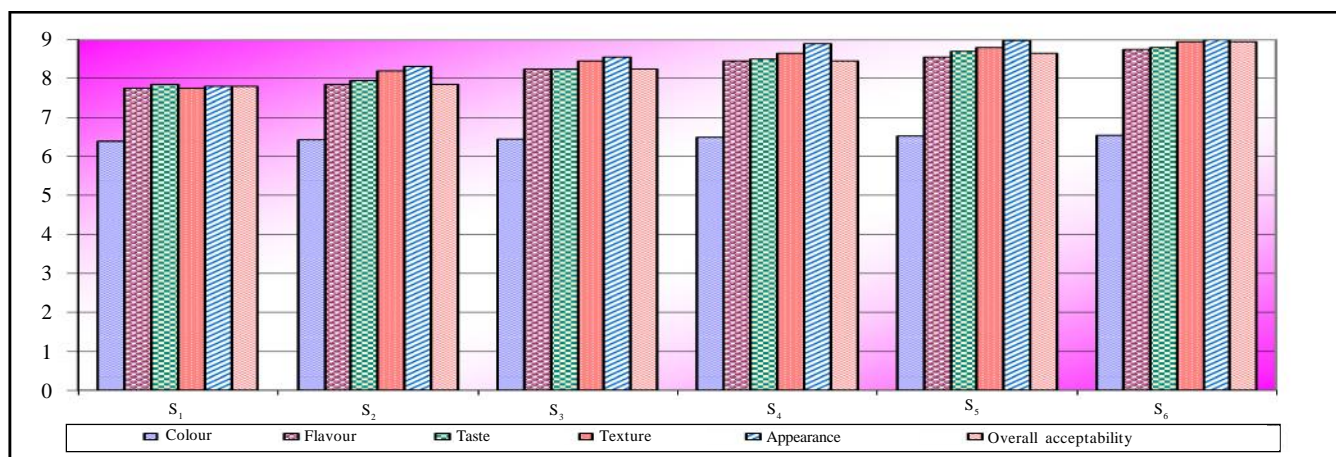


Fig. 1: Sensory qualities of composite flour cookies

Treatments	Colour	Flavour	Taste	Texture	Appearance	Overall acceptability
S_1	6.40	7.75	7.85	7.75	7.80	7.80
S_2	6.42	7.85	7.95	8.20	8.31	7.85
S_3	6.45	8.25	8.25	8.45	8.55	8.25
S_4	6.50	8.45	8.50	8.65	8.89	8.45
S_5	6.52	8.55	8.70	8.80	8.98	8.65
S_6	6.55	8.75	8.80	8.95	9.00	8.95
Mean	6.45	8.09	8.31	8.47	8.58	8.28
S.E. \pm	0.021	0.066	0.029	0.048	0.14	0.047
C.D. (P=0.05)	0.067	0.20	0.089	0.15	0.46	0.14

Taste is most essential parameter related to acceptability of the product. The average taste score was also progressively improved with the addition of oat flour in composite cookies 7.85 (S₁) to 8.80 (S₆). Similarly texture and crispiness were improved greatly with addition of oat flour in the composite cookies. As there was increase in all these parameters with the addition of oatmeal in the composite cookies. The overall acceptability parameter also scored maximum at highest level of addition of oatmeal in the composite cookies. The overall acceptability ranged from 7.80 (S₁) to 8.95 (S₆).

Calorific value of composite flour cookies:

It can be seen from table that calorific values are presented in Table 4. Calorie content increased with increase in percentage of oat flour of cookies. The increase in calorie content could be due to the high fat content of the added flour.

Sample	Calorie (Kcal/g)
S ₁	477.50
S ₂	483.55
S ₃	485.85
S ₄	485.86
S ₅	486.90
S ₆	491.85

Conclusion:

Cookies were fortified with oat flour at 0, 20, 40, 60, 80 and 100 per cent level of incorporation. The product prepared was evaluated for colour, flavour, taste, texture, appearance and overall acceptability using semi-trained panel members on 9 point hedonic rating. The sensory score revealed that replacement of oat flour has significant effect on almost all the characteristics of the cookies. However, textural qualities and appearance was improved to greater extent than all other samples. All the judges rated maximum the cookies with 80 and 100 per cent replacement of oat flour as compared to control sample. Thus in the light of the scientific data of the present investigation, it may be concluded that the oat flour can be used successfully in preparation of cookies at the replacement level of 80 per cent and 100 per cent levels without any undesirable changes in physical, chemical and organoleptic attributes of cookies.

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