

PRODUCT DEVELOPMENT AND SENSORY EVALUATION OF FOOD REMNANT BASED LOW COST FIBER RICH FOODS

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Abstract

Background: Recently new cereal based fibre rich food products have been developed by many food industries. But they are of high cost. Objective: In view of this, an attempt was made to utilize remnant of foods (fruit pomace and cauliflower greens) to develop low cost fibre rich products for people suffering from obesity, diabetes and hypercholesterolemia and to assess the sensory quality of developed products. Material and Methods: In the present study, fruit pomace and cauliflower greens were used at the level of 5%, 10% and 15% in the development of Chappati, pancake, buns and cookies whose acceptability was evaluated on 9-point hedonic scale. Results: The results of the study revealed that with increase in level of fruit pomace in Chappati, cookies and pancakes, no significant difference ($p \leq 0.05$) was found in the acceptability of colour, flavor and texture and all were acceptable at all level of supplementation. However, the acceptability for texture of buns was decreased significantly ($p \leq 0.05$). Similarly, Chapatti and pancakes supplemented with cauliflower greens were acceptable at all levels of supplementation but supplementation of cauliflower greens decreased the overall acceptability of cookies and buns. Conclusions- The products supplemented with fruit pomace were more acceptable than cauliflower greens. Both these food remnant can be efficiently used at home as well as commercial level to formulate fibre rich low cost health foods.

Keywords: Cauliflower greens, pomace, sensory acceptability, food remnant

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1. INTRODUCTION

Dietary fiber can be defined as an edible part of plants that cannot be digested or absorbed by humans and have complete or partial fermentation in the large intestine. Dietary fiber has beneficial physiological effects such as laxation and blood cholesterol and blood glucose reduction.

Indian diet primarily comprises of plant foods but foods available should have good quality fibre to obtain its recommended levels. Currently, there is a great variety of raw materials such as processing by-products, from which dietary fiber can be obtained [Femenia et al., 1997]. Many studies have been conducted to utilize the dietary and functional properties of fiber and many high dietary fiber formulated foods such as high fiber baked and extruded products are currently being developed [Tudorica et al., 2002]. But the main emphasis has been given on incorporation of cereal and pulse husk. But now researches have made it clear that the fruits and vegetables have

higher level of cellulose than cereals [Kumari and Grewal, 2007].

The industry of fruit juice produces significant amounts of by-products which could cause problems in their disposal but these products have only use in animal feeding. These by-products have great potential in developing new natural ingredients rich in fibre for the food industry [Sudha et al., 2007].

Researchers have found that fruit pomace is other source with beneficial dietary fiber and antioxidants that could turn by product into commercially viable food supplements. The dried material of pomace can be crushed into powder and used as a food ingredient [Gorinstein et al., 2001]. Cauliflower greens also come in this category of waste products which are often neglected. It is always that stalks are used for human consumption and leaves are discarded and become a part of animal feed. Cauliflower greens are good source of iron, calcium and dietary fiber [Gopalan et al., 2000].

Considering all these facts and results of past studies, a need was felt to evaluate functional properties of low cost fiber sources (fruit pomace and cauliflower greens) obtained from waste of foods, in order to use them as a potential fiber sources in the enrichment of foods. Therefore, the present study was designed to explore fruit pomace and cauliflower greens as a source of fiber to develop low cost- high fiber foods and to assess their sensory quality.

2. MATERIALS AND METHODS

Pomace and cauliflower were procured from local juice bar and vegetable seller. Seeds were separated from pomace by visual examination. The fruit pomace and cauliflower greens were used and the level of 5%, 10% and 15% of supplementation. The product developed were *Chappati*, pancakes, cookies and bread. Cookies were prepared by using margarine instead of shortening and pancakes were cooked plain without stuffing on nonstick. *Tava* to avoid the use of fat.

Sensory evaluation - The sensory evaluation was conducted by using a panel of judges for evaluating the sample on a 9- point hedonic scale ranging from 0-9 points [Lormond, 1977]. The judges recorded the judgment according to their experience and knowledge of the state of quality of the products. Mean scores for each attribute were calculated by summing up the scores of judges and divided by the number of attributes. The statistical effects were assessed in Complete Randomized Design (CRD) with the help of computer software. Data were compared at 5 per cent level of significance [Gupta, 1899].

3. RESULTS AND DISCUSSION

Sensory acceptability of products supplemented with pomace

The data regarding sensory acceptability of *Chappati* supplemented with pomace is presented in Table 1. As evident from data, there was no significant ($p \leq 0.05$) difference in the acceptability of color, flavor and texture of

the treatments. All the supplemented samples were rated as acceptable by panel of judges. The control sample was liked very good (8) while treatments were liked moderately (7.5-7.8) for colour. While for flavor and texture, there was no variation i.e. all samples were moderately acceptable. The rating for control sample was 7.7 and 7.6 for flavor and texture while the sample with 15% pomace (T_3) was rated as 7.2 and 7.1 for flavor and texture.

In case of pancakes, the sensory acceptability followed the same trend as of *Chappati* i.e. the control sample was adjudged as liked moderately (7) on 9-point hedonic scale for colour, flavor and texture while supplemented samples were rated in scale of liked slightly (6) only the sample with 5% pomace (T_1) was rated as liked moderately (7) for flavour. The reason for this may be overlapping of flavor of *Besan* by fragrant flavor of fruit and its pomace which has enhanced the flavor in pancakes. While the rating for samples with 10 and 15% of pomace (T_2 and T_3) for flavor was 6.9 and 6.6.

The data regarding acceptability of cookies as in Table reveals that the control sample was more acceptable in case of colour and was rated as liked very much (8.2) as compared to treatments which were rated as 7.6, 7.3 and 7.1. A perusal of the data revealed that sensory scores of supplemented samples for flavor and texture were equal i.e. liked moderately and there was no significant difference in overall scores obtained for different treatments i.e. T_1 , T_2 and T_3 (7.9, 7.6 and 7 and 7.9, 7.4, 7.3 and 7.2, respectively).

The scrutiny of data in the Table regarding acceptability of bread supplemented with pomace revealed that sensory scores were significant ($p \leq 0.05$) for overall acceptability with different treatments. It is clear from Table that control sample (T_0) was rated higher (8, 8 and 7.9 for colour, flavor and texture) than other samples. Sample with 5% pomace (T_1) was rated high than T_2 and T_3 sample (7.4, 7.4 and 7.5 for colour, flavor and texture, respectively). But the supplementation was not acceptable after 5% level.

Similar results were obtained by Massoodi and Chauhan [Masoodi et al., 2002] who prepared

bread by incorporating 2, 5, 8 and 11 per cent pomace in wheat flour. The sensory scores revealed that breads containing up to 5 per cent pomace were acceptable.

Supplementation with cauliflower greens

The sensory evaluation of *Chappati* supplemented with cauliflower greens is presented in Table 2. As evident from data, all supplementation levels were significantly ($p \leq 0.05$) acceptable. It is clear from the data that color acceptance of control sample was higher (8.5) than supplemented samples. Color acceptability of *Chappati* supplemented with cauliflower greens decreased with increase in levels of cauliflower greens i.e. 8.5, 7.4, 7.2 and 7 for T_0 , T_1 , T_2 and T_3 samples, respectively. In case of flavor, all samples were equally rated as liked moderately and there was no difference in flavor between different treatments. In case of texture, samples supplemented with 5 and 10% cauliflower greens i.e. T_0 and T_1 were rated as liked very much with almost similar values i.e. 8.4 and 8.1, respectively. The data also reveals that T_2 and T_3 had same rating 7.5 (liked moderately). Scrutiny of further data from the Table reveals that there was no significant ($p \leq 0.05$) difference in the sensory acceptability of pancakes supplemented with different levels of cauliflower greens. In case of color, control sample was rated higher as liked very much (8.1) in contrast to other samples. Data also conclude that T_1 , T_2 and T_3 were rated as liked moderately with minimum difference in their respective scores. In case of flavor, the acceptability rate was decreasing with increase in levels of cauliflower greens. Maximum score was obtained for control sample i.e. 8 whereas sample with 15 % level of cauliflower greens (T_3) was scored as 6.8. In case of texture, the control sample, T_1 and T_3 were rated higher as liked moderately. But T_2 was rated as liked slightly (6.7). Overall acceptability of all samples was equally rated as liked moderately. Cookies supplemented with 5, 10 and 15% cauliflower greens were equally accepted as

liked slightly and corresponding scores for these parameters were 6.6, 6.7 and 6, respectively. In case of flavor, control sample was rated higher as liked moderately (7.3) in contrast to other samples. Samples supplemented with 5 and 10% cauliflower greens i.e. T_1 and T_2 were rated as liked slightly. Minimum acceptability was for T_3 (5.3) and was rated as neither liked nor disliked. It is clear from Table that as level of cauliflower was increasing, the acceptability of samples was decreasing. Similarly, in case of texture, the control sample was rated higher as liked moderately (7) as compared to other samples. Data also revealed that T_1 (5% cauliflower greens) was rated as liked slightly (6.6). The texture of T_2 and T_3 i.e. cookies supplemented with 10 and 15% was least acceptable (5.9 and 5.5). Overall acceptability of cookies supplemented with 5 and 10% cauliflower was rated as liked slightly whereas the overall acceptability of T_3 (15% cauliflower greens) was rated as neither liked nor disliked (5.6).

The scrutiny of data in the Table reveals that color acceptance of control bread was 8.3 (liked very much). Bread supplemented with 5% cauliflower green was liked slightly (6.4) for color. Color of T_2 and T_3 i.e. bread supplemented with 10 and 15% cauliflower was scored as disliked slightly (4 and 4.3, respectively). In case of flavor, control sample was rated as liked moderately (7.8). T_1 was rated as neither liked nor disliked (5.5) while T_2 and T_3 were disliked moderately with scores 3.3 and 3.4, respectively. All most similar results were obtained in case of texture where control sample was rated higher as liked very much. Sensory acceptability of T_1 was rated as liked slightly (6.8), T_2 was neither like nor dislike (5.1) and T_3 was rated as disliked slightly (4.6).

Similar results were obtained by Towseef *et al.* [towseef et al., 2011] when cauliflower green powder was supplemented in noodles.

Table 1 Sensory acceptability of fruit pomace based products

Attributes`	T ₀	T ₁	T ₂	T ₃	Mean	CD (p≤0.05)
<i>Chappati</i>						
Color	8	7.8	7.5	7.5	7.7	0.60
Flavor	7.7	7.2	7.3	7.2	7.35	0.63
Texture	7.6	7.4	7.4	7.1	7.37	0.71
Overall acceptability	7.76	7.46	7.40	7.26	7.47	0.63
<i>Pancakes</i>						
Color	7	6.9	6.9	6.8	6.9	0.98
Flavor	7	7	6.9	6.6	6.87	0.71
Texture	7.1	6.9	6.9	6.4	6.82	0.55
Overall acceptability	7.03	6.93	6.90	6.6	6.86	0.81
<i>Cookies</i>						
Color	8.2	7.6	7.3	7.1	7.55	0.07
Flavor	7.9	7.6	7.6	7	7.52	0.40
Texture	7.9	7.4	7.3	7.2	7.45	0.62
Overall acceptability	8.0	7.53	7.4	7.1	7.50	0.32
<i>Bread</i>						
Color	8	7.4	6.9	6.9	7.30	0.20
Flavor	8	7.4	6.7	6.2	7.07	0.06
Texture	7.9	7.5	6.8	6.2	7.1	0.07
Overall acceptability	7.96	7.43	6.8	6.43	7.17	0.04*

T₀= 0% pomace, T₁= 5% pomace T₂= 10% pomace, T₃= 15% pomace

Table 2 Sensory acceptability of cauliflower green based products

Attributes	T ₀	T ₁	T ₂	T ₃	Mean	CD (p≤0.05)
<i>Chappati</i>						
Color	7.5	7.4	7.2	7	7.28	0.09
Flavor	7.5	7.5	7.1	7.1	7.30	0.80
Texture	8.4	8.1	7.5	7.5	7.88	0.15
Overall acceptability	7.8	7.67	7.27	7.20	7.49	0.15
<i>Pancakes</i>						
Color	8.1	7.6	7.4	7.1	7.55	0.54
Flavor	8	7	6.9	6.8	7.18	0.30
Texture	7.8	7.8	6.7	7.3	7.4	0.51
Overall acceptability	7.97	7.47	7	7.07	7.38	0.51
<i>Cookies</i>						
Color	7.7	6.7	6.6	6	6.75	0.06
Flavor	7.3	6.5	6	5.3	6.28	0.03*
Texture	7	6.6	5.9	5.5	6.35	0.10
Overall acceptability	7.33	6.6	6.17	5.60	6.46	0.04*
<i>Bread</i>						
Color	8.3	6.4	4.3	4	5.75	0.04*
Flavor	7.8	5.5	3.4	3.3	5	0.05*
Texture	8.3	6.8	5.1	4.6	6.2	0.01*
Overall acceptability	8.13	6.23	4.27	3.97	5.65	0.03*

T₀= 0% CG, T₁= 5% CG, T₂= 10% CG, T₃= 15% CG

4. CONCLUSIONS

The cauliflower greens and fruit pomace both are efficient sources of dietary fibre. The products supplemented with fruit pomace were more acceptable than cauliflower greens. The study concludes that though the increase in levels of both food remnants was decreasing acceptability but their acceptable level can be efficiently used at home as well as commercial level to formulate fibre rich low cost health foods.

5. REFERENCES

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