



DEVELOPMENT AND SENSORY EVALUATION OF HIGH FIBER RECIPES

Minori Ramteke & Prajakta Nande

Post Graduate Department of Home Science
Rashtrasant Tukadoji Maharaj Nagpur University, Jyotiba Phule Campus,
Amravati Road- 440033, Nagpur (Maharashtra)

ABSTRACT

Dietary fiber is steadily gaining importance in human diet. Beneficial effects of dietary fiber have been attributed to its role in modifying some of the physiological activities in the body. It is useful in the prevention and treatment of chronic diseases such as coronary heart disease, obesity, diabetes and certain cancers. Keeping all these in view, a study was conducted on development and sensory evaluation of fiber rich recipes. Six recipes namely, green gram whole & cabbage tikki, oats thalipeeth, bajra daliya, barley halwa, brown rice kheer, and sweet carrot poori were standardized. Sensory evaluation was conducted in three trials by six judges. Score cards with keys were developed. Nutritive values of the recipes were calculated, along with total, soluble and insoluble fiber content. Recipes were analyzed for crude fiber content. All sweet & savoury recipes were very well accepted for all sensory attributes. Crude fiber content of recipes ranged between 3.00 to 7.50 g/100 g. It is concluded that fiber rich recipes were successfully developed without affecting sensory quality.

Keywords: Sensory evaluation, soluble fiber, insoluble fiber, crude fiber.

INTRODUCTION

An energy-dense diet low in dietary fiber, common in many parts of the world today, is believed to play a major role in the development of conditions such as obesity, cardiovascular disease and type 2 diabetes. Eben Hipsley was probably the first to use the term “dietary fiber” to describe non-digestible plant cell walls in 1953, and in the 1970s, Dennis Burkitt and Hugh Trowell adopted

Hipsley’s term in association with beneficial effects on cardiovascular disease, type 2 diabetes and cancer. Today, dietary fiber is one of the most widely studied food components. (Kaczmarczyk, M. M. et al., 2012; Anderson, J. W. et al., 2009). Dietary fiber is a mixture of plant carbohydrate polymers, consisting of polysaccharides and oligosaccharides, as well as hemicelluloses, cellulose, resistant starch, pectin substances, inulin,



and gums. Plant foods are the only sources of dietary fiber (AACC Report, 2001).

Studies show that dietary fiber plays a pivotal role in the human diet. Available epidemiological studies indicate that dietary fiber intake lowers the risk of individuals developing obesity and certain kinds of cancers. High content of fiber in the diet provides a plethora of health benefits, including prevention of diabetes, heart disease, certain cancers, and weight gain. In addition, dietary fiber can also enhance digestive health. A number of health benefits are linked to dietary fiber, among them are-promoting healthier bowel function, decreasing blood cholesterol level and controlling blood glucose level. Dietary fiber increases the volume of stools as well as softening them, thereby preventing constipation and, at the same time, maintaining bowel health. Moreover, insoluble dietary fiber lowers transit time, limiting how long harmful substances could come into

contact with the intestinal walls. In addition to promoting healthier bowel function, dietary fiber also plays a crucial role in regulating blood sugar level. Soluble dietary fiber contributes to slowing down the release of sugar from the digested food into the blood stream. This indirectly helps to prevent rapid rises in blood sugar level which often result in the development type of 2 diabetes (Bessesen, D. H., 2001; Friedman, G., 1998).

In this era of global industrialization and advancement of technologies, the life style of the people has changed a lot. In this changing life style, the demand for ready to eat foods like extruded foods has increased. Among ready to eat foods, junk foods form an important part of Indian diet. These products are rich in starch, fat and energy but depleted in fiber. Various epidemiological studies have shown that the diet lacking in fiber may be the cause of various gastrointestinal and cardiovascular diseases (Chauhan, A. & Intelli, 2015; Lupton, J. R. &



Turner, N. D., 2003). Dietary fiber is currently considered a critical ingredient in food products. Present study deals with the development of fiber rich recipes.

METHODOLOGY

The study deals with the development & sensory evaluation of fiber rich products. For this, three savoury (green gram whole & cabbage tikki, oats thalipeeth & bajra daliya) & three sweet recipes (barley halwa, brown rice kheer & carrot poori) were standardized.

Tables 1 to 6 show composition of ingredients for green gram whole & cabbage tikki, oats thalipeeth, bajra daliya, barley halwa, brown rice kheer & sweet carrot poori, respectively. Standard methods were followed for preparation of the recipes.

Sensory Evaluation of Recipes:

Sensory evaluation of recipes was done in three palatability trials by six trained judges for appearance, colour, texture/consistency, flavour, taste and acceptability. Scoring was done for maximum score of 10 to a minimum score of 4 for all sensory attributes (10-very

good, 8-good, 6-fair and 4-poor). Table 7 shows key used for conducting sensory testing of recipes.

Calculation of Nutritive Value of Recipes:

Nutritive value of each recipe was calculated using standard reference food composition tables (Gopalan, C. et al., 2012 & [ndb.nal.usda.gov/-](http://ndb.nal.usda.gov/)).

RESULTS AND DISCUSSION

Table 8 shows mean palatability score for the recipes.

Green Gram Whole & Cabbage Tikki

The appearance of the tikki was good but due to coarse grinding of the green gram whole, the appearance was rated slightly lower than its colour (9.78). The colour of the tikki scored highest mean score of 9.89 which was due to greenish color of whole green gram. The texture of tikki was firm yet soft & well cooked. Tikki was well accepted for its flavour & taste (mean score 9.78 & 9.56). The tikki was well accepted with the mean score of 9.78 for its overall acceptability (Table 8).



Oats Thalipeeth

Oats have received considerable attention for their high content of dietary fibres, phytochemicals and nutritional value. It is believed that consumption of oats possesses various health benefits such as hypocholesterolaemic and anti-cancerous properties. Oats have also recently been considered suitable in the diet of celiac patients. Owing to their high nutritional value, oat-based food products like breads, biscuits, cookies, probiotic drinks, breakfast cereals, flakes and infant food are gaining increasing consideration (Rasane, P. et al., 2015).

For this study, oats thalipeeth was prepared. The mean palatability score for appearance of thalipeeth was 9.89. The thalipeeth was colourful with a nice yellowish & brownish colour (mean score for colour was 9.67). Oat bran and fenugreek leaves when mixed together became slightly sticky & hence, required more time to get fully cooked & to get the firm texture (mean score of 9.45). As

seen from Table 8, oats thalipeeth was very well accepted for taste & flavour.

Bajra Daliya

Vaijapurkar, K. R. et al. (2013) used bajra for making biscuits as it is rich in protein, calcium & dietary fibre.

For the present research, bajra was utilized for making daliya. From Table 8, it can be clearly seen that overall acceptability of daliya was 100% (mean score-10). Identical mean scores (9.67 for 'very good to excellent') were given by judges for appearance & colour of daliya. Daliya was found to be colourful because of addition of various ingredients. Daliya was perfectly cooked, with mean score of '10'. Flavour & taste of daliya was rated 'very good to excellent' by judges (9.89). Addition of bajra, wheat bran, oat bran along with different vegetables can lead to quality preparation of high fiber daliya.

Sheth, A. & Sengupta, R. (2015) developed high fiber muthia for diabetics by incorporating broken wheat daliya.



Barley Halwa

Halwa was prepared using flour of whole barley with husk. Appearance of halwa was rated as 'very good' with mean score of 9.45 (Table 8). Mean score for colour of halwa was 9.56 which was due to the addition of jaggery which imparted dark golden brown colour to halwa. Barley (husked) flour imparted slightly grainy yet soft texture to halwa, which scored mean of 9.56. Barley halwa was appreciated for its flavour & colour (mean scores 9.56 & 9.45, respectively). The overall acceptability of the halwa was found to be very good, with mean score of 9.45 as also seen from Table 8. One can prepare high fiber sweet dish like barley halwa.

Brown Rice Kheer

From Table 8, it is noted that appearance & colour of brown rice kheer was very well accepted by judges. Colour of kheer received mean score of perfect "10" (excellent). Kheer was slightly caramelized in colour because of addition of brown rice. Consistency of kheer was thick & creamy, with

mean score 9.45. This was because of addition of oats. Identical mean scores were given for flavour & taste of kheer (9.89). Addition of coconut milk gave specific taste to this sweet product which increased its flavour & taste profile. Kheer made out of brown rice was well accepted by the judges (mean score-9.89, Table 8).

Sweet Carrot Poori

Appearance & colour of sweet carrot poori was liked very much by judges because of bright red orange colour (9.56 & 9.78, respectively, Table 8). Poori was found to be slightly thick & it did not puff because of addition of carrot & wheat bran. However, because of addition of boiled & mashed carrot its texture was also well accepted with mean score of 9.67. Flavour & taste of poori were enhanced by addition of cinnamon powder (9.67 & 9.56, respectively). Poori made out of fiber rich ingredients was very well accepted by the judges (9.67, Table 8).

Nutritive Value of Recipes

Table 9 shows nutritive value of recipes.



Soluble fiber content (SDF) was found to be in the range of 2.21 to 29.23 g/100g of recipe. Bajra daliya & sweet carrot poori were found to be high in SDF content as also seen from Table 9 whereas green gram whole & cabbage tikki was found to be very good in its insoluble fiber (IDF) content (12.3%). IDF content of recipes was found to be ranged from 4.95 to 12.3%. Addition of different food sources of SDF & IDF increased the fiber content of these recipes. One can add or reduce the quantities of needed ingredients to match the fiber requirement.

Crude Fiber Content of Recipes

An attempt was made to analyse the recipes for their crude fiber content. Figure 1 presents data on crude fiber content of recipes.

Crude fiber content in halwa was found to be highest followed by kheer & carrot poori (Figure 1). It was seen that sweet recipes showed higher crude fiber content than savoury recipes. Crude fiber content of barley halwa, brown rice

kheer & sweet carrot poori was estimated as 7.50, 7.09 & 6.33%, respectively (Figure 1). Among savoury recipes, thalipeeth showed higher crude fiber content followed by tikki & daliya (4.86, 3.11 & 3.00%, respectively).

Norazmir, M. N. et al. (2014) incorporated whole wheat flour & carrot for developing nutritious high fiber chips, the crude fiber content of which was analyzed as 7.5 ± 0.141 %. Bora, P. & Kulshrestha, K. (2014) incorporated green gram husk in paratha which contained 4% crude fiber.

Dietary fiber is the indigestible component of plant foods. Although fiber is not a magic bullet that can prevent or cure everything from cancer to indigestion, research does suggest that the typically low fiber diets consumed may contribute to such widespread illness as coronary artery disease, diabetes, and diseases of the large intestine including cancer. From the results of the present study, it is concluded that different recipes



high in fiber can be prepared using variety of ingredients without affecting the sensory characteristics. Usually savoury items are emphasized for making them high in fiber. But present study attempted to prepare sweet recipes using fiber rich ingredients & the sensory attributes were found to be unaffected. These high fiber savoury recipes can serve as

a boon for diabetics & obese persons whereas sweet recipes can be given to underweight persons, constipated persons & also, these recipes can be given to children for increasing fiber content of their diet.

Table 1: Composition of ingredients for green gram whole & cabbage tikki



Sr. No.	Ingredients	Quantity (g)	Photograph of green gram whole & cabbage tikki
1	Green gram whole	50	
2	Oat bran	30	
	Bengal gram flour	15	
3	Cabbage	15	
4	Potato	20	
5	Curd	20	
6	Green chillies	3	
7	Coriander powder	0.5	
8	Turmeric powder	0.5	
9	Omum	0.5	
10	Coriander leaves	5	
11	Curry leaves	1	
12	Salt	1	
13	Oil	5	

Table 2: Composition of ingredients for oats thalipeeth

Sr. No.	Ingredients	Quantity (g)	Photograph of oats thalipeeth
1	Oats	30	
2	Oat bran	30	
3	Fenugreek leaves	20	
4	Onion	15	
5	Curd	20	
6	Garlic ginger paste	3	
7	Omum	1	
8	Coriander powder	1	
9	Salt	1	
10	Oil	5	

**Table 3: Composition of ingredients for bajra daliya**

Sr. No.	Ingredients	Quantity (g)	Photograph of bajra daliya
1	Bajra	30	
2	Oat bran	15	
3	Wheat bran	15	
4	Onion	25	
5	Carrot	25	
6	Tomato	15	
7	Green chillies	1	
8	Cumin seeds	1	
9	Mustard seeds	1	
10	Turmeric powder	2	
11	Groundnut	5	
12	Curry leaves	5	
13	Coriander leaves	5	
14	Salt	2	
15	Oil	5	

Table 4: Composition of ingredients for barley halwa

Sr. No.	Ingredients	Quantity (g)	Photograph of barley halwa
1	Barley (husked)	30	
2	Cow's Milk	100	
3	Ghee	6	
4	Jaggery	20	
5	Dried dates powder	5	
6	Almonds	5	
7	Saffron	5 strands	

Table 5: Composition of ingredients for brown rice kheer

Sr. No.	Ingredients	Quantity (g)	Photograph of brown rice kheer
1	Brown Rice	20	
2	Daliya	20	
3	Oats	10	
4	Coconut milk	100	
5	Buffalo's milk	100	
6	Amaranth seeds	5	
7	Garden cress seeds	5	
8	Sugar	30	
9	Cinnamon powder	0.5	
10	Black currants	3	
11	Almonds	3	
12	Walnuts	3	
13	Ghee	2	

**Table 6: Composition of ingredients for sweet carrot poori**

Sr. No.	Ingredients	Quantity (g)	Photograph of sweet carrot poori
1	Carrot	90	
2	Whole wheat flour	15	
3	Wheat bran	15	
4	Powdered sugar	30	
5	Cinnamon powder	0.5	
6	Oil	10	

Table 7: Key for sensory evaluation of recipes

Appearance	Colour	Mouthfeel	Flavour	Taste	Acceptability	Scores
Very Good	Very Good	Very Good	Very Good	Very Good	Highly Acceptable	10
Good	Good	Good	Good	Good	Acceptable	8
Fair	Fair	Fair	Fair	Fair	Fairly Acceptable	6
Poor	Poor	Poor	Poor	Poor	Unacceptable	4

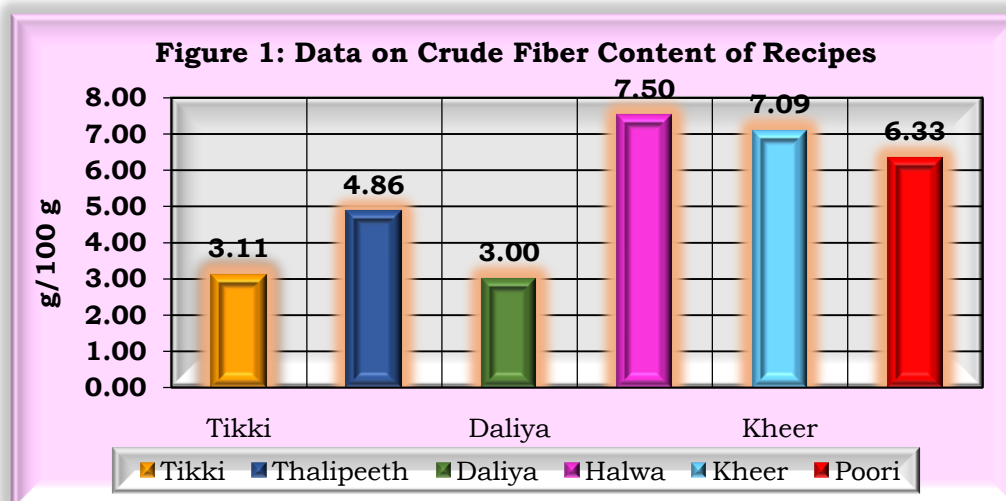
Table 8: Mean Palatability Scores for Recipes

Sr. No.	Sensory Characteristics	Mean Palatability Scores					
		Green gram whole & cabbage tikki	Oats thalipeeth	Bajra daliya	Barley halwa	Brown rice kheer	Sweet carrot poori
1.	Appearance	9.78	9.89	9.67	9.45	9.67	9.56
2.	Colour	9.89	9.67	9.67	9.56	10	9.78
3.	Texture/Consistency	9.67	9.45	10	9.56	9.45	9.67
4.	Flavour	9.78	9.78	9.89	9.56	9.89	9.67
5.	Taste	9.56	9.78	9.89	9.45	9.89	9.56
6.	Acceptability	9.78	9.78	10	9.45	9.89	9.67

*Consistency for kheer

Table 9: Fiber content of recipes (values are per 100 g)

Sr. No	Recipes	Values are in g		
		Soluble Dietary Fiber	Insoluble Dietary Fiber	Total Dietary Fiber
1	Green gram whole & cabbage tikki	3.21	12.3	15.51
2	Oats thalipeeth	2.51	5.55	8.06
3	Bajra daliya	29.23	6.76	35.99
4	Barley halwa	2.21	8.06	10.27
5	Brown rice kheer	6.85	4.95	11.8
6	Sweet carrot poori	27.6	5.14	32.74



REFERENCES

- AACC Report (Report of the Dietary Fiber Definition Committee to the Board of Directors of the American Association of Cereal Chemists). (2001). *Cereal Foods World*, 46 (3): Pp. Cited from 112-126. <https://www.aaccnet.org/initiatives/definitions/Documents/DietaryFiber/DFDef.pdf>. Retrieved on 10-12-2017.
- Anderson, J. W. Baird, P. Davis Jr, R. H. Ferreri, S. Knudtson, M. Koraym, A. Waters, V. & Williams, C. L. (2009). Health benefits of dietary fiber. *Nutrition Reviews*, 67(4): Pp 188-205. Cited from <https://pdfs.semanticscholar.org/1ce9/83e48e495d9133082fa0cf5f0d53c701e20b.pdf>. Retrieved on 10-12-2017.
- Bessesen, D. H. (2001). The Role of Carbohydrates in Insulin Resistance. *Journal of Nutrition*, 131: Pp. 2782S-2786S.
- Bora, Preeti. and Kulshrestha, Kalpana. (2014). Development of Low Glycemic Index Green Gram Husk Incorporated Fiber Rich Food Products and Their Intervention for Health Benefits. *International Journal of Food and Nutritional Science*, 3 (6): Pp. 196-203.
- Chauhan, Ambika. and Intelli. (2015). Product Development and Sensory Evaluation of Value Added Food Products



- Made By Incorporating Dried Cauliflower Green Leaves. *Journal of Nutrition and Food Science*, 5 (1): Pp.1-4. Cited from Downloads/product-development-and-sensory-evaluation-of-value-added-food-2155-9600-5-340.pdf. Retrieved on 10-12-2017.
- Friedman, G. Dietary Fiber in Health and Disease. (1998). *Gastroenterology*, 115 (3): Pp. 794. Cited from <https://www.sciencedirect.com/science/article/pii/S0016508598701696>. Retrieved on 10-12-2017.
 - Gopalan, C. Rama Shastri, B. V. Balasubramanian, S. C. (2012). Nutritive value of Indian foods. Revised and updated by Rao, B. S. National Institute of Nutrition, Hyderabad, Pp. 24, 48, 52, 54, 57-58, 60, 62-63, 66, 69-72.
 - Kaczmarczyk, M. M. Miller, M. J. & Freund, G. G. (2012). The health benefits of dietary fiber: Beyond the usual suspects of type 2 diabetes mellitus, cardiovascular disease and colon cancer. *Metabolism*, 61 (8): Pp 1058-1066. Cited from <http://www.sciencedirect.com/science/article/pii/S0026049512000455>. Retrieved on 10-12-2017.
 - Lupton, J. R. & Turner, N. D. (2003). Dietary Fibre and Coronary Disease: Does the evidence support an association? *Current Atherosclerosis Reports*. 5: Pp. 500-505.
 - [ndb.nal.usda.gov/-](http://ndb.nal.usda.gov/)
 - Norazmir, M. N. Mastura, K. Bariah, Syahrul, A. H. Devi, Naleena. M. & Sabariah, Siti. B. (2014). Development of Whole Grain Carrot (*Daucuscarota*) Chips. *Current Research in Nutrition and Food Science*, 2 (1): Pp. 26-32.
 - Rasane, Prasad. Jha, Alok. Sabikhi, Latha. Kumar, Arvind & Unnikrishnan, V. S. (2015). Nutritional Advantages of Oats and Opportunities for its Processing as Value Added Food. *Association of Food Scientists & Technologists (India)*, 52 (2):Pp. 662-675.



- Sheth, Ashwini. and Sengupta, Rupali. (2015). Muthiya for Diabetes-A Modified Food Product. *International Journal of Food and Nutritional Science*, 4 (4): Pp. 208-211.
- Vaijapurkar, K. R. Rudrawar, B. D. Dambalkar, V. S. & Poojari, V. R. (2013). Development and Standardization of Bajara Biscuits with Added Pomegranate Peel Powder and Their Physical and Sensory Attributes. *International Journal of Science and Research*, 4 (10): Pp. 952-956.