Quality evaluation of differently processed wheat flours

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Received: 27-10-2016 Accepted: 23-11-2017

DOI: 10.18805/ajdfr.DR-1179

ABSTRACT

Wheat as a grain is grown on more land area than any other commercial food. Its world trade in is greater than all other crops combined. Globally, wheat is the leading source of vegetable protein in human food, having higher protein content than other major cereals. Wheat is processed by various techniques to achieve different flours e.g. resultant flour, chakki flour and maida (refined flour) possessing different physicochemical, nutritional and sensory attributes. The proximate nutritional content were analyzed and the resultant flour has maximum calorie content whereas protein, fiber, fat and ash content were found to be higher in chakki flour. Maida (refined flour) exhibited maximum wet gluten content but dry gluten content was found to be highest in resultant flour. Recipe formulated by incorporating differently processed wheat flours was Chapattis which was evaluated for its sensory characteristics on a 5-point rating scale by a semi trained panel of 30 judges. Chapattis made from resultant flour were better than those from chakki flour and maida in overall acceptability.

Key words: Chakki and resultant flour, Gluten content, Proximate analysis, Refined, Sensory evaluation.

INTRODUCTION

Wheat (Triticum spp.) is a cereal grain, originally from the Levant region of East but now cultivated worldwide (Belderok, 2000; Shewry, 2009). Grains are staple diet of Indian population (Baranwal, 2017). According to World Agricultural Production in 2015, world production of wheat was 734.80 million metric tons out of which India produced about 86.53 million metric tons. Wheat flour is a powder made from the by grinding wheat seeds. Hard flour, or bread flour, is high in gluten, with 12% to 14% gluten content, and has elastic toughness that holds its shape well once baked. Soft flour is comparatively low in gluten and so results in a finer or crumbly texture (Anonymous, 2016a). Wheat is also used to prepare pasta products since ancient times (Kapagavalli and Amutha, 2015). There is difference in various physical as well as chemical properties of flours based upon the processing method used while processing. Chakki flour popularly known as whole wheat flour is a staple food item in every Indian household. It possesses multiple health benefits, and is widely used in preparing tender chapattis. Resultant flour is a by-product of wheat milling which is extracted while grinding wheat into flour. It is also produced by blending various flour streams in roller mills. As an extract of wheat flour, resultant flour also contains vitamins and minerals much needed for good health. Maida, also known as refined wheat flour is a finely milled form of wheat without bran and germ portion (Anonymous, 2016b). Flour (wheat flour), a key ingredient in India’s popular flatbreads, may also be a key instrument in addressing one of India’s primary health concerns (Zimmerman, 2010).

MATERIALS AND METHODS

Three types of differently processed wheat flours i.e. resultant flour, chakki flour and maida were procured from local market of Pantnagar; the flours were physically examined for sand grits and other particles. Proximate analysis, gluten estimation were performed in laboratory, Department of Foods and Nutrition, College of Home Science, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, UK.

Proximate composition of all the flours were analyzed- moisture, protein, fat, fiber and energy (AOAC, 2000). Carbohydrate content of flour samples were calculated by difference method. AACC, (1964) procedure was used for gluten estimation in all types of flours. After proximate analyses, chapattis were prepared from all flours to assess their organoleptic attributes. Sensory parameters are the basic and main attribute in testing acceptability of any food (Bhati and Goyal, 2017). Thus, a semi trained panel of 30 members was used for the purpose of sensory evaluation of developed product.

Standardized recipe of chapatti was used to obtain consistently good quality outcome which means that every repetition of the procedure will result in a standard quality product.

RESULTS AND DISCUSSION

Proximate composition of differently processed wheat flour (Table 1) showed that the moisture content of chakki flour was significantly lower than the resultant flour and refined wheat flour (maida). Among all the processed...
flours resultant flour has got highest moisture content (11.30%) and chakki flour exhibited the least amount (8.9%). Protein content of differently processed wheat flour ranged from 10.62 to 12.5 g/100g. Chakki flour had the highest protein content among the three flours. Similarly chakki flour was found to have significantly higher fat, fiber and ash content. Energy was found to be highest in resultant flour (391.36).

Wheat is the grain of choice in bread preparation due to its high gluten level, which is combination of gliadin and glutenin. Gluten balls of differently processed wheat flours are shown in Fig 1. Gliadin is very sticky when wet and very extensible and imparts adhesive properties to gluten. Glutenin is a large and complex protein which gives dough strength and elasticity. The dry gluten content is a direct indicator of flour strength and bread making potentialities. The quantity and quality of gluten is responsible for better gas production and retention capacity and forms a cellular network of crumb which imparts desirable characteristics to bread (Anjuman and Walker, 2000; Belderok, 2000). In the present study maida exhibited high wet gluten and chakki flour had least amount of wet gluten, whereas dry gluten was highest in resultant flour and lowest in chakki flour (Table 2). In a recent study conducted by Deshmukh and Yenag in 2016 wet gluten content and dry gluten content of refined wheat flour was found to be 8.69 and 2.94 resp. Kaur and Bains (1979) reported that 19.2 to 36.3 per cent of wet gluten was found in refined white flour obtained from Indian aestival wheat. According to a study the results of wet gluten content in various types of wheat flours ranged from 21.56% to 49.36% (Ferrari, 2014). Pomeranz (1988) and Pratt (1971) stated that, wheat gluten has relatively constant water absorption capacity (approximately 2.8 times the dry gluten content); therefore, the content of dry gluten in the samples ranged from 7.7 to 17.63%.

Prepared dough and chappati of differently processed flours is depicted in Fig 2 and 3 respectively. Data on sensory quality attributes of processed wheat flour.

### Table 1: Nutritional composition of wheat flours.

| Sample       | Moisture | Ash  | Protein | Carbohydrate | Fat  | Fiber | Energy |
|--------------|----------|------|---------|--------------|------|-------|--------|
| Resultant flour | 11.31    | 1.45 | 11.72   | 83.06        | 1.36 | 1.1   | 391.36 |
| Chakki Flour  | 8.9      | 1.8  | 12.5    | 73.87        | 1.63 | 1.3   | 360.15 |
| Maida         | 10.9     | 0.66 | 10.62   | 76.61        | 0.86 | 0.35  | 356.64 |

### Table 2: Percentage of dry and wet weight gluten in differently processed wheat flours.

| Sample      | Wet Gluten (gm) | Wet Gluten (%) | Dry Gluten (gm) | Dry Gluten (%) |
|-------------|-----------------|----------------|-----------------|----------------|
| Resultant flour | 7.48            | 29.92          | 4.49            | 17.96          |
| Chakki Flour  | 7.12            | 28.48          | 4.10            | 16.40          |
| Maida        | 8.07            | 32.28          | 5.27            | 21.08          |

Fig 1: Gluten balls of differently processed wheat flours

Fig 2: Dough prepared by differently using wheat flours for chappati preparation

Fig 3: Prepared dough and chappati of differently processed flours.
Table 3: Sensory evaluation of Chapattis prepared by using differently processed wheat flours

| Sample Code | Color    | Flavor   | Texture   | Taste     | Appearance | Overall Acceptability |
|-------------|----------|----------|-----------|-----------|------------|-----------------------|
| A           | 7.33±0.82| 7.4±0.83 | 7.4±0.83  | 7.4±0.83  | 7.2±0.77   | 7.43±0.66             |
| B           | 6.73±0.80| 6.6±1.06 | 6.33±0.98 | 6.53±0.92 | 6.93±1.22  | 6.76±0.85             |
| C           | 7.07±0.80| 6.87±0.83| 7.0±0.65  | 7.13±0.64 | 7.73±0.46  | 7.10±0.70             |

Chapattis presented in Table 3. Product A was resultant flour chapatti, product B was the chapatti prepared from chakki flour and product C was maida (refined flour) chapatti. The sensory evaluation of samples was conducted by a semi trained panel. The product prepared from resultant flour was reported to be most acceptable and least overall acceptability is exhibited by chapattis prepared from chakki flour due to its significantly low scores in color, taste, texture and appearance.

Processing of wheat has been found to bring significant changes in the nutritional composition of differently processed wheat flours. The present study depicted the chemical and sensory attributes of differently processed wheat flours. Resultant flour has been found to be organoleptically most acceptable. In addition it had high amount of energy as compared to other wheat flours. Proximate analysis of flours showed that chakki flour has comparatively higher amount of protein, fiber and fat in comparison with flours processed with other techniques. As a basic ingredient in diet further studies on processed flours will prove to be an interesting and promising area of research.

ACKNOWLEDGEMENT

The authors are grateful to Dr. Anita Malhotra, Associate Professor, Department of Food Technology, Lakshmi Bai College, Delhi University, for providing the samples for the study.

REFERENCES

Anjuman, F.M. and Walker, C.E. (2000). Grain, flour and bread-making properties of eight pakistani hard white spring wheat cultivars grown at three different locations for 2 years. International Journal of Food Science and Technology 35: 407-416.

Anonymous, (2016a). http://www.wheatflour.com/article/1/description_of_wheat_flour accessed on 20/8/ 2016

Anonymous, (2016b). Sanghvi Group. 2011. http://www.sanghvi-group.com/maida.html

AOAC. (2000). Official Methods of Analysis, 17th edn. Association of Official Analytical Chemists, Washington DC.

BIS. (1971). IS: 6273 Part I and Part II- 1971. Guide for sensory evaluation of foods. Indian standard Institutions, Manak Bhawan.

Baranwal, D. (2017). Malting: An indigenous technology used for improving the nutritional quality of grains- A review. Asian J. Dairy and Food Res. 36 (3): 179-183. DOI:10.18805/ajdfr.v36i03.8960

Bekderok, B. (2000). Developments in bread making process. Plant Foods for Human Nutrition 55: 3-86.

Bekderok, Robert, B., Hans, M. and Dingena, A. (2000). Bread-Making Quality of Wheat. Springerpp. 3 ISBN 0-7923-6383-3

Bhatti, D. and Goyal, M. (2017). Sensory evaluation of pearl millet cultivars grown in I-C Zone of Rajasthan. Asian J. Dairy & Food Res. 36 (3): 256-259. DOI: 10.18805/ajdfr.v36i03.8974

Deshmukh, P. and Venag, N. (2016) Nutritional and functional properties processed little millet flours in the development composite flour bread. International Journal of Food and Nutrition Science 5 (3): 42-52.

Ferrari, M.C., Clerici, M.T.P.S. and Chang, Y.K. (2014). A comparative study among methods used for wheat flour analysis and for measurements of gluten properties using the Wheat Gluten Quality Analyser (WGQA). Food Science and Technology 34(2) http://dx.doi.org/10.1590/fst.2014.0038
Kapagavalli, B. and Amutha, S. (2015). Development of pasta products using cereal pulse blends. *Asian J. Dairy and Food Res.*, **34**(3): 213-218. DOI: 10.5958/0976-0563.2015.00042.1

Kaur, M. and Bains, G.S. (1979). Effect of reducing and oxidizing agents on the farinograph characteristics of Indian wheat. *Journal of Food Science and Technology*, **16**: 132-137.

Pomeranz, Y. (1988). Wheat Chemistry and Technology (3rd ed.) St. Paul: AACC.

Pratt, D.B. (1971). Criteria of Flour Quality. In Y. Pomeranz (Ed.), *Wheat: Chemistry and Technology*; 201-226.

Shewry, J. and Peter, R. (2009). Wheat. *Journal of Experimental Botany*, **60**(6): 1537–1553. doi:10.1093/jxb/erp058

World Agricultural Production (2016). Department of Agriculture Foreign Agricultural Service Circular Series, United States, 2016; 8-16. http://apps.fas.usda.gov/psdonline/circulars/production.pdf

Zimmerman, S. (2010). Flour fortification with iron, folic acid, vitamin B12, vitamin A, and zinc: Proceedings of the Second Technical Workshop on Wheat Flour Fortification. *Food and Nutrition Bulletin*, **31**, no. 1 (supplement) http://www.flinetwork.org/plan/documents/FNB2010.pdf