

Original Research Article

Evaluation of Sensory Accessibility and Nutritive Values of Multigrain Flour Mixture Products

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ABSTRACT

Millets and Cereals can provide more Nutrients, Phytochemicals and Antioxidants which should be in demand for maintaining a good health status. By fortifying a food increases the level of Macro and Micro Nutrients, Dietary fibres, and Phenolic compounds which shows to impart an antimutagenic, antiglycemic and anti-protective activities. The preparation of multigrain flour mixture and assess the organoleptic properties of the prepared products with determine the nutritive value of the prepared products. The required materials i.e. Wheat grains, Oats, Finger millet, Buck wheat and Pearl millet were collected from the local market of Allahabad city and the flour and products were prepared in the lab. The nutrient composition as available in Gopalan's (2014) publication was used to calculate the nutritive values. Percentage, mean Score, standard error of mean, critical difference and ANOVA were applied and the sensory attributes in all multigrain products illustrated according to overall acceptability in the method. The result shows the sensory evaluation of the multigrain *chapatti* & *biscuit* illustrated that the according to overall acceptability mean score of *chapatti* & *biscuit* indicates that the treatment T₂ (8.3) scored maximum followed by other treatments. Hence From the ANOVA table of all three products that , it is evident that the calculated value of F is greater than the table value on 4,8 (d.f.) at 5% probability level so there was significant difference between treatments regarding all sensory Attributes of the product. The nutritive value of all three products was shown more in Treatment 4. From the above results which were obtained from the research it could be concluded that the simple wheat flour chapatti or other products could be replaced by multigrain products without much changes in taste because all the multigrain mixture products have a very good sensory score and also rich in nutritive values than normal wheat flour.

Keywords: good sensory score, rich nutritive values, multigrain products & health benefits.

INTRODUCTION

These cereals are called a member of grass family, "Graminea". Cereal plants are found in all over the world but less found in the acute dryness areas, desserts or the ice-covered poles. Cereals includes many different types of Grains like- Wheat, Rice and maize are more common other includes Barley, Oats, Rye, Sorghum and others varieties. The term 'Millets' which is applied for the different several

species of cereals provides small grains. Now the incidents of Diabetes and Obesity becomes very common due to increasing a demand for foods which contains the complex form of Carbohydrates (which are not easily digestible), Saturated fatty acids; Hydrogenated fats and Trans fats. Peoples are like to consuming foods which have high rate of Glycemic Index and due to these foods consumption the body requires proper secretion of insulin hormone for the

complete metabolism of glucose. Fortification in meals with other Millets and Cereals can provide more Nutrients, Phytochemicals and Antioxidants which should be in demand for maintaining a good health status. By fortifying a food increases the level of Macro and Micro Nutrients, Dietary fibres, and Phenolic compounds which shows to impart an antimutagenic, antiglycemic and anti-protective activities.

Wheat (*Triticum Aestivum*) is generally used as a staple food in many parts of India. The peoples mostly use of wheat flour to prepare Roti in the form of whole meal and traditional food. Wheat Refined flour is also uses for making a Biscuits, Breads, Pizza base, Cookies, Noodles. it provides 1419 (kj) Energy per 100 gm, 14.5 (%) Protein, 2.3 (%) fat, 2.9 (%) Crude fibre, 1.9 (%) Ash, 64.0 (%) Starch, 12.1 (%) Total dietary fibre, 20.5 (%) Total phenol content, 71 (g) carbohydrate, 34 (mg) Calcium, 40.1 (mg) Iron, 4.1(mg) Zinc, 0.14 (mg) Magnesium , 6.74 (mg) Niacin, 0.94 (mg) Pantothenic acid, 0.57 (%) Thiamin and 0.12 (mg) Riboflavin (Bhol, 2014). Oat belongs to the family '*Poaceae*' and genus '*Avena*' and are the seeds of the plant '*Avena sativa*', have been used for protection of heart strokes. The nutritional amount of Whole Oat grains has protein 15-17 %, starch and sugar 58-70 %, total dietary fibre 5-14%, B glucan 2-6 %, fat 4-9 %, dietary fibre 10-20 %. Oat bran protein 15-18%, starch and sugar 10-50 %, total dietary fibre 10- 40%, B- Glucan 5-20%, fat 5-10 %, dietary fibre 20-35 % (Masih *et al.* 2013). It help to lowered blood cholesterol and a reduced risk of coronary heart disease. Finger millet is scientifically called '*Eleusinian Caracara*' and commonly called 'Ragi' which is basically known as staple food in the eastern and central Africa and also grown extensively in some regions of India. The Ragi came under the millets which represents small grains. Nutritionally

Finger millet has the highest content of calcium (344 mg/100 g) content among all cereals and millets and also rich in Iron, Phosphorus, Phytates (0.48%), Tannins (0.16 %), it has the Trypsin inhibitor factors. Finger millet provides antioxidants, Phytochemicals which make Ragi slowly and easily digestible and poses good metabolic activities. With having richest properties of macro and micro minerals it also provides macro nutrients (65-75%) Carbohydrates, (5-8%) Protein, Fat, good amount of (15-20%) dietary fibres and Starch (Chethan and Malleshi, 2007). Pearl millet known as "*Pennisetum Glaucum*" and the common name is "Bajara". The role in the prevention of ageing and various diseases associated with oxidative stress, such as cancer, cardiovascular and neurodegenerative diseases. This is helpful to increase the Hemoglobin levels in human being. This, Due to high fibre (1.2g/100g) content Pearl millet is also recommended for the treatment of severe constipation, stomach ulcers, and weight loss. Pearl millet is a rich source of energy 361 Kcal/100g. The carbohydrate content of pearl millet is 67.5 g/100g. The germ of pearl millet has much larger percentage of the total kernel. This difference explains that pearl millet has lower starch and higher protein and oil content as compared to other grains. The main sugar in pearl millet is sucrose so it is recommended as a lowest glycemic index (55) food (NIN, 2003). Pearl millet has a very high amylase activity, about 10 times that of wheat. Maltose and D-ribose are the predominant sugars in the flour, while fructose and glucose levels are low (Oshodi *et al.* 1999). Buckwheat is not a grain or nor related to the wheat family. It is a seed but used in a similar way like any other common cereal grains. The family of Buckwheat in which it belongs is a '*Polygonaceae*'. Scientific name is '*Fagopyrum Esculentum*'. Buckwheat has the 80% unsaturated fatty acids more than

40% are constituted by polyunsaturated fatty acid (PUFA) and are an important source of trace minerals, such as: Zinc, Copper, Manganese, Selenium and macro minerals: potassium, sodium, Calcium, Magnesium apart from this it also contains the good amount of vitamins; Vitamin B1, Vitamin B2, and B6.

MATERIALS AND METHODS

Study Area

The present Investigation *Evaluation of Sensory Accessibility and Nutritive Values of Multigrain Flour Mixture Products* was conducted in the research laboratory of Foods and Nutrition department, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture, Technology and Sciences, (Deemed-to-be-University), Allahabad.

The details of materials, experiments, procedures followed and techniques followed that were adopted during the course of this present investigation are corroborated in this chapter. The required materials i.e. Wheat grains, Oats, Finger millet, Buck wheat and Pearl millet were collected from the local market of Allahabad city.

Preparation of Multigrain Flour Mixture

- Collect all five types of grain from the local market of Allahabad for making the flour firstly were

cleaned all the grains and made them free from dust and all the foreign material which can be harmful for human consumption.

- Wash out all the grains using water and keep them for drying in dehydrator at 60⁰C for a day.
- When drying have been done keep all dried grains individually in a miller for making flour one by one.
- When grinding has been done, collect all the flour and make them for use after sieving.

Products prepared out were:

- Chapatti.
- Biscuit.

Composition of flours:

For making a flour mixture, mix all the above flours one by one in given amount which represents by the Table 1. And the whole experiment had a control (T0 standardized and prepared products were made without incorporation of four course millets), and four treatments as T1, T2, T3, and T4 and three replication were carried out for each product. The four treatments of different rations were tried several times and evaluated by the sensory evaluation method and the best rations were then used to prepare the products.

Table 1. Treatments and replication of Chapatti and Biscuits:

- The all five types of grain flour were used in different rations for the preparation of chapatti and Biscuit.

Treatments Flours	T0 (%)	T1 (%)	T2 (%)	T3 (%)	T4 (%)	Replication
Wheat	-	35	30	25	20	3
Oats	-	10	20	15	25	3
Finger millets	-	20	15	15	20	3
Pearl millets	-	20	15	25	20	3
Buckwheat	-	15	20	20	15	3
Total % of flour incorporation	-	100	100	100	100	15

Nutritional Composition of Multigrain Flour Mixture

The method described by AOAC (2005) was used for determination of proximate composition of selected multigrain flours. This included estimation of moisture, crude fat, protein. The

carbohydrates were estimated by deference method.

Statistical Analysis of Prepared Multigrain Flour Products

The data was tabulated and analysed statistically with the help of approved statistical techniques Gacula and

Singh (2008). Percentage, mean Score, standard error of mean, critical difference

and Analysis of Variance were applied.

RESULTS AND DISCUSSION

Organoleptic Evaluation of the Prepared Multigrain Flour Products

Table 2. Average of different treatments of sensory score of Multigrain Chapatti and Biscuits

Average sensory score of control and treated sample of Multigrain Chapatti				
Sensory Characteristics/ Treatments	Score of Hedonic Score			
	Colour and Appearance	Body and Texture	Taste and Flavour	Overall Acceptability
	Mean \pm S.D	Mean \pm S.D	Mean \pm S.D	Mean \pm S.D
T ₀ (Control)	7.3 \pm 0.472	7.53 \pm 0.503	7.5 \pm 0.264	7.38 \pm 0.068
T ₁	7.73 \pm 0.461	7.4 \pm 0.264	7.63 \pm 0.057	7.59 \pm 0.315
T ₂	7.63 \pm 0.472	7.66 \pm 0.346	7.86 \pm 0.057	7.76 \pm 0.334
T ₃	7.36 \pm 0.378	7.23 \pm 0.152	7.43 \pm 0.208	7.34 \pm 0.115
T ₄	7.0 \pm 0.346	6.73 \pm 0.208	7.06 \pm 0.115	6.98 \pm 0.222
F Value	4.49 ^S	4.19 ^S	12.5 ^S	6.25 ^S
C.D Value	0.09229	0.406013	0.188283	0.266273
Average sensory score of control and treated sample of Multigrain Biscuits				
	Mean \pm S.E	Mean \pm S.E	Mean \pm S.E	Mean \pm S.E
T ₀ (Control)	7.6 \pm 0.01	7.4 \pm 0.173	7.5 \pm 0.577	7.5 \pm 0.519
T ₁	8.2 \pm 0.057	8.0 \pm 0.264	8.3 \pm 0.416	8.2 \pm 0.173
T ₂	8.3 \pm 0.152	8.3 \pm 0.058	8.4 \pm 0.321	8.3 \pm 0.251
T ₃	7.2 \pm 0.208	7.1 \pm 0.251	7.4 \pm 0.702	7.1 \pm 0.264
T ₄	6.9 \pm 0.251	6.9 \pm 0.208	7.4 \pm 0.602	7.0 \pm 0.190
F Value	54 ^S	25.25 ^S	12.6 ^S	25.12 ^S
C.D Value	0.188283	0.266273	0.326117	0.266270



Plate 1. Multigrain Chapatti prepared by incorporating of Oat, Finger Millet, Pearl Millet and buckwheat flours in wheat flour.
Plate 2. Multigrain Biscuits prepared by incorporating of Oat, Finger Millet, Pearl Millet and buckwheat flours in wheat flour.

Nutritive Value of Multigrain Nutritious Chapatti and Biscuits

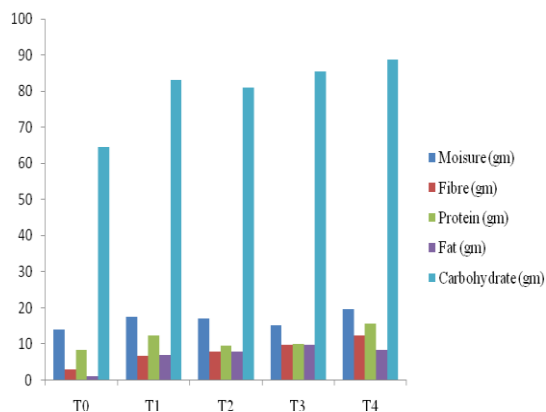


Fig. 1 the effect of incorporation of different flours in moisture content of Chapatti compared to control.

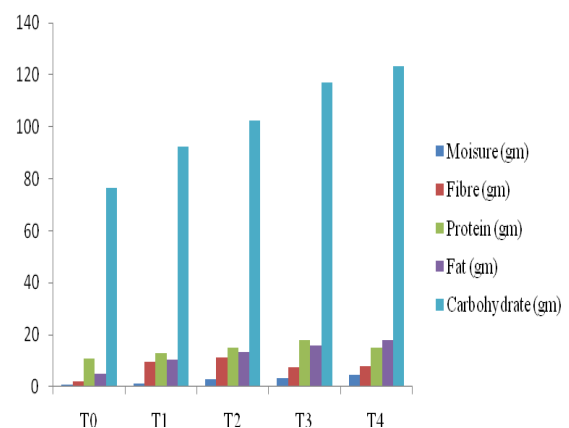


Fig. 2 the effect of incorporation of different flours in moisture content of Biscuits compared to control.

DISCUSSION

The data pertaining above in the Table 2 shows that the sensory attributes in the multigrain chapatti illustrated that the according to overall acceptability of product treatment T₂ is more acceptable by the panel followed by Colour and Appearance, Body and Texture and Taste and Flavour using nine point hedonic scale. The sensory evaluation of the multigrain Biscuit illustrated that the according to overall acceptability mean score of biscuit indicates that the treatment T₂ (8.3) scored maximum followed by treatment T₀ (7.5), T₁ (8.2), T₃ (7.1) & T₄ (7.0) respectively so T₂ is more acceptable by the panel of judges followed by different parameters of sensory, Color and Appearance, Body and Texture and Taste and Flavour. Hence From the ANOVA table of all three products that, it is evident that the calculated value of F is greater than the table value on 4,8 (d.f.) at 5% probability level so there was significant difference between treatments regarding all sensory Attributes of the product. Similarly Baljeet *et al.* (2010) another study by Desai *et al.* (2009) and Kumar *et al.* (2013) also reported that they also prepared the coarse grain products.

The nutritive values show in Fig. 2. Moisture (gm): The range of moisture content was 14.04 to 19.55g/100g which was higher than control. The maximum value 19.55 mg/100g was observed in Treatment T₄. Fiber (gm): Fiber content of the *Chapatti* product varied from 3.01 to 12.35 g/100g. The highest value 12.35 g/100g was observed in treatment T₄. Protein (gm): Protein content of the *Chapatti* was found to be in the range of 8.37 to 15.39 g/100g. The maximum value 15.39 g/100g was observed in Treatment T₄. Fat (gm): Results showed that fat content of the *Chapatti* was in range of 1.08 to 9.78 g/100g. The highest fat value 9.78 g/100g was found in Treatment T₃ with addition of Multigrain. Carbohydrate (gm): CHO content of the *Chapatti* was

found to be in the range of 64.58 to 88.67 g/100g. The maximum value 88.67 g/100g was observed in Treatment T₄.

Summarizes the average nutritive value of moisture, fiber, protein & carbohydrate content in the *chapatti* of T₄ was greater than other treatments, the fat same in T₃ and T₄ which is higher than T₀, T₁, and T₂. Devi *et al.* (2011) has been reported the calcium contents in flours in mg/100g.

Fig. 1. Moisture: The range of moisture content was 0.89 to 4.67g/100g which was higher than control. The maximum value 4.67 mg/100g was observed in Treatment T₄. Fiber (gm): Fiber content of the *Biscuits* product varied from 1.88 to 11.08 g/100g. The highest value 1.88 g/100g was observed in Treatment T₂. Protein (gm): Protein content of the *Biscuits* was found to be in the range of 10.89 to 17.89 g/100g. The maximum value 17.89 g/100g was observed in Treatment T₃. Fat (gm): Results showed that fat content of the *Biscuits* was in range of 4.99 to 17.77 g/100g. The highest fat value 17.77 g/100g was found in Treatment T₄ with addition of Multigrain. Carbohydrate (gm): Carbohydrate content of the *Biscuits* was found to be in the range of 76.67 to 88.67 g/100g. The maximum value 123.22 g/100g was observed in Treatment T₄.

The Fig. 2 illustrated that nutritive value of moisture, fat and carbohydrate content is more in the *biscuits* which found in Treatment₄, the amount of protein is more in T₃ and high fiber content in T₂ followed by T₀, T₁, T₃, and T₄. Similar trend of nutritive values of coarse grain has been reported by Huang and Ferraro (1982), Murugkar and Gupta (2013).

CONCLUSION

From the above results which was obtained from the research it could be concluded that the simple wheat flour chapatti or other products could be replaced by multigrain products without

much changes in taste because all the multigrain mixture products have a very good sensory score and more acceptable by the panel. With good taste of all products also very good in quality and more nutritious. In this recent era the life becomes so busy and fast so peoples are not able to eat more and timely so that they can maintain their health and nutritional level in the body. So if you will with these multigrain products in daily life you can full fill all nutritional requirements of the body. The multigrain flour mixture content of four different types of flour including of wheat flour and other flours like peral millets, Buck Wheat, Finger Millets, Oat which are very rich in many nutrients like soluble fiber consisting especially b-glucan, proteins, energy, good quality fat, carbohydrates, vitamins and minerals, such as Calcium, iron, magnesium, manganese, iron, copper and zinc, Antioxidants and photochemical, which makes it easy and slowly digestible. Hence it helps to control blood glucose levels in diabetic patients very efficiently. Finger millets are helpful for preventing many diseases like Osteoporosis, prevent for depletion of enamel on the teeth's, and make stronger to the bones and many other benefits. Oats is useful for preparation of functional food of potential application for those suffering from metabolic syndrome (Obesity, Diabetes and Hyperlipidemia). Pearl millets show their properties in iron deficiency disorders. The product prepared was evaluated for color, flavor, taste, texture appearance and overall acceptability using departmental semi trained panel members on 9 point hedonic rating. The sensory score revealed that we can make many other recipes like from multigrains like chapatti, biscuits, noodles and easily incorporate with other cereals also. The coast of all products is not more so it can be consumed by socio economically poor and vulnerable groups of people.

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