"Acceptability of developed nutrient rich multigrain based flour for weight reduction"

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Abstract

The present study was carried out to develop multigrain flour for weight management. The processed oat flour, barley flour, germinated soybean flour, wheat flour and blanched flaxseed flour was used to develop fiber & α linolenic acid rich multigrain flour for weight management in the ratio of 35:25:20:15:5. Developed multigrain flour and control (wheat) flour were subjected for sensory evaluation and rated as "liked extremely" by panel members on six point hedonic scale. Nutrient analysis of control and developed flour estimated for moisture, crude protein, crude fat, crude fiber, ash, total carbohydrate and minerals like iron & calcium and antinutrient like oxalic. On the basis of present study it can be concluded that multigrain flour is the excellent source of fiber, β glucan, α linolenic acid & isoflavones, thus it helps in reducing weight.

Key words: Multigrain Flour, Weight Management

Introduction: Weight management is necessary for the healthy life & protect from different diseases which cause due to overweight & obesity .Obesity is a state in which there is a generalized accumulation of excess adipose tissue in the body leading to more than 20% of the desirable body weight and invites disability, disease and premature health (Srilakshmi, 2005). Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems. Body mass index (BMI), a measurement which compares weight and height, defines people as overweight (pre-obese) if their BMI is between 25 and 30 kg/m^2, and obese when it is greater than 30 kg/m^2 (WHO, 2000). Obesity poses a major public health challenge since it is a well recognized independent predictor of premature mortality. Moreover, it often coexists with other cardiovascular risk factors, namely, diabetes, dyslipidemia, and hypertension, which further add to the burden of cardiovascular disease. The dramatic increase in the occurrence of overweight and obesity over the past several decades is attributed in part to changes in dietary and lifestyle habits, such as rapidly changing diets, increased availability of high-energy foods, and reduced physical activity of people in both developed and developing countries. In the beam of above scientific proceedings, research has been propelled towards correcting the obesity and its associated diseases by combination of cereals, legumes and oil seed like oat, barley, soyabean, wheat and flaxseed had been planned for obese patients, which essentially beneficial in the weight reduction, was exercised with the objective.

- To assess the organoleptic acceptability of multigrain flour for weight management
- To analyze the nutritional composition of developed multigrain flour

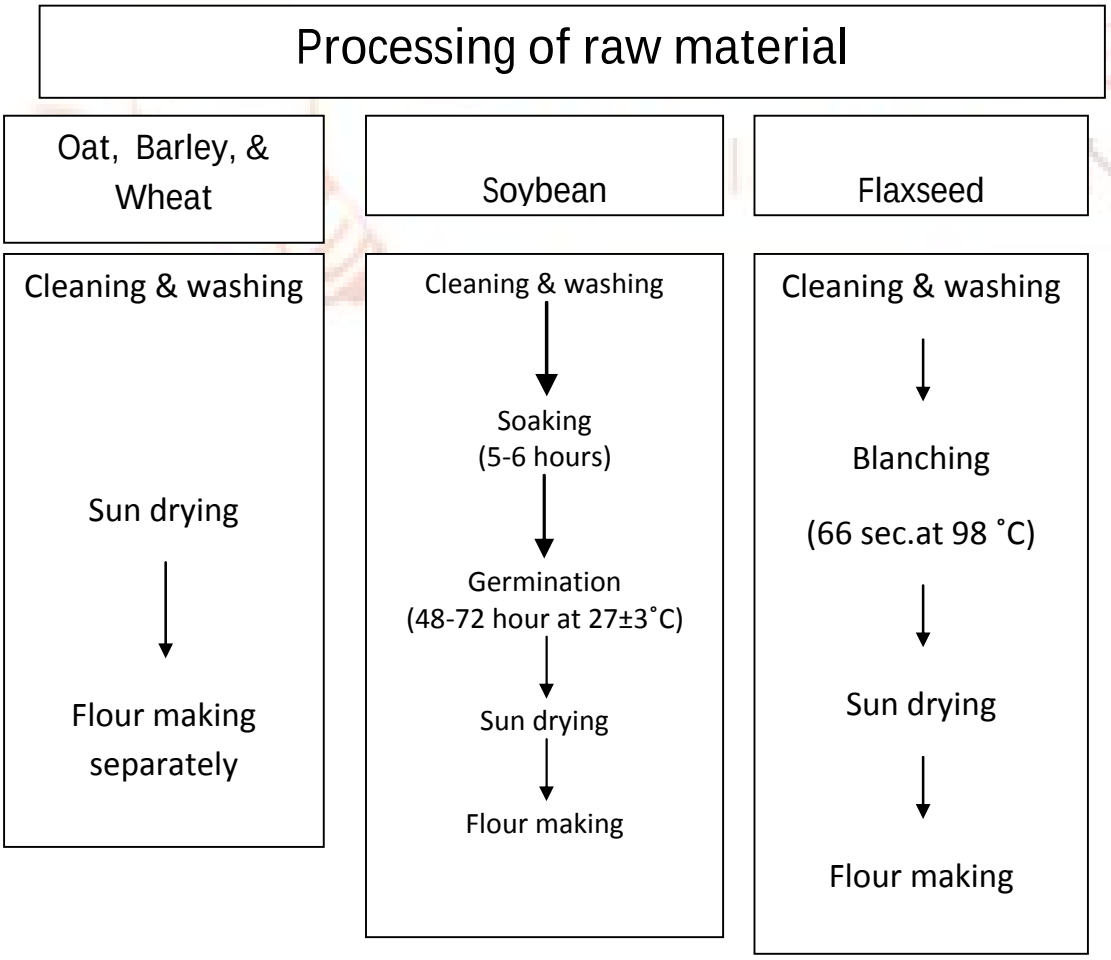
Material & method: The present study was focused on development of fiber, β glucan, α-linolenic acid, isoflavones rich multigrain flour. The present investigation entitled "Acceptability of developed nutrient rich multigrain based flour for weight reduction" was carried out to standardize multigrain flour. The study was conducted in the Department of Food and Nutrition, College of Home Science, Swami Keshwanand Rajasthan Agricultural University, Bikaner.

Procurement of material

For the present investigation materials like oat (Kent), barley (R.D. 57), soybean (NRC 37 Ahilya 4) and wheat (P.B.W. 226) were procured from the seed centre, SKRAU, Bikaner and flaxseed (brown variety) was procured from the local market of the Bikaner city in bulk during the month of February-March. The procuring was done in single lot to avoid variation and compositional differences so that quality differences could be ruled out. The ingredients incorporated in the flour was on the basis of their local availability, cost effective, high fiber and alfa linolenic and isoflavones contents (Gopalan, 1989).

Processing of raw material

The processing techniques like cleaning, washing, soaking, blanching (Srilakhsmi, 2008) under controlled condition and drying were carried out for the development of flour on the raw material i.e. oat, barley, soyabean, wheat and flax seed.



Development and standardization of multigrain flour

In view of the facts regarding nutritional quality of cereal, pulses, oil seed combination of different ratio of various ingredients (ICMR, 2002) were made to develop acceptable multigrain flour for weight management. Hence along with oat, barley, wheat, soybean and flaxseed were also added for the purpose of weight reduction, also with encountered the effect of other associated diseases. The ingredients incorporated in the flour on their local availability, low cost, greater beta glucan fiber contents and rich PUFA, isoflavones etc. Flour was prepared in different combinations using oats, barley, soybean, wheat, flaxseed and best multigrain flour combination was selected by panel members.

Organoleptic evaluation of developed multigrain flour

The developed multigrain flours were evaluated for sensory characteristics by a panel of semi-trained judges using 6-point hedonic scale for color, aroma, texture, and overall acceptability (Ranganna, 1986) to select the best flour combination.

Nutritional analysis of developed multigrain flour

The most acceptable multigrain flour was analyzed for its proximate composition (AOAC, 1995) i.e. moisture, crude protein, crude fat, crude fiber, ash, total carbohydrate, energy and minerals i.e. iron (Lindsey and Norwell, 1969) & calcium (AOAC, 1995) and antinutrient i.e. oxalic acid (NIN, 1980).

Statistical Analysis

Observations collected on the various aspects of the study have been statistically analyzed as suggested by Gupta (1998).

Results and Discussion: The multigrain flours developed in the four combinations (T_1, T_2, T_3, T_4) in the different ratios (Table 1). The developed multigrain flours were evaluated for sensory characteristics by a panel of semi-trained judges using 6- point hedonic scale (Table 1). Flour T_2 secured maximum overall acceptability score (5.4) whereas minimum scores were recorded by flours T_1 (4.1), T_3 (3.8) & T_4 (3.7). The scores clearly reveals that among all experimental samples mean overall acceptability of the T_2 sample was highest & fell in the category of "liked extremely" by the judges. Therefore from the above discussion on sensory parameters it can be concluded that among all four experimental samples (T_1, T_2, T_3 and T_4), T_2 had significantly (<0.05) higher mean scores for color (5.7), appearance (5.5), aroma (5.3), texture (5.2) & overall acceptability (5.4) by the panel members.

It concluded that among all the combinations of multigrain flour prepared using oat, barley, soybean, wheat and flaxseed combination in the ratio of 35:25:20:15:5 respectively was found to be more organoleptic acceptable than other combinations and selected by the panel members.

Results of nutritional analysis showed that moisture content of control and developed multigrain flour were found to be 8.70 per cent and 8.80 per cent respectively, the value being higher in the developed sample. Crude protein content was observed lower (12.50%) in control sample whereas a higher value (20.53) was observed in developed sample. Data depicts that 2.34 percent and 6.06 percent crude fat found in control and developed sample whereas crude fiber content was 2.03 per cent and 6.76 per cent respectively. Ash content of control and developed flour was 2.50 percent and 5.20 percent respectively. In control flour (wheat flour) total carbohydrate was calculated to be 80.63 per cent whereas 61.46 per cent in developed flour. Total energy content of control sample was 393.058 kcal/100 g whereas in developed multigrain flour, it was noted to be 382.46 kcal/100 g. In control sample iron, calcium and oxalic acid content were 4.13 mg/100g, 41.33 mg/100 g and 8.45g/100 g respectively whereas in developed multigrain flour recorded values were 4.20 mg/100 g, 85.53 mg/100 g and 4.30g/100 g respectively (Table 2 & 3).

In the same way study undertaken by Hussain et al., (2006) to develop composite flour, was prepared by incorporating flaxseed flour with wheat flour at 5, 10, 15, 20, 25 and 30 percent level & results revealed that mean quality score of flour decreased with the increase in the level of the flaxseed flour supplementation. Flour containing 20 percent and lower level of flaxseed flour were acceptable in relation to their overall acceptability. However Indrani et al., *(*2010) studied the effect of replacement of wheat flour with 5, 10, 15 and 20 percent multigrain mix (MGM) prepared by combining soybean, oats, fenugreek seeds, flaxseed and sesame seeds on rheological and bread-making characteristics of wheat flour. Addition of 20 percent MGM in wheat flour brought about significant improvement in the dough strength and overall quality of the bread. Similarly, Rita et al., (2010) developed soybean fortified flour for bread making by addition of soybean flour at 30 percent level into wheat flour and observed that addition of soybean flour in wheat flour was highly acceptable and also obtained higher nutritional value. Moreover Harshad, (2011) developed the multigrain blends of wheat, mungbean, sorghum, barley, corn (50:20:15:10:5) and flaxseeds at 1 percent to produce instant multigrain porridge. The results suggest that nutritionally dense multigrain blends can be acceptable and use as traditional breakfast food (porridge). However, studies carried out by different researches on the development of flour, Knuckles *et al.* (1997), Devi *et al.* (2000), Dhingra (2001), Naikare (2003) and Aroyeum (2009).

The present study conducted that developed multigrain flour are rich in the nutrient composition such as high protein, β glucan fiber, α linolenic acid, isoflavones and these nutrients play very important role in weight reduction and also help in the treatment of other metabolic diseases.

Table 1. Mean organoleptic acceptability scores of developed multigrain flours

Samples	Mean organoleptic scores on 6 point hedonic rating scale				
	Color	Appearance	Aroma	Texture	Overall acceptability
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Control	5.8±0.42	5.6±0.51	5.7±0.48	5.8±0.42	5.7±0.48
T_1	3.9±0.56	4.3±0.48	4.2±0.42	4.0±0.47	4.1±0.56
T_2	**5.7±0.48**	**5.5±0.52**	**5.3±0.48**	**5.2±0.42**	**5.4±0.51**
T_3	3.7±0.48	3.8±0.42	3.9±0.31	3.7±0.48	3.8±0.42
T_4	3.6±0.51	3.6±0.51	3.8±0.42	3.8±0.42	3.7±0.48
SEm±	0.222	0.220	0.191	0.198	0.222
CD(P=0.05)	0.59	0.57	0.50	0.52	0.59

Values are mean± SD of ten panelist SEm± – Standard error of mean

Control = 100 % wheat flour

T_1 = (35g oat flour + 20g barley flour+25g soybean flour+ 15g wheat flour + 5g flaxseed flour)

T_2 = (35g oat flour + 25g barley flour+20g soybean our+ 15g wheat flour + 5g flaxseed flour)

T_3= (15g oat flour + 25g barley flour+20g soybean flour+ 35g wheat flour + 5g flaxseed flour)

T_4 = (25g oat flour+ 15g barley flour + 20g soybean flour+ 35g wheat flour + 5g flaxseed flour)

Table 2. Proximate composition of developed multigrain flour (on dry weight basis)

Samples	Moisture (%)	Crude Protein (%)	Crude Fat (%)	Crude Fiber (%)	Ash (%)	Carbohydrate (%)	Energy (Kcal/100 g)
	Mean	Mean	Mean	Mean	Mean	Mean SD	Mean
Control	8.70±0.2	12.50±0.	2.34±0.4	2.03±0.0	2.50±0.4	80.63±0.61	393.58±0.
Experiment	8.80±0.2	20.53±0.	6.06±0.6	6.76±0.4	5.20±0.4	61.46 ±0.58	382.46±0.
SEm±	0.19	0.25	0.45	0.13	0.36	0.48	0.47
't' value	NS	31.60**	8.30*	19.78**	7.84*	39.44**	24.31**

Values are mean± SD of three replicates NS = Non significant *Significant at 5% level of significance

**Significant at 1% level of significance

Table. 3. Iron, Calcium and Oxalic acid content of developed multigrain flour (on dry weight basis)

Samples	Iron (mg/100g)	Calcium (mg/100g)	Oxalic acid (g/100g)
	Mean ± SD	Mean ±SD	Mean ±SD
control	4.13±0.05	41.33±3.21`	8.45±0.45
Experimental	4.20±0.10	85.53±0.45	4.30±0.28
SEm±	0.07	0.74	0.31
't' value	NS	59.78**	13.56**

Values are mean± SD of three replicates NS = Non significant **Significant at 1% level of significance

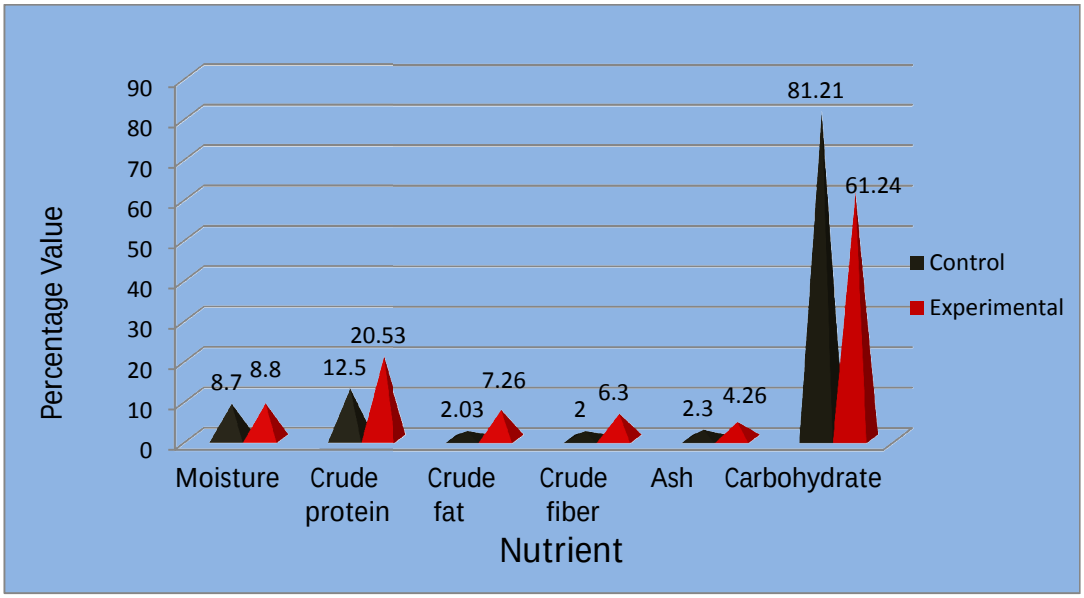


Fig. 1. Proximate composition of flours

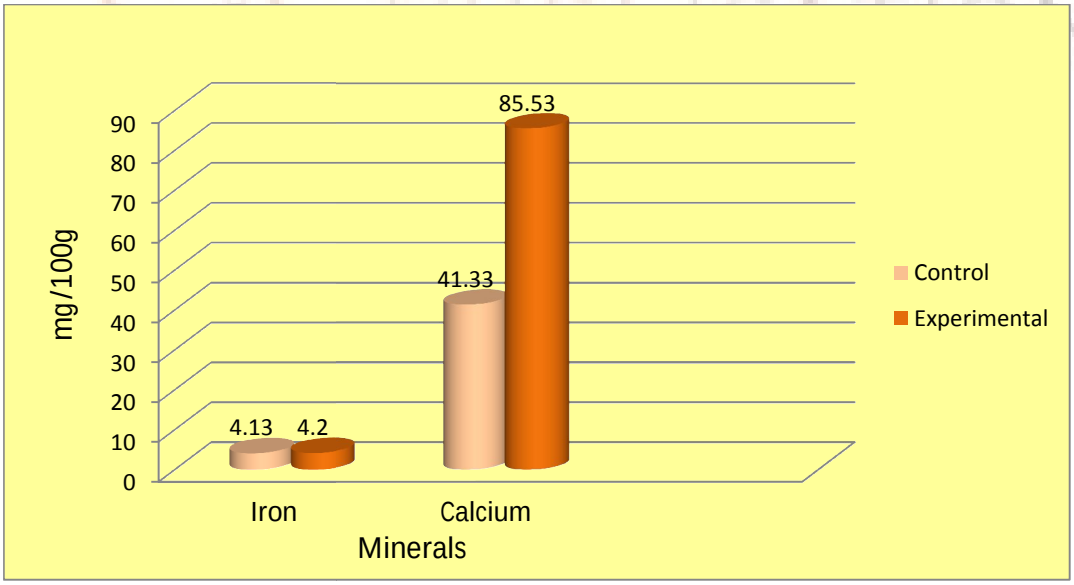


Fig. 2. Mineral content of flours

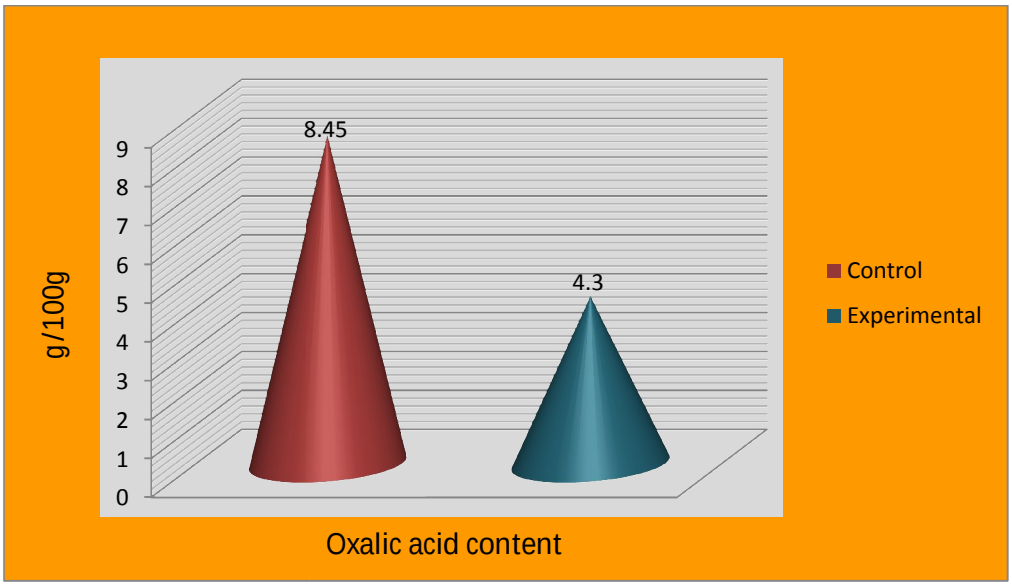


Fig. 3. Oxalic acid content of the flours

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