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ORGANOLEPTIC EVALUATION OF SELECTED HIGH FIBRE BREAKFAST MIX

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ABSTRACT

India is currently passing through an epidemiological transition due to rapid urbanization coupled with economic growth. This could have major implications on the present and future disease patterns in India, with particular reference to an increase in prevalence of non-communicable diseases (NCDs) like obesity, diabetes, and coronary artery disease. Unhealthy, processed food has become much more accessible following India's continued integration in global food markets. The main objective of this study is to formulate a product rich in Dietary Fiber. In the first phase of the study, foods rich in dietary fiber such as oat bran, wheat bran, green gram and whole wheat were selected using various criteria like availability, acceptability and cost. In the second phase, in order to produce an acceptable product with high dietary fiber, recipes such as pongal, roti, kitchadi, adai, chapathi, upma, dosa and porridge were formulated and standardized using numerical scoring method. In the third phase, Total Dietary fibre, toxic compounds, phytates and metals like zinc, tin, arsenic, lead and mercury content of the product was analyzed. Thus from the results obtained, 100g of high fiber mix which contains 16.09 g of dietary fiber along with protein can be recommended for the NCDs. Bran is a boon to NCDs.

Keywords: Obesity, Non communicable diseases, Dietary fiber, Oat bran, Wheat bran.

INTRODUCTION

Dietary fiber and whole grains contain a unique blend of bioactive components including resistant starches, vitamins, minerals, phytochemicals and antioxidants. As a result, research regarding their potential health benefits has received considerable attention in the last several decades. Epidemiological and clinical studies demonstrate that intake of dietary fiber and whole grain is inversely related to obesity, type II diabetes, cancer and cardiovascular disease (CVD). Defining dietary fiber is a divergent process and is dependent on both nutrition and analytical concepts. Generally speaking, dietary fiber is the edible parts of plants, or similar carbohydrates, that are resistant to digestion and absorption in the small intestine. Recent research has begun to isolate these components and determine if increasing their levels in a diet is beneficial to human health. These fractions include arabinoxylan, inulin, pectin, bran, cellulose, β-glucan and resistant starch (James et al., 2010). The study of these components may give us a better understanding of how and why dietary fiber may decrease the risk for certain diseases.

Oats were first found to have a cholesterol-lowering effect and the active component was identified as beta-glucans (Kerckhoffs et al., 2002). Oats reduced both serum total cholesterol and LDL cholesterol. Soluble fibre from oats lowers cholesterol levels in the blood. Some people are intolerant to gluten. Because oat bran as a cereal does not contain gluten a type of sugar, it is harmless for people suffering from digestion related disorders. Wheat has a natural property of controlling weight amongst all. Dietary intake of

beta-glucans is potentially beneficial in the treatment of diabetes and associated cardiovascular risks (Clelenad et al., 2006). Studies have shown that beta-glucans could reduce hyperglycemia, hyperlipidemia, and hypertension. So it was thought that it would be worthwhile considering cereal and pulse in combination with brans to prepare a mix which could help for NCD's.

MATERIALS AND METHODS

Selection of ingredients

Bran from a wide array of cereal grains have been shown to have an effect on postprandial glucose levels, serum cholesterol, colon cancer, and body mass [Ulmius et al., 2009]. Different foods rich in dietary fibre were selected based on the careful perusal of previous literature. Local availability, ease of procurement and low cost formed the secondary criteria for the choice of the ingredients.

Formulation and standardization of the mix

Supplements were tried out using different ratios ofwhole wheat, green gram, wheat bran and oat bran. The selected ingredients were cleaned, dried, roasted and powdered. This powder was tried in diferrerent ratios for the preparation of various recipes like pongal, roti, kitchadi, adai, chapathi, upma, dosa and porridge. The above mentioned combinations were prepared in the Foods Laboratory of Avinashilingam Institute for Home Science and Higher Education for Women Univ**e**rsity, Coimabtore, Tamil Nadu.

Organoleptic evaluation of the formulated recipes

Sensory qualities of the recipes were assessed by a numerical scoring for sensory quality attributes; namely, appearance, colour, flavor, texture, taste and overall acceptability. Evaluation was done by semi-trained panel members of Avinashilingam Institute for Home Science and Higher Education for Women University, using score card. The scores obtained in the acceptability trials were statistically analyzed to obtain significant and trustworthy results for the best acceptable and suitable product.

Analysis of the Breakfast mix

Selected breakfast mix was analysed for dietary fiber, active constituents and toxic elements to suit for human consumption.

Total Dietary fiber

Total dietary fiber in foods and food products is estimated by Non-Enzymatic-Gravimetric Method (Lee et al., 1992). The isolated fiber sources are suspended in H_2O and incubated 90 min at 37°C to solubilise sugars and others water-soluble components. Water-soluble fiber components are then precipitated with ethanol. Residue is washed sequentially with 78% ethanol and acetone and then dried at 105ºC. Duplicate was analysed for protein, and other for ash. Total Dietary Fibre (TDF) is calculated as weight of residue, less weight of protein and ash. The crude protein is estimated by Kjeldahl Nitrogen by using % N x 6.25.

$$TDF\ \% = 100\ X\ \frac{Wr-(P+A/100)\ x\ WR}{Ws}$$

Where, Wr= mg residue, P=% protein in residue,

A=% ash in residue and Ws=mg test portion.

Dietary fat

Dietary fat was analysed by was using the procedure outlined in Folch et al., (1957).

Active constituents

Active constituents and the toxic elements such as mercury, zinc, tin, phenol, arsenic, lead, trypsin inhibitor and phytic acid present in the mix were considered and were analyzed using a standard

procedure. Essential fatty acids were analysed as prescribed by the AOAC methods (1975). Total sugars were analysed as given by the Dubios et al., (1956).

Anti- nutritional factors

Anti-nutritional factors were analysed for hydrogen cyanide using the standard procedure by Colorimeter estimation.

RESULTS AND DISCUSSION

Standardisation of the high fiber mix

The ingredients selected were cleaned, dried, roasted and powdered separately. For standardization this mix was tried in different combinations for their nutrient content including dietary fiber, cost of the powder and suitability for various recipes. The combinations tried were tabulated below in Table 1.

From the above combinations tried with regard to the fiber content and acceptability, odour and cost, variation A supplied more calories and minimum fiber which was not acceptable. Variations C and D supplied more fiber but these two were unacceptable because of the coarseness and flavor for human consumption. So the investigator thought those combinations may induce various side effects such as constipation and diarrhea. Finally, the investigator decided that variation B would be suitable for the selected obese subjects as that would supply calorie and fiber for an adult individual. Also this was cost effective and suitable combination for the selected recipes

Organoleptic evaluation of the selected recipes

Sensory evaluation is a multidisciplinary science that uses human panelists and their senses of sight, smell, taste, touch and hearing to measure the sensory characteristics and acceptability of food products. Thus the quality of food is judged in terms of appearance, color, taste, texture and flavour (Chandrasekhar, 2002).

For standardization of these recipes, the investigator tried with 100 g of the formulated mix and compared with the standard recipe. This powder was tried in different ratios for various recipes like pongal, roti, kitchadi, adai, chapathi, upma, dosa and porridge. The above mentioned combinations were prepared in the foods laboratory of Avinashilingam Institute for Home Science and Higher Education for Women University, Coimbatore. The average scores obtained was tabulated and discussed below in Table 2.

To evaluate these recipes porridge and pongal was eliminated first because the flavor of bran dominated in these recipes and it was not acceptable with minimum score of 13.2 and 12.7 respectively. Then, the recipes such as kitchadi and uppma had very a maximum score of 16.9 and 17.5 respectively but these two were also eliminated because it required more oil for preparing when compared to other recipes and was not in the acceptability range. Finally, the recipes such as chappathi, adai, dosa and roti with their maximum scores of 26.7, 26.7, 25.5 and 20.2 respectively were nearer to the standard and were selected because they can be cooked with less oil or no oil.

Nutritional factors of high fiber mix

Table 3 gives the nutritive value of the selected mix. The nutritive value of the formulated mix reveals that it provides 235 calories 18.76g of protein, 3-4 g of fat, nearly 70 g of carbohydrate and 17 g of fiber. It is clear that the mix provides one third of the daily requirement for an Indian adult.

Nutritional factors of high fiber mix

The following Table 4 gives the results obtained from quantitative organic and inorganic analysis of the selected mix. As per the above analysis the formulated mix contains 76.73 g of total sugars, 16.9 g of dietary fiber and 4.57 g of dietary fat per 100g. The inorganic components such as Zinc and Lead were also present in minimal amounts of 40 µg/g of zinc and 274 µg/g of lead which is below the acceptable range for humans. The results are under safety limits as suggested by WHO (2005). It is known that certain inorganic mineral elements (potassium zinc, calcium, traces of chromium etc.) play an important role in the maintanance of normal glucose tolerance and in the release of

insulin from beta - cells of islets of langerhans (Huntley, 2005).

SUMMARY AND CONCLUSION

With changing dietary fashions, the current emphasis on a fiber rich diet - witness the vast array of 'light' and fat-reduced products lining supermarket shelves - has given dietary fibre a front seat. Although people may pay less attention to fibre, its health benefits have not vanished. Fibre remains an essential nutrient and a vital part of healthy eating for everyone, including those with diabetes. In fact, soluble forms of plant fibre may help to mute blood sugar swings.

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Table 1: Standardisation of the selected mix

Ingredients	A	B	C	D	E
Oat Bran (g)	10	20	25	30	40
Wheat Bran (g)	10	20	25	30	40
Whole wheat (g)	40	30	25	20	10
Green Gram (g)	40	30	25	20	10
Total	100	100	100	100	100

Table 2: Organoleptic evaluation of the selected recipes for accepatbility trial

Recipes	Scores (Max-5)						Total Score (Max-30)
	Appearance	Texture	Flavour	Colour	Taste	Overall acceptability	
Chappathi	4.5	4.4	4.6	4.4	4.4	4.4	26.7
Adai	4.6	4.3	4.5	4.5	4.4	4.4	26.7
Dosa	4.0	4.2	3.8	4.6	4.8	4.1	25.5
Roti	3.3	3.2	3.7	3.8	3.2	3.0	20.2
Kitchadi	3.9	2.0	2.0	2.0	3.1	3.9	16.9
Uppma	2.1	3.1	2.7	3.4	3.3	2.9	17.5
Porridge	2.2	2.0	1.9	3.0	2.0	2.1	13.2
Pongal	2.0	2.0	2.7	2.0	2.0	2.0	12.7

Table 3: Nutritive Value of the Selected Mix (100g)

Foods (g)	Nutrients				
	Energy (kcal)	Protein (g)	Fat (g)	Carbohydrate (g)	Dietary Fiber (g)
Oat Bran (20)	49.15	3.45	1.4	13.25	2.09
Wheat Bran (20)	43.1	4.66	1.29	19.33	7.55
Whole wheat (30)	69.2	3.45	0.45	21.36	3.25
Green Gram (30)	100.2	7.2	0.26	17.01	4.01
Total	**235.54**	**18.76**	**3.4**	**70.92**	**16.90**

Table 4: Nutritional factors of the supplement

NUTRIENTS	Analysed value Per 100 g
Active constituents	
Total Sugars (g)	76.73
Total Dietray Fiber (%)	16.90
Dietary Fat (%)	4.57
Essential Amino acids	
Linoleic acid (% of Total fat)	Nil
Linolenic (% of Total fat)	Nil
Oleic acid (% of Total fat)	0.37
Anti-nutritional factors	
Zinc (µg/g)	40
Tin (µg/g)	Nil
Lead (µg/g)	274
Mercury (µg/g)	Nil
Arsenic (µg/g)	Nil
Hydrogen cyanide	Nil
Phenols (mg)	0.22
Trypsin Inhibitor (Units/mg protein)	1.96