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# Subjective Nutrient Analysis and Sensory Evaluation of Fibre Rich Product

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**Abstract:** *Dietary fiber adds bulk to your diet and makes you feel full faster, helping you control your weight. It helps in digestion and helps prevent constipation. Fibre consumption is associated with high nutritive value and anti oxidant-status of the diet, enhancing the effects on human health. The aim of our study is to develop a low cost fibre rich product and minimize its inadequate intake in the affected age groups. A subjective nutrient analysis and consumer awareness of the product was developed with rich fiber. Two samples are prepared using sample one as the control or reference containing oats as the primary ingredient from sample 1 it is with flaxseeds at the rate of 25 grams of flaxseeds, 50 grams of oats and different ingredients. The awareness study among all age groups at college, school and hospital was conducted 150 samples were collected to know regarding the importance of fiber among all age groups showed the result. The less fiber Intake was found in old age groups above 70 years in male and female. According to the data collected of the subject surveyed 60% were aware of fiber diet. Each subject is provided with a developed product to create an awareness and to test the acceptability of the product.*

*Nutrient analysis was carried out to estimate Fiber (0.27), carbohydrate (1.63) and protein (0.17) in Oats and flaxseeds cookies.*

**Keyword:** *Dietary fiber, Oats and Flaxseeds, Subjective Nutrient Analysis.*

## I. INTRODUCTION

The intake of fibre in the diet of a child or an adult, through various foods (such as wholegrain foods, nuts, fruits and vegetables), plays an important role in reducing the risk and lowering the incidence of numerous diseases. Dietary fiber intake provides many health benefits. Individuals intakes of dietary fiber appear to be at lower risk if developing coronary heart disease, stroke, hypertension, diabetes, obesity and certain gastro intestinal diseases. Increase fiber intake lowers blood pressure and serum cholesterol levels. Increased intake of soluble fiber improves glycaemia and insulin sensitivity in non-diabetic and diabetic individuals. Increased fiber intake benefits a number of gastrointestinal disorders including the following – gastro-esophageal reflux disease, duodenal ulcer diverticulitis constipation and haemorrhoids. The aim of our study is to develop a low cost fibre rich product and minimize its inadequate intake in the affected age groups. The purpose of this study is to examine the recommended adequate fibre intake in children, adults and old age groups. Adequate intake (AI) values for fibre range from 19g to 25/d for children age 1 to 8 years, 31g to 38g/d for children and adolescents age men 9 to 18 years and 26 g/d for children, adolescents women 9 to 18 years. Dietary fiber or roughage is the indigestible portion of food derived from plants. It has two main components: 1:Soluble fiber, which is dissolves in water, is readily fermented in the colon into gases and physiologically active byproducts and can be prebiotics and viscous. 2:Insoluble fiber, which doesn't dissolve in water, is metabolically inert and provides bulking, or it can be prebiotic and metabolically ferment in the large intestine. Bulking fibers absorb water as they move through the digestive system, easing defecation.

Soluble fiber is found in varying quantities in all plant foods, including: Legumes( peas, soybeans, lupins and other beans)

Oats, rye, chia and barley. Some fruits (including figs, avocados, plums, prunes, berries, ripe bananas and the skin of apples, quinces and pears). Certain vegetables such as broccoli, carrots and Jerusalem artichokes. Root tubers and root vegetables such as sweet potatoes and onions (skins of these are sources of insoluble fibers also), .Psyllium seed husks (a mucilage soluble fiber) and flax seeds. Nuts, with almonds being the highest in dietary fiber.

Sources of Insoluble fibers include: Whole grains foods, Wheat and corn bran

Legumes such as beans and peas. Nuts and seeds, Potato skins, Lignans. Vegetables such as green beans, cauliflower, zucchini (courgette), celery and nopal. Some fruits including avocado.

OATS: Oats are a member of the grass family of plants (Poaceae) and are often described as a "cereal grass" or "cereal grain." Oats possesses beneficial health effects against gastrointestinal problems (Anderson and Bridges 1993; Wrick 1993, 1994; Stark and Madar 1994), and also boasts of anti-cancerous effects (Oku 1994; Salminen et al. 1998; Gallaher 2000). Oat consumption in human

diet has been increased because of health benefits associated with dietary fibres such as  $\beta$ -glucan, functional protein, lipid and starch components and phytochemicals present in the oat grain. Oats also contain a varied range of phenolic compounds including ester linked glycerol conjugates (Gray et al. [2002](#)), ester linked alkyl conjugates (Daniels and Martin [1967](#)), ether and ester linked glycerides (Collins [1986](#)), anthranilic acids and avenanthramides (AVAs) (Dimberg et al. [1993](#)).

Health claims regarding the association between cholesterol-lowering and soluble fiber from oat products/oat beta-glucan (OBG) have been approved by the food standards agencies worldwide (United States: US Food and Drug Administration; Canada: Health Canada; Europe: European Food Safety Authority; Australia and New Zealand: Food Standards Australia New Zealand; Malaysia: Ministry of Health Malaysia).

Compared with other cereals (wheat, rice, barley, buckwheat, and rice), oats contain higher content of protein, and the composition of oat amino acid is more reasonable.

**FLAX SEEDS:** Flaxseed, or linseed (*Linum usitatissimum* L.), comes from the flax plant, which is an annual herb. Flaxseeds have nutritional characteristics and are rich source of  $\omega$ -3 fatty acid:  $\alpha$ -linolenic acid (ALA), short chain polyunsaturated fatty acids (PUFA), soluble and insoluble fibers, phytoestrogenic lignans (secoisolariciresinol diglycoside-SDG), proteins and an array of antioxidants (Ivanova et al. [2011](#); Singh et al. [2011](#); Oomah [2001](#); Alhassane and Xu [2010](#)).

Its growing popularity is due to health imparting benefits in reducing cardiovascular diseases, decreased risk of cancer, particularly of the mammary and prostate gland, anti-inflammatory activity, laxative effect, and alleviation of menopausal symptoms and osteoporosis. According to its physico-chemical composition, flaxseed is a multicomponent system with bio-active plant substances such as oil, protein, dietary fiber, soluble polysaccharides, lignans, phenolic compounds, vitamins (A, C, F and E) and mineral (P, Mg, K, Na, Fe, Cu, Mn and Zn) (Bhatty [1995](#); Jheimbach and Port Royal [2009](#)).

Flaxseed is the richest plant source of the  $\omega$ -3 fatty acid i.e.  $\alpha$ -linolenic acid (ALA) (Gebauer et al. [2006](#)). Flaxseed oil is low in saturated fatty acids (9 %), moderate in monosaturated fatty acids (18 %), and rich in polyunsaturated fatty acid (73 %) (Cunnane et al. [1993](#)). flaxseed oil is naturally high in anti-oxidant like tocopherols and beta-carotene.

Flax fibers include both soluble and insoluble dietary fibers. The proportion of soluble to insoluble fiber varies between 20:80 and 40:60 (Morris [2003](#); Mazza and Oomah [1995](#)). The optimal pH range for viscosity of flaxseed mucilage is 6–8, the pH environment in human intestines. Only 10 g of flaxseed in the daily diet increases the daily fiber intake by 1 g of soluble fiber and by 3 g of insoluble fiber. Insoluble fiber helps improve laxation and prevent constipation, mainly by increasing fecal bulk and reducing bowel transit time (Greenwald et al. [2001](#)). On the other hand, water-soluble fiber helps in maintaining blood glucose levels and lowering the blood cholesterol levels (Kristensen et al. [2012](#)).

Increased blood sugar (Diabetes mellitus) is a major risk factor of cardiovascular diseases, which is defined as having a fasting plasma glucose level  $\geq 126$  mg/dl. Diabetes mellitus is characterized by hyperglycemia and associated with aberrations in the metabolism of carbohydrate, protein, and lipid that result in development of secondary complications (Mani et al. [2011](#)).

Dietary fibers, lignans, and  $\omega$ -3 fatty acids, present in flaxseed have a protective effect against diabetes risk (Prasad et al. 2000; Prasad 2001; Adlercreutz 2007).

The researchers suggested the ability of flaxseed to help maintain more early stages of cancer is due to the fact that flaxseed contains the highest level of plant lignans, which have antioxidant activities (Hall et al. 2006) and have also been shown to alter estrogen metabolism, which may decrease ovarian cancer risk and improve health (McCann et al. 2007).

Cicero et al. (2010) showed that long-term supplementation of omega-3 fatty acids was associated with a significant reduction in systolic and diastolic blood pressure. Hypertension is a risk factor for CKD; hence, the influence of long-chain n-3 PUFA on blood pressure may be a potential mechanism by which it protects the kidneys. However, a positive association between  $\alpha$ -linolenic acid and moderate CKD was observed by Gopinath et al. (2011). One possibility behind the results could be lesser conversion of  $\alpha$ -linolenic acid into EPA and DHA, which have been shown to be cardioprotective (Wang et al. 2006).

When type 2 diabetic patients were fed defatted flaxseeds for 2 months, patients showed significant reduction of plasma glucose, improvement in plasma lipid profile and significant reduction of lipid peroxidation (Mohamed et al. 2012). Dietary flaxseed may also offer protection against ischemic heart disease by improving vascular relaxation responses and by inhibiting the incidence of ventricular fibrillation (Jennifer et al. 2010).

Flax protein contains abundant arginine and glutamine (Oomah and Mazza 1993), which are very important in the prevention and treatment of heart disease (Gornik and Creager 2004), and in supporting the immune system (Avenell 2006). Flaxseed contains bioactive peptides, such as cyclolinopeptide A, which have strong immunosuppressive and antimalarial activities, inhibiting the human malarial parasite *Plasmodium falciparum* in culture (Bell et al. 2000).

## II. MEHTODOLOGY

The following methodology is planned is planned keeping the frames objectives in mind. The main components of the study are: 1. Product development. 2. Consumer awareness.

Product development product development is nutritious context means, the act of developing a basic product in to a new or value added product, which is high in terms of nutrients and other benefits. Because if the quantity and sometimes the physical reputations and characteristics of most primary product, when added to other product usually enhances the nutritive .hence the product developed with the combination of different fiber to maintain adequate fiber intake in different age groups. Formulation of the products : oats and flaxseed cookies oats and flaxseed cookies is a healthy choice for snack time, it is considered nutritious because it is attributed to their content of omega 3 fatty acids, lignans and fiber.

Formulation of oats and flaxseed cookies : table : 1

INGREDIENTS	GRAMS
Oats(g)	50
Flaxseeds(g)	25
Sugar(g)	50
Cocoa powder(tsp)	2
Peanut butter(tsp)	2
Milk(tbsp)	2
Baking powder(tsp)	½
Vanilla essence(tsp)	1/4

### A. Method Of Preparation 1

First, dry roast oats and flaxseeds separately. 2.Grind them separately into a coarse powder. 3. Now in a bowl add all ingredients and mix well. 4. Make a dough out of it. 5. Now make small balls flatten them on a baking tray and garnish with chocolate chips. 6. Bake for 25 min at 150 degrees C.

### B. Standardization

Standardization i a process where a recipe is tested and found consistently satisfactory in quality and yield. It is a gradual trial and error process. Use of standard recipe is a prime factor in developing good product. Quantities of each ingredient ,raw and cooked weights,preparation time were standardized ( kalai r. And r. Jagan mohan 2014). Development of score card: the developed products were tasted and rated on a scale of 5 based on the following sensory attributes, taste, odour,colour,texture,overall acceptability. Score card consisted of the name of the judge,date,ender,age,educationalqualification,contact no. and economic status.

### C. Calculation And Analysis Of Nutrients

The nutritive value was calculated for the basic from Nutritive value of Indian Foods (B.S Narsinga Rao et al., 2011)

Nutritive Value Of Variation Of Product Development : Table : 2

Cookies	Proteins (100g)	Carbohydrates (g)	Fiber (g)
VariationI	3.4	32.6	5.4

### D. Nutrient Analysis

The nutrients of importance in oats and flaxseed are the protein and dietary fiber. These were analyzed using the standard methods given by AOAC (Association of Official Agriculture Chemists).

### E. Determiation Of Crude Fiber In Food Sample

1) *Introduction:* The seed coat of oil seeds,nuts and pulses ,peels of fruits and vegetables, and bran of cereals contain considerably more fiber than the softer edible inner tissues. So, the fiber content can be employed fir assessing the proportion of outer coating of plant materials. The digestibility of food varies inversely with the crude fiber content.\_PRINCIPLE:\_The crude fiber

represents the cell wall material left after boiling with dilute acid and alkali. It contains a mixture of cellulose, lignin and pectans, together with sand, silica and other material matter locked in the tissues and little nitrogenous matter.

- 2) *Requirements:* 1. Sulphuric Acid – 0.255 N (1.25 percent (m/v)), accurately prepared. 2. Sodium Hydroxide Solution - 0.313N (1.25 percent (m/v)), accurately prepared. *PROCEDURE:* Weigh accurately about 2g of the dried material and extract the fat for about 8 hours with petroleum ether or hexane, food grade, using a Soxhlet or other suitable extractor or use the residue from the crude fat determination transfer the fat free dry residue to a one liter conical flask. Take 200 ml of dilute sulphuric acid in a beaker and bring to boil. Transfer the whole of the boiling acid to the flask containing the fat free material and immediately connect the flask with a reflux water condenser and heat, so that the contents of the flask begin to boil within one minute, rotate the flask frequently, taking (about 18 threads to the centimeter) held in a funnel, and wash with boiling water until the washings are no longer acid to litmus bring to the boil some quantity of sodium hydroxide solution under the reflux condenser. Wash the residue on the linen into the flask with 200 ml of the boiling sodium hydroxide solution, immediately connect the flask with reflux condenser and boil for exactly 30 minutes remove the flask immediately filter through the filtering cloth. Thoroughly wash the residue with boiling water and transfer to a Gooch crucible prepared with hot water and then with about 15ml of 95 percent (by volume) ethyl alcohol. Dry the Gooch crucible and contents at 105 ± 1 degree C in the air oven to constant mass cool and weigh incinerate the contents of the Gooch crucible 600 ± 20 degree C in a muffle furnace until all the carbonaceous matter is burnt. Cool the Gooch crucible the ash in a desiccators and weigh.

$$\text{Crude Fiber \% by mass} = \frac{100 \times (M1 + M2) \times (100 - f)}{M}$$

Where, M1 = Mass in grams of Gooch crucible and contents before ashing. M2 = Mass in grams of Gooch crucible and contents asbestos and ash. F = crude fat % on moisture – free basis 0 percent by mass and M = Mass in grams of dried material taken for the test.

#### F. Results and inference

The difference between the results of the two concurrent determinations carried out simultaneously or in rapid succession by the same analyst (repeatability) shall not exceed 0.1% by mass.

#### G. Precautions

- 1) The fitness of the particles has an important bearing on the result accuracy. Hence, the sample should pass through a 1mm sieve.
- 2) The concentration of sulphuric acid and sodium hydroxide is very important for the separation of the other food constituents from crude fiber.
- 3) While dilution of sulphuric acid, always add acid to water but not water to acid. , flaxseeds and importance of fiber etc.

#### H. T-Test

T test was applied to find out the significance of difference between the mean scored of the sensory properties of basic. *FORMULA APPLIED:* Let x<sub>1</sub> and x<sub>2</sub> be two independent samples of size N<sub>1</sub> & N<sub>2</sub> respectively, suppose we want to test the hypothesis. H<sub>0</sub>: is the significant difference between the means of the basics and variations. Under the null hypothesis, the H have been drawn from the same normal population has a ‘t’ distribution as per the statics.  $T = (x - y)$ , Where,  $x_1 = (x_i - y_i)$ ,  $y_1 = (y_i - y)$ .

### III. RESULTS AND DISCUSSION

#### A. Product Development

Product development in a nutritional context means the act of developing the basic product into a new of value added product which is high in terms of nutrients and other health benefits, because if the quantity and some times almost mystical reputation and characteristics of most primary, their addition other product usually enhance the nutritive value or the quantity of these sensory products. For these reason the secondary products with partially or wholly, can be made up of primary product are referred to here as “value added” product or develop products. Hence the product developed with combination of different ingredients known to maintain the sugar levels. Basic recipe selected was oats cookies and is well known and easy to prepare recipe. Any food can give the person pleasure if it has to be accepted and become part of being habits. Thus acceptance naturally depends primarily on those qualities that he readily perceives an experiences. These are appearances, colour, taste, texture and flavor which are secondary responses of the person to the food for the measurement of the sensory responses in the form of estimates of individual dimension of

overall quality we have to rely on human panels. Since each variation of product or a formulation could be tested at consumer level it becomes necessary to standardize the condition of testing with selected panel under optimal condition. The reasoning is that if by sensory testing a product will be approved by such panel of layman who is generally less critical or sees it as whole and not analytically will also approve the product.

The awareness study among all age groups at college, school and hospital. 150 samples were collected to know regarding the importance of fiber among all age groups showed the result. The less fiber Intake was found in old age groups above 70 years in male and female.

Table : 3 : Awareness Of Inadequate Intake Of Fiber Affects

OPTIONS	PERCENTAGE
YES	67%
NO	32%

Figure : 1

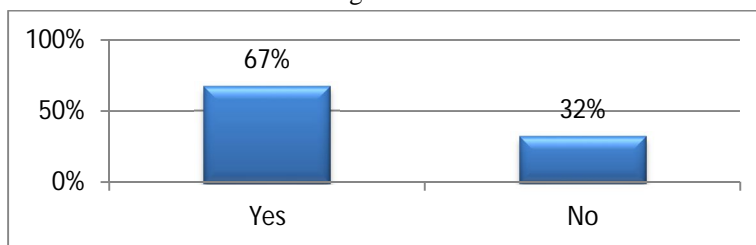
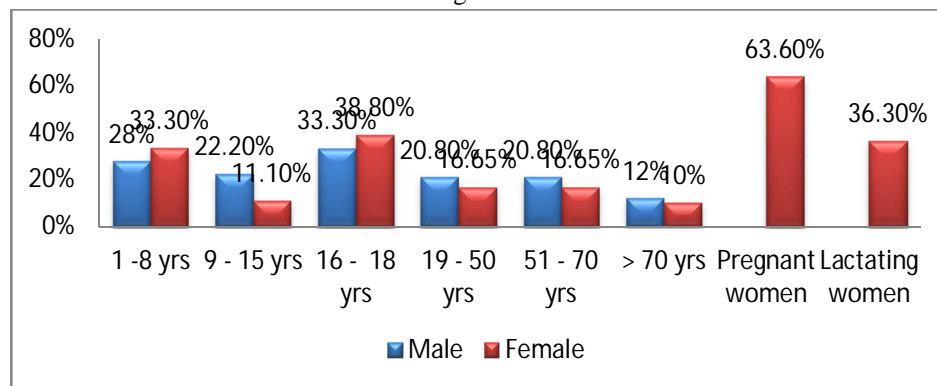


Table: 4: Awareness On Digestion Problem In Age Groups

OPTIONS		PERCENTAGE	
GENDER			
	MALE	FEMALE	
AGE	MALE	FEMALE	
1 to 8 years	1 to 8 years	28%	33.3%
9 to 15years	9 to 15 years	22.2%	11.1%
16 to 18 years	16 to 18 years	33.3%	38.8%
19 to 50 years	19 to 50 years	20.8%	16.65%
51 to 70 years.	51 to 70 years.	20.8%	16.65
>70yrs	>70yrs	12%	10%
	Pregnant women 21-50yrs		63.6%
	Lactating women 21-50 yrs.		36.3%

Figure : 2



#### IV. UMMARY AND CONCLUSION

The term dietary fiber also includes a type of starch known as resistant starch (found in pulses, partly-milled seeds and grains, some breakfast cereals) because it resists digestion in the small intestine and reaches unchanged the large intestine A questionnaire

method was conducted to assess the knowledge of fiber among different age groups and to create awareness of dietary fiber. 150 subject were selected and also provided with a product developed to test for acceptability of product . 80 % accepted the product in terms of appearance, texture, taste, flavor and acceptance. It was observed that the majority of the subject from different age groups like individuals above 70 years were not aware of the importance of fiber and aware of different fiber food, functions and its source. From the finding of the present study investigation, it is concluded that the product developed by using fiber contained appreciable amount of nutrients, If these were incorporated among older age groups ,the health status and fiber can be improved. As it helps in preventing from digestive problems. The panels among with variation were prepared. The basic consist of oats (50 grams) and were as in Variation 1 flaxseeds 25gms was added. The Variation1 was most acceptable one. The same method of preparation was followed preparing both the basic and Variation1 were formulated and standardization by conduction repeated trials. Panels of 25 Judges evaluation the palatability and acceptability of the product . The palatability of the basic and variation were accepted in term of appearance, taste , texture ,flavor and acceptability. The nutritive value calculation was done for the products and the nutrients of importance were estimated, fiber, energy , calcium, iron and protein in oats and flaxseeds cookies was estimated using standard methods given by AOAC. This Analysis was carried out at Prof. Jayashankar Telangana Agricultural University, Quality Control Laboratory. Rajendranagar, Hyderabad. Statistical analysis was done by applying 't' test and the results were found to be insignificant for basic and significant for variation 1. The cost of the developed products was calculated and it was found that the basic oats and flaxseeds cookies cost Rs.4 /ser and the variation 1 was for Rs. 5 /ser. It was concluded that the products developed were widely accepted by people and they contain good amount of nutrients .

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- [51] Udenigwe et al. (2009) showed that the protein components of flaxseed meal possess peptide amino acid sequences that can be exploited as potential food sources of anti-hypertensive agents
- [52] Alhassane et al (2010) studied that Lignans are compounds found in a variety of plant materials including flaxseed, pumpkin seed, sesame seed, soybean, broccoli, and some berries. Rodriguez-Leyva et al. (2010) stated that Marine food products have provided the traditional dietary sources of  $\omega$ -3 fatty acids. Rubilar et al (2010) suggested that flaxseed consumption and its possible applications as functional food ingredient in foodstuffs
- [53] Matthew (2011) concluded that flaxseed reduces total and LDL, or "bad," cholesterol concentrations. Pruthi et al. (2011) found that women who ate fibre bars with added flax seed got no more relief than women who ate the same fibre bars with out flax seeds. Rabetafika et al. (2011) observed that Flaxseed proteins are potent multi-functional ingredients for food formulation owing to their techno-functionalities, food preservation capacity, and health benefits. Singh et al. (2011) found that the high dietary fibre in flaxseed, due to high water holding capacity and low digestibility, increasing the bulkiness and gastric emptying of stool.





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