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Development and nutrient analysis of vegetable oats soup using nuts

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Abstract
Oats unique macro, micro, and phytonutrient composition, high nutritional value, and relatively low agricultural input requirements make oats unique among cereal crops. The health benefits of the oats are becoming well established. While the connection between oat β-glucan fibre in reducing the risk of cardiovascular disease and controlling glycaemia have been unequivocally established, other potential benefits including modulation of intestinal micro biota and inflammation continue to be explored. Furthermore, oats starch has a low glycemic index, which is favourable for weight control. Healthy nuts are also a great source of plant protein, minerals and other life-enhancing nutrients. In light of the above health benefits a nutritious product (vegetable oats soup) was developed using oats and nuts. A basic along with three variations were prepared whose acceptability was tested using hedonic rating test by twenty panellists. Variation-ll was most accepted. The data collected from the sensory evaluation was compiled and "T" test was applied to find out the significance of the difference between the mean scored for the sensory properties of the basic and variations. The product developed contained good amount of soluble fibre and was affordable. The products were subjected to nutrient analysis. In variations the amount of Protein, fat and fibre was significantly increased.

Keywords: phytonutrient, cardiovascular disease, glycaemia

Introduction
Oats have a long history of use as human food and animal feed. From its origins in the Fertile Crescent, the oat has adapted to a wide range of climatic conditions and geographic regions. Its unique macro-, micro-, and phytonutrient composition, high nutritional value, and relatively low agricultural input requirements makes oats unique among cereal crops. The health benefits of the oats are becoming well established. While the connection between oat β-glucan fiber in reducing the risk of cardiovascular disease and controlling glycemia have been unequivocally established, other potential benefits including modulation of intestinal microbiota and inflammation continue to be explored. Advances in food technology are continuing to expand the diversity of oat-based foods, creating opportunities to deliver the health benefits of oats to a larger segment of the population.

Five approved European Food Safety Authority (EFSA) health claims apply to oats. Four relate to the oat-specific soluble fibres, the beta-glucans, and concern the maintenance and reduction of blood cholesterol, better blood glucose balance and increased faecal bulk. The fifth claim concerns the high content of unsaturated fatty acids, especially present in the endosperm, which reduces the risks of heart and vascular diseases. Furthermore, oat starch has a low glycemic index, which is favourable for weight control. Oat-specific polyphenols and avenanthramides have antioxidant and anti-inflammatory properties. Thus, oats can contribute significantly to the presently recommended whole-grain diet.

The persistent obesity crisis, with its increased risk for the metabolic syndrome (MetS), type 2 diabetes, and cardiovascular disease (CVD), continues to damage the health of populations globally, including children. Diets rich in the fiber provided by fruit and vegetables support good metabolic health, although few adults and children achieve the recommended daily target. Daily fiber supplementation, particularly with soluble fiber products, such as psyllium, oat bran, or a newer product such as Poly Glycople X, may provide a convenient solution. The addition of a soluble fiber product, improves blood lipid profiles, particularly total and low-density lipoprotein cholesterol, as well as glycemic response, and increases satiety, and by thus improving MetS and CVD risk factors, may augment the processes initiated by weight reduction diets. β-glucan present in oat bran has a beneficial effect on Met S and CVD risk factors, particularly blood lipids and glycemia. Thus the soluble fiber supplements used as an adjunct to dietary and lifestyle modifications may assist with the treatment of CVD and MetS risk factors.

The hypocholesteromic effects of oats are well documented in over 50 clinical studies. However oats also have exerted cardiovascular benefits that go beyond its cholesterol reducing properties.

NUTS
Nuts are rich in energy and nutrients. Nuts nutrition loaded with excellent source of monounsaturated-fatty acids (MUFA) such as oleic and palmitoleic acids**,** which help to lower LDL or "bad cholesterol" and increase HDL or "good cholesterol." Research studies suggest that Mediterranean diet that is rich in MUFA to prevent coronary artery disease, strokes by favoring healthy blood lipid profile. Nuts nutrition is complete in the sense that in addition to calories, and vitamins, they are rich source of minerals like manganese, potassium, calcium, iron, magnesium, zinc, fluoride and selenium. Healthy nuts are also a great source of plant protein, minerals and other life-enhancing nutrients.

In addition nuts like pecans, walnuts, and almonds contain tryptophan, an amino acid that stimulates the production of

a hormone called serotonin brain, which can help ward off depression and promote a more relaxed mode. Therefore, eating nuts regularly has many health benefits. Although, most nuts contain similar nutrients. Different type of nuts provides different type of health benefit. They also vary considerably in their fat content and amount of calories. For many years, nuts have gotten a bad reputation for being high in fat. But In reality, nuts are a vital part of our diet, as they are high in monounsaturated fat that actually keeps us heart-healthy and disease free.

Method of preparation

- **Step 1:** Oats were soaked for 10 minutes prior to seeking.
- **Step 2:** All the vegetables were chopped finely and separately pressure cooked until they were done.
- **Step 3:** Almonds and walnuts were coarsely grounded and kept separately.
- **Step 4:** In a one stick pan, the measured quantities of oats and vegetables were added along with 100 ml of water. To this, salt, chili powder and turmeric powder were added.
- **Step 5:** For the variations grounded almonds and walnuts were added along with the vegetables.
- **Step 6:** The pan was covered with a lid and soup was cooked for 2-3 min and was garnished before serving.

Table 1: Quantity of ingredients used in vegetable oats soup for basic and variations

Ingredients	Basic	Variation I	Variation Ii	variation III
Oats	50 g	50g	50g	50g
Spring onion	10 g	10g	10g	10g
Carrot	10g	10g	10g	5g
French beans	10 g	10g	10g	10g
Onion	7 g	2g	-	-
Peas	10g	10g	7g	7g
Almond	-	5g	10g	15g
Salt	2g	2g	2g	2g
Chilli powder	0.5g	0.5g	0.5g	0.5g
Turmeric powder	0.5g	0.5g	0.5g	0.5g

Standardization

Standardization is a process where a recipe is tested a number of times and found consistently satisfactory in quality and yield of the products. It is basically a gradual trial and error process. The use of standardizing a recipe is a prime factor in producing a good, healthy and nutritious product.

The basic recipe of oats soup was prepared as per the method of preparation of soup. The variations were standardized depending on the quantities required to get an acceptable product. The amount of ingredients like oats, vegetables were included, almonds and walnuts were included in variations keeping in mind the acceptability factor.

Sensory evaluation of oats soup

Once the standardization was completed, 20 panelists were selected for both the trials of evaluation of sensory attributes of the soup prepared. The panelist in each trial did sensory evaluation of the basic as well as the variations done.

Same procedures and temperatures were followed for both the trials to minimize any change in the preparation that might bring about differences in taste, texture, flavor. etc...

Four samples were placed together, in front of the panel members with a score card to rate the four different recipes. A glass of water was also provided to the Judges, to drink in between the assessment of the four samples, so as it becomes easier for the pane list to get the exact taste of the four samples.

Finally, the sensory attributes evaluated in terms of appearance, flavour, texture, taste, acceptability for all the four samples showed significant results.

Nutritive value of basic and variations

Nutritive value (energy, carbohydrates, proteins, fat, fiber, iron) of the basic and variations were calculated.

Table 2:- Nutritive value of basic and variations of vegetable oats soup

Oats soup	Energy (kcal)	Protein (gms)	Fat (gms)	Carbohydrates (gms)	Fiber (gms)	Cost (RS)
Basic	214.6	8.03	3.87	36.5	2.77	9.25
Variation –I	242.8	8.92	6.76	37.2	3.07	12.55
Variation- II	269.0	9.73	9.6	37.4	3.06	16.25
Variation –III	304.1	10.7	12.64	37.6	2.91	18.75

Nutrient analysis: Proximate composition of oats soup were carried out by method given by AOAC (1990).

Moisture estimation

Moisture was determined according to the procedure given by AOAC (1975) by drying the sample (2g) at 105^0C in moisture oven in pre dried and weighed aluminum dishes until constant weight was obtained. The loss in weight of the sample was used to calculate percent moisture as follows:

$$\text{Per cent moisture content (g/100g)} = \frac{W_2 - W_3}{W_2 - W_1} X\ 100$$

W_1 =Weight of empty aluminium dishes (g)
W_2 = Weight of aluminium dish + Sample before drying (g)
W_3 = Weight of aluminium dish + Sample after drying (g)

Total ASH Estimation

Total ash in the sample was determined according to the method of AOAC (1975). Two-gram sample was charred in predried and weighed porcelain crucible. Charred sample was incinerated in muffle furnace at 500-570 ^{0}C for 8 hours or till the ash becomes white or grayish white in colour. After ashing porcelain crucibles were removed, allowed to cool in desiccators and weighed. Porcelain crucibles were kept in air oven at 100 ^{0}C for one hour, cooled and weighed to a constant weight, percent ash was calculated as follows:

$$\text{Percent ash in the sample (g/100g)} = \frac{\text{Weight of ash}}{\text{Weight of sample (g)}} X\ 100$$

Statistical analysis

The data collected from the sensory evaluation was compiled; using "T" test was applied to find out the significant difference between the mean scored for the sensory properties of the basic and variations

Formula applied

$$t = (\bar{X} - \bar{Y}) \sqrt{\frac{n(n-1)}{\Sigma_{i=1}^{n} (\hat{X}_i - \hat{Y}_i)^2}}$$

Where, XI = (Xi-X)
YI = (Yi- Y)

Results and discussion

Table 3: Comparision of nutritive value of basic and variations of vegetable oats soup

Oats soup	Energy (kcal)	Protein (gms)	Fats (gms)	Carbohydrate (gms)	Fiber (gms)	Cost (Rs)
Basic	214.6	8.03	3.87	36.5	2.77	9.25
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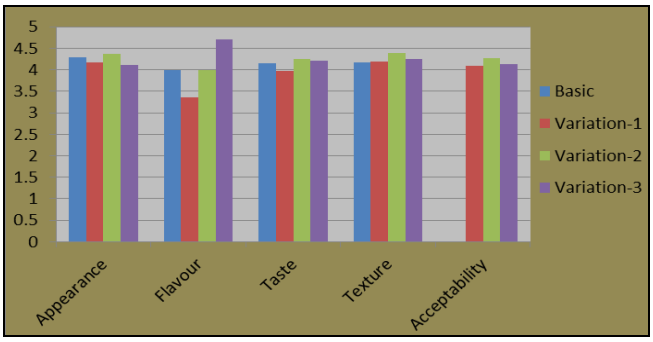

Fig 1: Comparison of mean values of the sensory attributes of basic and variations

Table 4: 'T'- Test for variation –i in comparison with basic (vegetable oats soup)

S. No	Sensory Attributes	Mean value of variation-I	Mean value of basic	"T" value	Result
1.	Appearance	4.17	4.3	0.027	insignificant
2.	Flavour	3.35	4		
3.	Texture	3.97	4.15		
4.	Taste	4.02	4.17		
5.	Acceptability	4.1	4.3		

Note: critical value of 'T' at p at 0.05 is 2.13

Table 5: 'T' Test for variation-ii in comparison with basic (vegetable oats soup)

S.no	Sensory attributes	Mean value of variation-II	Mean value of basic	"T" value	Result
1.	Appearance	4.37	4.3	0.080	insignificant
2.	Flavour	4.00	4.00		
3.	Texture	4.25	4.15		
4.	Taste	4.40	4.17		
5.	Acceptability	4.28	4.3		

Note: critical value of 'T' at p at 0.05 is 2.1

Table 6: 'T' Test for variation-iii in comparition with basic (vegetable oats soup)

S.no	Sensory Attributes	Mean value of variation-II	Mean value of basic	"T" value	Result
1.	Appearance	4.12	4.3	0.345	insignificant
2.	Flavour	4.07	4.00		
3.	Texture	4.22	4.15		
4.	Taste	4.25	4.17		
5.	Acceptability	4.13	4.3		

Note: critical value of 'T' at p at 0.05 is 2.13

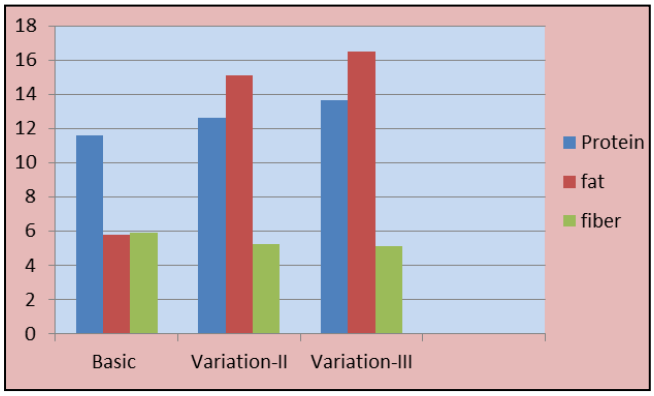

Fig 2: Comparison of nutrient analysis of protein, fat, fiber basic and variations of vegetable oats soup

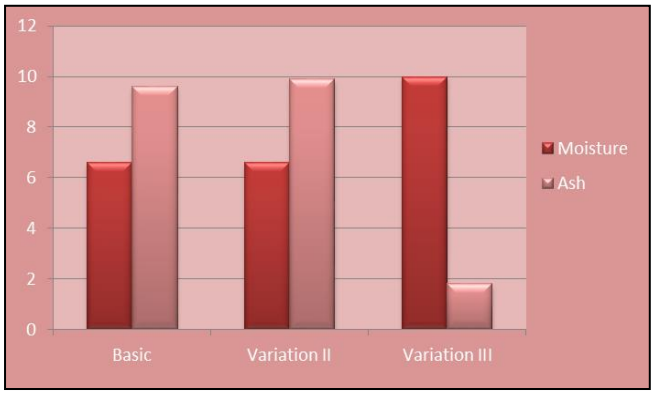

Fig 3: Comparison of estimation of moisture and ash of basic and variations

Summary and conclusion

Excess body weight is a hindrance, leading to breathlessness on moderate exertion and predisposes a person to diseases like atherosclerosis, high blood pressure, stroke, diabetes, gall bladder diseases and osteoarthritis of weight bearing joints and varicose veins. oat starch has a low glycemic index, which is favourable for weight control.

The product developed was a healthy mixed vegetable soup with oats and nuts incorporated in it. This product consists of oats, nuts and vegetables which are the richest source of fiber and is helpful in weight reduction for obese persons

A basic along with three variations were developed and the quantity of nuts was increased in each variation. The product was selected because of the ingredients used in the preparation of oats soup, as oats, vegetables are one of the richest source of fiber which increase the palatability and also have other health benefits. Nuts were included as they have monounsaturated fatty acids and other vitamins and minerals which add up to nutrient content of the product.

The product was standardized by trial and error method, the same method of preparation and timing was followed for all the variations.

Once the standardization was completed, members of 20 panellists were selected for both the trials of sensory attributes of oats soup. The panellist in each trial did sensory evaluation for basic as well as for all the variations. All the four samples were placed together in front of the panellist along with a Hedonic rating scale score card to rate the four different recipes. And a glass of water was also provided to drink in between the assessment of the 4 samples, so that it becomes easier for the panellist to get the exact taste of the four samples of the oats soup presented.

The basic and variations of oats soup were accepted in terms of appearance, flavour, texture, taste, acceptability. Statistical analysis of the trials showed that't' value at p 0.005 was found to be insignificant for all the three variations. Variation 2 was the most accepted.

Finally, the products were subjected to nutrient analysis. In variations the amount of Protein, fat and fibre was significantly increased. The developed product oats soup was a nutritious and healthy recipe which can be consumed by every age group regardless for obese persons only.

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