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Production process and chemical analysis of oat milk

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Abstract
Plant-based milk alternatives are a rising trend, which can serve as an inexpensive alternate to poor economic group of developing countries and in places, where cow's milk supply is insufficient. Nowadays, cow milk allergy, lactose intolerance, calorie concern and prevalence of hypercholesterolemia, more preference to vegan diets has influenced consumers towards choosing cow milk alternatives. Though numerous types of innovative food beverages from plant sources are being exploited for cow milk alternative. Oat (*Avena sativa*) is a cereal that contains soluble fibre β – glucan renders several health benefits. In the present investigation an attempt was made to develop oat milk. Oat milk prepared from oat groat showed 2.0 % fat, 1.76 % protein, 11.39 % total solids and 0.8 % crude fiber. Oat flavour is highly accepted by customers; thus oat ingredients can be considered to be ideal for delivering the health promoting properties in variety of consumer products.

Keywords: Oat milk, Groats, β – glucan and lactose intolerance

1. Introduction
During recent years non-dairy milk types, such as soymilk, coconut milk, almonds milk, mill milk, rice milk and oat milk, have been an increased demand from consumers due to their high functional properties. The cereal and grain milks aqueous extracts also do not contain cholesterol or lactose; hence, these milk types are preferred by health conscious people and lactose intolerant.

Oats belongs to the family of *poaceae* and is commonly known as *Avena sativa.* About 6 % of oats grains are used for human nutrition (Norja and Lehtinen, 2008) [8]. Food uses for oats include oatmeal, oat flour, oat bran and oat flakes for use as breakfast cereals and ingredients in other food stuffs.

Oats have many therapeutic properties and are best known for their high protein and fiber content along with cholesterol plummeting abilities. Nutritionally oats are an excellent source of soluble fiber in the form of β-glucans, besides alpha tocopherols, B vitamins, minerals, proteins, and plant fats. Oat milk is free from lactose, provides minerals and phytochemicals which can protect against diseases including cardiac arrest and cancer. It is generally prepared by blending oat to water ratio of 1:2. The extracted fluid is oat milk which is then filtered through muslin cloth. It is available throughout World market. Oat milk is second most common vegetable milk in Europe. It is suitable for people suffering from milk protein allergy or lactose intolerance as well as to the people following special diets.

Oats has recently attracted its research and commercial attention mainly due to its high nutritional value. Oats is a good source of antioxidant vitamin E (tocols), phytic acid, phenolic acid and avenanthramides. Oat is well accepted in human nutrition and it is an excellent source of different β-glucan, arabinoxylans and cellulose. It contains relatively high levels of protein, lipids (unsaturated fatty acids), vitamins, antioxidants, phenolic compounds and minerals (Ahmad *et al.*, 2014) [1].

The Food and Drug Administration (FDA) of the United States approved in January 1997 a health claim that "Water-soluble fibre from oatmeal, as part of a low saturated fat, low cholesterol diet, may reduce the risk of heart disease" (Kerckhoffs *et al.*, 2003) [7]. The FDA determined that 3 g of β-glucan must be consumed per day to achieve a clinically relevant serum cholesterol-lowering effect.

United States Department of Agriculture (USDA., 2015) [12] reported to contain nutrients viz., carbohydrates 66.3 g, Dietary fibre 10.6g, Fat 6.9 g, Protein 16.9 g, Pantothenic acid(B_6) 1.3 mg, Folate(B_9) 56 µg, Calcium 54 mg, Iron 5 mg, Magnesium 177 mg, Potassium 429 mg, β – glucan 4 mg per 100 gm.

1.1 Composition of oat groat

Oat (*Avena sativa*) is distinct among the cereals due to its multifunctional characteristics and nutritional profile. It is a good source of dietary fibre especially β-glucan, minerals and other nutrients. Oat groat in particular is a good source of B complex vitamins, protein, fat, minerals besides heart healthy soluble fibre β-glucan.

1.1.1 Composition of oat groat (Gopalan *et al.*, 2007) [4]

Composition	% per 100gm
Protein	13.6
Fat	7.6
Minerals	1.8
Fibre	3.5
Carbohydrate	62.8
Calcium	50 mg
Phosphorous	380mg
Iron	3.8mg

1.1.2 Oat protein

Oats have a good quality protein due to their amino acid composition and high protein content, compared to other cereals. The total oat protein content in oat kernel is 11-15% and in oat groat it contains around 12.4-12.45 %. The oat proteins are simple proteins fractions like albumins, globulins, prolamins and glutenin. The protein fraction in total oat protein contain albumin is 1-12 %, globulin 50-80 %, prolamin 4-15 % and glutenin < 10 %. In other cereals the major storage protein is prolamin where as in oats the storage protein is globulin fraction. The consequence of high globulin, low prolamin oat protein provides a better balance of the amino acids essential for human beings because oat prolamins contain low amount of basic amino acid and high content of glutamic acid and proline. The oat protein contains all essential amino acid but lacks in lysine and leucine compared to a complete protein (Hamad and Fields, 1979) [5].

1.1.3 Oat lipid

Oats contains much higher levels of lipids than any other cereal grain, which makes them an excellent source of energy. Long-chain fatty acids present either as triacylglycerols or as other acyl lipids constitute the bulk of the total lipid, as in oat grains. The major fatty acids are palmitic 13-26%, stearic 1-3 %, oleic 22-47 %, linoleic 25-52 % and linolenic1–3 % acids together account for more than 95 % of total fatty acids and minor fatty acids include lauric, palmitoleic, and rachitic acids <0.1 %. Oat lipids also contain significant proportions of phospholipids, glycolipids, free fatty acids and sterols (Shahastrabhudhe, 1979) [11].

1.1.3 Oat β – glucan

Oat β-glucan is a linear, unbranched polysaccharide composed of 1→4 linked (70%) and 1→3 linked (30 %) β-D-glucopyranosyl units (Sadiq Butt *et al.*, 2008) [10]. The 1→3-linkages occur singly and most of the 1→4 linkages occur in groups of two or three leading predominantly to a structure of β-(1→3)-linked cellotriosyl and cellotetraosylunits (Dawkins and Nnanna, 1995) [3]. β – glucan has outstanding functional and nutritional properties exhibiting high viscosities at relatively low concentrations.

About 20 % - 30 % of the total weight of oat kernel. In its unprocessed state, the oat kernel contains approximately 85 % insoluble dietary fibre, where the hull content is less than 5 %. Hulls can be further processed to obtain oat hull fibre, which has a dietary fibre content of more than 90 %, all of it being insoluble. In the remaining edible part, the groat, the total content of dietary fibre is usually 6 % - 9 %, about half of which is insoluble fibre, located mainly in the tissues outside the aleurone layer (Patel and Ghosh, 2015) [9].

2. Materials

2.1 Oat groats

Cleaned and dehulled, oat groats were procured from Sattvic foods, Goa.

3. Methods

3.1 Preparation Oat milk

The procedure followed by (Patel and Ghosh, 2015) [9] for preparation of oat milk was adopted with suitable modifications. Oat groats is cleaned and soaked in warm water overnight. The soaked oat groat is taken at the ratio of 1:4 oat to water add to a high speed blender blend on medium-high speed for about 30 to 45 seconds just enough to completely pulverize the oats without making them gummy and filtered through muslin cloth the extract obtained is oat milk and heated to 60 ºC for 5min and cooled to room temperature and stored at refrigeration temperature. The goat milk had 88.02, 2.0, 1.76, 0.86, 11.39 and 0.8 per cent of moisture, fat, protein, ash, total solids and crude fiber. The goat milk contained higher moisture and ash content.

Flowchart for preparation of oat milk

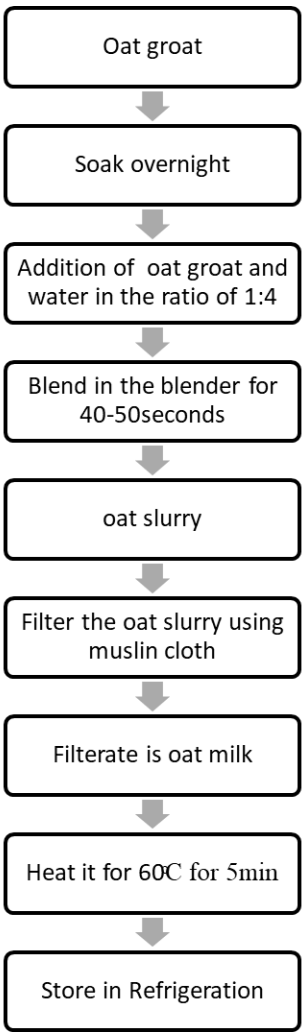

Table 1: Gross composition of oat milk

Constituents (%) / Milk sample	Moisture	Fat	Protein	Lactose	Ash	Total Solids	Fiber
Oat milk	88.02[b]	2.00[b]	1.76[b]	absent	0.86[b]	11.39[b]	0.80
CD ($p \leq 0.05$)	0.12	0.17	0.41	-	0.08	0.17	-

All the values are average of three trials
CD: Critical difference

3.2 Compositional analysis of oat milk

3.2.1 Fat
Fat content of oat milk was determined by Mojjonniers method.

3.2.2 Protein
Protein content of oat milk was determined by micro Kjeldahl method as per ISI: SP18 part XI (1981) [6].

3.2.3 Total ash
Total ash content of oat milk was estimated by gravimetric method as per ISI: SP18 part XI (1981) [6].

3.2.4 Moisture
Moisture content of oat milk was determined by gravimetric method as per ISI: SP 18 (Part XI) 1981 [6].

3.2.5 Total Solids (TS)
Total solids oat milk was determined by gravimetric method as per ISI: SP 18 (Part XI) 1981 [6].

3.2.6 Total fiber
The total fiber of oat milk and cow milk-oat milk blend was determined by AOAC method (1980) [2].

4. Conclusion
Oat milk represents an enormous expansion prospective for health food market, and needs to be widely investigated through the development of advanced processing, technological interventions, fortification techniques, for developing a nutritionally complete beverage with high overall acceptability. Due to benefits associated with goat milk alternatives as detailed above, advanced non-thermal technologies like pulse electric field technology can be helpful in targeting factors responsible for limiting success in processing of such oat milks on wide scale thus, for helping in providing low cost, nutritious newer alternatives to all-those cow milk allergic population. The advanced non-thermal technologies which are well adapted in cow's milk processing needs to be fully explored; for their potential in processing, as well as preservation of oat milk. To enable oat milk to be used as nutritionally equivalent alternatives for bovine milk by population who is sensitive to milk, fortification with a suitable form of fortificant using appropriate technology, and maintaining the bioavailability of nutrients throughout the storage is a major area of research.

5. References

1. Ahmad WS, Rouf TS, Bindu B, Ahmad GN, Amir G, Khalid M, *et al*. Oats as a functional food. J. of Pharma. 2014;03(01):14-20.
2. AOAC. Official methods of analysis 13th Ed., Association of Official Agricultural Chemist, Washington, DC, USA; c1980.
3. Dawakins NL, Nnanna. Studies on oat gum [(1→3, 1→4)-β-D-glucan]: Composition, molecular weight estimate and rheological properties. Food Hydrocolloids. 1995;9(1):1-7.
4. Gopalan C, Rama Sastri BV, Balasubramanian SC. Nutritive value of Indian foods. Hyderabad, Andhra Pradesh, India: National Institute of Nutrition; c2007. p. 74.
5. Hamad AM, Fields ML. Evaluation of the potential and available lysine of germinated and fermented cereals. J. Food Sci. 1979;44:456-459.
6. ISI: SP: 18, (Part XI). ISI Hand book of food analysis, Part XI Dairy products. Indian Standards Institute, Manak Bhavan, New Delhi; c1981. p. 167-173.
7. Kerckhoffs DAJM, Hornstra G, Mensink RP. Cholesterol-lowering effect of β- glucan from oat bran in mildly hypercholesterolemic subjects may decrease when β-glucan is incorporated into bread and cookies. The American Journal of Clinical Nutrition. 2003 Aug 1;78:221-227
8. Norja AK, Lehtinen P. Traditional and modern oat based foods. In: Technology of Functional Cereal Products. Ed.Hamaker, B. R. Woodhead Publishing Ltd., Abington, Cambridge, England; c2008 Jan 1. p. 215-232.
9. Patel DH, Ghosh BC. Oats-beneficial attributes and application in foods. Indian Food Industry Mag; c2015 May. p. 34.
10. Sadiq Butt M, Tahir Nadeem M, Khan MK. Oats: unique among the cereals. European Journal of Nutrition. 2008 Feb 26;47(2):68 -79.
11. Sahastrabhudhe MR. Lipid composition of oat (*Avena sativa* L.). J Am Oil Che. Soc. 1979;56:80-84.
12. United States Department of Agriculture. Crop production summary. National agriculture statistics service. ISSN: 1057-7823; c2015.