



Proximate composition and antioxidant analysis of some good mode foods and their sensory analysis

Umar Shah¹, Waqas N Baba^{2,*}, Imtiyaz Rather³, Masood ur Rehman⁴, Mudasar Ahmad², Nuzhat Rasool⁴ and F.A. Masoodi

¹Amity institute of Food Technology, Amity University, Noida, UP, India.

²Department of Food Science and Technology, University of Kashmir, Srinagar, India.

³Islamic university of science and technology, Awantipora, India.

⁴Department of Chemistry, National Institute of Technology, Srinagar, India.

ARTICLE INFO

Article history:

Received: 9 January 2015;

Received in revised form:

25 May 2015;

Accepted: 30 May 2015;

Keywords

Cornflakes,

Dalia,

Oats,

Proximate composition,

Sensory Analysis.

ABSTRACT

Three different good mood foods cereals or breakfast cereals viz; Cornflakes, Dalia and Oats were analyzed for different physico-chemical properties. The ash and protein content of three different breakfast cereals does not vary significantly with each other while moisture content showed significant difference. The protein content of Dalia and Oats does not vary with each other, however both varied significantly with Cornflakes. The crude fiber of Cornflakes and Oats differs significantly with each other. Based on organoleptic evaluation by semi-trained panelists; the appearance of all the three breakfast cereals does not vary significantly with each other. Overall acceptability of all the three breakfast cereals does not vary with each other.

© 2015 Elixir All rights reserved.

Introduction

Breakfast not only leads to improved mood but better memory, more energy throughout the day, and feeling of calmness. Eating a healthy breakfast put your brain in balance so that hunger for the right amount of healthier foods. Breakfast means break the overnight fast. Eating breakfast allow you to restock the energy stores that have run out overnight and being the day with a tank full of the right fuel. you hunger for the right amount of Breakfast cereal is a food made from processed grains that is often eaten as the first meal of the day. It is often eaten as cold, usually mixed with milk (e.g. cow's milk, soya milk, rice milk, almond milk), water or yogurt and sometimes fruit, but may be eaten dry. Some companies promote their products for the health benefits from eating oat-based and high-fiber cereals. Cereals may be fortified with vitamins. A significant proportion of cereals are made with high sugar content. Many breakfast cereals are produced via extrusion. It is commonly eaten with a spoon. Breakfast has been described as the most important meal of the day. There is considerable evidence that individuals who consume breakfast, including ready-to-eat (RTE) cereals, have better overall nutrition profiles, show improvements in cognitive functioning and might be less likely to be overweight. Despite the reported benefits of breakfast consumption, there has been an increase in the past few decades in the number of children who go to school without having breakfast. Currently 6.5% of 4-to-8-year-olds, 20.5% of 9-to-13-year-olds and 36.1% of 14-to-18-year-olds do not consume breakfast regularly. Breakfast is a very important meal which fuels the body after it awakes from a full night's sleep. Although many people do not take the time to eat breakfast in the morning, skipping breakfast can diminish mental performance throughout a day.

Breakfast helps a person concentrate and one who eats breakfast will learn better because of it. One who does not eat breakfast is more likely to be tired during the day. Some people think that by skipping breakfast they will lose weight, however this was proven false. Porridge was a traditional food in much of Northern Europe and Russia back to antiquity. Barley was a common grain used, though other grains and yellow peas could be used. In many modern cultures, porridge is still often eaten as a breakfast dish. The first breakfast cereal Granula was invented in the United States in 1863 by James Caleb Jackson. The cereal never became popular as the heavy bran nuggets needed soaking over night before they were tender enough to eat and were considered as inconvenient. George H. Hoyt created wheatena circa 1879 during an era when retailers would typically buy cereal (the most popular being cracked wheat, oat meal and cerealine) in barrel lots and scope it out to sell by the pound to customers. Breakfast cereal primarily marketed to children, such as Froot loops is commonly brightly colored and high in sugar. In 1902, wheat flakes became the first ready to eat breakfast cereal introduced in the United Kingdom. The cereal and the sunny Jim character, achieved wide success in Britain, at its peak in 1930 selling 12.5 million packages in one year (Williams 2006).

A breakfast that includes hot or ready-to-eat cereal may be linked to better weight management for adults, children and adolescents. Adults who ate ready to eat cereal, cooked cereal, and quick bread for breakfast have significant lower BMI and those who skipped breakfast or who ate meat or eggs. Certain combinations of cereals and leguminous can be quite desirable from a nutritional stand point, because of complementation of essential amino acids and an increase in protein content. The mixture of rice and beans is a good nutritional mix, providing

energy and essential amino acids required in a healthy diet and provide substantial amounts of vitamins, minerals and fiber (Dors, et al., 2006).

A balanced, varied diet is essential for developing and maintaining strong bones throughout life. Eating breakfast can contribute nutrients important to bone health. In particular milk and milk products provide calcium, vitamin D, protein and several other key bone health nutrients (Smith, et al., 2003)

Cereals that are viewed as healthy tend to be basic whole grain types, with simple formulas and non-proprietary names like raisin-bran, oat meal and shredded wheat. Less healthy cereals tend to be sweetened and made with more complex formulas using refined grains and added flavorings. They also have proprietary names. These product differences makes private label more competitive for healthy cereals that will affect their product mix. The present investigation was carried out to analyze the proximate composition and sensory properties of different breakfast cereals that also are categorized as good mood foods and are easily available in the market.

Materials and Methods

Materials

The breakfast foods were brought from Srinagar city and local market of Awantipora.

Method

Proximate Analysis of breakfast food samples

The breakfast food samples were analyzed on dry weight basis for moisture content, ash content, crude protein crude fat and crude fiber according to their respective procedures (AACC, 2000) as given below.

Moisture content

The moisture content of breakfast food samples was determined in a hot air oven (Model NSW-144, Narang Scientific Works Pvt. Ltd. New Delhi) through drying method (at 105±5°C) according to the procedure described in AACC (2000) Method No. 44-15A. The moisture content of samples was determined by weighing 4 g of samples into a pre weighed china dish and drying it in an air forced draft oven at a temperature of 105±5°C till the constant weight of dry matter was obtained. The moisture content in the sample was determined as given below.

(%) Moisture =	Wt. of fresh sample (g) -Wt. of dried sample (g)	x 100
	Wt. of fresh sample (g)	

Total Ash

Ash is an inorganic residue remaining after the material has been completely burnt at a temperature of 550°C in a muffle furnace (Model NSW-101, Narang Scientific Works Pvt. Ltd. New Delhi). It is the aggregate of all nonvolatile inorganic elements present in a material as its oxides. The ash content of breakfast samples was determined according to AACC (2000), Method No. 08-01. The sample (3 g) was weighed into a previously heated, dried, cooled and weighed crucible. The sample was charred over a Bunsen flame until no more smoke was given off and then transfer red into a muffle furnace and heated at a temperature of 550°C until it turned to a completely grey material. The ash content was then cooled in a desiccators and weighed. The difference in weight between the empty crucible and crucible with ash residue expressed as a percentage of the original sample weight and recorded as ash content.

$$\text{Ash}(\%) = \frac{\text{Weight of ash (g)}}{\text{Weight of sample (g)}} \times 100$$

Crude protein

The percentage of nitrogen in the sample was determined by

using the method given by AACC (2000) Kjeldahl's method. The sample was first digested with concentrated H₂SO₄ in the presence of digestion tablets for 2-3 hours or until the digested material attained light greenish or transparent color. This material was diluted (250 ml using distilled water) and distillation was done by taking 10 ml of diluted material and 10 ml of 40% NaOH solution in the distillation apparatus. The ammonia thus liberated was collected in 2% boric acid solution containing methyl red as an indicator. Finally the distillate was titrated against 0.1 N H₂SO₄ till golden brown end point. The crude protein percentage was calculated by multiplying nitrogen (N) with a factor given below:

Crude Protein = N x (%) x 5.7	Vol. of 0.1 N H ₂ SO ₄ x Vol. of dilution x 0.014	x 100
	Wt. of sample (g) x Vol. of dill taken (ml)	

Crude fat

The crude fat in each such sample was determined by running sample through Soxhlet apparatus according to the procedure given in AACC (2000) Method No. 30-25. A sample (5 g) was weighed into an extraction thimble and extraction carried out in Soxhlet apparatus with petroleum ether for 2 hours, the previously heated, dried, cooled and weighed receive flask containing oil were dried in a hot air oven, cooled in a desiccators and weighed. The fat content was the difference in weight between the empty flask and the residual oil expressed as a percentage of the sample weight:

Crude Fat (%) =	Weight of Fat (g)	x 100
	Weight of Sample (g)	

Crude fiber

Fiber percentage was calculated according to the AACC (2000) method 32-10. The crude fiber was calculated The crude fiber was estimated by digesting defatted free sample and Crude digesting first with 1.25% H₂SO₄, followed by 1.25% NaOH solutions. The residue was weighed and ignited in a muffle furnace at 550°C till white residue left.

Crude fiber (%) =	Weight loss on Ignition (g)	x 100
	Weight of Sample (g)	

Antioxidant Analysis

3 gms of each sample (oats, cornflakes, dahlia) was crushed in a pistol and motor and dissolved in 30 mls of methanol-water (70:30) solution and stirred at 50 °C for 60 minutes. The solution was filtered and centrifuged at 3500 g for ten minutes. The supernatant (extract solution) was taken and stored at 4 C for further analysis.

DPPH

DPPH radical scavenging activity of the extract solutions was determined according to the method of Baba et al. (2014) with some minor changes. 100 µl each of native as well as roasted each sample extract was added to 2.9 ml of 0.05 mM methanolic solution (70%) of DPPH. The absorbance at 517 nm was measured with a spectrophotometer (Hitachi U-2900) after the solution was allowed to stand in the dark for 60 min. Lower absorbance of the reaction mixture indicates higher free radical scavenging activity. Percentage inhibition was calculated by using the formula:

$$\% \text{ inhibition} = (A_{\text{control517}} - A_{\text{sample517}}) / A_{\text{control517}} \times 100$$

where A_{control517} is the absorbance of the control and A_{sample517} is the absorbance of the extract.

Reducing power

The reducing power was determined by the method of Shah et al. (2014) with minor changes.

Table 1. Proximate composition of breakfast cereals

SAMPLE	Moisture %	Ash %	Protein %	Fat %	Crude fiber %
Cornflakes	7.137 ^c ±0.346	0.2077 ^a ±0.74	6.066 ^a ±0.366	2.927 ^a ±0.66	5.83 ^a ±0.185
Dalia	6.147 ^b ±0.314	0.251 ^a ±0.047	9.01 ^b ±0.155	2.793 ^a ±0.47	7.00 ^b ±0.80
Oats	5.150 ^a ±0.387	0.238 ^a ±0.57	8.713 ^b ±0.595	2.86 ^a ±0.125	6.473 ^a ±0.571
LSD(P<0.05>)	0.70	NS	0.82	NS	0.70

Mean of triplicate determinations ± Standard deviations at (P <0.05).

Mean values in the same columns bearing same superscript does not differ significantly

Table 2. Sensory properties of breakfast cereals

SAMPLE	Appearance	Texture	Flavour	Over all acceptability
Cornflakes	4.00 ^a ±0.707	4.25 ^b ±0.880	3.63 ^a ±0.637	3.96 ^a ±0.437
Dalia	3.5 ^a ±0.632	3.33 ^a ±0.408	3.50 ^a ±0.632	3.44 ^a ±0.328
Oats	3.58 ^a ±0.92	3.00 ^a ±0.632	4.16 ^a ±0.408	3.63 ^a ±0.35
LSD(P<0.05)	NS	0.822	NS	NS

Mean of triplicate determinations ± standard deviation.

Mean values in the same column bearing the same superscripts does not differ significantly.

Table 3. Antioxidant analysis of Breakfast cereals

	DPPH (% inhibition)	Reducing power (% inhibition)	TPC (mg GAE/g db)
Oats	45.34 ^a ±0.5	37.47 ^a ±0.7	21.25 ^a ±0.7
Corn flakes	21.29 ^b ±0.5	19.38 ^b ±0.5	10.37 ^b ±0.5
Dhalia	32.58 ^c ±0.7	28.59 ^c ±0.5	17.61 ^c ±0.5

Mean of triplicate determinations ± standard deviation.

Mean values in the same column bearing the same superscripts does not differ significantly.

100 µl of each extract was mixed with sodium phosphate buffer and potassium ferricyanide. The mixture was incubated at 50 °C for 20 min followed by the addition of trichloroacetic acid and then centrifuged at 3000 rpm for 10 min. The upper layer was mixed with deionized water and FeCl₃, and then the absorbance was measured at 700 nm. Increased absorbance of the reaction mixture indicated increased reducing power.

Total phenolic content

The TPC of the sample extracts was determined according to the Folin–Ciocalteu spectrophotometric method as described by Ahmad et al (2014) (Singleton and Rossi, 1965) with some modifications. 100 µl of each sample extract was mixed with 2.5 ml of 10-fold diluted Folin–Ciocalteu's phenol reagent and allowed to react for 5 min. Then, 2 ml of 7.5% Na₂CO₃ solution was added to each of the samples, and the final volume was made up to 10 ml with deionized water. After 1 h of reaction at room temperature, the absorbance at 760 nm was determined. The measurement was compared to a standard curve of gallic acid (GA) solution, and the total phenolic content was expressed as milligrams of gallic acid equivalents (GAE) per gram of dry samples (mg GAE/g db).

Evaluation of Sensory properties of breakfast food samples.

Sensory properties of breakfast samples were determined using a seven-member panelist consisting of students and faculty members of Department of Food Technology, IUST Awantipora. Samples were presented in coded polyethylene bags. The order of presentation of samples to the panel was randomized. Tap water was provided to rinse the mouth between evaluations. The panelists were instructed to evaluate the coded samples for color, taste, texture, appearance and overall acceptability. Each sensory attribute was rated on a 9-point Hedonic scale (9-Like extremely, 8-Like very much, 7-Like moderately, 6-Like slightly, 5-Neither like nor dislike, 4-Dislike slightly, 3-Dislike moderately, 2-Dislike very much, 1-dislike extremely).

Results and Discussion

The present investigation was conducted to analyze the breakfast cereal samples available in the local market of Srinagar. The analysis of the product conducted comprised of moisture content(%), ash(%), fat(%), fiber(%), protein(%). The sensory evaluation of these products was done on the basis of appearance, taste, texture, aroma and overall acceptability. The salient features of various parameters involved are given as under.

Proximate Analysis of Breakfast Cereals

The proximate chemical composition of breakfast cereals was calculated as per AACCC(2000) methods. On evaluation of results it was found that breakfast cereal Dalia have high moisture content than other two breakfast cereals. The mean value of moisture content of the three breakfast cereal samples ranges from 5.15 to 7.13%(table 1). Breakfast cereal Cornflakes have moisture content of 7.13% followed by Dalia 6.147% and Oats (5.10%). The difference in moisture content is attributed by different packaging material of breakfast cereals (Robertson, food packaging). The Breakfast cereals procured from local market were analyzed for protein content. The highest value of protein content (9.01%) were recorded in Dalia followed by Oats (8.713%) and Cornflakes (6.66%). The increase in protein content in Dalia is attributed by the wheat floor protein (gluten) used in preparation of Dalia (Lopez 1993, Smith 2002), showed varied difference with Dalia (Miler 2001). Breakfast cereal have been proved as a good source of fiber (Pires, et al., 2006). The highest value of crude fiber (7%) was recorded in breakfast cereal Dalia followed by Oats (6.4%) and Cornflakes (5.83%). The increase in fiber content in Dalia is attributed by the bran of whole wheat used in preparation of Dalia.

The ash content (0.25%) was recorded highest in Dalia followed by Oats (0.23%) and Cornflakes (0.207%). The highest value of fat content (2.92%) was recorded in breakfast cereal Dalia followed by Oats and cornflakes. Statistically at (P<0.05),

the ash and fat content of the three breakfast cereals does not differ significantly. However the moisture of 3 breakfast cereals differs significantly. At ($P < 0.05$) protein content of Dalia and Oats varied significantly with cornflakes. Crude fiber of cornflakes and Oats does not vary significantly with each other, however both these breakfast cereal

Anitoxidant activity

DPPH radicle scavenging activity showed highest value in oats followed by dahlia while corn flakes showed lowest value. Similar trend was seen in reducing power. TPC content of oats (21.25 mg GAE/g db) was highest among all the three samples. DPPH and reducing power increased with increase in TPC of samples. A high correlation coefficient of 0.97** and 0.98** was seen between TPC & DPPH and TPC & Reducing power respectively.

Sensory properties of breakfast cereals

Sensory analysis is carried out by using semi trained Panelists from the department of food technology IUST Awantipora. On the basis of 5-point hedonic to measure sensory characteristics like senses of sight, smell, taste, touch and acceptability of food products. Mean score for sensory evaluation of breakfast cereals is given in (table 3). Sensory rating for breakfast cereals for appearance showed that Cornflakes ranked at the top due to the excellent appearance followed by Oats and (Davies 2005) Mean score I increasing order was observed in Dalia (3.5), Oats(3.58) and Cornflakes(4). Mean score of texture for breakfast cereals was observed Where Cornflakes scored (4.25) highest followed by Dalia (3.3) and lowest score (3) for Oats. The mean score of flavor for oats earned maximum score (4.16) followed by cornflakes (3.63) and minimum score for Dalia (3.5). The overall acceptability was observed on the basis of Quality where Cornflakes scored (3.96) highest followed by Oats (3.63) and lowest scored by Dalia (3.44). Statistically at ($P < 0.05$), appearance and flavor of three breakfast cereals does not differ significantly with each other. Texture of Oats and Dalia differ significantly with corn flakes (Nicklas et al, 2004, Rampersaud 2005, Serramajem 2000). Overall acceptability of all the three breakfast cereals showed no significant difference with each other.

Conclusion

Breakfast cereal plays important role in human diet. Since these contain high amounts of valuable nutrients like soluble fibers, proteins, vitamins, minerals etc. The consumption of breakfast cereals is an important factor in the nutrition well being of children, adolescents and young adults which contribute to their healthy dietary profile and are rarely replenished by other daily meals.

References

1. Davies KM, Heaney RP, Recker RR and Hinders S. Calcium intake and body weight. *Journal of Clinical Endocrinol Mettabolism*.2005; **85**:211-220.
2. Miler GD, Jarvis JK and MC Bean LD. The importance of meeting calcium needs with foods. *Journal of American Nutrition*.2001; **20**:168-185.
3. Nicklas TA and Myers L. The importance of breakfast consumption to nutrition of children, adolescents and young adults. *Nutrition Today*.2004; 30-39.
4. Serramajem L, Ribas L, Garcia Closas R and Aranceta J. Determinants of nutrient intake among children and adolescents. *Journal of Nutrition Metabolism* .2000; **46**:31-38.
5. Smith AP. Breakfast cereal consumption and subjective reports of health by young adults. *Journal of Nutrition Neuroscience*.2003; **6**:59-61.
6. Smith AP and Ress G. Breakfast cereal consumption and susceptibility to upper respiratory tract illness. *Journal of Nutrition Neuroscience*.2002; **3**:339-343.
7. Baba NW, Rashid I, Shah A, Ahmad M, Gani A, and Masoodi FA Effect of microwave roasting on antioxidant and anti-cancerous activities of barley flour. *Journal of Saudi Society of Agricultural Science* (2014); **27**: 143-154.
8. Shah U, Baba WN, Ahmad M, Shah A, Gani A, Masoodi FA, Gani A et al.. Invitro antioxidant and antiproliferative activities of seed extracts of Nymphaea Mexicana in different solvents and GC-MS analysis. *International journal of drug development and research* (2014); **6**, **4**: 280-285.
9. Ahmad M, Gani A, Baba WN, Gani A, Masoodi FA, Shah A, Rather SA (2014). Effect of Extraction Time on Physiologically Important Constituents of Green Tea (*Camellia sinensis*) Using GC/MS. *Journal of Food Processing & Technology* (2014); <http://dx.doi.org/10.4172/2157-7110.1000276>