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Nutritional analysis of value-added product by using pearl millet, quinoa and prepare ready-to-use upma mixes

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Abstract
Rapid urbanization, industrialization and consequent changes in eating habits of people have lead to development of instant dry mixes and ready-to-eat convenience foods. With the availability of "Retort Technology" developed by Defence Food Research Laboratory (DFRL); food processing sector like Ready to Eat (RTE) and Ready to Use (RTU) food segment has emerged as one of the fastest growing sectors in the Indian economy. The study has been carried out in research laboratory of Food Science and Technology, School for Home Sciences, Babasaheb Bhimrao Ambedkar University, Lucknow. Two value-added products i.e., Quinoa Upma mixes and Pearl Millet Upma mixes with the Quinoa (75%) and Pearl Millet (75%) as a basic ingredient were developed. These products were analyzed nutritionally. The result of the nutritional analysis indicated that the nutritional composition of Pearl Millet upma mixes is: Protein(13.29%), Fat(23.17%), Carbohydrate(53.49%), Calcium(23.9mg), Vitamin C(19.5mg) and the nutritional composition of Quinoa upma mixes is: Protein(13.29%), Fat(23.17%), Carbohydrate(53.49%), Calcium(27.96mg), Vitamin C(14.69mg).The products are highly recommended for all the age groups, degenerative diseases and heart diseases.

Keywords: Ready-to-use, Pearl Millet, Quinoa, Value-added, Nutritional composition Degenerative diseases

1. Introduction
Ready-to-use (RTU) foods are foods intended to be consumed as they are. These foods do not require additional cooking and are usually stored in refrigeration or at room. "Ready-to-use food" means food that is in a form that is edible without additional preparation. Ready-to-use foods are foods that will not be cooked or reheated before serving. These include salads, cooked meats such as ham, desserts, sandwiches, cheese and foods that we cook in advance to serve cold. The range of products currently comprises of Soups, Vegetable curries, Paneer gravies and various items like Upma mixes, Halwa mixes, Porridge mixes etc. Each item of Ready-to-use menu is natural, preservative-free and 100% vegetarian. Now the time is to provide better food processing & its marketing infrastructure for Indian industries to serve good quality & safest processed food like Ready to eat and ready to use food. It is opening a new window in world scenario as far as taste & acceptance is concerned. The retort processed foods do not require rehydration or cooking and can be consumed straight from the pouch with or without pre-warming, depending upon the requirement of the users and the weather conditions. Up until a few years back, the RTE foods market had not really provided any options beyond the Cup O Noodles produced by Indo-Nissin. These foods meet the specific needs of convenience, nutritional adequacy, shelf stability, storage, distribution to the centers and have become very popular after the Year 2002. This all had made the high valuable sale of 'Ready-to-use' food products commercially viable with great taste.

Pearl Millet *(Pennisetum typhoides*) is a tall, warm season and an annual grass belongs to family Poaceae. It is locally known as Bajra is a very important dual-purpose summer crop grown for both fodder and grain. It is a coarse cereal grain cultivated mostly in semi-arid parts of Africa and Asia. The nutritive content of Pearl Millet is equivalent or even superior to those of other cereals (Obilana and Manyasa 2002). It is considered to have one of the best protein quality and amino acid scores. It has high levels of calcium, iron, zinc, lipids and high quality proteins. Pearl millet has well-balanced protein, with high concentration of Threonine and Tryptophan along with less (but adequate) Leucine, than other cereals. Pearl millet is a principal source of energy, protein, vitamins and minerals for millions of poorest people in the regions where it is cultivated. It generally has 9 to 13% protein, but large variation among genotypes ranging from 6 to 21% has been observed. Pearl millet contains more calories than wheat, probably because of its higher oil content of 5%, of which 50% are poly-unsaturated fatty acids. It is rich in calcium, potassium, magnesium, iron, zinc, manganese, riboflavin, thiamine, niacin, lysine and tryptophan. Pearl millet grain is gluten-free and thus is the only grain that retains its alkaline properties after being cooked which is ideal for people with gluten allergies. Pearl millet grain compares favorably with maize and sorghum as high-energy and high-protein ingredient in feed for poultry, pigs, cattle and sheep. Several studies indicated that, compared to maize, pearl millet is 8–60% higher in crude protein, and 40% richer in amino acids such as lysine and methionine. Oxalic acid in pearl millet forage reduces the bioavailability of calcium and hence has a negative impact on milk production and fat content.

Quinoa *(Chenopodium quinoa)* is one of the oldest crops in the Andean region, with approximately 7000 years of cultivation, and great cultures such as Incas and Tiahuanacu have participated in its domestication and conservation (Jacobsen, 2003). Since about 1975, however, the crop has received considerable attention both within and outside South America, due to a nurmber of attractive features. It is a versatile plant and a prolific biomass producer. It is able to grow well under poor

environrnental conditions and can be combine-harvested. Quinoa has recently become of interest at a national and international level due to its nutritional properties like protein and magnesium, among others. It's been said that if you had to choose some form of nourishment for NASA's deep space voyages, the best choice would be quinoa. The program for (Alternative Nutrition of the Archdioceses of La Paz, 2002) states that problems related with malnourishment which affect a great deal of the Bolivian population could be solved through the consumption of quinoa and other products from the Andean region like amaranth or kewina. Furthermore, "If you had to choose one kind of sustenance among many to survive, the best choice by far would be quinoa" (Johnson Duane, 1997). Recent studies conducted on Quinoa have shown that it contains a high degree of magnesium, which helps to ensure good cardiovascular circulation and consequently helps to keep the heart healthy and reduce the chance of migraine headaches. Furthermore, quinoa helps the body create and maintain new muscle fiber and its regular consumption prevents muscle cramps. It's also been regarded as a grain that is high in protein content (contains 9 essential amino acids), free of gluten and offers twice the fiber of oatmeal. Other uses include bakery products and snacks, to a very limited extent with a texture much like brown been introduced in Europe, North America, Asia and Africa (FAO, 2011). The year 2013 has been declared "The International Year of the Quinoa" (IYQ) by the United Nations. This crop is a natural food resource with high nutritive value and is becoming a high quality food for health and food security, for present and future human generations. Quinoa is a rich source of a wide range of minerals, vitamins, oil containing large amounts of linoleate, and natural antioxidants (Koziol, 1992; Repo Carrasco *et al.*, 2003) and high quality protein containing abundant amounts of sulphur rich amino acids. Quinoa leaves contain a high amount of ash (3.3%), fibre (1.95%), nitrates (0.4%), vitamin E (2.9 mg a-TE/100g) and Na(289 mg/100g), vitamin C (1.2-2.3g/kg) and 27-30g/kg of proteins (Bhargava *et al.* 2006).

2. Objective

To characterize the different Upma mixes developed by Pearl Millet and Quinoa on the nutritional basis.

3. Material & Methods

The experiment was carried out in the research laboratory of the Department of Food Science & Technology, Babasaheb Bhimrao Ambedkar University, Lucknow. The required sample for the product development are Quinoa, Pearl Millet, Dalia, Chana Dal, Onion, Carrot, Green peas. Green pepper, Curry leaves, Mustard seeds, Cumin, Spices, Salt.

3.1 Quinoa Upma mixes preparation

The basic ingredient used were Quinao (500gm), Dalia(175gm), Chana Dal(75 gm), Onion(2 large), Carrot(250gm), Green peas(200gm), Green pepper(50 gm), Curry leaves(as desired), Mustard seeds(30gm), Cumin(30gm), Spices(as desired), Salt(to taste). After that all the raw ingredients were sun-dried for two days and allowed to be moisture free. Now the ingredients were roasted in a half teaspoon vegetable oil and all the spices and salt was added. Allowed it to cool and were stored in air-tight containers until evaluation. During packaging, Citric acid was used as a preservative.

3.2 Pearl Millet Upma mixes preparation

The basic ingredient used were Pearl Millet (500gm), Dalia (175gm), Chana Dal (75 gm), Onion (2 large), Carrot (250gm), Green peas (200gm). Green pepper (50 gm), Curry leaves (as desired), Mustard seeds (30gm), Cumin (30gm), Spices (as desired), Salt (to taste). After that all the raw ingredients were sun-dried for two days and allowed to be moisture free. Now the ingredients were roasted in a half teaspoon vegetable oil and all the spices and salt was added. Allowed it to cool and were stored in air-tight containers until evaluation. During packaging, Citric acid was used as a preservative.

3.3 Nutritional analysis

The tests were determined at the RFRAC (Regional Food Research Analysis Centre) Lucknow. The protein content was determined by AOAC method the carbohydrate content was determined by SP: 18 method the calcium content was determined by IS: 5838:1970.

4. Result and Discussion

The nutritive values of both the samples i.e., Quinoa Upma Mixes and Pearl Millet Upma Mixes shown in the result are as below:

Table 1: Nutrient contents in Quinoa Upma Mixes and Pearl Millet Upma Mixes

Samples	Protein	Fat	Carbohydrate
B1	13.29	23.17	53.49
B2	13.29	23.17	53.49

Protein, Fat and carbohydrate contents in Quinoa Upma Mixes and Pearl Millet Upma Mixes.

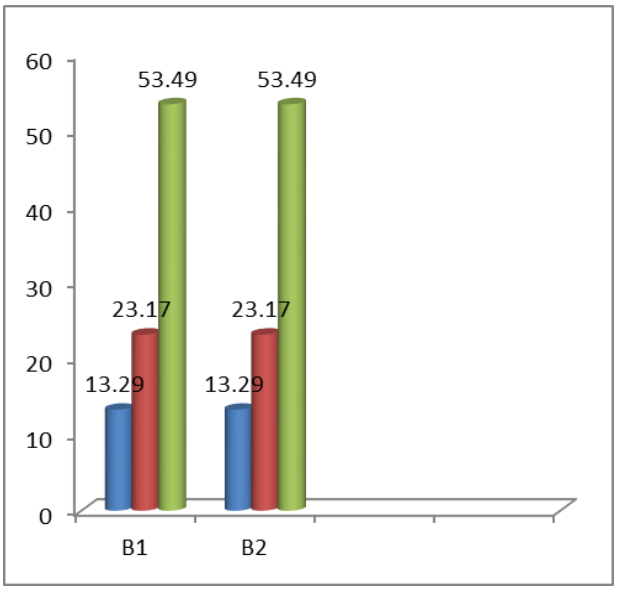

Fig 1: Protein, Fat and Carbohydrate contents in Quinoa Upma Mixes and Pearl Millet Upma Mixes

Table 2: Nutrient contents in Quinoa Upma Mixes and Pearl Millet Upma Mixes

Samples	Vitamin C	Calcium
B1	14.69	27.96
B2	19.5	23.9

Vitamin C and Calcium contents in Quinoa Upma Mixes and Pearl Millet Upma Mixes

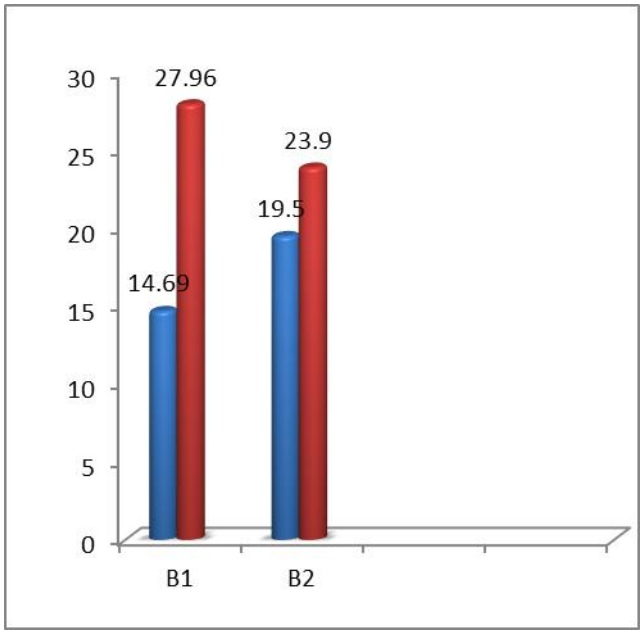

Fig 2: Vitamin C and Calcium contents in Quinoa Upma Mixes and Pearl Millet Upma Mixes

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6. References

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