RESEARCH ARTICLE

SENSORY 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. 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 evaluated on sensory parameters using Nine point hedonic rating scale. Highest overall acceptability score was obtained for Quinoa Upma mixes. Micronutrient content increased significantly with incorporation of Dalia (25%) in both the two products. The developed value- added products are calcium, potassium, magnesium, iron, zinc, manganese, riboflavin, thiamine, niacin, lysine and tryptophan etc. The products are highly recommended for all the age groups, degenerative diseases and heart diseases.

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.

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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).

Objective

To characterize the different Upma mixes developed by Pearl Millet and Quinoa using sensory evaluation method.

MATERIALS AND METHODS

Organoleptic evaluation of product developed

Organoleptic evaluation is a scientific discipline that analyses and measures human responses to the composition of food and drink, e.g. appearance, touch, odour, texture, temperature and taste. This discipline requires panel of human assessors by whom the products are tested, and responses are recorded by them. The different products of Upma mixes developed by Pearl Millet and Quinoa and were put forward for the sensory evalation for identifying the best acceptable product. Codes B1 and B2 were alloted to different Upma mixes product developed respectively. Then a 9 point hedonic scale was prepared. The most widely used hedonic scale is a nine-point scale, in which the person rates their prefrences for food, ranging from "extremely dislike" to "extremely like". Differently coded samples were presented to panel members one at a time and they were asked to rate their hedonic responseon the scale. At the end of this phase marking of individual products were calculated and the best acceptable product was determined.

RESULTS AND DISCUSSION

Characterization of developed product on various parameters

The experimental Upma mixes products of Pearl Millet and Quinoa were characterized as developed product in the present study. For that, sensory evaluation process was done by set of panellist constitute 5 members in the expertise field of Food Science and Technology. For evaluating, a 9-point hedonic scale which is one of the sensory evaluation method used to evaluate any product. Four parameters were used to analyze the acceptibility of developed product. These are as follows-

- Body and Texture
- Color and Appearance
- Flavor and Taste
- Overall acceptability

The total average and standard deviation of individual product was calcuated and the best of the two products was found. Individual markings from each of the panel members for different parameters have been mentioned below.

Parameter 1. Flavour and Taste

Table 1. Individual markings for Flavour and taste

	B1	B2
Member1	8	8
Member2	8	8
Member3	9	8
Member4	9	9
Member5	9	8
Total	43	39

The above mentioned score represents individual markings by members on the basis of flavour and taste. The average score is 43 by B_1 and 39 by B_2.
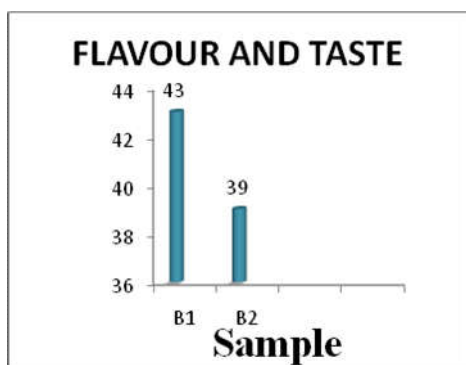

Fig. 1. Graphical representation of scores for Flavour and taste

Parameter 2. Body and Texture

Table 2. Individual marking for body and texture

	B1	B2
Member1	7	7
Member2	9	9
Member3	8	8
Member4	8	9
Member5	9	8
Total	41	41

The above mentioned score represents individual markings by members on the basis of body and texture. The average score is 41 by B_1 and 41 by B_2.
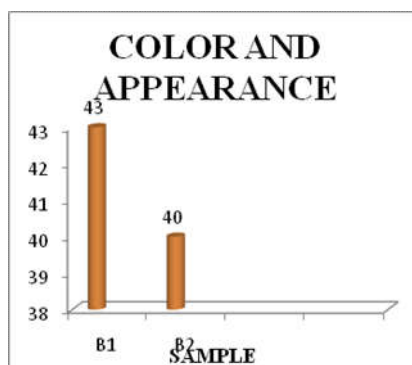

Fig. 2. Graphical representation of scores for body and texture

Parameter 3.Colour and Appearance

Table 3. Individual markings for color and appearance

	B1	B2
Member1	8	8
Member2	9	8
Member3	9	8
Member4	8	8
Member5	9	8
Total	43	40

The above mentioned score represents individual markings by members on the basis of body and texture. The average score is 41 by B_1 and 41 by B_2.
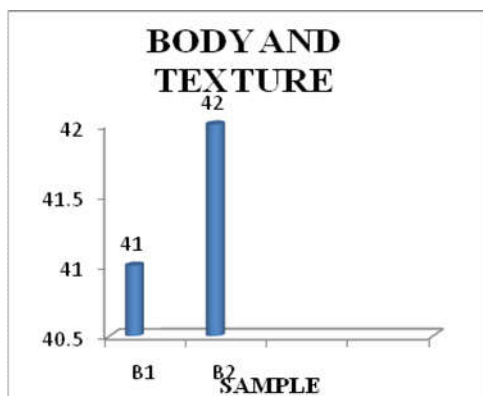

Fig. 3. Graphical representation of scores for color and appearance

Parameter 4. Overall Acceptability

Table 4. Individual markings for overall acceptability

	B1	B2
Member1	8	7
Member2	8	8
Member3	9	8
Member4	9	9
Member5	9	9
Total	43	41

The above mentioned score represents individual markings by members on the basis of body and texture. The average score is 43 by B_1 and 41 by B_2.
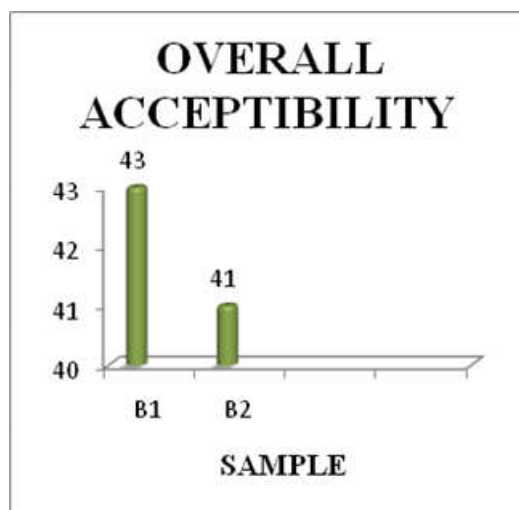

Fig. 4. Graphical representation of scores for overall acceptability

The respective table which is drawn above shows the overall calculations of average marks given by each panellist in each parameter, with calculated average values & S.D. of each sample on the basis of each parameter.

Table 5. Overall Calculation

	B1	B2
P1	43	41
P2	41	41
P3	43	40
P4	43	41
Overall	170	163
Average	42.5	40.75
S.D	1.63	1.59

The respective table which is drawn above shows the overall calculations of average marks given by each panellist in each parameter, with calculated average values & S.D. of each sample on the basis of each parameter.
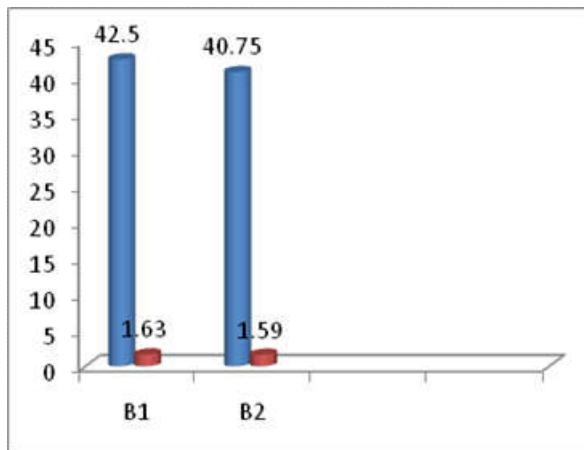

Fig. 6. Graphical representation of average score and standard deviation for overall calculation

Where, B1, B2 were coded samples prepared

P= Parameter (P1= Flavor and Taste, P2= Body and Texture, P3= Color and Appearance and P4= Overall Acceptability)

*S.D. = **Standard Deviation (SD reflex the fluctuation in the marks given by different Members and for different parameter)***

B1 scored maximum with highest average and SD which indicate its highest acceptability among the two prepared experimental samples.

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