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Development and evaluation of quinoa based snack items

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Abstract

Quinoa has exceptional physico-chemical and nutritional properties amongst food grains. This pseudo-cereal and to a certain extent its leaves were traditionally used for human and livestock consumption in the Andean region from times immemorial. Quinoa was used to prepare snack items like porridge, salad and payasam.

The best colour rating was for payasam (8.57) followed by salad (7.53) and porridge (6.67). Payasam had the highest score for texture with 8.33 and least was for porridge with 6.56. Taste was highest for payasam (8.60) followed by salad (7.83) and porridge (6.77). Payasam with (8.40) had the highest flavour followed by salad (7.73) and porridge (7.00). Overall acceptability was highest for payasam and least was porridge. Hence out of the three snack items, payasam was rated the best.

Keywords: Snacks, quinoa, payasam, kichidi, salad

1. Introduction

Chenopodium quinoa Willd is a pseudo cereal belonging to amaranthaceae family grown for its edible and highly nutritious achene (Kahane *et al.*, 2013) [4]. To the growing Indian population, quinoa seeds and leaves can be nutritious supplement to rice and wheat (Bhargava *et al.*, 2006) [1] as it has exceptional tolerance to hostile environments. In view of this it can be good crop offering food security (FAO, 2011) [2].

Quinoa contains all the 20 essential amino acids including lysine and methionine that are commonly limiting in cereals and legumes. It has good protein digestibility with similarity to milk casein along with high content of calcium, phosphorus, iron, B complex vitamins and fiber. It lacks gluten and hence can be used to prepare diverse gluten-free products to be safely eaten by people with celiac diseases (Stikic *et al.*, 2012; Zevallos *et al.*, 2015) [7, 8].

Quinoa can be used as a rice replacement in breakfast items or infant foods. The seeds are boiled like rice or sprouted or used as thickener in soups or as porridges or as popcorn or ground and used as flour. Quinoa flour can be made into noodles mixed with maize or wheat Flour. The quinoa flour was substitution in various products at different levels like in bread at 10–13% proportion, noodles and pasta with 30–40% and sweet biscuits up to 60% (Zevallos *et al.*, 2015) [8]. The γ -amino butyric acid in quinoa can lower the enhanced blood pressure and provide anti-cancer potential when added to commonly consumed foods (Kumpun *et al.*, 2011) [5].

Materials and Methods

Procurement of raw materials

Quinoa seeds were obtained from College of Agriculture, PJTS Agricultural University, Rajendranagar, Hyderabad. The other ingredients were procured from local market of Hyderabad. The glassware and equipment were from Post Graduate & Research Centre, PJTSAU, Rajendranagar, Hyderabad.

Sensory analysis of quinoa based snack items were carried out by fifteen semi-trained panelists using 9 point hedonic scale and were scored for colour, texture, flavour, taste and overall acceptability (Meilgaard *et al.*, 1999) [6]. The nutrient analysis of quinoa was carried out at Post Graduate & Research Centre, PJTSAU, Rajendranagar, Hyderabad and for the rest of the ingredients, values were taken from Nutritive value of Indian foods (Gopalan *et al.*, 2014) [3].

Results and Discussion

Sensory evaluation of quinoa products

Dehulled quinoa was used to prepare snack items like porridge, salad and payasam.

The payasam was prepared using quinoa milk, salad with sprouted quinoa and porridge with quinoa flour. The results of

sensory evaluation of quinoa based snack items are given in the figure below:

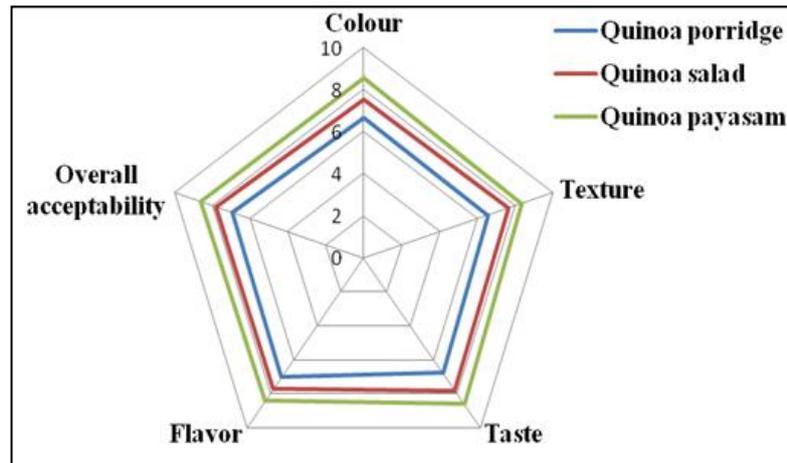


Fig 1: Sensory scores of quinoa based snack items

Among the three snack items prepared, the best score for colour was given to payasam with 8.57 followed by salad (7.53) and porridge (6.67). The best texture and taste were for payasam with 8.33 and 8.60 respectively as quinoa milk was extracted and added where as it was least for porridge.

Payasam had the highest score for flavour followed by salad and porridge. Overall acceptability was highest for payasam and least was for porridge. The mean scores for each of the sensory parameters are given in the table below.

Table 1: Mean sensory scores of quinoa snack products

Samples	Colour	Texture	Taste	Flavor	Overall acceptability
Quinoa porridge	6.67±0.16 ^c	6.56±0.13 ^c	6.77±0.13 ^c	7.00±0.17 ^c	6.93±0.17 ^c
Quinoa salad	7.53±0.16 ^b	7.67±0.13 ^b	7.83±0.12 ^b	7.73±0.12 ^b	7.78±0.12 ^b
Quinoa payasam	8.57±0.13 ^a	8.33±0.16 ^a	8.60±0.13 ^a	8.40±0.26 ^a	8.60±0.13 ^a
Mean	7.62	7.49	7.76	7.71	7.75
SE of mean	0.13	0.141	0.14	0.13	0.12
CD	0.46	0.32	0.49	0.47	0.25
CV (%)	8.08	5.73	6.91	6.31	4.33

Note: Values are expressed as mean ± standard deviation of three determinations.

Means within the same column followed by a common letter do not significantly differ at $p \leq 0.05$

After the sensory evaluation for the snack items was carried out, the nutritive value for them was calculated using Nutritive value of Indian foods (Gopalan *et al.*, 2014) [3] and

for quinoa proximate analysis was carried out at the institute (Unpublished data). The nutritive value per 100g serve size is given in table 2.

Table 2: Nutritive value for quinoa based snack items

Samples	Mineral content (g)	Protein(g)	Fat(g)	Carbohydrates(g)	Energy(Kcal)	Crude fiber (g)
Quinoa porridge	1.93	7.03	8.15	43.77	296.3	1.20
Quinoa salad	1.26	3.19	3.97	24.85	137.8	1.41
Quinoa payasam	2.26	7.21	13.36	61.71	416.0	0.82
Mean	1.81	5.81	8.49	43.44	283.47	1.14
SE of mean	0.29	1.31	2.71	10.64	80.55	0.17
CD	3.10	13.92	28.63	112.26	848.97	1.92
CV (%)	28.05	39.09	55.39	42.43	49.24	26.26

Note: Values used for calculation of nutritive values of prepared snack items were taken from

Nutritive Value of Indian Foods (Gopalan *et al.*, 2014) [3].

Serve size of 100g per sample.

For the snack items, the mineral content ranged between 1.26 to 2.26 g/100g. Protein between 3.19 to 7.21 g/100g, fat between 3.97 to 13.6 g/100g, carbohydrate between 24.85 to 61.71 g/100g and energy between 137.3 to 416 (K cal/100g) with the descending order as follows: payasam > porridge > salad. However the values for crude fibre, it was as follows: salad > porridge > payasam and values ranged between 0.82 to 1.41 g/100. Salad had high crude fibre as fresh vegetables were added to the sprouts. The extract of quinoa milk may have decreased crude fibre content in payasam.

Conclusion

Among the three snack items prepared, payasam had the best sensory scores for colour, texture, taste, flavour and overall acceptability. The nutritive value analysis also showed that payasam only had good mineral, protein, carbohydrates, energy and crude fibre content amongst the snack items, as milk was added along with quinoa extract.

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