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Standardisation and evaluation of quinoa incorporated breakfast items

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Abstract

Quinoa seeds have been consumed similar to rice in soups, puffed to make breakfast cereal or ground to flour to produce toasted and baked goods like cookies, breads, biscuits, noodles, flakes, tortillas and pancakes after it was discovered as healthy food by North Americans and Europeans in the 1970's. Its popularity is dramatically increased in recent years due to its high protein content and gluten free nature helpful for diabetic and celiac patients respectively. The germinated quinoa sprouts have been incorporated in salads.

The best colour rating for kichidi was 7.69 followed by vada with 7.60 and chapathi with 6.57. Kichidi only had the highest score for texture with 7.56 and least was for chapathi with 7.13. Taste was highest for kichidi (8.17) followed by vada (7.80) and chapathi (7.43). Kichidi with (7.70) had the highest flavour followed by vada (7.50) and chapathi (7.20). Overall acceptability was highest for kichidi and least was for chapathi. Hence, out of the three breakfast items prepared, kichidi was rated the best.

Keywords: Breakfast items, quinoa, chapathi, kichidi and vada.

Introduction

Chenopodium quinoa Willd is an annual herbaceous plant belongs to amaranthaceae family originating in the Pacific slopes of the Andes in South America (Schlick and Bubenheim, 1996). Quinoa is easy to cook and has versatility in terms of culinary preparation as it can be used as whole grains, uncooked or roasted flour, small leaves, meal and instant powders. Commercially available quinoa products are available as pasta, bread, cookies, muffins, cereal, snacks, drinks, flakes, baby food and diet supplements with approximately 20% quinoa content (Tang *et al.*, 2016) [7].

Populations consuming flavonoid enriched foods high low cancer frequency. Moreover, animal models fed with quinoa rich in isoflavones such as quercetin and kaempferol glycosides produced better quality milk (Alvarez-Jubete *et al.*, 2010) [1]. Quinoa seeds can be fermented to make traditional ceremonial alcoholic beverage from South America called chicha and possess large amounts of flavonoids conjugates (FAO, 2011) [2]. Flavonoids can prevent degenerative diseases like coronary heart diseases, atherosclerosis, cancer, diabetes and Alzheimer's disease by its antioxidative action or the modulation of protein functions, their by exerting health promoting effects (Hirose *et al.*, 2010) [4].

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 breakfast 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) [5]. The nutrient analysis of quinoa based breakfast items was carried out as per the Nutritive value of Indian foods (Gopalan *et al.*, 2014) [3].

Results and Discussion

Sensory Evaluation of quinoa products: Dehulled quinoa was taken and breakfast items like chapathi, kichidi and vada were prepared. Chapathi was prepared using quinoa flour, kichidi with sprouted quinoa and vada with quinoa seeds. The results of sensory evaluation of quinoa based breakfast items are given in the figure below:

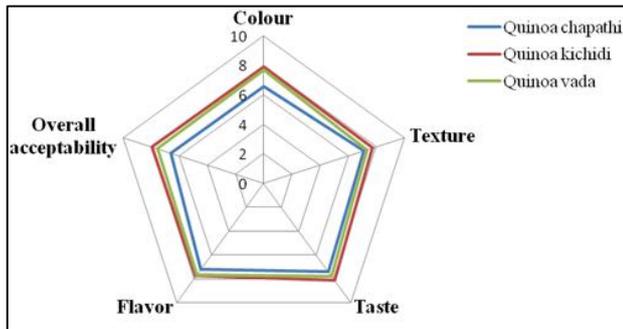


Fig 1: Sensory scores of quinoa based breakfast items

Table 1: Mean sensory scores of quinoa breakfast products

Samples	Colour	Texture	Taste	Flavor	Overall acceptability
Quinoa chapathi	6.57 ± 0.13 ^b	7.13 ± 0.26 ^c	7.43 ± 0.29 ^c	7.20 ± 0.20 ^c	6.40 ± 0.13 ^c
Quinoa kichidi	7.69 ± 0.13 ^a	7.56 ± 0.21 ^a	8.17 ± 0.15 ^a	7.70 ± 0.19 ^a	7.83 ± 0.19 ^a
Quinoa vada	7.67 ± 0.13 ^a	7.33 ± 0.16 ^b	7.80 ± 0.13 ^b	7.50 ± 0.13 ^b	7.43 ± 0.13 ^b
Mean	7.24	7.31	7.60	7.40	7.15
SE of mean	0.11	0.10	0.18	0.10	0.10
CD	0.49	0.45	0.40	0.47	0.39
CV (%)	7.23	9.13	7.19	8.89	7.44

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 breakfast 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 breakfast items

Samples	Protein (g)	Fat (g)	Carbohydrates (g)	Mineral content (g)	Crude fiber (g)	Energy (Kcal)
Quinoa chapathi	9.04	2.81	80.45	3.47	4.23	383.25
Quinoa kichidi	13.47	9.61	69.37	4.96	2.59	417.85
Quinoa vada	8.87	21.72	64.25	2.05	3.11	487.96
Mean	10.46	11.38	71.36	3.49	3.31	429.69
SE of mean	1.46	5.98	13.24	4.19	0.48	64.11
CD	15.46	63.16	139.56	43.07	5.19	675.79
CV (%)	21.54	70.43	37.03	103.71	25.32	30.74

Note: Values used for calculation of nutritive values of prepared items were taken from Nutritive Value of Indian Foods (Gopalan *et al.*, 2014)^[3].

Serve size of 100g per sample.

For the breakfast items, the mineral content ranged between 2.05 to 4.96 g/100g. Protein between 8.87 to 13.47 g/100g, carbohydrate between 45.36 to 88.11 g/100g and energy from 383.25 to 487.96 K cal/100g with the descending order as follows: vada > kichidi > chapathi. However the values for crude fibre, it was as follows: chapathi > vada > kichidi and values ranged between 2.59 to 4.23 g/100, and the values for fat, it was as follows: vada > kichidi > chapathi and values ranged between 2.81 to 21.72 g/100.

Conclusion: Among the three breakfast items prepared, kichidi had the best sensory scores for colour, texture, taste, flavour and overall acceptability. The nutritive value analysis also showed that kichidi only had good mineral, protein and energy content amongst the breakfast items.

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