

Standardization of Cakes by using Different Levels of Amaranth Flour and its Acceptability

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Abstract: Eggless cakes were prepared by using different levels of amaranth flour into refined wheat flour with the constant level of whey protein concentrate by method of U.S. Wheat Associates in 1983. Physical characteristics of amaranth grains and functional properties of flour were studied. It was found that seed weight, volume are less than other cereal as amaranth seeds are tiny and lighter in weight. Amaranth flour had more water absorption capacity and fat absorption capacity. Cakes prepared from blends containing varying proportions (20, 40, 60, 80 and 100 per cent) of amaranth flour, using the sponge cake method. The overall acceptability scores of 40 per cent amaranth flour cakes were maximum and more than control for cakes (8.3).

Keywords: Cakes, amaranth flour, wheat flour, whey protein concentrate, physical characteristics, physical indices

1. Introduction

Amaranth (*Amaranthus*) is an annual plant whose name derives from the Greek. Amaranth belongs to Amaranthaceae family which consists of hardy, weedy, herbaceous and fast growing cereal like plants (Opute, 1979). Amaranth (*amaranthus spp.*), popularly known as *chaulai*, is very nutritive and highly suitable crop for kitchen gardening and commercial cultivation. Rapid growth, quick rejuvenation after each harvesting and high yield of edible matter unit area in limited time as well as high nutritive value are its important features. It could be a very valuable source for combating undernutrition and malnutrition in India. Amaranth is one of those rare plants whose leaves are eaten as a vegetable while the seeds are used as a cereal. Amaranth is a gluten free cereal and due to the increasing demands of gluten free products amaranth can be used in bakery products. Rising demands for gluten free products parallels the apparent or real increase in celiac disease, or other allergic reactions/intolerances to gluten. Therefore, amaranth grains are taken into consideration for development of bakery products. Amaranth (grain and vegetable) also comes in the category of an underutilized crop in spite of its high nutritional value and health benefits. In India, amaranth grain is cultivated as a minor crop in many parts. It is mainly grown in the high hill and very high hill regions at an altitude of 1,500-2,400m and more than 2,400m. (www.organicuttarakhand.org, 2010). Amaranth seeds are small and lenticular. In addition to the unique characteristics of the major components i.e. protein, carbohydrates and lipids, amaranth grain also contain high levels of calcium, iron and sodium when compared to other cereal grain (Becker *et al.*, 1981). Since the food uses are similar to such cereal grain grasses as wheat and oats, amaranth is sometimes called a "pseudo cereal." Pseudo cereals can be defined as starchy food grains excluding those currently classified cereals, legumes, oilseeds and nuts (Fletcher, 2004). The study was blend to prepare cakes by using amaranth flour.

2. Experimental Procedure

PRA-3 amaranth variety was obtained from amaranth grains of variety PRA-3 for the research work were procured from College of Forestry, Hill campus, G.B.P.U.A.&T., Pantnagar, Ranichauri, Uttarakhand. Whey Protein Concentrate were procure from Mahan Proteins Pvt. Ltd. Delhi. For the analysis of physical characteristic whole grains were used. After sun drying the grains were oven dried at 60°C for 3 hours. The oven dried grains were then milled and sieved to give fine flour.

3. Product Formulation

The sponge cake method was used to prepare eggless cake using following ingredients of recipe of (U.S. Wheat Associates, 1983). Standardization of whey protein concentrate was done in basic recipe of cake without egg. Three different trials was done at 4, 6 and 8 per cent level and the cakes were prepared.

Third trial gave successful results by panel members and this recipe was used for standardized control cake (without egg). Then different levels of incorporation of amaranth flour were done in control standardized recipe. Refined wheat flour and amaranth flour were added in the above recipe with the proportions of 0:100, 20:80, 40:60, 60:40, 80:20, and 100:0 respectively and the whey protein concentrate levels were kept constant i.e. 8 per cent in all the above variations. All the other ingredients were constant.

Physical characteristics and physical indices of cake

Physical characteristics volume, weight, specific volume, diameter were studied. Physical indices volume index, symmetry index, uniformity index were studied. Cakes were cut carefully through the centre. The cut section of cakes was placed on a shelf and a template was held in front and against cake, lining up as in figure and necessary observations were made. The indices were estimated by following formulae (AACC, 1969):

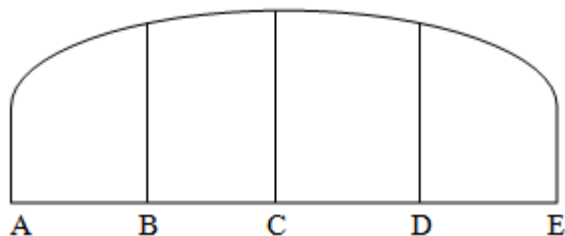


Figure 2: Physical indices of cake

- Volume Index = B + C + D Symmetry Index = 2C – B – D
- Uniformity Index = B – D Where A, B, C, D and E are given in cm.

The colour of the cakes prepared from blends of refined wheat and amaranth flour (with and without egg) were estimated by the Munsell Colour System as developed by Munsell (**Rathore, 1954**). Cakes were evaluated for sensory characteristics using sensory score card (**Amerine et al., 1965**). Nutrient composition of prepared cake was computed per 100 g by calculation of nutritive values of wheat flour, amaranth grain, sugar and oil given by **Gopalan et al. (1989)**.

4. Statistical Analysis

The statistical analysis of various data was done using ANOVA technique to find out significant differences between control with different levels of incorporated eggless cakes and cake with egg as described by **Snedecor and Cochran (1967)**.

5. Results and Discussion

Physical Characteristics of Grains

Seed weight of amaranth was obtained as 0.786 g/1000 grains, seed volume 22ml/1000 grains and seed density was recorded 4355 g/ml. Hydration capacity of amaranth was obtained as 0.006g/100 grains, swelling capacity of amaranth was recorded as 0.11 ml /100 grains. The swelling index of cereal grain is associated with the swelling capacity of the cereal grains. The swelling index of amaranth grain was obtained as 0.55ml/100 grains. Physical characteristic of amaranth grains is presented in Table 1.

Table 1: Physical characteristic of amaranth grains

Physical characteristic	Value
1000Grain weight	0.786g
1000Grain volume	2.2ml
100Grain density	4.355gm per ml
100 Grain Hydration capacity	0.006g
100 Grain Hydration index	0.0075g
100 Grain Swelling capacity	0.11ml
1000 Grain Swelling index	0.55ml

Sensory quality evaluation of amaranth flour eggless cake

Sensory quality evaluation of amaranth flour eggless cake was done for their acceptability using score card method. The results are presented in Table 2

Table 2: Sensory scores of amaranth flour eggless cakes

Flour blends	Appearance	Flavour	Color	Taste	Texture	Overall acceptability
A	7.65	7.5	7.7	7.65	7.45	7.6
B	7.9	7.35	8.15	7.4	7.7	7.7
C	8.35	8.15	7.65	8.25	8.35	8.5
D	7.35	6.95	7.15	7.40	7.15	7.6
E	6.65	6.85	6.95	6.9	6.6	6.65
F	6.1	6.95	6.25	6.15	5.95	6.05
F-value	**	**	**	**	**	**
CD at 5%	0.360	0.373	0.368	0.390	0.414	0.353

¹All the values are average of ten panelists' observation on score card method

*: significant at five per cent level of significance ns: non significant

A: 100% RWF B: 80% RWF + 20% A.F. C: 60% RWF + 40% A.F.

D: 40% RWF + 60% A.F. E: 20% RWF + 80% A.F. F: 100% A.F

Among the products prepared, the most acceptable amaranth eggless cake was found to be with the incorporation of 40 per cent amaranth flour. It was more preferred than the control cake with respect to colour 7.65, flavour 8.15 taste 8.25, texture 8.35 and overall acceptability 8.5 score respectively.

Physical characteristic of amaranth flour eggless cakes

Physical characteristics and physical indices of amaranth flour eggless cake was done and it was depicted in Table 3. and Table 4 respectively.

Table 3: Physical characteristics¹ amaranth flours eggless cakes

Flour blends (%) Refined Wheat flour + amaranth flour	Volume (cc)	Weight (g)	Specific Volume (cc/g)	Diameter (cm)
100 : 0	131.0	322.0	0.40	13.027
80 : 20	128.0	325.5	0.39	13.016
60 : 40	128.5	327.0	0.385	13.053
40 : 60	121.0	337.0	0.355	13.000
20 : 80	116.5	340.0	0.335	13.015
0 : 100	111.0	341.0	0.320	13.105
F value	**	*	*	Ns
CD at 5%	5.554	5.41	0.122	0.151

Table 4: Physical indices¹ of amaranth flour eggless cakes

Flour blends (%) Wheat flour + Amaranth flour	Volume index	Symmetry index	Uniformity index
100 : 0	16.00	2.25	0.10
80 : 20	15.85	2.20	0.30
60 : 40	15.30	2.55	0.25
40 : 60	15.05	2.60	0.30
20 : 80	14.15	2.10	0.30
0 : 100	13.50	2.10	0.40
F-value	Ns	*	Ns
CD at 5%	1.8272	0.3665	0.2116

*: significant at five per cent level of significance ns: non significant

In case of amaranth eggless cakes, weight of the cakes increased as the level of incorporation of amaranth flour was increased from 0 to 100 per cent. Volume and specific

volume of control cake was higher than the amaranth flour incorporated cakes. There was significant difference between volume index, symmetry index and uniformity index of control and 40 per cent amaranth flour incorporated eggless cakes. Weight of the amaranth eggless cakes was increased with the increased level of amaranth flour incorporated eggless cakes (322 to 341g) while there was significant decrease in volume and specific volume with the increase in amaranth flour incorporated cakes.

Nutritive value of amaranth flour cakes

Nutritive value of amaranth eggless cakes was presented in Table 6. Nutritive values of the acceptable products were also calculated on the basis calculation method. Nutritive value of amaranth flour eggless cakes were found to be higher than that of the control with respect to all the nutrients.

Table 6: Nutritive value of formulated amaranth flour eggless cakes

Flour blends	Energy (kcl)	Protein (gm)	Fat (gm)	CHO (gm)	Fibre (gm)	Ca(mg)	Iron (mg)
100 : 0	400	8.86	19.56	44.12	3.88	98.60	0.92
80 : 20	394	8.99	19.21	42.83	3.66	122.39	1.42
60 : 40	390	9.09	19.24	41.83	3.46	154.55	1.92
40 : 60	377	9.14	18.77	39.80	3.19	178.87	2.36
20 : 80	369	9.23	18.69	38.62	2.98	204.21	2.82
0 : 100	329	9.41	19.03	37.73	2.81	233.26	3.30

6. Conclusion

PRA-3 amaranth flour variety is suitable for baked products especially cakes as it contained higher amount of protein. More amount of amaranth flour might be incorporated in the formulation of cookies, breads and doughnuts as the crispness and hardness are suitable characteristics for them. Amaranth flour is rich in iron and it can be used for preparation of iron rich food supplements. There is need to popularize the use of amaranth flour in daily diet.

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