Where: 100% (wf) = wheat flour, (25% q + 75% w) = 25% quinoa meal + 75% wheat flour, (50% q + 50% w) = 50% quinoa meal + 50% wheat flour, (75% q + 25% w) = 75% quinoa meal + 25% wheat flour, (100% q) = 100% quinoa meal.

Addition of quinoa meal adversely affected the salt-biscuit structure in negative linear relationship, led to biscuits contained 25% quinoa meal had negligible efficiency in structure character, while quinoa meal addition with 50% led to slightly effects in structure, but at 75% addition of quinoa meal in the blend produced biscuit with significant differences in structure score, more than 75% quinoa meal addition produced unacceptable structure of biscuit, due to increasing the replacement of wheat flour with quinoa meal caused weakened the gluten network which is responsible for retaining the leavening gases. However, the compact structure of biscuits was increased by quinoa meal replacement levels. These results are confirmed with those found by **Abou-Zaid (2011).** Biscuit was made from formula contained 75% quinoa meal had slightly differences compared to control, and the sample was contained 100%quinoa meal had poor in sensory scours.

Sensory Evaluation of pan cake:

The effects of quinoa meal supplementation on the sensory characteristics of cakes are presented in Table (11). With the increase in the level of quinoa meal in the blend, the sensory scores for (highest, taste, crust color, odor, crumb structure, texture, and general appearance) of cakes slightly decreased.
The sensory characteristics of cake as (highest, taste, crust color, odor, crumb structure, texture, and general appearance) which prepared from blends of wheat flour (72% extraction) and 0, 25, 50, 75 or 100% quinoa meal were evaluated by ten members of stuff of food science and technology department in national research center. The results presented in Table (11) showed that effect of wheat flour replacement by 25 or 50% of quinoa meal on cake characteristics. Results indicated negligible difference between control and sample contained 25 or 50% quinoa meal on (highest, taste, crust color, odor, crumb structure, texture, and general appearance) compared to control. While, quinoa meal replacement with 75% had no significant differences on properties of (highest, taste, crust color, odor, crumb structure, texture, and general appearance) compared to control, but sample was contained 100% quinoa meal had slightly lower scores in cake properties of (highest and taste) compared to 100% wheat flour sample. Mean while the other properties haven't significant effects.

Table 11: Influence of quinoa meal addition on sensory evaluation of cake

Cake sample	*Highest*	*Taste*	*Crust color*	*Odor*	*Crumb grain*	*Texture*	*General appearance*
	15	30	10	10	10	15	10
100% wf	15.0^a	29.4^a	9.8^a	9.5^a	9.9^a	14.8^a	9.9^a
25% q + 75% w	14.8^a	28.5^a	9.5^a	9.3^a	9.5^a	14.5^a	9.6^a
50% q + 50% w	14.6^a	28.4^a	9.7^a	9.2^a	9.4^a	14.3^a	9.5^a
75% q + 25% w	14.5^b	27.8^b	9.5^a	9.3^a	9.3^b	14.2^a	9.2^b
100% q	14.3^b	26.4^c	9.2^b	9.2^a	9.2^b	13.8^b	8.9^c
L.S.D.	0.51	1.32	0.50	0.95	0.6	0.92	0.50

Where: 100% (wf) = wheat flour, (25% q + 75% w) = 25% quinoa meal + 75% wheat flour, (50% q + 50% w) = 50% quinoa meal + 50% wheat flour, (75% q + 25% w) = 75% quinoa meal + 25% wheat flour, (100% q) = 100% quinoa meal.

Replacement of flour with 25, 50 and 75% quinoa meal impaired the taste of cakes (control samples had 29.4 score), which slightly decreased from 28.5 to 26.4. The control samples had a maximum overall acceptance, whereas cakes containing levels from 25% to 100% quinoa meal possessed significant lower values. At all levels of substitution by quinoa meal the crust colors were insignificant differences among samples and control (at $p<0.05$).

With respect to the sensory evaluation, the organoleptic characteristics of cakes samples made from wheat flour and different levels of quinoa meal are acceptable to customers, while the organoleptic characteristics of cakes samples made from wheat flour and quinoa meal more than 75% possessed lower significant values in all sensory properties of cake compared to the control sample. Similar observations were also reported with supplementation of rice bran-fenugreek blends flour **(Sharma and Chauhan, 2002),** fenugreek flour **(Hooda and Jood, 2005)** and bean flour **Abou-Zaid et al., (2011)** with wheat flour.

Cakes prepared quinoa meal at any level addition received non significantly difference for color, taste, odor and texture with the highest acceptability. Therefore, it could be concluded that quinoa meal could be incorporated up to 100% level in the formulation of cake without affecting their sensory qualities.

Color Characteristics:

Color characteristic is a major criterion that affects the quality of the final product. The fortified flours blends showed a difference in color compared to the control (100% wheat flour). The slight improvement in color was interpreted as an intense color and it was dependant on the fortification level. Mean color values of biscuit of different treatments are recorded in Table (12). Data in the same table showed Hunter values of whiteness (L), redness (a) and Yellow (b) measured for upper surfaces colors. All fortified samples had slightly lower L values for crust than the control. All biscuits incorporating quinoa meal, had lower crust L values than the control, indicating darker color, it was due to dietary fiber level increased and color of quinoa meal was yellowish white. These results are in coincidence and confirmed with that obtained by **Saricoban and Yilmaz (2010).** Increasing the percentage of added quinoa meal to wheat flours, led the values of whiteness (L), redness (a) and Yellow (b), to be slightly increased in all fortified samples. Subjective evaluations confirmed that the quinoa meal biscuits samples were darker, more red (a-values) than control samples. The results showed that the a-values (redness) increased in the fortified biscuit samples with the increasing of quinoa meal level from 0% to 100% (Table 12). The results are consistent with that obtained by **Abou-Zaid et al., (2012).**

Table 12: Color characteristics of biscuit samples

Biscuit sample	*L*	*a*	*b*
100% wf	58.40	11.44	21.34
25% q + 75% w	57.59	11.59	19.41
50% q + 50% w	56.05	11.85	17.31
75% q + 25% w	55.11	12.10	15.32
100% q	53.42	12.24	14.60

Where: 100% (wf) = wheat flour, (25% q + 75% w) = 25% quinoa meal + 75% wheat flour, (50% q + 50% w) = 50% quinoa meal + 50% wheat flour, (75% q + 25% w) = 75% quinoa meal + 25% wheat flour, (100% q) = 100% quinoa meal.

Color characteristic is a major criterion that affects the quality of the final product. The fortified flours blends showed a difference in color compared to the control (100% wheat flour). The slight improvement in color was interpreted as an intense color and it was dependant on the fortification level. Mean color values of cake of different treatments are recorded in Tables (13). Table (13) shows Hunter values of whiteness (L), redness (a) and Yellow (b) measured for crust and crumb color. All fortified samples had slightly lower L values for crust than the control. All cake incorporating quinoa flour, had lower crust L values than the control, indicating darker color, it was due to dietary fiber level increased and the color of quinoa meal was yellowish white. There results are in coincidence and confirmed with that obtained by **Saricoban and Yilmaz (2010)** and **Abou-Zaid et al., (2012).** Increasing the percentage of added quinoa meal to wheat flours, led the values of whiteness (L), redness (a) and Yellow (b), to be slightly increased in all fortified samples.

Subjective evaluations confirmed that the quinoa meal cakes samples were darker, more red (a-values) than control samples. The results showed that the a-values (redness) increased in the fortified cakes samples with the increasing of quinoa meal level from 0% to 100%. The results are consistent with that obtained by **Abou-Zaid et al., (2012).**

Table 13: Color characteristics of cake crust and cake crumb color samples

	Crust color			*Crumb color*		
	L	a	b	L	a	b
100% wf	50.12	11.72	12.85	66.71	1.41	15.85
25% q + 75% w	48.01	11.60	13.45	66.00	1.38	18.68
50% q + 50% w	46.26	11.49	15.00	65.70	1.35	21.65
75% q + 25% w	42.63	11.41	15.61	64.21	1.31	24.85
100% q	39.21	11.30	15.75	63.82	1.27	27.30

Where: 100% (wf) = wheat flour, (25% q + 75% w) = 25% quinoa meal + 75% wheat flour, (50% q + 50% w) = 50% quinoa meal + 50% wheat flour, (75% q + 25% w) = 75% quinoa meal + 25% wheat flour, (100% q) = 100% quinoa meal.

4. Conclusions

The results obtained indicated that quinoa meal can be blended with wheat flour at levels as high as 75% without adversely affecting baking performance of salt-biscuit and pan cake, but with 100% of quinoa meal sample was acceptable with slightly differences compared control in cake sample. However, the addition of quinoa meal as a wheat substitute to produce gluten free bakery products to wheat flour affected the rheological, color and sensory characteristics of salt-biscuits and pan cake in various ways. Salt-biscuits involved 75% quinoa meal and pan cake containing quinoa meal 100% with low significant difference in sensory properties there were gluten free and acceptable. The quinoa meal showed that gluten, which plays a very important role in improving rheological, technological and sensory properties of baking products, could be used for produce bakery products as salt-biscuits and pan cake for celiac and autism stuffs. These studies have shown the potential for produce gluten free (salt-biscuits and pan cake).

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