Websites:
http://www.lifesciencesite.com
http://www.sciencepub.net

Emails:
editor@sciencepub.net
sciencepub@gmail.com

MARSLAND PRESS
Multidisciplinary Academic Journal Publisher

Technological and sensory characteristics of biscuits fortified with garden cress (*Lepidium sativum*) seeds

Garsa Ali Alshehry

Food Science and Nutrition Department, College Science, Taif University, KSA
E-mail: garsa_2006@hotmail.com

Abstract: In the present study, a biscuit was developed using garden cress seed. Chemical composition reported the protein, lipid, crude fiber, and ash content were increased gradually in the blends fortified with 2.5, 5.0, 7.5 and 10% garden cress from 11.12, 1.52, 0.67 and 0.64% to 12.38, 2.70, 1.35 and 1.30%, respectively, and total carbohydrates were gradually decreased from 86.05 to 82.27%. Sensory evaluation and physical characteristics gives the best biscuits acceptability fortification with garden cress until 7.5%. Minerals content the results reported that when increasing fortification of garden cress during preparation biscuits the minerals contents were increased gradually may be due to the garden cress had contained rich amounts from minerals content. The results observed that the biscuits at different levels were increased in total phenolic and flavonoids compounds moreover, the antioxidant activity was the highest amounts in biscuits fortified with 10% garden cress was 5002.0 µmol Fe (II)/100 g these results confirmed that the garden cress had contained rich amounts from natural antioxidant activity. The color analysis of different biscuits showed that lightness (L^*) and yellow color (b^*) values decreased gradually when garden cress was increased in biscuits meanwhile, (a^*) value redness color was gradually increased**.** This means when the best addition was 7.5% from garden cress gave the best color. The obviously results recommended that the biscuits fortified utilizing garden cress powder could help to become better the biscuits until 7.5% addition Also, biscuits product are the most acceptability for panelists may be due to their easy availability, the best taste, safety, and high nutrition value.
[Garsa Ali Alshehry. **Technological and sensory characteristics of biscuits fortified with garden cress (*Lepidium sativum*) seeds.** *Life Sci J* 2019;16(8):28-35]. ISSN: 1097-8135 (Print) / ISSN: 2372-613X (Online). http://www.lifesciencesite.com. 3. doi:10.7537/marslsj160819.03.

Keywords: Technological; sensory; characteristics; biscuits; fortified; garden; cress; *Lepidium sativum;* seed

1. Introduction

Garden cress seed (*Lepidium sativum* L.), has contained high amounts of nutrients nutraceuticals, and possess many health useful characteristics. Epidemiologically, it is recognized to have galactagogue characteristics and is traditionally used as a functional nutrition recipe for lactating mothers **(Doke *et al.*, 2018).**

Garden cress seed has been used in curing many health related complications by our ancients. It has been used in the treatment of many health problems such as hypertension, kidney diseases, prevention of cancer and mild glycemia. Garden cress seed is widely used to heal fractures and to increase milk secretion during lactation. Garden cress seed also possesses a wide range of antioxidant. Fatty acids of Garden cress seed oil helps in preventing coronary heart diseases **(Prajapati and Dave, 2018).**

Garden cress seed has including high amounts of chemical composition which contains 22, 27and 30% from protein, fat and dietary fiber. Moreover, it was contained vital minerals like calcium, iron, and zinc were 296, 7.6 and 5 mg/100 g, respectively, **(Gokavi *et al.*, 2004)** and also a rich source of natural antioxidants as tocopherol was 139 mg/100 g **(Zia-Ul-Haq *et al.*, 2012)**. The researchers observed that the garden cress seeds to be safe to consume as a functional recipe (≤10%) in nutrition compositions **(Datta *et al.*, 2011).**

Garden cress has been a significant nutritional and medicinal plant may be caused by its health-elevating characteristics **(Doke and Guha, 2014)** and it could be contained the concentration of protein was from 22.0 to 26.0 g/100g **(Al-Jasass and Al-Jasser, 2012)** and other vitamines as thiamine, riboflavin, and niacin, were 0,59, 0.61 and 14.3 mg/100g, respectively **(Gopalan *et al.*, 2011).** Moreover, the garden cress seeds which can combat malnutrition, anemia and other micronutrient deficiencies. It acts as memory boosters as it had contained essential fatty acids and also, it is a high amount of some minerals as calcium, iron and magnesium were 377, 100 and 430mg/100g, respectively, therefore it helps in normal contraction of the muscle for healthy movements of limbs and heart **(Singh *et al.*, 2015 and Dashora and Choudhary, 2016).**

Lepidium sativum is very famous in folk medicine. Garden cress is known for its pungent odor due to the several volatile oils and used to treat various condition; respiratory disorders, muscle pain, inflammation, bone fractures in the past.

Leaves, seeds, Arial parts extracts found to have alkaloids, flavonoids, glycosides, polyketides, vitamins, minerals, proteins, fats, carbohydrates which give the plant it's hepatoprotective, antihypertensive, diuretics, fracture healing respiratory disorder healing, antimicrobial, milk production, anti-inflammation, antioxidant, laxative, chemoprotective and many other therapeutic applications (**Falana *et al.*, 2014)**.

One of the traditional uses of *Lepidium sativum* is for increasing the speed of bone fracture healing. The plant and its seeds were used for this purpose mainly in Saudi Arabia and other Arabic Parts. Due to *Lepidium sativum* has a significant rule in accelerating bone fracture healing which supports the rationality of its traditional use for this purpose. Several other studies showed similar results which supports the need for more researches on this aspect **(Wadhwa *et al.*, 2012).**

The aim of this investigation was carried out to evaluate and sensory properties of biscuit fortified using garden cress (*Lepidium sativum*) seeds to known the best addition from garden cress to prepare biscuits high nutrition value.

2. Materials and Methods

Materials:

Procurement of garden cress seeds:

Garden cress seeds, used for the preparation of food products, were purchased from the local market. The seeds were ground in a grinder and the seed powder was packed in an airtight plastic container.

Wheat flour 72% extraction was brought from the local market and also the ingredients was used to prepare biscuits were brought from the local market at Saudi Arabia.

Methods:

Preparation of different blends:

Developed of different blends by incorporating garden cress flour in primary ingredient at 2.5, 5.0,7.5and 10.0% level for wheat flour 72% extraction to prepare biscuits in the Food Laboratory of Food and Nutrition Department, College of Science, Saudi Arabia.

Preparation of biscuits:

Wheat flour (250 g) was sieved with one fourth teaspoon sodium-bi-carbonate for even distribution and 125 g of sugar was added. Butter (125g) was cut with the knife into small pieces and rubbed into the flour mixture with the help of wooden spoon until it isproperly mixed. Milk (10 ml) was added, followed by sprinkling of Deionized water and mixed until a ball of dough formed. The dough was rolled on a rolling board with a rolling pin to one fourth inch thickness. Flat dough was cut into round shapes using biscuit cutter. The control biscuits were baked on the pre-greased aluminum baking trays in a gas oven at 280°C for fifteen minutes according to **Kulshreshta (2008).** Moreover, the different blends were prepared and cooking as the control biscuits.

Determination of the chemical analysis of raw materials and its blends

Proximate analysis including crude protein, crude lipids, ash, crude fibers and total carbohydrates were determined in the raw materials and its blends according to the methods of **AOAC (2012)**.

Minerals content were determined in the diluted solution of ash raw materials and different biscuits using the atomic absorption spectrophotometer (3300 Perkin-Elme) as described in by **AOAC (2012).**

Estimation of total phenolics and total flavonoids compounds

The total phenolic content was measured in the biscuits using the method described by **Qawasmeh *et al.* (2012)** with Folin-Ciocalteu reagent. The UV reading will have been measured at 760 nm. Gallic acids are used as standard (1 mg/ml) and the results are expressed as gallic acid equivalents GAE mg100/g of dry weight.

The total flavonoids content will be determined in the biscuits by the method of **Eghdami and Sadeghi (2010).** The absorbance will have been measure against a blank solution at 510 nm and the total 143 flavonoid content is expressed in terms of milligrams of quercetin equivalent per 100 gram dry weight (mg QE /100g dry weight).

Determination of antioxidant capacity *in vitro*

The total antioxidant potential of each extract was determined in the biscuits using the ferric reducing antioxidant power (FRAP) assay of **Szeto *et al.* (2006).** Briefly, the Ferric Reducing Antioxidant Power reagent was prepared from 300 mM acetate buffer (pH 3.6), 10 mM TPTZ solution in 40 mM HCL and 20 mM iron (III) chloride solution in proportions of 10:1:1 (v/v), respectively. The FRAP reagent was prepared fresh daily and was warmed to 37 ºC in a water bath before use. AST extracts (50 µL) were added to FRAP reagent (3 mL). After 4 min, the absorbance of the colored product (ferrous tripyridyltriazine complex) was then recorded at 593 nm. The standard curve was constructed using iron (II) sulfate solution (0–3,000 µM), and the results were expressed as µmol Fe (II)/100 g dry weight of plant material. Additional dilution was made if the FRAP value measured was over the liner range of the standard curve. All the measurements were taken in triplicate and the mean values were calculated.

Physical characteristics of biscuits

Biscuits were evaluated for weight (g), thickness (cm), diameter (cm), density (g/cm^3), breaking strength (N), and spread ratio as described by **Gaines (1991)**. Spread ratio and Density were calculated using the following equation:

Spread ratio = Diameter / Thickness.

Density = weight/volume g /cm^3.

Color evaluation

The color of biscuits at different levels was measured with a Hunter Lab Colorimeter (MiniScan XE Plus, Reston, VA) according to **Gallegos-Infante *et al.* (2010)**. The color values were recorded as L^* = lightness (0 = black, 100 = white), a^* ($-a^*$ = greenness, $+a^*$ = redness) and b^* ($-b^*$ = blueness, $+b^*$ = yellowness).

Sensory evaluation

All the supplementary food was processed for sensory evaluation immediately after development. The organoleptic characteristics of products were determined using a taste panel consisting of 10 judges who were familiar with the major sensory attributes of food products. The panelists were asked to evaluate the products for appearance, color, texture, flavor and overall acceptability. Each day, four samples having one control and three experimental were presented in identical containers coded with different numbers and served simultaneously. Each sample was repeated thrice during the course of evaluation. The ratings were done on 9 point hedonic scale **(Watts *et al.*, 1989).** The degree, to which a product was liked, was expressed as like extremely (9 point), like very much, (8 points), like moderately (7 points), like slightly (6 points), neither like nor dislike (5 points), dislike slightly (4 points), dislike moderately (3 points), dislike very much (2 points) and dislike extremely (1 point). The testing was conducted in food laboratory of the department of Food and Nutrition, College of Science, King Abdul-Aziz University, Taif, Saudi Arabia.

Statistical analysis

Statistical analyses were carried out by SPSS10 program. Data were expressed as means ± SEM and the Statistical analysis was performed using one-way analysis of variance followed by Duncan's tests (**SPSS, 2000**).

3. Results and Discussions

Chemical composition in raw materials and its blends

Chemical compositions as protein, lipid, crude fiber, ash content and total carbohydrate were determined in raw materials (wheat flour and garden cress powder) and its blends and the results are reported in Table (1). From the results it could observed that the garden cress was the highest in protein, lipid, crude fiber and ash content (22.47, 27.48, 7.0 and 4.65%, respectively) and the lowest in total carbohydrates was 38.40%. Meanwhile, wheat flour 72% extract was 10.82, 1.04, 0.55 and 0.54%, respectively, and the highest in total carbohydrates was 87.01%.

Blends was made from wheat flour fortification with garden cress at 2.5, 5.0, 7.5 and 10% levels, the results reported that the protein, lipid, crude fiber and ash content were increased gradually from 11.12, 1.52, 0.67 and 0.64% to 12.38, 2.70, 1.35 and 1.30%, respectively, and total carbohydrates was gradually decreased from 86.05 to 82.27%. These results are confirmed with **Gopalan *et al.*, (2011) and Sat *et al.* (2013).**

Table (1): Chemical composition in raw materials and its blends on dry weight

Chemical composition	Control as Wheat flour 72%	Garden cress	Blendsfortified with garden cress at level			
			2.5%	5%	7.5%	10%
Protein	10.82 ±0.15^{d}	22.47 ± 0.78^{a}	11.12 ±0,42^{c}	11.52 ±0.51^{c}	11.91 ±0.43^{b}	12.38 ±0.62^{b}
Lipids	1.04c ±0.09^{d}	27.48 ± 0.14^{a}	1.52 ±0.04^{c}	1.93 ±0.02^{c}	2.41 ±0.17^{b}	2.70 ±0.18^{b}
Crude fiber	0.55c ±0.03^{d}	7.0 ± 0.08^{a}	0.67 ±0.10^{c}	0.85 ±0.10^{c}	1.12 ±0.21^{b}	1.35 ±0.31^{b}
Ash content	0.54 ±0.01^{c}	4.65 ± 0.09^{a}	0.64 0.06^{c}	0.83 ±0.03^{c}	1.08 ±0.25^{b}	1.30 ±0.35^{b}
Total carbohydrates	87.01 ±2.23^{a}	38.40 ± 0.92^{c}	86.05 ±3.54^{b}	84.87 ±4.12^{b}	83.48 ±3.84^{b}	82.27 ±5.61^{b}

Data are expressed as the mean ± standard deviation; values in the same row having different letters differ significantly ($p < 0.05$).

Sensory evaluation of biscuits fortified with garden cress at different levels

Table (2), showed that the biscuits fortified with garden cress seed powder from 2.5 to 7.5 % become better the appearance of biscuits and acceptability due to pure seeing of evenly prevalence colored garden cress particles (8.1, 8.2 and 8.6). But at the 10.0 % level, it decreased to 7.6. Moreover, the control biscuits made from wheat flour 72% extraction the appearance was given 8.0 scores.

In case of color, the biscuits fortified with garden cress at 7.5% got the highest scores (8.1) followed by

the control was prepared wheat flour and 5.0% fortified were an equal score (7.9), and 2.5 and 10.0 % fortified they scores were 7.8 and 7.5, respectively.

The results from texture reported that a no considerable variation observed average degree in biscuits and its fortification biscuits for texture and it was observed that the control, 5 and 7.5 % fortification were an equal score (7.9) and the texture in the biscuits fortification at 2.5 and 10 % were 7.8 and 7.5 degrees.

The results from the taste and odor were found that the highest scores (8.9 and 8.5) were attained by 7.5 % level of garden cress seed powder fortification, followed by 5.0 % (8.4 and 8.2) respectively. The least scores (7.3 and 7.5) were computed for at level 10.0 % fortification in case of taste and odor. Overall 10 % level from the taste and odor of garden cress seeds fortification differed significantly from other treatments and control and got the lowest scores. The overall acceptability from the panelists confirmed that the addition of garden cress powder until 7.5% level gives the greatest degrees followed by 5 % fortification, respectively.

Nathiya and Vigasini, (2014) found that no variation in all measures in the biscuits fortification with garden cress seeds except texture which was observed that little hard in a sample containing the highest amount of seeds. The repeated results in a state of the appearance of biscuits prepared with amla powder which become better in the sensory characteristics of biscuits **(Kulshreshta, 2008).** The results found that no variation for all sensory properties when biscuits were made from utilizing potato flour **(Kaur, 2013).**

Figure (1): Biscuits fortified with garden cress at 2.5, 5.0, 7.5 and 10.0 levels

Table (2): Sensory evaluation of biscuits fortified with garden cress at different levels

Biscuits	Appearance	Taste	Color	Odor	Texture	Acceptability
Control	8.0±0.24 ^{c}	8.2±0.21 ^{c}	7.9±0.22 ^{c}	8.0±0.19 ^{c}	7.9±0.15 ^{c}	8.0±0.20^{c}
2.5	8.1±0.18^{d}	8.1±0.38 ^{d}	7.8±0.39 ^{d}	7.9±0.37 ^{d}	7.8±0.24 ^{d}	7.94±0.34 ^{d}
5.0	8.2±0.36^{b}	8.4±0.49 ^{b}	7.9±0.31 ^{b}	8.2±0.28 ^{b}	7.9±0.31 ^{b}	8.08±0.35 ^{b}
7.5	8.6±0.29^{a}	8.9±0.39^{a}	8.1±0.42 ^{a}	8.5±0.46 ^{a}	7.9±0.19 ^{a}	8.40±0.38 ^{a}
10.0	7.6±0.16^{e}	7.3±0.12 ^{e}	7.5±0.43 ^{e}	7.5±0.51 ^{e}	7.5±0.61 ^{e}	7.48±0.41 ^{e}

Data are expressed as the mean ± standard deviation; values in the same row having different letters differ significantly ($p < 0.05$).

Physical properties of biscuits fortified with garden cress

The results of measurements from the physical characteristics of different biscuits made from wheat flour 72% extraction fortified with garden cress at 2.05, 5.0, 7.5 and 10.0% levels are presented in Table (3). Their diameters and spread ratio in biscuits control were 7.0 cm and 10.77%, and different levels were 6.9, 6.7, 6.5 and 6.2 cm, in the diameter and the spread ratio was 10.68, 10.63, 10.48 and 10.16%, respectively. The diameter and spread ratio in different fortified biscuits was slightly decreased than control biscuits. These reduce may be due to increasing the absorption of water by gluten development in biscuit dough, therefore, reduced their diameter and spread ratio. Reduced spread ratio of the cookie referred to the truth that composite flours clearly form total with increased numbers of hydrophilic sites available for competing for the limited free water in cookie dough **(Hooda and Jood, 2005).**

The thickness of control biscuits and its fortified biscuits was 0.65, 0.64, 0.63, 0.63 and 0.672 cm, respectively. Moreover, the weight biscuits were 56.5, 58.0, 61.1 and 61.3g than control biscuits (56.1 g). The alterations in diameter and thickness are reflected in spread ratio which lowering consistently and adversely affecting the thickness and diameter, therefore, spread ratio of the supplemented biscuits **(Eissa *et al.*, 2007).**

The density of biscuits was significantly increased in different fortified biscuits 0.43, 0.43, 0.47 and 0.49 g/m^{3}than control biscuit were 0.40 g/m3. These increases may be due to the garden cress gives the porous nature of the biscuits. Finally, the breaking strength of control biscuit was 10.9 N, and breaking strength slightly lower of different fortified biscuits was 10.7, 10.5, 10.3 and 10.0 N, respectively, than control biscuits (10.9 N) it could be due to a lower thickness of different fortified biscuits.

Table (3): Physical characteristics of biscuits

Physical characteristics	Control 72% Wheat flour	Biscuits fortified with garden cress at level			
		2.5%	5.0%	7.5%	10.0%
Diameter (cm)	7.0±0.65 [a]	6.9±0.57 [a]	6.7±0.39[b]	6.5±0.61 [b]	6.2±0.65[c]
Thickness (cm)	0.65±0.05 [a]	0.64±0.07[a]	0.63±0.02[b]	0.62±0.08 [b]	0.61±0.07[c]
Weight (g)	56.1±3.49[c]	56.5±2.46[c]	58.0±4.16[b]	61.1±3.07 [a]	61.3±2.94 [a]
Spread ratio	10.77±1.38 [a]	10.68±1.38 [b]	10.63±2.25 [b]	10.48±1.56	10.16±2.01[c]
Density (g/m3)	0.40±0.01[c]	0.43±0.04 [b]	0.43±0.03[b]	0.47±0.04[a]	0.49±0.06 [a]
Breaking Strength (N)	10.9±2.01 [a]	10.7±1.25[a]	10.5±2.08[b]	10.3±1.62 [b]	10.0±1.95[c]

Data are expressed as the mean ± standard deviation; values in the same row having different letters differ significantly ($p < 0.05$).

Minerals content in garden cress and different biscuits

Mineral contents of raw material (garden cress powder) and its biscuits at different levels than with biscuit made from wheat flour were determined and the results are tabulated in Table (4). It could be observed the potassium constitutes major mineral in both garden cress and control biscuits were 643.0 and 134.0 mg/100g. **Sumangala *et al.* (2004)** recommended that increasing potassium in the diet for the sportsmen who are included in the strength training and also for trouble concerning high blood pressure.

Manganese was found in the lowest quantity (0.41 and 2.78 mg/100g). Furthermore, the garden cress and biscuits as control had contained good amounts of calcium (255.8 and 34.0mg/100g) and magnesium was 195.25 and 89.0 mg/100g, respectively. When increasing fortification of garden cress during preparation biscuits the minerals contents were increased gradually may be due to the garden cress had contained rich amounts from minerals content. Considering the different elements present in garden cress and biscuits as control, and also it had contained the possibility for understanding that essential nutrients for human may could be due to the nutritional activity of any plant is generally concerning the particular elements it contains (**Zia-Ul-Haq *et al.*, 2012).**

Table (4): Minerals content in raw materials and different biscuits mg/100g dry weight

Minerals content	Control as Wheat flour 72%	Garden cress	Biscuits fortified with garden cress at level			
			2.5%	5.0%	7.5%	10.0%
Calcium	34.0 ±2.49[d]	255.8 ±10.28[a]	40.0 ±1.28 [c]	49.45 ±1.39[c]	55.13 ±1.98 [b]	62.8 ±1.58
Iron	3.56 ±0.53 [c]	4.12 ±1.14 [b]	3.88 ±1.64[c]	4.42 ±0.18 [b]	4.98 ±0.67 [b]	5.32 ±0.81 [a]
Potassium	134.0 ±5.48 [d]	643.0 ±6.58[a]	148.0 ±7.53[d]	169.0 ±8.36 c	182.7 ±8.34c	206.0 ±10.25[b]
Magnesium	89.0 ±3.79 [d]	195.25 ±3.46[a]	94.76 ±5.19 [d]	104.45 ±4.61 [c]	109.7 ±4.61[c]	117.9 ±7.35[b]
Manganese	2.78 ±0.28 [b]	0.41 ±0.05[c]	2.89 ±1.23 [b]	2.97 ±0.91[b]	3.20 ±0.91 [a]	3.28 ±0.68 [a]
Zinc	2.91 ±0.19[b]	2.10 ±0.17 [c]	3.00 ±1.61 [a]	3.11 ±0.57 [a]	3.56 ±1.04 [a]	3.89 ±0.73 [a]

Data are expressed as the mean ± standard deviation; values in the same row having different letters differ significantly ($p < 0.05$).

Total phenolic and flavonoids compounds and Antioxidant activity in biscuits

Total phenolic and flavonoids compounds and total antioxidant activity were determined in control biscuits compared with biscuits made from wheat flour fortified with garden cress at 2.5, 5.0, 7.5 and 10% levels, and the results are showed in Table (5). The results observed that the biscuits at different levels were increased in total phenolic and flavonoids compounds from 351.3 mg100/g GAE and 11.41 mg100/g QE to534.0 mg100/g GAE and 63.0 mg100/g QE, respectively, compared control biscuits was 130 mg100/g GAE and 2.20 mg100/g QE. These increased may could be the garden cress is rich amounts total phenolic and flavonoids compounds. Moreover, the antioxidant activity was the highest amounts in biscuits fortified with 10% garden cress was 5002.0 µmol Fe (II)/100 g than control biscuits was 171.0 µmol Fe (II)/100 g. these results confirmed that the garden cress had contained rich amounts from natural antioxidant activity.

The using up of natural antioxidant-rich food affords therapeutic influences versus many serious diseases like cancer and atherosclerosis. Thus, the highest of natural antioxidant in nutrition is a target but how to great the natural antioxidant content of diets without losing their taste. It has been widely shown that the garden cress seed had contained the highest nutritive value, phenolic content and antioxidant activity. **(Hung *et al.*, 2011).**

Table (5): Total phenolic and flavonoids compounds and Antioxidant activity in biscuits

Antioxidants content	Control as Wheat flour 72%	Biscuits fortified with garden cress at level			
		2.5%	5%	7.5%	10%
Total phenolic	130.0±7.24^{e}	351.3±10.22^{d}	392.6±9.48^{c}	494.011.65^{b}	534.0±12.24^{a}
Flavonoids	2.20±0.04^{e}	11.41±1.07^{d}	30.0±2.46^{c}	34.09±3.17^{b}	63.0±4.62^{a}
Antioxidant activity	171.0±4.33^{e}	2035.28±12.90^{d}	3470.56±14.22^{c}	4205.84±22.23^{b}	5002.0±92.23^{a}

Data are expressed as the mean ± standard deviation; values in the same row having different letters differ significantly ($p < 0.05$).mg100/g of gallic acids equivalent GAE of dry weight. mg100/g of quercetin equivalent QE of dry weight Antioxidant activity (µmol Fe (II)/100 g)

Color of biscuits fortified with garden cress

Color is a leading property for determining the apparent acceptance of the biscuits. The results from *L**, *a**, and *b** values of the fortification different biscuits are shown in Table (6). The *'a*'* value indicated that the intensity of redness color; the positive *'b*'* value indicated that the yellow color, while *'L*'* value is a measure of lightness of the biscuits. The color analysis of different biscuits showed that lightness (*L**) and yellow color (*b**) values decreased gradually when garden cress was increased in biscuits meanwhile, (*a**) value redness color was gradually increased**.** This means when the garden cress was increased in biscuits the color directed to the dark until 10% but the best addition was 7.5% from garden cress gave the best color.

Food colors are a great influence on the consumer's attractive attention to the direction of the food product. The color is well known the significant seeing responsible for deciding the sensory acceptability of the food products **(Spence, 2015)**.

Table (6): Effect of garden cress on the biscuits color

Biscuits	*L**	*a**	*b**
Control Wheat flour 72%	56.40±2.45^{a}	11.22±0.95^{a}	21.34±1.27^{a}
2.5% Garden cress	55.89±2.76^{a}	11.34±0.73^{a}	21.31±1.39^{a}
5.0% Garden cress	54.04±3.18^{b}	11.67±0.82^{b}	20.31±1.64^{b}
7.5% Garden cress	53.91±2.89^{b}	12.00±0.61^{b}	20.12±1.29^{b}
10%Garden cress	52.42±3.47^{c}	12.84±0.53^{c}	19.60±1.37^{c}

Data are expressed as the mean ± standard deviation; values in the same row having different letters differ significantly ($p < 0.05$).

Conclusions

The results were concluded that when increases addition gradually from garden cress powder to prepare biscuits, the acceptability biscuits at least up to 7.5% level to prepare different biscuits. On the basis of the results, it may be concluded that the biscuits can be successful in using garden cress seed powder had contained rich amounts from the nutritional value and vital compounds without found a negative effect on sensory characteristics.

References

1. Al-Jasass, F.M. and Al-Jasser, M.S. (2012), "Chemical composition and fatty acid content of some spices and herbs under Saudi Arebia conditions", Scientific World Journal, doi: 10.1100/2012/859892 (accessed 27 January 2016).
2. AOAC. (2012). Official methods of analysis, 19th edition Association of Official Analytical Chemists. Washington DC.
3. Dashora, R. and Choudhary, M. (2016), "Development of recipes from garden cress seeds and its effect on anaemic patients", Food Science Research Journal, Vol. 7, pp. 299-305.
4. Datta, P. K., Diwakar, B. T., Viswanatha, S., Murthy, K. N., & Naidu, K. A. (2011). Safety evaluation studies on Garden cress (Lepidiumnsativum L.) seeds in Wistar rats. International Journal of Applied Research in Natural Products, 4(1), 37–43.
5. Doke, S., and Guha, M. (2014). Garden cress (Lepidium sativum L.) seeds—an important medicinal source: A review. Food Analytical Methods, 4, 69–80.
6. Doke, S., Chetana R. and Guha, M. (2018). Quality assessment of sweet snack from Garden cress (*Lepidium sativum* L.) seeds. An unexplored health grain, J Food Process Preserv. 2018;42:1-6.
7. Eghdami, A. and Sadeghi, F. (2010). Determination of total phenolic and flavonoids contents in methanolic and aqueous extract of Achillea millefolium. Journal of Organic Chemistry, 2, 81-84.
8. Eissa, H.A., Hussein, A.S. and Mostafa, B.E. (2007). Rheological properties and quality evaluation of Egyptian balady bread and biscuits supplemented with flours of ungerminated and germinated Legume seeds or mushroom. Poland J. Food Nutr. Sci. 57(4): 487–496.
9. Falana, H., Nofal, W. and Nakhle, H. (2014). Lepidium sativum (Garden cress): A review article. https://www.researchgate.net/publication
10. Gallegos-Infante, J.A.; Rocha-Guzman, N.E.; Gonzalez-Laredo, R.F.; Ochoa-Martnez, L.A.; Corzo, N.; Bello-Perez, L.A.; Medina-Torres, L. and Peralta- Alvarez, L.E. (2010). Quality of spaghetti pasta containing Mexican common bean flour (Phaseolus vulgaris L.) *Food Chemistry* 119, 1544–1549.
11. Gaines, C.S. (1991). Instrumental measurement of the hardness of cookies and crackers. Cereal Foods World 36: 989-996.
12. Gokavi, S. S., Malleshi, N. G., & Guo, M. (2004). Chemical composition of garden cress (Lepidium sativum) seeds and its fractions and use of bran as a functional ingredient. Plant Foods for Human Nutrition,59(3), 105–111.
13. Gopalan, C., Sastri, B.V.R., Balasubramanian, S.C., Rao, B.S.N., Deosthale, Y.G. and Pant, K.C. (2011), Nutritive Value of Indian Foods, National Institute of Nutrition, Indian Council of Medical Research (ICMR), Hyderabad.
14. Hooda, S., and Jood, S. (2005). Organoleptic and nutritional evaluation of wheat biscuits supplemented with untreated and treated fenugreek flour. Food Chem. 90: 427–435.
15. Hung, P.V., Hatcher, D.W., Barker, W., 2011. Phenolic acid composition of sprouted wheats by ultra-performance liquid chromatography (UPLC) and their antioxidant activities. Food Chem. 126, 1896–1901.
16. Kulshreshta, K. (2008). Development of value added amla (Phyllanthus emblica) based baked products and evaluation of their antioxidant activity. M.Sc. Thesis, Punjab Agricultural University, Ludhiana, India.
17. Nathiya, M. and Vigasini, N. (2014). Formulations of cereal based nutricookies prepared incorporating garden cress seeds (*Lepidium sativum*) - a protein and iron rich snack. *Int. J. Sci. Res*. 3(2): 225-226.
18. Prajapati, M.R and Dave, P.H. (2018). Therapeutic and nutritional importance of garden cress seed. Journal of Pharmacognosy and Phytochemistry 2018; 7(5): 140-143.
19. Qawasmeh, A., Obied, H. K., Raman, A. and Wheatley, W. (2012). Influence of fungal endophyte infection on phenolic content and antioxidant activity in grasses: Interaction between Lolium perenne and different strains of Neotyphodium lolii. Journal of Agricultural and Food Chemistry, 60(13), 3381-3388.
20. Sat, I.G., Yíldírím, E., Turan, M. and Demírbas, M. (2013), "Antioxidant and nutritional characteristics of garden cress (Ledidium sativum)", Acta Scientiarum Polonorum - Hortorum Cultus, Vol. 12, pp. 173-179.

21. Singh, C.S., Paswan, V.K., Naik, B. and Reeta, (2015), "Exploring potential of fortification by garden cress (Lepidium sativum L). seeds for development of functional foods- a review", Indian Journal of Natural Products and Resources, Vol. 6, pp. 167-175.
22. Spence, C. (2015). On the psychological impact of food colour. Flavour, 4(1), 3.
23. SPSS (2000). Statistical package for Social Sciences. SPSS for Windows, Version 10, SPSS Inc., Chicago, IL, USA.
24. Sumangala S. G., Nagappa G. M. and Mingruo G. (2004). Chemical Composition of Garden Cress (*Lepidium sativum*) Seeds and Its Fractions and use of Bran as a Functional Ingredient. Plant Foods for Human Nutrition 59: 105–111, 2004.
25. Szeto, Y.T.; Chu, W.K. and Benzie, I.F.F. (2006). Antioxidants in fruits and vegetables: a study of cellular availability and direct effects on human DNA. *Biosci. Biotechnol. Biochem*. 2006, *10*, 2551-2555.
26. Wadhwa, S., Panwar1, M. S., Agrawa, A., Saini, N. and Patidar Wadhwa, L. N. (2012). A Review on pharmacognostical study of lepidium sativum, ARPB, 2012; Vol 2 (IV)Accepted on 22/12/2012.
27. Watts, B.M., Ylimaki, G.L., Jeffery, L.E. and Elias, L.G. (1989). Basic sensory methods for food evaluation. IDRC- 277e. The International Development research Centre, Ottawa, Canada.
28. Zia-Ul-Haq, M., Ahmad, S., Calani, L., Mazzeo, T., Rio, D. D., Pellegrini, N., & Feo, V. D. (2012). Compositional study and antioxidant potential of Ipomoea hederacea Jacq. and Lepidium sativum L. seeds. Molecules, 17(12), 10306–10321.

8/3/2019