تأثير إضافة بذور الشيا وحب الرشاد على بعض المنتجات المخبوزة

Effect of adding chia and garden cress seeds on some baked products

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المجلة العلمية لكلية التربية النوعية – جامعة دمياط
عدد (٨) – ديسمبر ٢٠٢٣

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Abstract

The seeds of Chia and Garden cress contain many important vitamins, minerals, and antioxidants. Therefore, the current study aimed to study the effect of adding Chia seeds and Garden cress seeds to some baked products. For this purpose, three types of baked products (cupcakes, biscuits, and small pizza) were prepared using (3, 6% Chia seeds, 3, 6% Garden cress seeds, 3% Chia seeds + 3% Garden cress seeds) with a substitution of flour, and the products were evaluated for sensory properties. The results showed that all the previous products, which were supplemented with Chia seeds and Garden cress seeds and their mixture, were generally accepted, and 3% Chia seeds recorded the highest results after control. The results of the chemical analysis of flour mixtures fortified with Chia seeds and Garden cress seeds also showed an increase in the content of the mixtures of protein, ash, fat, and fiber. The mineral content of sodium, calcium, potassium, magnesium, phosphorus, and iron also increased with the addition of seeds. The results of rheological tests showed that the addition of seeds led to increased water absorption and dough time. The study recommends adding both Chia seeds and Garden cress seeds and their mixtures to baked products to take advantage of their nutritional and health benefits.

Keywords: Functional food, Sensory evaluation, Chemical analysis, Rheological properties.

Introduction

In recent years, human diets have changed, and as indicated by the **FAO**, using edible seeds is essential to human nutrition **(Hayat** *et al***., 2014)**. Moreover, a significant contribution to health and well-being can be made by using healthy food, but consumers may not have enough time to access their optimum diet. **(Ahmad and Al-Shabib, 2020)**. As a result, incorporating nutraceuticals and functional foods can lead to more effective therapeutic outcomes as complementary or alternative treatments. Consequently, alternative medicine has the potential to aid in the prevention of numerous diseases (**Patel** *et al.,* **2017; Ung** *et al.,* **2018; Los** *et al.,* **2021; Shabbir** *et al.,* **2021; Balthazar** *et al.,* **2021; Rabail** *et al.,* **2021).**

Notably, consumption of edible seeds increases the protein quality, minerals, vitamins, dietary fibers, bioactive peptides, and bioactive phenolic compounds in the meal **(Gan** *et al***., 2017)**. In this regard for human health, bioactive phenolic compounds have several advantages, such as anticancer, anti-inflammatory, anti-snake, and antimicrobial effects **(Abdel-Aty** *et al.,* **2018; 2019b; Barakat** *et al.,* **2020)**. In light of this, Chia seeds contain lipids (34.4%) and are rich in "Omega-3, 6, and 9", which constituted 62, 17.4, and 10.5% of the total lipids, respectively. It also contains fibers (23.7%) and proteins (19.6%) **(Coelho** *et al.,* **2018)**. Plus, Chia contains essential fatty acids, polysaccharides, protein, and antioxidant active components of polyphenols **(Arumsari and Sofyaningsih, 2020)**.

On the one hand, Garden cress seeds also contain 27.80 g of fat, 26.32 g of protein, 7.05 g of crude fiber, 29.97 g of carbohydrate, and 4.24 g of moisture, in addition to minerals such as calcium, phosphorus, iron, zinc, copper, and manganese, which were found to be 253.46, 418.35, 6.48, 2.37, 2.31, and 1.52 mg, respectively **(Shwetha** *et al.* **2017)**. It's known locally as ‘Hab el Rashaad in Egypt and is famous for its medicinal and nutritional value. Plus, its extract contains a lot of phytochemical substances responsible for its antioxidant and

antimicrobial properties, such as α-tocopherol, β-sitosterol, tannins, flavonoids, alkaloids, triterpenes, Benzyl isothiocyanate, and sterols **(Bary *et al*., 2017).**

On the one hand, the incorporation of oil seeds improves the nutritional profile of bread, increasing its protein, fiber, vitamins, minerals, essential fatty acids, and bioactive compounds. In addition to using oil seeds, mucilage has also been successfully used to replace the fat to produce a healthier, better-quality bakery. Therefore, the inclusion of these compounds in bakery products is of great interest, both in wheat products and in gluten-free products. **(De Lamo and Gómez, 2018)**.

Numerous studies have shown that consuming Chia seeds can have beneficial and protective effects on cardiovascular diseases, diabetes, hypertension, and other disorders. This is because the omega-3 fatty acids in Chia seeds positively impact the mechanisms of these chronic diseases. Additionally, evidence suggests that the high fiber content of Chia seeds is responsible for reducing postprandial glycemic levels. This is because fiber slows down digestion and glucose release. As a result, there is a growing interest in the effects of whole grain foods, like Chia seeds, on appetite and satiety measures **(Ayaz *et al*., 2017)**.

Garden cress seeds are helpful in preventing and curing various diseases like PEM, anemia, osteoporosis, osteomalacia, and bone fractures through long-term consumption as a food of a nutraceutical nature. Incorporation of Garden cress seeds into food products could benefit all age groups, individuals for nourishment, and those at risk or suffering from anemia, fractures, diabetes mellitus, and other chronic degenerative diseases to pursue prevention and management of these diseases **(Agarwal and Sharma, 2013).**

Therefore, the present study aimed to investigate the effect of different ratios of Chia seeds and Garden cress seeds and mixture on chemical, rheological and sensory properties of cupcakes, biscuits, and mini pizzas.

Materials and Methods

Materials:

1- The Chia seeds (Cs) and Garden cress seeds (GCs) were bought from an herbal shop in New Damietta city, located in Damietta Governorate, Egypt.

2-The ingredients for bakery products were obtained from the local market in New Damietta city, Damietta Governorate, Egypt. These include wheat flour with a 72% extraction rate, dry yeast, baking powder, salt, pepper, sugar powder, cocoa powder, vanilla, cinnamon powder, full cream milk, oil, ghee, olive oil, tomatoes, pepper colors, olive mix, cheese mix, garlic, and Italian herbs.

Methods:

Preparation of seed powder:

1-The seeds were cleaned and rendered free of dust, dirt, foreign materials, and broken seeds. Garden cress seed and Chia seed powder were prepared by grinding the seeds (Moulinex A59, France). The sieving process was conducted using a 60-mesh sieve (Toliba and Mohamed, 2019).

2-The seeds were stored in a cold room until use (Paiva et el., 2016).

Preparation of blends:

Wheat flour (72% extraction) was replaced with 3, 6% powdered Garden cress seeds. Also, the wheat flour (72% extraction) was substituted with 3, 6% Chia seed powder. Wheat flour (72% extraction) has also been replaced with a mix with 3% Chia seeds and 3% Garden cress seeds (Romankiewicz et el., 2017; El-Kherbawy and Dewidar, 2019).

Composition of food products

Preparation of bakeries samples:

The formula used to prepare the bakeries products (cupcakes, biscuits, and mini pizzas) was carried out according to the method of Saba (2010).

Chemical analyses:

The moisture and ash levels of both the raw materials and final products were analyzed using A.A.C.C. (2000) International methods 44-15.02 (Moisture-Air Oven Method) and 08-01.01 (Ash-Basic Method), respectively. to determine the lipid and crude protein (Nx5.7) contents, methods from A.O.A.C. (2000) were used, with N-hexane as a solvent for lipid extraction in a Soxhlet apparatus. Total carbohydrates were calculated based on the difference between other components.

The mineral content of Chia and Garden cress seeds, including Sodium (Na), Calcium (Ca), Potassium (K), Magnesium (Mg), Phosphorus (P), and Iron (Fe), was measured using an Atomic Absorption Spectrophotometer (type AAnalyst 400, Perkin-Elmer, Waltham, MA, USA). The samples were digested with HCl following the method described by Gupta et al. (2011).

Rheological properties:

The farinograph and extensograph tests were done in National Research Center, Dokki, Giza, Egypt, carried out according to the method of A.A.C.C.(2002).

Sensory evaluation:

Fifteen panelists from the Faculty of Specific Education at Damietta University sensually evaluated the baked goods, examining their color, aroma, texture, taste, and general appearance. The evaluation was conducted using the A.A.C.C. (2002) method.

Statistical analysis:

Data obtained was analyzed statistically using a computer. The results were presented as mean ± standard deviation ("S. D") and were subjected to a one-way analysis of variance ("ANOVA") test to compare two groups of numerical (parametric) data. Post-hoc tukey was then performed. A P value of 0.05 was considered statistically significant, as stated by **Armitage and Berry (1987)**.

Results and Discussion

Sensory evaluation of baked products:

Data in Table (1) showed the sensory evaluation process of some products (cupcakes, biscuits, and mini-pizzas) in terms of color, smell, texture, taste, and general acceptability. The findings indicated that all three baked goods were deemed acceptable when fortified with Chia seeds (Cs), Garden cress seeds (GCs), or a combination of both. The highest acceptance rates were observed after control with a 3% Chia seed enrichment in cupcakes, biscuits, and mini-pizzas, while the lowest rates were seen with a 6% Garden cress seed enrichment in cupcakes, biscuits. and the lowest rates were in the mini- pizza recorded with the mixture (3% Chia seed+ 3% Garden cress) . The general acceptance scores further confirmed these findings.

The result coincides with that of **John et al. (2020),** who declared that muffins containing 10% and 20% Garden cress seeds received higher scores in terms of color, texture, aroma, taste, and overall acceptability compared to the control muffins. However, muffins with 30% Garden cress seed had slightly lower scores.

On the one hand**, Arafa and Al-Kholey (2021)** declared that the addition of Garden cress seeds to peanut sweets was successful as all samples met the requirements for color, flavor, texture, and overall acceptability. Samples containing 2.5% and 5% Garden cress seeds resembled the control samples, while those with 7.5% Garden cress seeds had slightly different sensory qualities but were still deemed acceptable. As per the study's findings, peanut candies and similar products can contain up to 7.5% Garden cress seeds.

On the other hand, according to **Khan *et al.* (2022),** significant variations ($P \leq 0.05$) were observed in the sensory evaluation of wheat rusks regarding color, flavor, texture, and general acceptance. The inclusion of 5% Chia flour received the highest average score, 8.10. Therefore, Chia rusks enriched with Chia flour at a level of up to 5% can be utilized as a suitable dietary option for enhancing nutritional status with essential health-beneficial substances.

Table (1): Sensory evaluation to some food products.

Cupcakes					
Propertie s / Treatments	Color (20 scores)	Smell (20 scores)	Texture (20 scores)	Taste (20 scores)	General acceptability (20scores)
Control	19.70±0.59^{a}	19.73±0.45^{a}	19.76±0.41^{a}	19.66±0.48^{a}	19.83±0.36^{a}
3% Cs	19.33±0.81^{a}	19.13±0.74^{ab}	19.20±0.56^{a}	18.60±1.05^{ab}	19.33±0.89^{ab}
6% Cs	18.10±1.33^{b}	18.50±1.11^{ab}	17.23±1.80^{b}	17.63±1.89^{b}	18.10±1.44^{ab}
3% GCs	18.60±1.95^{ab}	18.20±3.68^{ab}	17.26±2.18^{b}	16.60±2.32^{b}	17.80±2.21^{b}
6% GCs	17. 33±1.11^{b}	16.93±1.62^{b}	16.40±2.52^{b}	16.40±2.26^{b}	17.00±2.29^{b}
3%Cs+ 3%GCs	17.80±2.14^{b}	17.46±1.99^{b}	17.46±1.45^{b}	17.26±2.21^{b}	18.06±1.66^{b}
Biscuits					
Properties / Treatments	Color (20 scores)	Smell (20 scores)	Texture (20 scores)	Taste (20 scores)	General acceptability (20scores)
Control	19.66±0.61^{a}	19.60±0.82^{a}	19.20±0.94^{a}	19.06±1.79^{a}	19.20±1.52^{a}

Follow Table (1)

3% Cs	17.73±1.62^{b}	18.00±1.25^{a}	18.20±1.47^{ab}	18.06±1.33^{ab}	18.26±1.53^{a}
6% Cs	17.26±1.48^{b}	17.40±1.72^{b}	17.06±2.65^{b}	17.46±1.84^{ab}	17.86±1.59^{b}
% GCs	16.93±1.98^{b}	16.73±3.03^{b}	17.20±1.98^{b}	17.00±2.75^{ab}	18.13±1.99^{b}
6% GCs	15.80±2.65^{c}	15.40±3.39^{c}	17.60±3.089^{b}	15.80±4.05^{b}	17.20±3.27^{c}
3%Cs+ 3%GCs	16.26±2.86^{c}	15.20±3.18^{c}	16.46±2.89^{b}	16.40±3.50^{b}	17.53±2.82^{c}
Mini pizza					
Properties / Treatments	Color (20 scores)	Smell (20 scores)	Texture (20 scores)	Taste (20 scores)	General acceptability (20scores)
Control	19.66±0.81^{a}	19.66±0.61^{a}	19.53±0.91^{a}	19.40±1.12^{a}	19.73±0.45^{a}
3% Cs	18.60±0.82^{a}	18.80±1.08a^{b}	18.20±1.47^{ab}	18.93±1.27^{a}	18.73±1.03^{ab}
6% Cs	16.93±1.66^{b}	17.66±2.12^{ab}	17.53±2.26^{b}	17.40±2.35^{ab}	17.20±1.85^{b}
3% GCs	18.66±1.34^{a}	17.60±1.76^{ab}	17.53±1.40^{b}	17.40±2.06^{ab}	18.06±1.75^{b}
6% GCs	17.86±1.92^{b}	17.26±3.08^{b}	17.53±2.06^{b}	16.73±3.08^{b}	17.53±2.38^{b}
3%Cs+ 3%GCs	17.33±1.87^{b}	17.26±2.15^{b}	16.80±1.78^{b}	17.06±2.34^{b}	17.40±2.16^{b}

Control: 100% wheat flour 72%extraction, CS: Chia seed, GCS: Garden cress seed.

Different letters on same column represent statistically significant ($p \leq 0.05$) difference between means.

Chemical composition of Chia and Garden cress seed powders:

Data in table (2) presents the chemical composition of Chia seed (Cs) and Garden cress seed (GCs) powders. Cs and GCs powders contained 7.09% and 10.43% moisture, 20.89% and 21.42% crude protein, 23.39% and 13.86% crude fat, 25.96% and 38.52% carbohydrate, 17.84% and 12.92% crude fiber, and 4.83% and 2.85 ash, respectively. Additionally, Cs and GCs powders had a

sodium content of 18.32 and 31.21 mg/100 g, calcium content of 588.45 and 250.64 mg/100 g, potassium content of 420.48 and 1033.54 mg/100 g, magnesium content of 326.09 and 289.90 mg/100 g, phosphorus content of 804.39 and 421.09 mg/100 g, and iron content of 7.30 and 6.81 mg/100 g.

These findings align with the results of **Sargi *et al.* (2013)**, who stated that Chia seed (Cs) has 796, 592, 323.79, 296, and 7.1 mg/100 g of Phosphorus, Calcium, Potassium, magnesium, and Iron, respectively. Additionally, **Gokavi *et al.* (2004) and Zia-Ul-Haq *et al.* (2012)** demonstrated that Garden cress seed contains 514.59 mg Phosphorus, 266.35 mg Calcium, 339.23 mg Magnesium, and 7.62 mg iron.

These findings are nearly consistent with the results reported by **Mohammed *et al.* (2019)**, who stated that the proximate analysis of Chia seeds (Cs) on a dry weight basis showed percentages of 20.6% for crude fiber, 33.9% for lipids, 24.2% for proteins, 7.3% for moisture, and 4.77% for ash. Similarly, **El-Salam *et al.* (2019)** conducted a study and found that Garden cress seeds had a moisture content of 7.05%, crude protein content of 19.73%, crude fat content of 14.18%, carbohydrate content of 35.45%, crude fiber content of 18.79%, and ash content of 4.8%.

Table (2): Chemical composition of Chia and Garden cress seeds powder per 100g.

Component	Cs	GCs
Chemical composition		
Moisture (g)	**7.09**	**10.43**
Protein (g)	**20.89**	**21.42**
Ash (g)	**4.83**	**2.85**
Fat (g)	**23.39**	**13.86**
Crude fiber (g)	**17.84**	**12.92**
Carbohydrates (g)	**25.96**	**38.52**
Mineral's content		
Sodium (Na) (mg)	**18.32**	**31.21**
Calcium (Ca) (mg)	**588.45**	**250.64**
Potassium (K) (mg)	**420.48**	**1033.54**
Magnesium (Mg) (mg)	**326.09**	**289.90**
Phosphorus (P) (mg)	**804.39**	**421.09**
Iron (Fe) (mg)	**7.30**	**6.81**

Each value represents the mean of three replicates.

Cs: Chia seeds powder. GCs: Garden cress seeds powder.

Effect of various treatments on the chemical composition of wheat flour:

The chemicals and metals presented in samples made from mixture of wheat flour (72%), Chia seed powder (Cs), Garden cress seed powder (GCs), or a combination of 3% Chia seeds and 3% Garden cress seeds are presented in Table (3). The results show that substituting wheat flour with either or both of these seeds leads to an increase in the protein, ash, fat, and fiber content of the fortified flour compared to unfortified wheat flour.

The highest percentage was achieved with 6% Garden cress seeds for protein and 6% Chia seeds for ash and fat, resulting in the mixture having the highest fiber content compared to the control sample. The moisture and carbohydrate levels decreased at 6% Chia seeds. Furthermore, the addition of seeds increased the mineral content compared to the control sample, with the highest amounts being 6% Chia seeds for sodium, calcium, magnesium, phosphorus, and iron, and 6% Garden cress seeds for potassium.

According to a study by **John *et al.* (2020),** it was found that adding 10, 20, and 30% of these ingredients to muffins resulted in significantly higher levels of protein (13.23–15.59%), fat (20.57–20.99%), ash (1.77–2.64%), total dietary fiber (7.98–12.37%), total calcium (91.3–155.99 mg/100 g), iron (4.83–8.06 mg/100 g), and antioxidants in all three types of GCs supplemented muffins (type-I, type-II, and type-III).

Table (3): Effect of various treatments on the chemical composition of wheat flour.

Component	W	C1	C2	G1	G2	CG
Chemical composition						
Moisture (g)	10.19	10.09	10.00	10.19	10.20	10.10
Protein (g)	9.40	9.74	10.08	9.76	10.12	10.09
Ash (g)	0.54	0.66	0.79	0.60	0.67	0.72
Fat (g)	1.23	1.89	2.55	1.59	1.98	2.26
Crude fiber (g)	0.58	1.09	1.61	0.96	1.31	2.03
Carbohydrates (g)	88.25	86.37	84.51	86.75	85.26	84.87
Mineral's content						
Sodium (Na) (mg)	25.86	25.63	26.18	26.01	26.17	25.77
Calcium (Ca) (mg)	10.60	27.93	45.27	17.80	25.00	35.13
Potassium (K) (mg)	140.76	149.15	157.54	167.54	194.32	175.93
Magnesium (Mg) (mg)	22.82	31.91	41.01	30.82	38.84	39.93
Phosphorus (P) (mg)	71.73	93.70	117.83	82.2	92.71	104.19
Iron (Fe) (mg)	0.69	0.87	1.09	0.86	1.05	1.07

W=100%Wheat flour, C1=97%wheat flour+3% Chia seeds powder, C2=94%wheat flour+6% Chia seeds powder, G1=97%wheat flour+3% Garden cress seeds powder, G2=94%wheat flour+6% Garden cress seeds powder, CG=94%wheat flour+3% Chia seeds powder+3% Garden cress seeds powder.

Rheological analysis

Farinograph parameters:

Data collected from Table 4 and Figures 1, 2, 3, 4, 5, and 6 provided information on the behavior of wheat flour dough when Chia seeds (Cs) and Garden cress seed (GCs) powder were added at varying levels, either separately or together. The results showed that as the amount of seed powder increased, the dough absorbed more water due to its high fiber content. This can be attributed to the fibers greater water hydration capacity. The highest water absorption occurred with the use of 6% GCs powder, while the control group had the lowest absorption. The time it took for the dough to reach its

maximum torque, known as dough time, increased when higher amounts of Cs and GCs powder were used. This could be because the presence of these plant sources causes a delay in hydration and gluten development. Dough stability time, which measures dough strength based on the quantity and quality of gluten, was highest when 6% GCs powder was added, while the least stable dough was observed with 6% Cs. As the levels of addition increased, the dough became weaker and less tolerant when 6% GCs were added compared to wheat flour.

Table (4): Farinograph properties of wheat flour 72% with Chia seeds and Garden cress seeds powder.

Tests / Treatments	Water absorption (%)	Dough weakening (BU)	D-Tolerance index (BU)	Stability (min)	Dough time (min)
100%W	61	90	110	2	1
3% Cs	63.50	80	80	1.50	1
6% Cs	64.50	70	60	1	2
3% GCs	66.00	70	100	7.50	4
6% GCs	66.30	30	40	8.50	6
3%CSs+3%GCs	66.20	70	100	3.50	2.5

W:100% wheat flour.
Cs: Chia seed.
GCs: Garden cress.

In this regard, Rabail et al. (2022) examined the potential of Garden cress seeds (GCs) to enhance dough quality, focusing on their nutraceutical, functional, and therapeutic benefits. The results of farinographic studies demonstrated that higher levels of GCs fortification resulted in improved characteristics of the dough overall.

On the other hand, Nassef et al. (2023) conducted research to explore the effects of substituting wheat flour with defatted Chia seed flour at different levels (5%, 10%, 15%, and 20%) on dough rheology, bread composition, and

physical characteristics. The study found that this substitution significantly increased water absorption, dough development time, dough stability, and arrival time ($P \leq 0.05$).

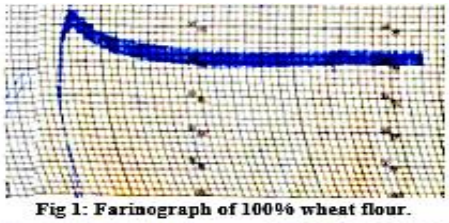

Fig 1: Farinograph of 100% wheat flour.

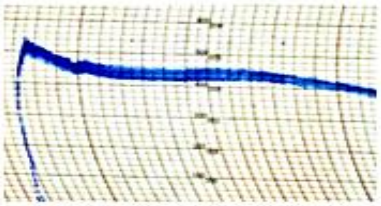

Fig 2: Effect of addition (3%) Chia seeds flour on farinograph parameters.

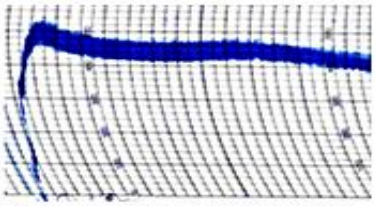

Fig 3: Effect of addition (6%) Chia seeds flour on farinograph parameters.

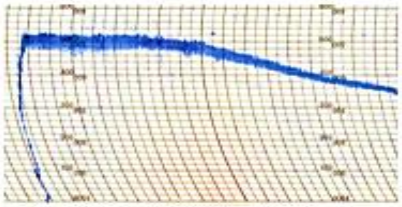

Fig 4: Effect of addition (3%) Garden cress seeds flour on farinograph parameters.

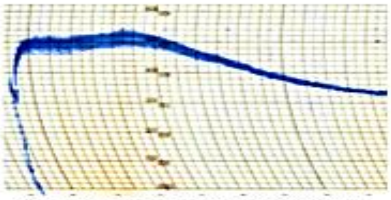

Fig 5: Effect of addition (6%) Garden cress seeds flour on farinograph parameters.

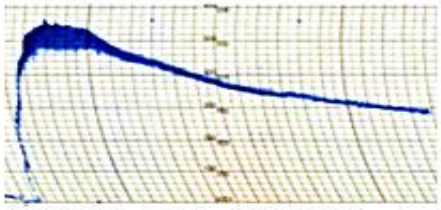

Fig 6: Effect of addition 6% (3% Chia seeds +3% Garden cress seeds powder) on farinograph parameters.

Extensograph parameters:

Data in table (5) and Figures 7,8,9,10,11, and 12 showed that the qualities of the milling measurer of wheat flour dough were enhanced by substituting Chia seeds, Garden cress seed powder, or a combination of the two at various levels. In general, the addition of Chia seed powder increased resistance to extension, Extensibility, and Energy, in contrast to Garden cress seeds, which decreased these values, Garden cress increased Maximum elasticity and Proportional Number, while the addition of Chia decreased these values.

This study is consistent with **Toliba and Mohamed (2019),** it was discovered that the wheat flour containing 5% Garden cress seed powder demonstrated the highest resistance to extension (R50), maximum resistance (MR), and ratio number (R50/E). However, as the level of Garden cress seed powder addition increased, the extensibility (E) and dough strength (DS) decreased.

Similarly, **Nassef *et al.*, (2023)** conducted a study to examine the effects of substituting wheat flour with defatted Chia seed flour at different levels (5%, 10%, 15%, and 20%) on dough rheology, bread composition, and physical properties. The results showed that incorporating defatted Chia seed flour resulted in a reduction in softening degree for all blends, while elasticity and energy levels were enhanced.

Table (5): Extensograph properties of wheat flour 72% with Chia seeds and Garden cress seeds powder.

Tests / Treatments	Resistance to extension after 5 mim (BU)	Maximum elasticity (BU)	Extensibility (mm)	Proportional number (BU/mm)	Energy (cm2)
100%W	440	370	158	2.34	82
3% Cs	470	320	167	1.92	85
6% Cs	480	250	168	1.49	86
3% GCs	440	380	151	2.52	80
6% GCs	410	380	150	2.53	77
3%CSs+ 3%GCs	480	410	155	2.65	90

W:100% wheat flour.
Cs: Chi a seed.
GCs: Garden cress.

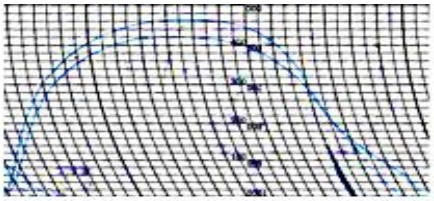

Fig 7: Extensograph of 100% wheat flour.

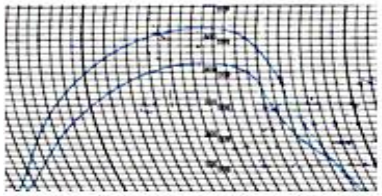

Fig 8: Effect of addition (3%) Chia seeds flour on Extensograph parameters.

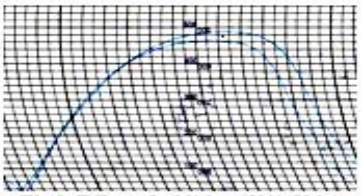

Fig 9: Effect of addition (6%) Chia seeds flour on Extensograph parameters.

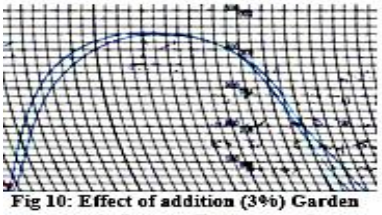

Fig 10: Effect of addition (3%) Garden cress seeds flour on Extensograph

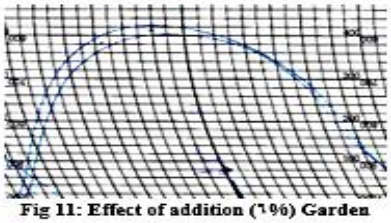

Fig 11: Effect of addition (٦%) Garden cress seeds flour on Extensograph

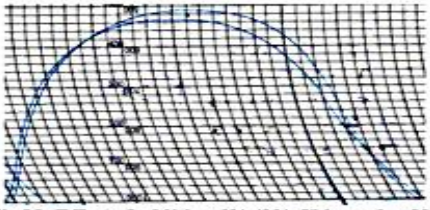

Fig 12: Effect of addition 6% (3% Chia seeds +3% Garden cress seeds powder) on Extensograph parameters.

Conclusion

In conclusion, this study discovered that sensory evaluation of products such as cupcakes, biscuits, and mini pizzas was deemed acceptable when they were enhanced with small amounts of Chia seeds, Garden cress seeds, or a combination of both. Including Chia or Garden cress seed powder, or a mixture of the two, in wheat flour increased the protein, ash, fat, and fiber content while reducing the moisture and carbohydrate content. The addition of seeds also increased the mineral content. The Farinograph tests demonstrated that increasing the quantity of seed powder resulted in greater water absorption and a longer dough time. However, the dough tolerance index and dough weakening decreased. The extensograph tests revealed that incorporating Chia seeds or Garden cress seed powder into wheat flour dough improved its qualities. Chia seeds increased resistance to extension, extensibility, and energy, while cress seeds decreased these values. On the other hand, Garden cress seeds increased maximum elasticity and proportional number, while Chia seeds decreased these values. Using a combination of the two seed powders increased all values except extensibility when compared to the control sample. The study suggests that adding Chia and Garden cress seed powder can enhance the nutritional benefits of baked products made with wheat flour, but further research is required to determine the optimal quantities.

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تأثير إضافة بذور الشيا وحب الرشاد على بعض المنتجات المخبوزة

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الملخص

تحتوي بذور الشيا وحب الرشاد على العديد من الفيتامينات والمعادن ومضادات الأكسدة الهامة. لذا هدفت الدراسة الحالية الي دراسة تأثير إضافة بذور الشيا وحب الرشاد إلى بعض المنتجات المخبوزة. ولهذا الغرض تم تحضير ثلاثة أنواع من المنتجات المخبوزة (الكب كيك، البسكويت، والبيتزا الصغيرة) باستخدام (٣، ٦% بذور شيا، ٣، ٦% بذور حب رشاد، خليط ٣% بذور شيا + ٣% بذور حب الرشاد) باستبدال من الدقيق، وتم تقييم المنتجات حسيا حيث أظهرت النتائج أن جميع المنتجات السابقة والتي تم تدعيمها بكل من بذور الشيا وبذور حب الرشاد وخليطهما لاقت قبول عام وقد سجل ٣% بذور شيا أعلي النتائج بعد الكنترول. كما أظهرت نتائج التحليل الكيميائي لخلطات الدقيق المدعم ببذور الشيا وحب الرشاد زيادة محتوي الخلطات من كل من البروتين، الرماد، الدهون، والألياف. كما زاد المحتوي المعدني من الصوديوم والكالسيوم والبوتاسيوم والمغنيسيوم والفوسفور والحديد مع إضافة البذور. هذا وأظهرت نتائج الاختبارات الريولوجية أن إضافة البذور أدي الي زيادة امتصاص الماء ووقت العجين. وتوصي الدراسة باضافة كل من بذور الشيا وحب الرشاد وخليطهما الي المخبوزات للاستفادة من الفوائد الغذائية والصحية لهما.

الكلمات المفتاحية: الاغذية الوظيفية، التقييم الحسي، التحليل الكيميائي، الخصائص الريولوجية.