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Physicochemical, Antioxidant, Microbiological And Sensory Characteristics Of Yoghurt Enriched With Garden Cress Seed Powder

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Abstract

The effect of addition garden cress seed powder on the rheological, physicochemical and sensory characteristics of yoghurt was investigated.

Garden cress seed powders were added to yoghurt at ratios of 1, 2, and 3 %. Yoghurt treatments were analyzed when fresh and after 5, 10 and 15 days of storage at 5 ± 1˚C.

Results showed that total solids, fat, protein, ash , fibers, phenolic contents and antioxidant activity of yoghurt enriched with garden cress seed powder increased gradually by increasing the percentage added compared with control yoghurt. Fortification of yoghurt with garden cress seed powder increased the pH and decreased titratable acidity values with increasing the fortification ratio. Also, yoghurt enriched with garden cress seed powder shows a significantly decrease in whey syneresis and increase in viscosity compared with control yoghurt and this increase was proportional to the fortification ratio. Yoghurt treatments fortified with garden cress seed powder had the lowest counts of total bacterial, yeast and moulds, and Streptococcus thermophiles and Lactobacillus bulgaricus counts.

Addition of garden cress seed powder improved the rheological, physicochemical and organoleptic properties of fortified yoghurt; the highest mean value was related to sample containing 2% garden cress seed powder.

Key words: Garden Cress Seed, Yoghurt, Antioxidant Activity, Phenolic Content, Organoleptic Properties

INTRODUCTION

Yogurt is one of the most consumed healthy and nutritious foodstuff worldwide (**Shi et al., 2017; Zhi et al., 2018).** Yogurt has a better digestibility of proteins than milk and many latent positive effects on health by providing the human body prebiotic and probiotic bacteria. Additionally, by incorporating fibers in yogurt, researchers have achieved a mean of increasing fibers consumption in all sectors of the populace and they have developed a functional food with an extensive array of beneficial effects. Several studies reported prebiotic fortification by adding dietary fibers in yogurt. Consumption of high fiber yogurt may

prevent or reduce obesity, diabetes, cancer, hypercholesterolemia, gastrointestinal disorders, colonic diverticulosis and constipation, ulcerative colitis, hyperlipidemia, hypertension, coronary artery disease, but also promote intestinal microflora and gastrointestinal immunity (**Dello et al, 2017; Tomic et al., 2017**).

Since it is known that a lack of fibers in the diet can be the cause of many nutrition-associated illnesses, the European Food Safety Authority (EFSA) has been forced to recommend an average daily fibers intake of 25 g (**EFSA, 2010**). Fibers are found in the cell wall of vegetables, fruits or cereals. They include polysaccharides (pectins, cellulose and hemicelluloses) and lignin. Although both soluble and insoluble fibers are available, usually the insoluble fibers are used with food fortifying intents (**Tejada-Ortigoza et al, 2016: Dönmez & Gökmen, 2017,**).

Many researchers reported that the rheological properties of yogurt are affected differently depending on the type of fiber source (**Luana et al., 2014; Raju & Pal, 2014).** The role in increasing the water holding capacity, in stabilization of high fat yogurt, in enhancing viscosity characteristics the gel forming ability are properties of fibers that allow the development of fiber-enriched yogurt with improved texture and reduced syneresis (**Dello Staffolo et al.,2017; Balthazar et al., 2016).**

Garden cress seed (GCS) possesses several of pharmacological properties like antihyperglycemic properties (**Behrouzian et al., 2014 and Hassan, et al., 2015**). Anti-anemic, antioxidant, antibacterial and antifungal properties (**Bansal et al., 2012**). Galactogogues, nutritional and medicinal attributes, and are recommended for anti-diarrheal, cardiotonic, hypotensive, and has tremendous potential for the development of functional food by fortification with it. (**Ait-yahia et al., 2018)**. Garden cress seed (L. sativum) have contain protein , fat and dietary fiber. It is a good source of calcium, iron , magnesium and other nutrients (thiamine, , riboflavin, niacin) **Gopalan et al., (2011).**Also , garden cress seed oil (GCSO) has a balanced amount of polyunsaturated fatty acids (PUFA) (46.8%) and monounsaturated fatty acids (MUFA) (37.6%) (**Jain and Grover, 2017).**

The aim of this study was to evaluate the effect of the addition of Garden cress seed powder on the rheological, physicochemical and sensory characteristics of yogurt.

2. Materials and Methods

2.1. Materials

Fresh buffalo's standardized milk (3% fat) was obtained from Dairy Technology Unit, Food Science Department, Faculty of Agriculture, and Zigzag University, Egypt. Garden cress seeds were purchased from local market. The seeds were cleaned and rendered free of dust, dirt, foreign materials and broken seed. Preparation garden cress seed powder by the using of grinder seed is converted in to the powdered form. Sieving process with 40, 60 mesh sizes used to sieve the end product. Streptococcus salivarius subsp. thermophilus EMCC104 and Lactobacillus delbruekii subsp. bulgaricus EMCC1102. Were obtained from the Microbiological Resources Center (MIRCEN), Faculty of Agric. Aim Shams Univ., Egypt.

2.2. Methods

Total phenolic compounds were determined by using Folin-Ciocalteu reagent and expressed as milligrams of Gallic acid equivalents (GAE) per 100 gm According to **Zheng & Wang (2001).**

2.2.1. Radical scavenging activity (Scavenging DPPH):

The antioxidant activity was evaluated by the DPPH (2, 2-diphenyl-1-picrylhydrazyl) assay according to **Brand Williams et al, (1995).** The scavenging activity percentage (AOA %) was determined according to **Mensor et al,(2001)** as follows:

AOA (%) = 1- Abs sample _ Abs blank / Abs control ×100 (1)

2.2.2. Determination of total flavonoid content in chia and quinoa seeds.

The total flavonoid content was determined by the aluminum chloride colorimetric method according to **Lin and Tang (2007).** Quercetin was used as the reference standard and the results were milligram quercetin equivalents (mg EQ)/g.

2.2.3. Manufacture of yoghurt:

Fresh bulk buffalo's milk was separated to skim-milk and cream. Cream used to standardize the percentage of milk fat. Milk containing 3% fat was used in the preparation of yoghurt and served as a control (C). Buffalo's milk (3% fat) was divided into 3 portions, garden cress seed powder was added to three portions at the rate of 1, 2 and 3% (T1, T2 and, T3). The fortified milk bases were homogenized and heated to 90 ˚C for 15 min., then, cooled to 42 ± 1 ˚C, inoculated with 2% of yoghurt starter cultures, filled in plastic cups and incubated at 42 ˚C until a uniform coagulation was obtained. The yoghurt samples from all treatments were stored at 5± 2 ˚C and analyzed at fresh and after 5, 10 and 15 days of storage. This experiment was triplicated.

2.2.4. Chemical analysis

Total solids, fat, total protein (TN) contents, titratable acidity and dietary fiber of yoghurt samples were determined according to **AOAC (2007).** The changes in pH in the yoghurt samples during storage were measured using a laboratory pH meter with glass electrode (HANNA, Instrument, Portugal). Crude fiber, ash contents were determined according to **AOAC (2007).**

2.2.5. Rheological measurements:

The viscosity and released whey from yoghurt samples was measured according to the method of **Aryana (2003).**

2.2.6. Sensory evaluation:

The sensory properties of yoghurt samples were assessed by 10 panel members of the Dairy Sci., Dep., Fac. Agric., Zagazig, Univ. They evaluated 20 g portions of each yoghurt sample and used a quality rating score card for evaluation of color & appearance (9 points), flavor (9 points), body& texture (9 points), consistency (9 points) and overall acceptability as described by **Nelson and Trout (1981).**

2.2.7. Microbiological analysis:

Microbiologically analyses preformed when fresh and after 5, 10, and 15 days of storage. Total bacterial count (T.B.C) was determined using plate count agar according to **Hought by et al., (1992).** Coliform bacteria and yeast and mould counts were determined according to **Marshall (1992).** The enumeration of Streptococcus thermophilus was performed at 37ºC for 48hr. under anaerobic condition using M17agar

(Oxide Ltd). Counting of Lactobacillus delbrueckii subsp. bulgaricus was carried out on MRS agar (Oxide Ltd) the plates were incubated in anaerobic condition at 42ºC for 48hr. **Rybka and Kailasaphaty (1996).**

2.2.8. Statistical analysis:

All data were statistically analyzed using the general linear models procedure of the statistical analysis system SAS (1998).Significances of differences were defined at p <0.05.All experiments as well as related analysis results were repeated three times and all obtained data are expressed as an average.

Results and Discussion

Chemical composition of garden cress seed powder

The proximate macro nutrients contents of garden cress seed powder are illustrated in Table (1) .The results showed that there is a difference between for each macro nutrients contents. Moisture, protein, fat, ash and fiber contents of garden cress seed powder were (7.72, 18.86, 14.0, 4.20 and 17.80 g/100g respectively. These results are in agreement with the data obtained by **Doke & Guha, (2014).**

Table (1) reveled that, the TPC of ethanolic garden cress seed extract was 950.30 mg/100g. While the TFC of ethanolic garden cress seed extract was 490.48 mg/100g.RSA (%) of ethanolic garden cress seed extract was 90.46 %, These results agree with that previously reported (**Attwa and El maadawy, 2019**) .

Table (1): Chemical composition, Total phenolic, flavonoid contents and radical scavenging activity of garden cress seed powder

Components %	garden cress seed powder
Moisture	7.72±0.07
Total protein	18.86±0.06
Fat	14.00±0.02
Ash	4.20±0.08
Fiber	17.80±0.04
Total phenolic content (mg/100g)	950.30±64.00
Total flavonoid content (mg/100g)	490.48±20.40
Radical scavenging activity (%)	90.46±1.30

* Values (means ±SD) statistically significantly different (P ≤ 0.05).

Chemical composition of different types of fortified yoghurt:

Chemical compositions of fortified yoghurt samples are shown in Tables 2. Control yoghurt had the lowest total solids (TS) and it was significantly (P ≤ 0.05) compared with fortified yoghurt treatments. The TS content of yoghurt containing garden cress seed powder at different concentrations increased gradually by increasing the percentage added. The TS content of all yoghurt treatments slightly increased as storage period progressed.

Control yoghurt (C) had the lowest protein content. The total protein of yoghurt containing garden cress seed powder at different concentrations increased gradually by increasing the percentage added. The total protein of all yoghurt treatments slightly increased as storage period progressed.

Supplementation of yoghurt with garden cress seed powder at different concentrations slightly increased fat contents by increasing the percentage added. The fat of all yoghurt treatments slightly increased as storage period progressed. Supplementation of yoghurt with garden cress seed powder at different concentrations slightly increased ash contents by increasing the percentage added. The fat of all yoghurt treatments slightly increased as storage period progressed Total fiber content of yoghurt treatments increased by adding garden cress seed powder at different concentrations and these increments were proportional to the fortification ratio. The fiber content of all yoghurt treatments slightly increased as storage period progressed. These results are in agreement with the data obtained by **Karaca et al,(2019), and Pérez-chabela et al,(2021)**.

Table 2: Chemical composition of different fortified yoghurt during storage at refrigerator temperature for 15 day

Components %	Storage period (Day)	Treatments			
		C	T_1	T_2	T_3
TS	Fresh	14.34 ± 0.04^{d}	15.04 ± 0.02^{c}	15.80 ± 0.03^{b}	16.54 ± 0.03^{a}
	5	15.12 ± 0.03^{d}	15.82 ± 0.02^{c}	16.55 ± 1.17^{b}	17.20 ± 0.10^{a}
	10	16.04 ± 0.04^{d}	16.80 ± 0.06^{c}	17.56 ± 0.04^{b}	18.30 ± 0.10^{a}
	15	16.70 ± 0.21^{d}	17.44 ± 0.10^{c}	18.12 ± 0.09^{b}	18.90 ± 0.10^{a}
Fat	Fresh	3.1 ± 0.15^{d}	3.25 ± 0.10^{c}	3.40 ± 0.10^{b}	3.54 ± 0.10^{a}
	5	3.25 ± 0.15^{d}	3.37 ± 0.21^{c}	3.50 ± 0.10^{b}	3.65 ± 0.02^{a}
	10	3.35 ± 0.15^{d}	3.50 ± 0.21^{c}	3.65 ± 0.10^{b}	3.80 ± 0.04^{a}
	15	3.40 ± 0.15^{d}	3.57 ± 0.21^{c}	3.70 ± 0.10^{b}	3.85 ± 0.05^{a}
Protein	Fresh	3.70 ± 0.02^{bc}	3.90 ± 0.03^{b}	4.12 ± 0.02^{ab}	4.20 ± 0.10^{a}
	5	4.20 ± 0.02^{bc}	4.38 ± 0.03^{b}	4.60 ± 0.04^{ab}	4.80 ± 0.10^{a}
	10	5.00 ± 0.09^{bc}	5.20 ± 0.04^{b}	5.38 ± 0.05^{ab}	5.50 ± 0.10^{a}
	15	5.26 ± 0.06^{bc}	5.45 ± 0.07^{b}	5.66 ± 0.07^{ab}	5.80 ± 0.10^{a}
Ash	Fresh	0.74 ± 0.02^{d}	0.78 ± 0.02^{c}	0.82 ± 0.03^{b}	0.86 ± 0.03^{a}

	5	0.78±0.04^{d}	0.82±0.04^{c}	0.86±0.04^{b}	0.90±0.04^{a}
	10	0.82±0.04^{d}	0.86±0.04^{c}	0.90±0.03^{b}	0.95±0.03^{a}
	15	0.90±0.05^{d}	0.94±0.06^{c}	0.99±0.06^{b}	1.04±0.06^{a}
Fiber	Fresh	0.00	0.20±0.02^{d}	0.38±0.01^{c}	0.46±0.02^{b}
	5	0.00	0.28±0.02^{d}	0.44±0.01^{c}	0.52±0.02^{b}
	10	0.00	0.34±0.02^{d}	0.52±0.01^{c}	0.60±0.02^{b}
	15	0.00	0.42±0.01^{d}	0.60±0.01^{c}	0.68±0.02^{b}

* Values (means ±SD) with different superscript letters are statistically significantly different (P ≤ 0.05).

C: Control yoghurt (3 % fat). , T1: yoghurt with 1% garden cress seed powder, T2: yoghurt with 2% garden cress seed powder, T3: yoghurt with 3% garden cress seed powder

pH and acidity and rheological properties of fortified yoghurt

Table 3 shows the effect of adding garden cress seed powder at different concentrations on pH and titratable acidity was highly significant. Addition of garden cress seed powder at different concentrations increased the pH in yoghurt. Whereas, titratable acidity decreased with increased fortification ratio .Acidity of all yogurt treatments increased, while pH of all yogurt treatments decreased as storage period progressed .Similar observation was reported by **Atwaa et al, (2020) and Pérez-chabela et al,(2021)**.

Fortification of yoghurt with garden cress seed powder at different concentrations significantly decreased whey syneresis and increased viscosity compared with control yoghurt and this increasing was proportional to the fortification ratio Table (3) .These results might be due to increasing the water holding capacity of garden cress seed powder. Viscosity of all yogurt treatments increased as storage period progressed up to 10 days and then decreased at the end of storage period. While whey syneresis of all yogurt treatments decreased as storage period progressed up to 10 days and then increased at the end of storage period. These results are in agreement with those reported by **Karaca et al,(2019), and Pérez-chabela et al,(2021)**.

Table 3: Acidity, pH and rheological properties of different fortified yoghurt during storage at refrigerator temperature for 15 day

Item	Storage period (Day)	Treatments			
		C	T_1	T_2	T_3
Acidity %	Fresh	0.88±0.03^{b}	0.86±0.05^{bc}	0.84±0.04^{c}	0.84±0.05^{c}
	5	0.95±0.03^{b}	0.96±0.03^{bc}	0.90±0.02^{c}	0.87±0.03^{c}

	10	1.02±0.02^{b}	1.02±0.03^{bc}	0.95±0.03^{c}	0.90±0.03^{c}
	15	1.12±0.03^{b}	1.10±0.03^{bc}	0.97±0.03^{c}	0.97±0.03^{c}
pH	Fresh	4.30±0.03^{b}	4.38±0.05^{ab}	4.45±0.05^{a}	4.48±0.06^{a}
	5	4.16±0.02^{b}	4.25±0.21^{ab}	4.36±0.02^{a}	4.41±0.08^{a}
	10	4.05±0.03^{b}	4.12±0.02^{ab}	4.24±0.02^{a}	4.28±0.02^{a}
	15	3.95±0.02^{b}	4.00±0.02^{ab}	4.15±0.02^{a}	4.18±0.02^{a}
Whey syneresis (ml/100gm)	Fresh	28.67±1.53^{a}	26.00±2.00^{b}	25.00±2.00^{c}	24.00±2.52^{d}
	5	25.00±2.00^{a}	23.00±2.00^{b}	22.00±2.00^{c}	22.00±2.00^{d}
	10	22.33±1.53^{a}	18.00±2.00^{b}	16.00±2.00^{c}	15.00±2.00^{d}
	15	24.00±2.00^{a}	20.00±2.00^{b}	18.00±2.00^{c}	18.00±2.00^{d}
Viscosity (C. P.S.)	Fresh	5200±25.17^{e}	5330±25.17^{d}	5400±25.17^{b}	5520±25.17^{a}
	5	5600±30.00^{e}	5800±329.24^{d}	5950±25.17^{b}	6140±557.34^{a}
	10	6000±20^{e}	6440±20.82^{d}	6560±25.17^{b}	6630±30.00^{a}
	15	5900±26.44^{e}	6280±26.46^{d}	6340±20.00^{b}	6450±20.82^{a}

* Values (means ±SD) with different superscript letters are statistically significantly different (P ≤ 0.05).

C: Control yoghurt (3 % fat). , T1: yoghurt with 1% garden cress seed powder, T2: yoghurt with 2% garden cress seed powder, T3: yoghurt with 3% garden cress seed powder

Total phenolic content and radical scavenging activity of fortified yoghurt:

Phenolic contents and antioxidant activity of yogurt samples are presented in Table 4 There were significant differences in the phenolic contents and antioxidant activity of the samples (P <0.05).Addition of garden cress seed powder at different concentrations significantly increased phenolic contents and antioxidant activity of yoghurt treatments and these increments were proportional to the fortification ratio. The highest value of phenolic contents and antioxidant activity at the end of storage period was to yoghurt fortified with 3 % garden cress seed powder. Similar observation was reported by **Atwaa et al, (2020) and Pérez-chabela et al,(2021)**. Phenolic contents and antioxidant activity of all yogurt treatments decreased as storage period progressed.

Table: 4. Total phenolic content and radical scavenging activity of different fortified yoghurt during storage period

Item	Treatments	Storage period (days)			
		Fresh	5	10	15
TFC mg / 100g	C	42.40±2.98^{d}	30.80±2.80^{d}	22.60±2.88^{d}	14.50±2.90^{d}
	T1	185.6±2.02^{c}	144.5±2.33^{c}	98.4±2.24^{c}	80.8±2.54^{c}
	T2	218.2±2.10^{b}	175.6±2.44^{b}	128.4±2.23^{b}	100.5±2.58^{b}
	T3	325.3±2.06^{a}	294.5±2.14^{a}	243.4±2.22^{a}	204.2±2.10^{a}
	LSD	12.25	14.60	16.22	11.80
RSA%	C	22.50±1.12^{d}	16.40±1.08^{d}	12.20±1.11^{d}	9.80±1.22^{d}
	T1	42.4±1.02^{c}	38.5±1.00^{c}	33.6±1.14^{c}	28.2±1.08^{c}
	T2	48.8±1.14^{b}	43.4±1.10^{b}	39.4±1.32^{b}	37.5±1.40^{b}
	T3	56.7±1.00^{a}	52.2±1.10^{a}	48.6±1.30^{a}	44.8±1.36^{a}

ND= not detected. :

Control yoghurt (3 % fat). , T1: yoghurt with 1% garden cress seed powder, T2: yoghurt with 2% garden cress seed powder,T3: yoghurt with 3% garden cress seed powder

Microbiological evaluation of fortified yoghurt:

Table (5) shows the differences in total bacterial counts of plain and fortified yogurt during storage period. The results indicated that total bacterial count decreased gradually as storage period progressed until the end of storage period. Yoghurt treatments fortified with garden cress seed powder at different concentrations had the lowest counts of total bacterial count. Total bacterial count decreased with increasing the fortification ratio.

Yeast and mould counts increased in all treatments up to the end of storage period yoghurt treatments fortified with garden cress seed powder at different concentrations had the lowest yeast and moulds counts. Yeast and moulds counts decreased with increasing the fortification ratio.

Coliform bacteria not detected in all treatments up to the end of storage period. These results may be due to high antibacterial or antifungal properties of garden cress seed powder (**Ait-yahia et al., 2018).**

The general trend of these results agreed with those reported **Elsanhoty and Ramadan.,(2018) and Habib et al,(2018).**

Streptococcus thermophiles and Lactobacillus bulgaricus counts increased gradually in all treatments up to 5 days form storage and then decreased at the end of storage period. Yoghurt treatments fortified with garden cress seed powder at different concentrations had the lowest Streptococcus thermophiles and Lactobacillus bulgaricus counts Table 5**.** Fortification of yoghurt with garden cress seed powder decreased the counts of Streptococcus thermophiles and Lactobacillus bulgaricus compared to control yoghurt; this may be due to high antibacterial or antifungal properties of

garden cress seed powder. The general trend of these results agreed with those reported **Elsanhoty and Ramadan., (2018) and Habib et al,(2018).**

Table (5): Microbiological evaluation of different fortified yoghurt during storage period

Item	Treatments	Storage period (days)			
		Fresh	5	10	15
T.B.C cfu/10^7 g	C	100	5	56	30
	T1	86	73	42	20
	T2	77	58	38	14
	T3	60	44	30	9
Coliform cfu/10^1 g	C	ND	ND	ND	ND
	T1	ND	ND	ND	ND
	T2	ND	ND	ND	ND
	T3	ND	ND	ND	ND
Yeasts & Moulds cfu/10^2 g	C	ND	ND	ND	6.0
	T1	ND	ND	ND	1.0
	T2	ND	ND	ND	ND
	T3	ND	ND	ND	ND
Streptococcus thermophiles cfu/10^7 g	C	52	70	68	59
	T1	38	57	42	30
	T2	32	52	38	26
	T3	27	46	30	18
Lactobacillus bulgaricus cfu 10^7	C	26	44	63	82
	T1	20	40	47	60
	T2	26	42	45	48
	T3	20	35	38	45

ND= not detected. :

Control yoghurt (3 % fat). , T1: yoghurt with 1% garden cress seed powder, T2: yoghurt with 2% garden cress seed powder,T3: yoghurt with 3% garden cress seed powder

Sensory evaluations of fortified yoghurt.

Results in Table (6) reveal that there was significant different between control and the different type of yoghurt for sensory attributes, control yoghurt had the lowest values .Addition of garden cress seed powder improved the organoleptic properties of fortified yoghurt expect appearance which decreased by adding garden cress seed powder , the highest mean value was related to sample containing 2% garden cress seed powder .The organoleptic properties of all yoghurt treatments decreased as storage period progressed. A similar observation was found by **Al-hamdani et al (2015), and Atwaa et al, (2020).**

Table: 6. Sensory evaluations of different types fortified yoghurt during storage period

Properties	Storage period (Day)	Treatments			
		C	T_1	T_1	T_3
Appearance	Fresh	8.40±0.12^{a}	7.80±0.20^{b}	7.40±0.26^{c}	7.00±0.32^{d}
	5	8.10±0.24^{a}	7.30±0.28^{b}	7.00±0.40^{c}	6.70±0.42^{d}
	10	8.0±0.26^{a}	7.10±0.34^{b}	6.60±0.38^{c}	6.30±0.44^{d}
	15	7.70±0.32^{a}	6.70±0.44^{b}	6.30±0.42^{c}	6.00±0.53^{d}
Flavour	Fresh	8.10±0.16^{c}	8 .30±0.12^{b}	8.50±0.11^{a}	8.00±0.20^{c}
	5	8.30±0.28^{c}	8.50±0.20^{b}	8.70±0.14^{a}	8.20±0.17^{c}
	10	8.00±0.34^{c}	8.20±0.18^{b}	8.40±0.16^{a}	7.80±0.12^{c}
	15	7.70±0.36^{c}	8.00±0.28^{b}	8.20±0.14^{a}	7.40±0.16^{c}
Texture	Fresh	8.20±0.14^{c}	8.40±0.10^{b}	8.60±0.14^{a}	8.70±0.10^{a}
	5	8.00±0.20^{b}	8.10±0.14^{b}	8.50±0.18^{a}	8.50±0.16^{a}
	10	7.70±0.30^{d}	7.90±0.26^{c}	8.10±0.23^{b}	8.30±0.20^{a}
	15	7.40±0.34^{c}	7.60±0.30^{b}	8.00±0.32^{a}	8.10±0.23^{a}
Consistency	Fresh	8.00±0.14^{c}	8.20±0.08^{b}	8.40±0.05^{a}	8.40±0.11^{a}
	5	7.70±0.16^{c}	8.00±0.11^{b}	8.20±0.08^{a}	8.20±0.09^{a}
	10	7.50±0.22^{c}	7.70±0.15^{b}	7.90±0.12^{a}	7.80±0.18^{a}
	15	7.20±0.31^{c}	7.50±0.22^{b}	7.70±0.18^{a}	7.70±0.22^{a}
Overall acceptability	Fresh	8.30±0.12^{c}	8.50±0.14^{b}	8.80±0.10^{a}	8.20±0.18^{c}
	5	8.00±0.16^{c}	8.20±0.17^{b}	8.60±0.13^{a}	8.00±0.21^{c}
	10	7.90±0.22^{bc}	8.00±0.20^{b}	8.30±0.17^{a}	7.70±0.24^{c}
	15	7.80±0.26^{b}	7.80±0.22^{b}	8.20±0.22^{a}	7.50±0.28^{c}

* Values (means ±SD) with different superscript letters are statistically significantly different ($P \leq 0.05$).

Conclusion

Garden cress seed powder showed a high content of dietary fiber. Therefore, garden cress seed powder could be used at a rate of 2 % as a source of dietary fiber in manufacture of yoghurt to improve its physicochemical, rheological and sensory properties.

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