

***Effect of Low Fat Yoghurt Supplemented With
Garden Cress Seeds Powder on
Hypercholesterolemic Rats.***

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Abstract

Garden cress seeds powder has a rich composition of dietary fiber, minerals, antioxidant and vitamins. The study was carried out to evaluate the effect of fortification garden cress seeds powder on the physicochemical, rheological and sensory properties of low fat yoghurt (1% fat). Garden cress seeds powder was added at ratios of 1, 2 and 3 %.

Manufacture yoghurt were analyzed for physicochemical, rheological and sensory properties. Results showed that gradual increase of pH values, dietary fiber, viscosity, phenolic content and antioxidant activity as garden cress seeds powder ratio was increased in low fat yoghurt. On the other hand, the acidity and syneresis were decreased as the ratio of garden cress seeds powder was increased. Low fat yoghurt that containing of 3% of garden cress seeds powder

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were the highest of physicochemical properties , high acceptability sensory properties and improvement rheological properties (viscosity and syneresis), than the other treatments. Low fat yoghurt fortified with 3% garden cress seeds were evaluated as a hypocholesterolemic agent in rats. garden cress seeds fortified yoghurt were able to lower the serum cholesterol, triacylglyceride (TG), low density lipoprotein cholesterol (LDL-C), and atherogenic index, but were found to increase the high density lipoprotein cholesterol (HDL-C) as compared to the corresponding high fat diet group (positive control). Also, results showed that garden cress seeds fortified yoghurt were able to improve the serum creatinine and blood urea as compared to the corresponding high fat diet.

Thus, the study demonstrates that garden cress seeds can be used as a source of phenolic compounds and dietary fiber in low fat yoghurt which enhanced its nutritional value, rheological and sensory properties and possess a hypolipidemic effect.

Introduction

Garden cress (*Lepidium sativum* L.) is a fast growing annual herb that is native to Egypt and west of Asia, and presently it is cultivated in all over the world. In local languages, garden cress (GC) is considered as an important medicinal crop in India (*Tiwari et al., 2004*).

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, cardiogenic, 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**).

Many studies showed that natural antioxidants, as flavanoids and other phenolic phytochemical present in plants are associated with reduced chronic disease risk and inhibit lipid peroxidation of human low-density lipoprotein in vitro (**Goncalves et al., 2004**).

Low fat dairy products including yoghurt have gained popularity because of consumer awareness about health concerns related to decreasing the risks connected with obesity and coronary heart diseases (**Sandoval et al., 2004**). However, the partial or total removal of fat from yoghurt decreases the overall quality perceived by the consumers (**Folkenberg and**

Martens, 2003). It was reported that reduction of fat content in yoghurt resulted in lower gel strength and firmness than full fat yoghurt, as a consequence of lower number of fat globules embedded in the protein network (***Duboc and Mollet, 2003***). To improve textural and functional properties of low fat yoghurt, the use of cereal fibers has been widely investigated (***Hasania, 2017 and Dabija et al., 2018***).

The aim of this study to determine of physicochemical, antioxidant activity and total phenolic content of garden cress seeds and evaluation the effect of added garden cress seeds on physicochemical, rheological, and sensory properties of low fat yoghurt and to investigate the role of yoghurt fortified with garden cress seeds as hypocholesterolemic agents.

Materials and Methods

Materials

Fresh buffalo's 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 .

Cholesterol was obtained from pro- lap, France. Bile salts (gallbladder extract) were obtained from slaughtered cow.

Adult males Wister albino rats (100 – 120 gm.), was obtained from National Research Center.

Starter Cultures: *Streptococcus salivarius subsp. thermophilus* EMCC104 and *Lactobacillus delbruekii subsp. bulgaricus* EMCC1102. Were obtained from the Microbiological Resources Center (MIRCEN), Faculty of Agric. Ain Shams Univ., Egypt.

Methods

Determination of total phenolic content:

The concentration of total phenols was measured by a UV spectrophotometer (Jenway-UV-VIS Spectrophotometer), based on a colorimetric oxidation/ reduction reaction, as described by **Skerget et al., (2005)**. The used oxidizing reagent was Folin–Ciocalteu reagent (**AOAC, 1990**).

Radical scavenging activity (Scavenging DPPH):

The electron donation ability of the obtained extracts was measured by bleaching of the purple colored solution of the 2, 2-diphenyl-1-picrylhydrazyl radical (DPPH) according to the method of **Hanato et al., (1988)** and modified method by (**Gulcin et al., 2004**).

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). Low fat buffalo's milk (1% fat) was divided into 4 portions. The first portion was left without additive as a control (C1), garden cress seeds powder was added to the other 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 6 ± 1 °C and analyzed at fresh time. This experiment was triplicated.

Chemical analysis:

Total solids, fat, total protein (TP) 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). Carbohydrate, crude fiber ,ash , calcium, phosphorus, manganese, potassium and sodium contents were determined according to **AOAC, (2007)**.while iron and zinc content were determined according to **Page et al., (1992)**.

Rheological measurements:

The viscosity and released whey from yoghurt samples was measured according to the method of **Aryana, (2003)**. The quantity of whey collected from every sample in graduated cylinder after 2 h of drainage at 20 °C was used as index of syneresis. Viscosity of nonfat yoghurt samples was determined using Rotational Viscometer Type Lab. Line Model 5437. Results expressed as CPS.

Sensory evaluation:

The sensory properties of yoghurt samples were assessed by 10 panel members of the Dairy Sci., Dep., Fac. Agric., Zagazig, Univ. for flavour (60) body and texture (30) and appearance (10) as reported according to **Nelson and Trout, (1981)**.

Preparation of standard and high-fat diets:

Basal diet: the basal diets was prepared according to the following formula as mentioned by **(AIN, 1993)** as follow: protein (10%), corn oil (10%), vitamin mixture (1%), mineral mixture (4%), choline chloride (0.2%), methionine (0.3%), cellulose (5%), and the remained is corn starch (69.5%). The used vitamin mixture component was that recommended by **(Campbell, 1963)** while the salt mixture used was formulated according to **(Hegsted, 1941)**..

High- cholesterol diet: the basal pellet diets which described above was grinded and supplemented with ; 5% buffalo fat ,1%

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cholesterol and 0.25% bile s acid according to **Sharma, (1984)** and **Pandya et al.,(2006)**.

Condition and preparation of the animals:

Twenty four healthy adult male Wister albino rats (140±10g) were divided into four groups of six rats each. After the adaptation period (7 days), one group continued feeding on the basal diet and served as negative control (Group1). Another group was fed on high fat diet and served as a positive control (Group 2). The two other groups were allowed to feed on hypercholesterolemic diet with 20% low fat yoghurt without any additives (Group 3) and 20% low fat yoghurt fortified with 3% garden cress seeds powder (Group 4) for 30 days. At the end of experimentation period (i.e., day 30), blood samples were collected from all animals from retro-orbital venous plexus for biochemical analyses.

Biochemical assays for lipids:

Cholesterol, HDL- cholesterol and triacylglyceride levels were estimated from serum by CHOD-PAP method and GPO-PAP method (**Devi & Sharma, 2004**), respectively. LDL-cholesterol was calculated following the method by **Johnson et al., (1997)**. While the atherogenic index was calculated by using the method described by **Muruganandan et al., (2005)**. Total serum protein, serum albumin and serum globulins were determined according to **Henry, (1964),Doumas et al. ,(1971)** and **Renhold, (1953)**, respectively. Kidney function was

determined as serum creatinine and blood urea nitrogen according to **Reder and Hartmann, (1994)**.

Statistical analysis:

The obtained results were evaluated statistically using analysis of variance as reported by **McClave& Benson, (1991)**. In addition the other reported values were expressed as mean \pm SD and \pm SE, two – tailed Student’s t test was used to compare between different groups. . P value less than 0.05 was considered statistically significant. SPSS (Chicago, IL, USA) software window Version 16 was used.

Results and Discussion

Chemical composition, minerals content and antioxidant properties of garden cress seeds.

The proximate macro nutrients contents of garden cress seeds powder are illustrated in Table (1). Protein, fat, ash, crude fiber and carbohydrate contents of garden cress seeds powder were (18.92, 14.20, 4.60, 17.84 and 44.44 g/100g respectively. These results are in agreement with the data obtained by **Zia-UI-Haq et al.,(2012)** and **Doke&Guha ,(2014)**.

Minerals content of garden cress seeds are presented in Table (1). The results showed that Ca, Zn, Fe, Mg, K, P, and Na contents of garden cress seeds powder were (220.212, 4.246, 5.628, 342.20, 2650.50, 246.30. and 980.320 mg/100g) respectively. The highest content was potassium, while the

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lowest content was Zn. These results are in agreement with the data obtained by *Zia-UI-Haq et al., (2012)*, *Doke&Guha ,(2014)* and *Chaudhary& Gupta, (2017)*.

Total phenolic content TPC of ethanolic GCS was 1382.6 – 1584.2 mg/100g. Total flavonoid content TFC of ethanolic GCSE was 680.12 – 820.6 mg/100g, while the radical scavenging activity RSA (%) of ethanolic GCS was 90.4%. These results agree with that previously reported (*Zia-UI-Haq et al., 2012 and Ait-yahia et al., 2018*) who studied antioxidant activity of garden cress seeds extract. Therefore, GCSE could be a good source of bioactive compounds with high antioxidant potential.

Chemical composition of low fat yoghurt fortified with garden cress seeds powder:

Tables (2) showed that yoghurt made from milk containing 3% fat (C) had the highest total solids (TS) and it was significantly ($p = 0.05$) different from all yoghurt treatments, while the low fat yoghurt treatments exhibited the least (TS) content. This decrease in TS was due to the fat separation from milk yoghurt treatments. The TS content of low fat yoghurt fortified with GCS increased gradually by increasing the percentage added.

Lowering fat content in low fat yoghurt milks slightly increased the total protein in low fat yoghurt about the full fat yoghurt (C). The total protein of low fat yoghurt fortified with GCS slightly increased by increasing the percentage added

Control yoghurt (C) contained highest fat content was significantly ($P = 0.05$) different from other treatments. On the other hand, fortification of low fat milk with GCS did not affect the fat content of the resultant yoghurt.

Dietary fiber content increased by adding of garden cress seeds powder in the yogurt samples. Dietary fiber contents were 0.72, 1.28 and 2.12 g dietary fiber /100 g in yogurt prepared with 1, 2 and 3% garden cress seeds powder respectively. The dietary fibers may offer physiological effects on viscosity, solubility, oil-binding capacity, hydration property and antioxidant activity in food products. **Jambi, (2018)**, used date pits powder as source of dietary fiber for improving rheological properties of yogurt.

Slight differences were observed in acidity of yoghurt from different treatments. Reduced fat slightly increased acidity but fortification of yoghurt milk with GCS at different concentration was decreased acidity of low fat yoghurt as the ratio of garden cress seeds powder was increased.

Changes in pH value of yoghurt from different treatments as affected by fortification of GCS followed almost opposite trend to acidity .These results are in agreement with those reported by **Hasani et al., (2017)**, who studied the effect of different amounts of barley bran on the physicochemical properties of low-fat yoghurt. Also, **Al-hamdani et al., (2015)**,found that supplemented yogurt with 2 and 4% of

lupine flour were the highest positive effect on physicochemical properties.

Total phenolic content and radical scavenging activity of yogurt prepared with different ratio of garden cress seeds powder.

Total phenolic content and radical scavenging activity of yogurt prepared with different ratio of garden cress seeds powder are illustrated in Table (3): Total phenolic content of yogurt prepared with garden cress seeds powder were increased by garden cress seeds powder increasing in the yogurt product. Radical scavenging activity of yogurt prepared with garden cress seeds powder were increased by garden cress seeds powder increasing in the yogurt product. These results are in agreement with those reported by **Jambi, (2018)** who found that total phenolic content and radical scavenging activity of yogurt prepared with date pits powder were increasing date pits powder ratios increased in the yogurt product.

Rheological properties of low fat yoghurt fortified with garden cress seeds powder:

Separation of whey increased by decreasing the fat content in yoghurt but fortification of yoghurt with GCS significantly reduced whey syneresis compared with low fat yoghurt without additives (C1) and this reduction was proportional to the fortification ratio Table (4). These results might be due to increasing the water holding capacity brought

by GCS in the resultant curd. A similar observation was found by **Behnia et al., (2013)** in fresh yoghurt containing cress seed gum.

Non fortified low fat yoghurt were significantly less viscous than full fat yoghurt (control) but fortification of yoghurt milk with GCS significantly increased ($P = 0.05$) the viscosity of the resultant yoghurt. The increase was slightly proportional to the rate of additives. This increase could be attributed to the water hydration of GCS. Similar results were reported by **Hassan et al., (2015)**, who found that addition of cress seed mucilage or guar gum to yoghurt reduced its whey syneresis and increased viscosity than control yoghurt.

Organoleptic properties of low fat yoghurt fortified with garden cress seeds powder:

Scores of organoleptic properties (flavour, body & texture, appearance, acidity and total scores) of low fat yoghurt without additives or with added GCS are shown in Table (5).

It is evident from these results that, the reduction of milk fat in (C1) gained lowest scores for organoleptic properties. Fortification of low fat milk with GCS improved the organoleptic properties of low fat treatments and this improvement was proportional to the fortification ratio, low fat fortified with GCS 3 % was similar to the full fat yoghurt (control) .

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A similar observation was found by *Al-hamdani et al., (2015)*, who found that sensory evaluation of the supplemented yogurt product were showed that the 2 and 4% of lupine flour for both origin were the highest positive effect on physicochemical and sensory scores (flavor, taste, acidity, texture and consistency, appearance, and the total properties)

Biochemical assays for lipids

There was a significant increase in the levels of serum cholesterol, triacylglyceride and LDL-C and a decrease in level of HDL-C in the high fat diet fed animals when compared to normal fed rats. Elevated level of blood cholesterol especially LDL-C is a known major risk factor for chronic heart diseases (CHD) whereas HDL-C is cardio protective.

Treatment with low fat yoghurt fortified with garden cress seeds, significantly decreased the levels of total cholesterol and LDL-c as compare to the controls (Table 6), this may be due to a high content of dietary fiber and phenolic compounds of garden cress seeds which have an antihyperglycemic properties (*Behrouzian et al., 2014 and Hassan et al., 2015*).

Similar results were reported by *Alharbi and Sobhy, (2017)* who found that feeding rats on GCS powder caused a decrease of serum levels of cholesterol, and serum triglyceride. Atherogenic index indicates the deposition of foam cells or plaque or fatty infiltration or lipids in heart, coronaries, aorta,

liver and kidneys. The higher the atherogenic index, the higher is the risk of the above organs for oxidative damage (**Mehta et al., 2003**). Atherogenic index was significantly reduced in the low fat yoghurt fortified with garden cress seeds, treated groups **Alharbi and Sobhy,(2017)** .High fat diet (HFD) causes the oxidative stress which finally increases production of reactive oxygen species. Since the result of the study indicated that the GCS has beneficial effect on lipid profile.

Hypocholesterolemic state was accompanied by a high significant decrease in total serum protein, albumin and globulin for positive control .the lowest levels of serum total protein, and albumin in control positive may be caused by the disorder in liver . Serum total protein, albumin and globulin were increased for the group treated with low fat yoghurt fortified with garden cress seeds. (Table 7), this finding can explain the possible effect of garden cress seeds consumption on improving liver function for rats suffering for hepatotoxicity . Similar results were reported by **Abulnaja and El Rabey,(2015)** who found that feeding of rats on barley bran improving liver function and increased of serum levels protein, albumin and globulin than hypercholesterolemic diet or positive control rats.

As shown in Table 7, hypercholesterolemia rats fed on 20%yoghurt fortified with 3% garden cress seeds decreased urea and creatininelevels comparedto group (G2) hypercholesterolemia rats and fed on basal diet after 30 days. The levels of creatinine and uric acid have been reported as a

factor finding in lead toxicity. The mechanism through which lead exposure raises the level of uric acid is unclear but is thought to be due to damaged renal tubules by lead (**Ghalehkand et al., 2012**).GCS components have demonstrated chronic disease fighting activity, particularly for protection against cardiovascular disease and certain cancers (**Behrouzian et al., 2014**).A similar observation was found by **Althnaian,(2014)**, found that feeding of rats on dietary supplementation of garden cress seed decrease of urea and creatinine levels than rats fed high cholesterol diet or positive control.

Conclusion

Garden cress seeds (GCS) showed strong antioxidant capacity and high content of dietary fiber. Therefore, garden cress seeds could be used as natural additives in manufacture of low fat yoghurt to improve its physicochemical, rheological and sensory properties. Also, the observed cholesterol reducing action of the GCS indicates the hypolipidemic activity.

Table (1): Chemical composition, minerals content and antioxidant properties of garden cress seeds.

Chemical composition (g/100g)	
Crude protein	18.92
Crude Fat	14.20
Ash	4.60
Crude Fiber	17.84
Carbohydrate	44.44
Minerals content (mg/100g)	
Ca	220.212
Zn	4.246
Fe	5.628
Mg	342.20
K	2650.50
Na	246.30
P	980.320
Antioxidant properties	
Total phenolic compounds (mg/100g)	1382.6 – 1584.2
Total flavonoids compounds(mg/100g)	680.12 – 820.6
Radical scavenging activity (RSA) %	90.24 %

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Table (2): Chemical analysis of low fat yoghurt as affected by adding garden cress seeds powder.

Treatment	Total solids%	Total fat%	Total protein%	Fiber %	Acidity	pH
C	11.80 ±0.47A	3.16 ±0.15 A	3.58 ±0.65B	0.0 ±0.02 D	0.85 ±0.08 E	4.56 ±1.05 A
C1	10.12 ±0.45 D	1.22 ±0.12 BC	3.84 ±0.68 B	0.0 ±0.01 D	0.96 ±0.11 A	4.20 ±1.0 D
T1	10.24 ±0.42 D	1.30±0.14 BC	4.14 ±0.75 AB	0.72 ±0.05 C	0.94 ±0.09 B	4.26 ±1.03 C
T2	10.78 ±0.38 C	1.38 ±0.10 B	4.26 ±0.77 AB	1.28 ±0.09 B	0.92 ±0.08 C	4.28 ±1.05 C
T3	11.02 ±0.45 B	1.44 ±0.12B	4.38 ±0.75 A	2.12 ±0.11 A	0.90 ±0.07 D	4.34 ±1.02 B

Values with different letters in the same column or row are significantly different (P< 0.05)

C: control yoghurt

C 1: Low fat yoghurt (1% fat).

T2: Low fat yoghurt treated with 1% garden cress seeds powder

T2: Low fat yoghurt treated with 2% garden cress seeds powder

T2: Low fat yoghurt treated with 3% garden cress seeds powder

Table (3): The effect of different ratio of garden cress seeds powder on total phenolic content and radical scavenging activity of yogurt.

Treatment	Total phenolic content (mg /100 g)	Radical scavenging activity RSA %
C	84.60±3.12 D	44.80±1.45 D
C1	82.42±3.05 D	42.36±1.32 D
T1	102.20±4.20 C	52.14 ±1.58C
T2	250.64±5.60 B	64.20±1.94 B
T3	310.14 ±12.14 A	78.32±2.05 A

Values with different letters in the same column or row are significantly different (P< 0.05)

Table (4): Rheological properties of low fat yoghurt as affected by adding garden cress seeds powder.

Treatment	Whey syneresis (ml/100gm)	Viscosity (C. P.S.)
C	27±0.46 E	5200±0112 A
C1	38±0.52 A	4200±110 E
T1	35±0.50 B	4500±208 D
T2	32±0.48 C	4800±214 C
T3	30±0.53 D	5000±304 B

Values with different letters in the same column or row are significantly different (P< 0.05)

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Table (5): Organoleptic properties of low fat yoghurt as affected by adding garden cress seeds powder.

Treatments	Appearance (10)	Flavour (60)	Body& texture (30)	Total (100)
C	10±0.25 A	58±0.42 A	30±0.36 A	98±0.92 A
C1	8±0.22 B	52±0.38 D	23 ±0.28 E	83±0.78 E
T1	8±0.20 B	54 ±0.35 C	25±0.30 D	87±0.82 D
T2	7±0.18 C	54±0.37 C	27±0.34 C	88±0.84 C
T3	6±0.15 D	56±0.35 B	29±0.34 B	91±0.90 B

Values with different letters in the same column or row are significantly different (P< 0.05)

Table 6. Effect of low fat yoghurt fortified with garden cress seeds powder on lipid profile in cholesterol fed hyperlipidemia rats.

Groups	Cholesterol (mg/dl)	Triacylglyceride (mg/dl)	LDL-C (mg/dl)	HDL-C (mg/dl)	Atherogenic index
Group(1)	96.20 ±6.35C	142.72 ±3.62C	29.00 ±0.24C	52.70 ±4.28 B	1.14 ±0.25 C
Group(2)	178.24 ±8.54 A	292.60 ±6.18A	68.20 ±0.58A	34.22 ±2.36 D	5.20 ±1.50 A
Group(3)	126.30 ±7.46 B	218.24 ±5.95B	42.34 ±0.52B	42.12 ±3.40 C	3.40 ±0.68 B
Group(4)	84.36 ±6.14D	114.62 ±3.24D	17.60 ±0.20D	64.30 ±4.52 A	1.04 ±0.21 CD

Values with different letters in the same column or row are significantly different (P< 0.05)

Group (1) -Control diet or negative control

Group (2) - hypercholesterolemic diet or positive control

Group (3) - hypercholesterolemic diet+20% low fat yoghurt.

Group (4) - hypercholesterolemic diet+20% low fat yoghurt fortified with 3% garden cress seeds powder.

Table (7). Effect of low fat yoghurt fortified with garden cress seeds powder on serum total protein, albumin, globulin (mg/dl), creatinine , urea contents of male rats.

Groups	Total protein (mg/dl)	Albumin (mg/dl)	Globulin (mg/dl)	Creatinine (mg/dl)	Urea (mg/dl)
Group(1)	8.96±0.62A	6.20±0.24A	2.76±0.14C	0.942±0.05C	40.12±1.15C
Group(2)	6.78±0.75D	4.20±0.30D	2.58±0.26A	1.374±1.04A	48.21±1.32A
Group(3)	7.14±0.68C	4.90±0.28C	2.24±0.24B	1.246±1.02B	42.36±2.24B
Group(4)	8.16±0.60B	5.60±0.22B	2.56±0.12D	0.865±0.04D	38.43±1.06D

Values with different letters in the same column or row are significantly different (P< 0.05)

Group (1) -Control diet or negative control

Group (2) - hypercholesterolemic diet or positive control

Group (3) - hypercholesterolemic diet+20% low fat yoghurt.

Group (4) - hypercholesterolemic diet+20% low fat yoghurt fortified with 3% garden cress seeds powder

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تأثير اليوجورت منخفض الدهن المدعم بمسحوق بذور حب الرشاد على خفض مستوى الكوليستيرول فى الفئران

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الملخص العربى

بذور حب الرشاد غنية فى محتواها من الالياف الغذائية والاملاح المعدنية ومضادات الاكسدة والفيتامينات ولقد اجريت هذه الدراسة لتقييم تأثير اضافة مسحوق بذور حب الرشاد على الخواص الفيزيوكيميائية والريولوجية والحسية لليوجورت منخفض الدهن..حيث تم استخدام مسحوق بذور حب الرشاد فى صناعة اليوجورت منخفض الدهن (١%دهن) بنسب ١ و ٢ و ٣%. وتم تحليل عينات اليوجورت من حيث التركيب الكيماوى والخواص الحسية والريولوجية. ولقد اوضحت النتائج ان اضافة مسحوق بذور حب الرشاد الى اليوجورت منخفض الدهن أدت الى حدوث زيادة ملحوظة فى قيم الرقم الهيدروجينى, محتوى الالياف الغذائية, اللزوجة, محتوى المواد الفينولية والنشاط المضاد للأكسدة لعينات اليوجورت منخفض الدهن على الجانب الاخر حدث انخفاض فى قيم انفصال الشرش والحموضة وذلك بزيادة نسبة مسحوق بذور حب الرشاد المضافة الى اليوجورت منخفض الدهن, كما أن عينات اليوجورت المحتوية على ٣ % مسحوق بذور حب الرشاد كانت الأفضل من حيث الخواص الفيزيوكيميائية والأكثر قبولا من حيث الخواص الحسية كما حسنت من الخواص الريولوجية لليوجورت (انفصال الشرش واللزوجة) عن باقى معاملات اليوجورت منخفض الدهن. كذلك تم استخدام عينات اليوجورت منخفض الدهن المدعمة ب ٣% مسحوق بذور حب الرشاد كعامل خافض للكوليستيرول فى تغذية الفئران. ولقد اوضحت النتائج أن اليوجورت منخفض الدهن المدعم بمسحوق بذور حب الرشاد والمستخدم فى تغذية الفئران ادى الى خفض محتوى الدم من الكوليستيرول والدهون الثلاثية والليپوبروتين منخفض الكثافة بينما أدى الى زيادة محتوى الدم من الليپوبروتين عالى الكثافةمقارنة بنتائج مجموعة الفئران التى تم تغذيتها على وجبات مرتفعة فى نسبة الكوليستيرول (الكنترول) كما ان تغذية الفئران على اليوجورت منخفض الدهن المدعم بمسحوق بذور حب الرشاد قلل من مستوى اليوريا والكرياتين فى فئران التجارب عن مجموعة الكنترول الايجابية. ومن هذه النتائج يتضح أن مسحوق بذور حب الرشاد يمكن استخدامه فى صناعة اليوجورت منخفض الدهن بنسبة ٣% كمصدر جيد للمواد الفينولية والالياف الغذائية لتحسين الخواص الفيزيوكيميائية والحسية والريولوجية لليوجورت منخفض الدهن وأن مسحوق بذور حب الرشاد يمتلك تأثير قوى خافض للكوليستيرول.