Using Fennel Seeds and their Oil as a Preservative and Functional Food to Produce Some Food and Drink Products to Alleviate Cough Symptoms

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ABSTRACT

Fennel seeds and their aromatic oil contain ingredients which are biologically active with high nutritional value, as well as their antimicrobial and fungal effects and alleviation of some disease symptoms. The aim of this research was to determine the chemical properties of fennel seeds, their aromatic oil, effect on the growth of microbes and alleviation of respiratory disease symptoms such as cough and sore throat.

Drinks of fennel seeds and their aromatic oil were prepared with different ratios and used to treat a group of individuals suffering from cough and compare them with the control group. In addition, biscuits containing different ratios of fennel seeds and their aromatic oil were prepared.

The results of this study showed that fennel seeds contained a high percentage of protein, Crude fiber, carbohydrates and minerals. The results also showed that fennel seeds and its aromatic oils contained substances, which had an effect in relieving cough and sore throat. Methanolic extract from fennel seeds had antioxidant and antimicrobial activities. This study also showed that biscuits containing fennel seeds and its aromatic oil could be stored for longer periods than biscuits without fennel seeds and its aromatic oil. No change in sensory properties or microbial growth during storage was observed. Therefore, we can use it as a natural preservative. In addition, biscuits prepared containing the different percentages of fennel seeds and their aromatic oil were accepted by the panelists when they were stored. Its sensory properties were well maintained. The results also showed that drink of fennel seeds and their oil had an effective effect in the treatment of cough.

Keywords*:* Fennel, food products, antibacterial activity, aromatic fennel oil.

INTRODUCTION

Nutraceutical is the harmonious sequence of 2 words "nutrition and pharmaceutical" that is defined as the food product that helps to reinforce health status along with medicinal benefits, comprehensive the treatment of diseases with safeguard. Many types of products that link under the group of nutraceuticals are dietary complement and functional foods (Chaturvedi *et al*., 2011 & Bukhari *et al*., 2014).

According to IFIC (International Food Information Council), functional foods are defined as dietary components in which health avails are along with the required nutrition. Many foods like breads, cereals, herbalists, medicinal and aromatic herbs, snack foods, prepared meals and many others are included in functional foods (Keservani *et al*., 2010).

Food spoilage caused by microorganisms are of the most important trouble facing the food industry and consumers, so synthetic additives are used to inhibit growth of microorganisms (Al-Reza *et al.,* 2010& Bajpai *et al*., 2012). Because of consumer's fears of the safety of foods containing synthetic chemicals, there is an increase interest in using natural antibacterial products for food preservation (Bajpai *et al*., 2012). On the other hand, the long-term use of drugs to treat diseases has various adverse effects, so there is a need to use natural substances that have little side effects instead of using chemical treatments (Choi and Hwang, 2004).

Recently, awareness increased concerning spices beneficial physiological functions and its antimicrobial activity. In addition, use of essential oils as antimicrobial agents in food systems considered as determinant to increase the safety and increase shelf life of foods (Salgueiro *et al*., 2010). And they are commonly used as a natural remedy for some diseases(Choi and Hwang , 2004).

Fennel (*Foeniculum vulgare*) is a familiar herb, it is universally known as fennel and is known by more than 100 names and recognized as aromatic, herbaceous, and is widely cultivated and used as a culinary spice (Gori *et al*., 2012 &Diao *et al*., 2014). Fennel and its essential oil were used as flavoring agent in food products such as bread, pastries, and cheese consumed daily, in the raw form as salads and, boiled, grilled, in several dishes and even used in the preparation of herbal teas. They are also used as a constituent in pharmaceutical products to cure certain diseases and the inhibition of pain (Barros *et al*., 2010 & He and Huang, 2011 & Rather *et al*., 2012). It is a traditional and popular herb and has a long history of use as a medicine. Studies showed that

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fennel seeds and their essential oil effectively control numerous infectious disorders of bacterial, fungal, viral, antimicrobial, and used to treat tuberculosis and respiratory diseases (Corona *et al*., 2008 &Badgujar *et al*., 2014). The antioxidant and antimicrobial characteristics of the fennel seeds and their essential oil were exploited in products as natural preservatives (Telci *et al*., 2009 &Diao *et al*., 2014).

Thus, this work was undertaken to study the chemical components of fennel seeds, their oil, biological compounds, and their effect on inhibiting the growth of microorganisms in some food products and the use of fennel seeds and their oil in the treatment and relieve symptoms of respiratory diseases such as cough, laryngitis.

MATERIALS AND METHODS

Materials

Fennel (*Foeniculum vulgare*) and its essential oil were procured from the local market of Alexandria, Egypt. Bacterial and fungal strains including: *Staphylocoous aureus*, *Escherichia coli*, *C. albicans* and *Aspergillus niger* CAIM 147 were obtained from Department of Dairy Science and Technology, Faculty of Agriculture, Alexandria University.

Technological processes

The traditional methods were applied to prepare three samples of biscuits by different percentages of fennel seeds and their essential oil as follows:

25% of fennel seeds were added to the first sample, 50 % of fennel seeds were added to the second sample, and 25 % fennel seeds + 2 % of their essential oil(equivalent 2 -3 pt of oil)was added to the third sample. Percentage of the seeds and their oil were calculated from the flour weigh. In addition, eggs, sugar, butter, vanilla and baking powder and the procedure used for preparing biscuits were followed according to the method described by Hazelton *et al.,* (2003). Moreover, the other ingredients included products were stored at room temperature for three months.

Drinks of fennel seeds and their oil

Teaspoon of fennel seeds (equal to 5 g) was added to small cup (150 ml) of water and boiled for 3 min. (which is the perfect time to obtain the highest amount of antioxidants). The drink was left until it became warm, one drop of oil was added to the mixture (Malhotra, 2012 & Kontogiorgis *et al.,* 2016). The same procedure was repeated using 10 g and 15 g of fennel seeds. Patients suffering of cough repeated this drink 4 to 5 times daily until symptoms disappeared (7 to 3 days).

Analytical methods

Proximate chemical composition

Moisture, crude protein, crude ether extract and total ash of fennel seeds were determined according to AOAC (2006) unless otherwise stated. Carbohydrate content was calculated by difference.

Mineral determination

Mineral content of fennel seeds were determined by atomic absorption spectrometry, flame photometry and spectrophotometry according to the methods of AOAC (2006).

Gas Chromatography–Mass Spectrometry (GC–MS)

Oil of fennel seeds was analyzed on a gas chromatograph, coupled with mass spectrometer. Identification of different constituents of fennel oil was determined by the spectrum fragmentation pattern compared to the chromatograms from standards. Furthermore, the four major components of the fennel essential oils, trans-anethole, fenchone, estragole and limonene, were quantified by mean of the internal standard addition method (Mansour *et al*., 2010&. Burkhardt *et al*., 2015).

Preparation of fennel seed extracts

Fennel seeds powder were soaked in 70% ethanol (1:40, w/v) and left for 72 h at room temperature, and the mixture was shaken. The extract was filtered and the precipitate was re-extracted by the same process using the same solvent until the extraction was exhausted. The combined extracts were separately filtered through a filter paper. The filtrate was dried under reduced pressure at 50 ^{0}C using a rotary vacuum evaporator. The crude extract was weighed and kept in a tightly closed container protected from light (Anwar *et al*., 2009).

Antioxidant capacity by DPPH assay

Free radical scavenging activity were measured by using the 2,2- diphenyl-1-picrylhydrazil (DPPH) according to a modified method by Roby *et al*. (2012). The effect of antioxidant on DPPH radical scavenging can be due to their hydrogen donating ability or radical scavenging activity. When a solution of DPPH is mixed with a substance that can donate a hydrogen atom, it then leads to a loss of this violet color.

The effect of fennel seeds extract on (DPPH) radical was estimated using a solution of DPPH (0.135 mM) and 1 ml of this solution was mixed with 1 ml of the extract. The reaction mixture was left in the dark at room temperature for 30 min. The absorbance of the mixture was measured at 517 nm using butylated hydroxyanisole (BHA) as a control .The radical scavenging activity is expressed by the following formula:

$$\text{DPPH inhibition } \% = \frac{\text{Initial absorbance} - \text{sample absorbance}}{\text{Initial absorbance}} \times 100$$

The half maximal inhibitory concentration (IC_{50}) values denoted the concentration of sample required to scavenge 50% of DPPH free radicals was calculated.

Total phenolic content

Total phenolic content was determined using Folin - Ciocalteu reagent. 1 ml of the extract was mixed with 5 ml Folin – Ciocalteu reagent and 4 ml of sodium carbonate (75 g/l). The mixture left for 15 s and allowed to stand for 30 min for colour development. The absorbance was read at wave length 765-nm.using spectrophotometer. Total phenolic content was expressed as mg gallic acid equivalent /g of extract (Ahmad *et al*., 2018).

Total flavonoid content

The total flavonoid content was determined using the aluminum chloride assay through colorimetry (Ahmad *et al*., 2018). The absorbance of the reaction was measured at 500 nm with a UV- Visible spectrophotometer after 15 min. Distilled water was used as blank. Quantification was done based on a standard curve of rutin and expressed in mg of rutin equivalent / g of extract.

Antimicrobial, antibacterial and antifungal activities

Detected antimicrobial activity of fennel seed extracts and their essential oil by selected two species of bacteria, one of them was Gram-negative bacteria (*Escherichia coli*) and the other Gram-positive bacteria (*Staphylococcus aureus*). In addition to one species of yeast (*Candida albicans*) and one species of mold (*Aspergillus niger* CAIM 147), determined using the disk expansion assay. Isolates were cultured at 37°C for 24h in Nutrient Agar and bacterial suspensions were all set with Nutrient Broth to match McFarland standard No. 0.5 turbidity (Kaskatepe *et al*., 2016). The antimicrobial activity was performed by disk diffusion, the disc diameter was 6 mm (Whatman No. 1). Used different dilutions of the methanol extracts and essential oils under aseptic conditions, the discs were placed on the agar plates and then take 7.5, 10, 12.5, 15 and 20 µg dry extract or essential oil. The plates were then incubated at 37 ◦C for bacteria and 25 ◦C for yeast and fungi for 24–48 h to get microbial growth. Diameters of microbial inhibition zones (mm) were measured and recorded (Roby *et al*., 2012).

Microbiological analysis:

Total viable count (TVC) analysis was carried out following Difco (2009).

Sensory evaluation

Colour, taste, odour, texture, (consistency) and overall acceptability of the products prepared containing the different percentages of fennel seed extracts and its essential oil were assessed using 15 of arbitrators. The panelists were asked to score the above attributes according to a standard hedonic rating score from 9 (like extremely) to (dislike extremely): 1 = dislike extremely, 2 = dislike very much, 3 = dislike moderately, 4 = dislike slightly, 5= like/dislike, 6 = like slightly, 7 = like moderately, 8 = like very much, 9 = like extremely. as described by Wichchukita and O'Mahony,(2014).

Sample of patients

Twenty members of patients were selected suffering from cough and sore throat (10 smokers and 10 non-smokers) Their age ranged from 25 to 40 years. They were divided into two groups each group contains equal number of smokers and non-smokers:

- The first group (control): Ten people taking medicines to treat cough and sore throat (they took cough medication recommended by doctor).
- Second group: (test group): Ten people took drink of fennel seeds and their oil.

Statistical analysis:

Data were analysed using SPSS statistical analysis software package (Version 21).

RESULTS AND DISCUSSION

Fennel seeds Chemical composition

Consumers have been more conscious of food related health troubles and using healthy food to provide the body with the important natural nutrients and resistance to some diseases. Table (1) shows the proximate chemical composition. These analyses have an important role in chemical screening of compounds. Proximate composition of fennel seeds contain moisture, crude protein, crude fat, crude fiber and ash as (8.04, 10.18, 10.71, 18.01 and 12.87) %, respectively and the total carbohydrate by difference was 40.19%.

Table 1. Proximate composition of the fennel seeds

Component	%Value**
Moisture	8.04±0.23
Crude protein	10.18±0.39
Crude Fat	10.71±0.32
Crude fiber	18.01±0.73
Total ash	12.87±0.41
Carbohydrate*	40.19 ±1.24

* calculated by difference

** Mean value ± S.D. on dry weight basis

This study are in harmony with investigations of Badgujar *et al*., (2014) & Bukhari *et al*. (2014)who found that percentages of moisture, protein, fat, fiber and ash in fennel were 7.27, 9.5, 10.18, 18.97and 13.4%, respectively. However, in this study the moisture, protein, fat, and fiber content are lower than the values reported by Malhotra (2012) &USDA.

(2018). While the ash content in this study is relatively higher than the values reported by USDA. (2018).

Mineral contents of fennel seeds

Mineral content of fennel seeds are determined and presented in (Table 2).

Table 2. Mineral content of fennel seeds

Mineral*	Amounting (mg/100g)
K	849.45
Na	15.91
Fe	9.69
Ca	583.6
Zn	2.89
Mg	85.87
Mn	209.35
P	470
Pb	ND

* On dry weight basis
ND: Non detected

Table (2) showed that fennel seeds contained iron (6.33mg/g), zinc (2.89 mg/100g), calcium (583.6 mg/100g), manganese (209.35 mg/100g), magnesium (83.87mg/100 g), sodium (15.91mg/100 g), potassium (849.45 mg/100g) , phosphorus (470 mg/100g). These results agreed with those reported by Badgujar *et al*., (2014)& Bukhari *et al*., (2014) The data obtained in the present study are more or less in accordance with those reported by Koudela and Petříková (2008). Fennel seeds may be considered as a good source of K, Ca and Mg.

Chemical composition of the essential oil

The chemical composition of fennel oil is shown in Table (3). Fennel oil contains Trans-anethole (77.91%). This component was the highest, and in accordance with the results obtained in the present study Mansour *et al*., (2011) & Qiu*et al*., (2012) and Ahmad *et al*., (2018) reported that the percentage of Trans-anethole was 65.28%,88.91% and 70.72 % ,respectively. while, the other components were low.

Bioactive components and antioxidant activity of fennel seeds

Phenolics and flavonoids are considered the major groups of compounds which are very important as antioxidants and have different therapeutic and protective effects on human health. Table (4) shows total phenolics, total flavonoids and the bioactive components as well as the antioxidant activity of fennel seeds.

It can be noted that fennel seeds contained 64.37 mg/100 g total phenolics as gallic acid equivalent. On the other hand, the results shown in Table (4) indicated that flavonoids as rutin equivalent were 48.8 mg/100 g, which are in accordance with the results obtained by Krizman *et al*.,(2007). The antioxidant activity (DPPH inhibition %) as well as IC_{50} (mg/ml) of fennel seeds are shown in Table (4). These values were 59.42 % and 36.43 mg/ml, respectively. These values are mainly due to its content of phenolics and flavonoids. These results are in agreement with those of Faudale *et al*., (2008) who found that the amounts of total phenolics in fennel seeds ranged from 34.9 to 106.7 mg /100 g, and the total flavonoids content of the ethanol extracts from 34.1to 95.8 mg/100 g. The antioxidant activity (DPPH inhibition %) as well as IC_{50} (mg/ml) ranged from 46.1 to 226.3 %), (10.5to 134.7 mg/m), respectively. Mohamad *et al*. (2011) and Shahat *et al*. (2011) found that there is discrepancy in the values of antioxidant activity which is mainly due to existence different species of fennel. There are medicinal fennel, edible fennel and wild fennel. Different agriculture places lead to differences antioxidant activity where the antioxidant activity of the medicinal fennel was found to be higher than that of edible fennel but lower than that of wild fennel.

Table 3. Relative percentage composition of fennel essential oil

Compound	Relative Contents (%)	Compound	Relative Contents (%)
β -cymene	0.30	Cis-anethole	0.29
D-limonene	4.44	Trans-anethole	77.91
Eucalyptol	0.23	Anisaldehyde	4.54
γ-terpinen	0.84	Apiole	0.39
Anisole	3.59	Estragol	5.65
Camphor	0.46	*p*-acetonylanisole	0.59

Table 4. Antioxidant activities using DPPH

Parameter	Value±
Ascorbic acid*	20±0.55
Total phenolics**	64.37 ± 0.14
Flavonoids***	48.8±2.15
DPPH inhibition %	59.42 ± 2.96
IC_{50} (mg/ml)	36.43 ±1.32

± Mean ± S.D. on dry weight basis
* mg/100g
** Gallic acid equivalent
*** Rutin equivalent

Antimicrobial activity of essential oils and fennel extract

Properties of fennel extract and its essential oil, and its components inhibit the growth of microorganisms in food, which leads to stop the deterioration of foods and foodborne pathogens.

Antimicrobial activity of extract of fennel seeds and the essential oils are shown in Fig. (1).

The results indicated that all samples have antibacterial activity against Gram negative and Gram-positive bacteria. The effect of the sample was higher on Gram-positive bacteria *Staphylococcus aureus*, than Gram-negative bacteria *Escherichia coli*. While the oil extract was more effective than the seed extract in the diffusion assay (inhibition zone diameter in mm). It was 10, 8 and 12, 9, respectively. In addition, the higher the concentration of extract from oil or seeds the greater the diameter of the inhibition zone. When the extract concentration of oil and seeds was 20 µg / disk, the diameter of the inhibitory region was (27, 25 and 21, 20 mm) for *Staphylococcus aureus* and *Escherichia coli* respectively. The same approach is noted in yeasts and mold for the concentration of the extract while the extract has the same effect on both yeasts and mold. These results are consistent with those reported by Anwar *et al*., (2009), while the data in the present study vary with the results obtained by Shahat *et al*., (2011).

These results enable us to use fennel seeds as natural food preservative. Fennel is recommended because it is economic value. In addition, it can be used for preparing foods and local industries as functional foods, besides its traditional uses.

Effect of fennel seeds and its essential oil on microbial content of stored biscuit

Table (5) shows the microbiological properties evaluation for biscuit containing fennel seeds and their essential oil stored at room temperature for different times.

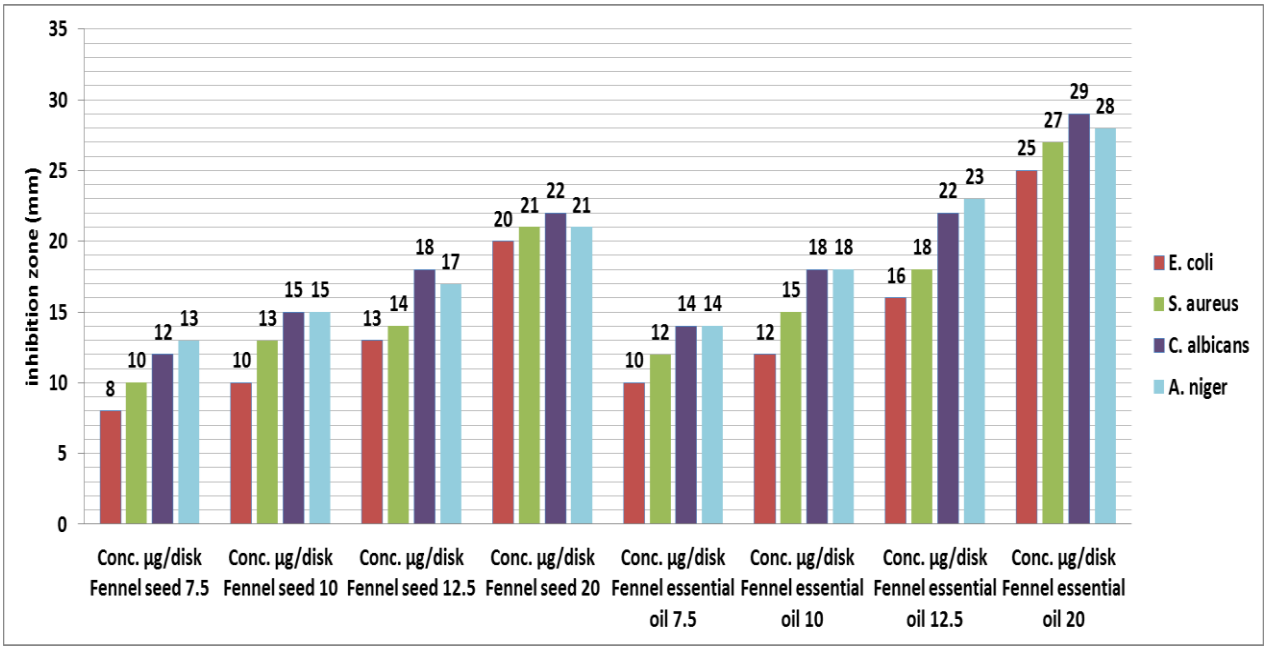

Fig. 1. Antimicrobial activity of fennel seeds and oil extracts using disc diffusion assay (Inhibition zone diameter in mm).

Table 5. microbiological properties evaluation for biscuit containing fennel seeds and their essential oil stored at room temperature for different times

product	test	time	Additive			
			0	Fennel seeds		25 % Fennel seeds + 2 % essential oil
				% 25	% 50	
Biscuit	TVC (cfu/ml)	0	ND*	ND*	ND*	ND*
		30 day	$10x3\pm0.1^{a}$	$10x1\pm0.1^{a}$	ND	ND
		60 day	$10^{2}\pm0.1^{b}$	$10x3\pm0.1^{a}$	$10x1\pm0.1^{a}$	ND
		90 day	10^{2} x2 ± 0.1^{c}	$10x4\pm0.1^{b}$	$10x1\pm0.1^{a}$	$10x1\pm0.1^{a}$

*ND = Not Detected

Different superscript letters mean values differ significantly ($p \leq 0.05$).

The results showed that the bacterial growth was inhibited in a biscuit with increasing percentage of fennel seeds and its essential oil during storage. These results are in accordance with the results obtained by Diao *et al*., (2014) who found that the fennel seeds and their essential oil had an effect on the membrane integrity in bacteria. Fennel seeds and their essential oil prevent the damage of the cell membrane. The level of cell damage depended on the different concentrations of the extract and the bacterial species also. This is because the leakage of the intracellular constituents including proteins which finally results in cell death. These results make it possible to use fennel seeds as a natural preservative for food.

Sensory evaluation of some traditional food products

Table (6) shows sensory attributes of some traditional food products (biscuit).

Table 6. Evaluation of sensory properties of biscuit during storage period at room temperature

Time	% concentrate		color	Taste	Odor	Texture	General Acceptance
zero	0		8.40 ± 0.10 a	8.32 ± 0.08 a	8.37 ± 0.15 a	8.40 ± 0.10 a	8.40 ± 0.08 a
	Fennel seeds	% 25	8.40 ± 0.10 a	8.32 ± 0.08 a	8.37 ± 0.15 a	8.40 ± 0.10 a	8.40 ± 0.08 a
		% 50	8.37 ± 0.15 a	8.27 ± 0.06 a	8.37 ± 0.15 a	8.37 ± 0.15 a	8.37 ± 0.15 a
	25 % Fennel seeds + 2 % essential oil		8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.37 ± 0.15 a	8.40 ± 0.10 a
30 day	0		7.35 ± 0.20 b	7.35 ± 0.20 b	7.35 ± 0.20 b	7.35 ± 0.20 b	7.35 ± 0.20 b
	Fennel seeds	% 25	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a
		% 50	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.37 ± 0.15 a	8.40 ± 0.15 a
	25 % Fennel seeds + 2 % essential oil		8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.37 ± 0.15 a	8.37 ± 0.15 a
60 day	0		6.35 ± 0.20 c	6.00 ± 0.20 c	6.00 ± 0.20 c	6.00 ± 0.20 c	6.00 ± 0.20 c
	Fennel seeds	% 25	7.35 ± 0.20 b	7.35 ± 0.20 b	7.35 ± 0.20 b	7.35 ± 0.20 b	7.35 ± 0.20 b
		% 50	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a
	25 % Fennel seeds + 2 % essential oil		8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a
90 day	0		4.00 ± 0.20 d	4.00 ± 0.20 d	4.00 ± 0.20 d	4.00 ± 0.20 d	4.00 ± 0.20 d
	Fennel seeds	% 25	6.35 ± 0.20 c	6.00 ± 0.20 c	6.00 ± 0.20 c	6.00 ± 0.20 c	6.00 ± 0.20 c
		% 50	8.00 ± 0.10 a	8.00 ± 0.10 a	8.00 ± 0.10 a	8.00 ± 0.10 a	8.00 ± 0.10 a
	25 % Fennel seeds + 2 % essential oil		8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a	8.40 ± 0.10 a

Numbers are mean ± standard deviation. Different superscript letters in the same column indicate mean values differ significantly ($p \leq 0.05$).

Table 7. Effect of fennel seeds and its oil in the treatment of cough and bronchitis

group			Dose	healing period
control		smoker	medicine Specific dose	more than a 30 day
		Non-smoker	medicine Specific dose	30 day
Test- group	smoker		Beverage 5 g of fennel seeds +one drope of oil	7 day
			Beverage 10 g of fennel seeds +one drope of oil	7 day
			Beverage 15 g of fennel seeds +one drope of oil	5 day
	Non-smoker		Beverage 5 g of fennel seeds +one drope of oil	7 day
			Beverage 10 g of fennel seeds +one drope of oil	3 day
			Beverage 15 g of fennel seeds +one drope of oil	3 day

It can be shown from Table (6) that there is no significant differences in the organoleptic contributes of biscuit containing different ratios of fennel seeds and its oil comparing with the control sample at zero time. There were significant differences between the control sample and the organoleptic contributes of biscuit containing the different ratios of fennel seeds and their oil during the storage periods. On the other hand, degree of sensory properties given increased with the increase in the percentage of fennel seed and oil with the length of storage period. Mariod, (2016) found that the oil from the fennel seeds are responsible for providing a typical flavor owing to the presence of anethole, Estragol, limonene, these constituents give a warm, aromatic and pleasing flavor to food products when used in processed foods, snacks, sauces, and various vegetables. Addition of some essential oils to foods during processing can prevent their oxidation rate and reduce oxidation effects without any changes in color and texture properties.

Effect of fennel and its oil in the treatment of cough and bronchitis.

The results showed that in the control group, whether the person is a smoker or not, it took more than a month to heal. The group that took doses of fennel extract and its oil, took 7 to 3 days to heal depending on the dose and number of times taken during the day (Table 7).

The results of Choi and Hwang (2004) showed a significant anti-inflammatory, and analgesic activities from F. vulgare extract when given at dose of 200 mg/kg in mice and rats. Badgujar *et al*. (2014) reported that the fennel extract was effective in bronchial persons.

This study agreed with the study of Jahan *et al*. (2015). They prepared a syrup from fennel seeds, its oil; they evaluated the syrup effect on decreasing coughing in rats. After they were exposed to a dose of SO_2. Experimental rats were divided into three groups (n = 6). The first group (control) received a standard medication for cough, coding phosphate (10 mg / kg). From group 2 to 3, cough syrup was given at 0.25 ml / kg and 0.5 mg / kg body weight to the rats. After 30 min. taking the dose, rats were exposed to sulfur dioxide for 30 sec. The mice were then placed under observation to calculate coughing seizures for five min. Cough Syrup showed the decrease of cough inhibition was 63.91% and 70.64%, respectively inhibition of cough frequency at 0.25mL / kg and 0.5mL / kg dose level, respectively. Highly effective anti-tussive cough syrup proved in the cough model caused by sulfur dioxide. Thus, cough syrup was useful as an alternative medicine for cough, which have a lot of side effects.

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الملخص العربي

استخدام حبوب وزيت الشمر كمادة حافظه وغذاء وظيفي لإنتاج بعض الأغذية والمشروبات لتخفيف أعراض الكحة

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تحتوي بذور الشمر وزيته العطري على مكونات نشطه بيولوجياً ذات قيمة غذائية مرتفعة بالإضافة إلى تأثيرهما المضاد للميكروبات والفطريات والتخفيف من أعراض بعض الأمراض. لذلك كان الهدف من هذا البحث هو معرفة الخواص الكيميائية لمستخلص بذور الشمر وزيته العطري وتأثيرهما على نمو الميكروبات والتخفيف من أعراض أمراض الجهاز التنفسي مثل الكحة والتهاب الحنجرة.

تم تحضير مشروب من الشمر وزيته العطري بنسب مختلفة لعلاج مجموعة من الأفراد المصابين بالكحة ومقارنتهم بالمجموعة الضابطة. وكذلك تم إعداد بسكويت يحتوي على نسب مختلفة من الشمر وزيته العطري.

أظهرت نتائج هذه الدراسة أن بذور الشمر تحتوي على نسبة مرتفعة من البروتين، الألياف، الكربوهيدرات، المعادن. كذلك أظهرت النتائج ان بذور الشمر وزيته العطري يحتويان على مواد فعالة لها تأثير في تخفيف أعراض الكحة والتهاب الحنجرة. كما كان لمستخلص الميثانول من بذور الشمر فعل مضاد للأكسدة ومضاد للميكروبات. كما أظهرت هذه الدراسة أيضًا أن البسكويت الذي يحتوي على بذور الشمر وزيته العطري يمكن أن يخزن لفترات أطول من البسكويت غير المحتوي على بذور الشمر وزيته العطري دون حدوث أي تغيرات في الخواص الحسية أوظهور نموات ميكروبية خلال فترة التخزين، لذلك يمكننا استخدامه كمادة حافظة طبيعية. بالإضافة إلى ذلك تم قبول المنتج المُخزن والمُحتوي على نسب مختلفة من بذور الشمر وزيته العطري من قبل المحكمين. والحفاظ على خصائصه الحسية بشكل جيد. أظهرت النتائج أيضا أن المشروب المعد من الشمر وزيته العطري له تأثير فعال في علاج الكحة.

أظهرت النتائج أيضا أن المشروب المعد من الشمر وزيته له تأثير فعال في علاج الكحة.