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## Study on Antioxidation Property of *Ferulago angulata* Plant

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**Abstract:** Due to adverse effects of synthetic antioxidants on humans, it is logical to use antioxidants from natural sources in eatable oils and fats. Vast experimental studies have been proven antioxidant properties of *Ferulago angulata*, which basically belongs to west of Iran. Traditionally this plant was added to different products to prevent from decay as well as give them a pleasant taste. Different concentration of essential oil and extract were added to vegetable oil. Peroxide and Thiobarbituric indexes of samples were determined and compared with blanks samples (without any antioxidant and with TBHQ) showed that minimum concentration of extract for conserving of vegetable oil is about% 0.02 under excremental conditions. Extract with 0.5% concentration is more effective than TBHQ.

**Key words:** *Ferulago angulata*, antioxidant, synthetic antioxidant, natural antioxidant

### INTRODUCTION

Due to adverse effects of synthetic antioxidants on Human tissue and knowing this fact that eliminating antioxidants lead to harmful materials of fat antioxidants and makes some problems for body. To overcome this problem using antioxidants extracted from natural resources in edible fates and oils is a logic solution. (Loliger, 1991, 1989)

New tendency toward replacing chemical preservers with natural ones pave the way for doing more researches on medical plants (Shahidi, 1997; Bauernfeind *et al.*, 1974) for centuries.

Herbs and spices are used as flavors and antioxidants in food industry for century. However the first scientific study about antioxidants was done by Chipait *et al.* (1952) and Djarment (1991).

Herbs and species are the main resources of natural antioxidants and the most prominent of them tocopherols.

Some spices and varieties of umbelliniferae family which are used as natural antioxidants are as follows: *Pimpinella anisum*, *Trigonella foenum*, *Coriandrum sativum*, *Anethum graveolens* and *Foeniculum vulgare* Miller (Souri *et al.*, 1993).

*Ferulago angulata* is an endemic plant of Iran, which belongs to west part of Iran (Mozaffarian, 1996). Traditionally this plant was added to different productions such as diary and oil ghee to prevent from decay as well as give them a pleasant taste by spreading inside the meat to cold keep it longer.

The genus *Ferulago* comprises of some thirty-five species. Seven of which are found in Iran. Limited studies have been done on this genus and its essential oil and its components were determined in Turkey and Greek (Husnu *et al.*, 2002).

The antibacterial properties of essential oil some genus of this plant such as *F. humilis*, *F. galbanifera*. that are native to Turkey, were studied against 15 microorganisms (Can, 2002).

The antibacterial impacts of some type *E. coil*, *Enterobacter*, *Candida albicans*, were significant. Moreover in another study Comarini components of two types *F. capiliaries*, *F. brachyloba* were studies (Jimenez, 2000).

Although there are two more studies in this regard, no report is announced on pharmacological impacts to the best knowledge, this is the first report on the pharmacological activity of *F. angulata*. This study is concerned with the antioxidant activates of *F. angulata*.

### MATERIALS AND METHODS

**Plant material:** The plant material was gathered in Oramanat area (west of Kermanshah province) in June 2005 and was approved in Kermanshah Research Institute of Forests and Rangelands.

**Preparation of extract and essential:** The plants were dried in shadow and room temperature after harvesting in order to get extract from infloers and other parts oil of the plants they were ground; ground materials were extracted

with pure ethanol. (E. Merck) in a Soxhlet apparatus. The crude extracts were filtered and concentrated in a rotary evaporator and kept in sealed dark bottles under refrigerated and frozen conditions until used. Essential oil obtained by using Clevenger distillation apparatus. All chemicals were purchased from Merck.

The chemical composition of *F. angulata* essential oil was analyzed by gas chromatography (GC)/Mass spectrometry system.

**Evaluation antioxidant properties of *F. angulata*:** The quality of oils was measured by determining the selected quality parameters such as: Oven test, peroxide value (POV) and Thiobarbituric index.

Then the following myrtles was added to purified sunflower oil determined this antioxidant activity:

- In Floras extract of *F. angulata* 2, 1, 0.5, 0.1, 0.02 and 0.01%
- In Floras essential oil of *F. angulata* 0.5 and 1%

(The oil was selected for being the most wading used as edible oil in Iran).

Then antioxidant activity of these samples was compared with sample oil containing 25 ppm synthesis antioxidant TBHQ.

**Oven Method:** Under the autoxidized condition, different concentration of *F. angulata* extract (1, 2, 0.5, 0.1, 0.02, 0.01%) and *F. angulata* essential oil (0.5,1 %) test solutions were mixed with oil samples (50 g) and the mixtures were stored in an incubator (63°C). Iodimetry (recommended by AOCS) was used to determine POV. When POV attained 100 meq kg<sup>-1</sup> oil, induced period (days) were counted (Pearson, 1975).

Fifty gram oil pored on dry, clean flax and put on oven the temperature of 63°C. The peroxide numbers were measured based on AOCS standard every day until the oil peroxide index research to 100 mg kg<sup>-1</sup>. A control without any added antioxidant and containing 25 ppm TBHQ was prepared under the same conditions.

**Determining POV by AOCS method:** Test solutions (5±0.5) were dissolved in 30 mL of CH<sub>3</sub>COOH/ CHCl<sub>3</sub> with the ratio of (3:2 vol/vol) and 0.5 ml of saturated KI solution was added and shaken for 1 min. samples were than stored in the dark for 5 min. Finally, 30 mL of distilled water were added. The liberated iodine was titrated with the 0.01 N sodium thiosulfate solution with vigorous shaking until the yellow almost gone. Two milliliters of Starch solution 0.1 N as an indicator were added and the solution was titrated until the blue disappeared.

The Peroxide Value (PV) expressed in millimoles of active oxygen per kilogram of sample, is given by the formula:  $PV = V \cdot N / m \cdot 1000$  were V is the milliliters of the standardized sodium thiosulfate solution used for the test, corrected to take into account the blank test, N is the exact molarity of the sodium thiosulfate solution used and m is the mass of oil in grams (Pearson, 1975).

**Determining the index thiobarbituric by AOCS method:**

Three gram of samples oil were solved in Benzene and 10 mL Acid thiobarbituric is added then extracted was done by 4 min with 125 cycle in minute. Liquid part is separated and boiled in boiled water in 30 min. Absorbance (A) was measured at 530 nm using a UV-265 FW spectrophotometer (shimadzu CO, Japan). Absorption strength was calculated using the formula: (Pearson, 1975).

$$E_{1\text{cm}}^{1\%} = A / (\text{ticknesses of cell-mass of oil in grams})$$

## RESULTS AND DISCUSSION

The yield of essential oil and extract of *Ferulago angulata* were 2.8 and 10% (%W/V).

As shown in Table 1, 63 components were identified, constituting 97.6% of oil.

Cis-Osymene (30.17%),  $\alpha$ -pinene (15.41%), myrcene (3.621%), Limonene (4.88%),  $\beta$ -ocimene (5.7%),  $\beta$ -Germancrene (6.64%) were the major components of the oil, others are in small amounts (Table 1).

A qualitative comparison of the oil continents of *F. angulata* with those of other result reported in the literature showed varying of  $\alpha$ -pinene (17.3%), cis-ocymene (14.4%), Bornyle acetate (14.45%). Thirty three components were identified constituting 89.7% of the oil. (Rezazadeh *et al.*, 2003) in this research aerial parts of *F. angulata* were collected at Dalahoo (west part of Kermanshah).

**Table 1: Important composition of the essential oil of *Ferulago angulata***

| Compound           | RI     | %     |
|--------------------|--------|-------|
| Alfa-Pinene        | 945    | 15.41 |
| Camphene           | 954    | 2.41  |
| Beta-Pinene        | 978    | 1.84  |
| Myrcene            | 997    | 3.62  |
| Limonene           | 1032   | 4.88  |
| Cis-Ocimene        | 1061.5 | 30.17 |
| Trans-Beta-Ocimene | 1063   | 5.7   |
| Gamma-Terpinene    | 1066   | 5.77  |
| Neo-Allo-Ocimene   | 1136.6 | 1.87  |
| Bornyl Acetate     | 1290   | 4.58  |
| Germancrene-D      | 1483   | 5.03  |
| Bicyclgermacrene   | 1495   | 1.29  |
| Delta-Cadinene     | 1524   | 1.18  |
| Suberosin          | 2211.5 | 1.24  |
| B-Gemacrene        |        | 6.64  |

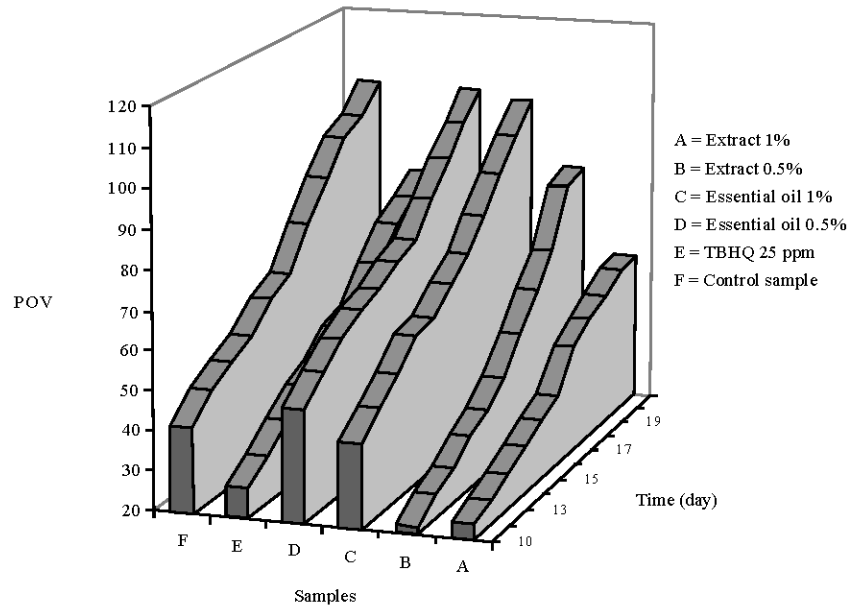


Fig. 1: Antioxidant effect of *F. angulata* extracts, essential oil, TBHQ and control sample by determination of POV

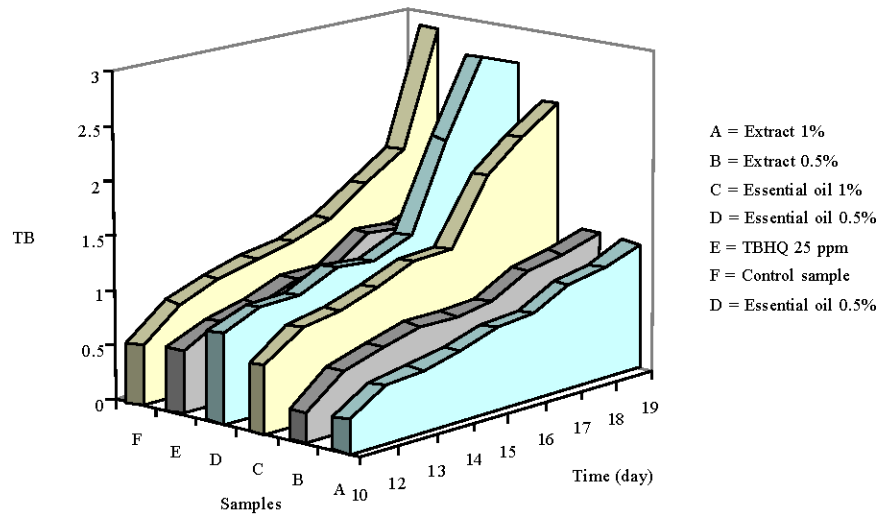


Fig. 2: Antioxidant effect of *F. angulata* extracts, essential oil, TBHQ and control sample by determination of TB

Another research showed the main components as followed:  $\alpha$ -phelandren (13%),  $\beta$ -phelandrenen (32%) (Sedaghat *et al.*, 2001).

A qualitative comparison of the oil constituents of *F. angulata* with those of other *F. angulata* reported in the literature showed varying composition these variation can result from this fact that the plants used in this study were collected from different regions of Kermanshah.

Interrelation between two methods (POV and TB) was studied. Results indicated that the two methods had remarkable interrelation.

Figure 1 and 2 presents the antioxidant activity of the ethanol extracts, essential oil compared with those of the TBHQ-containing and the control samples.

The results revealed that essential oil and extract of *F. angulata* decreased the peroxide value in oil studied but it is shown in comparison, extract of *F. angulata* gain better results.

Peroxide values of all samples partly increased during oven test. The efficiency of antioxidative extracts of plants 0.01% witch has the nearest concentration with TBHQ 25 ppm was found to be low when compared with

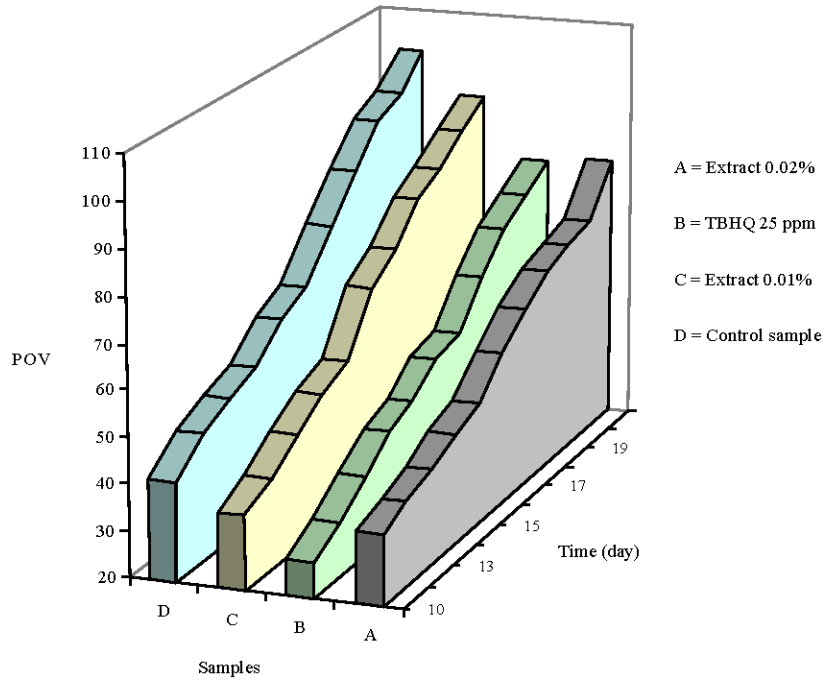


Fig. 3: Antioxidant effect of *F. angulata* extracts 0.01%, 0.02 % with TBHQ 25 ppm and control sample

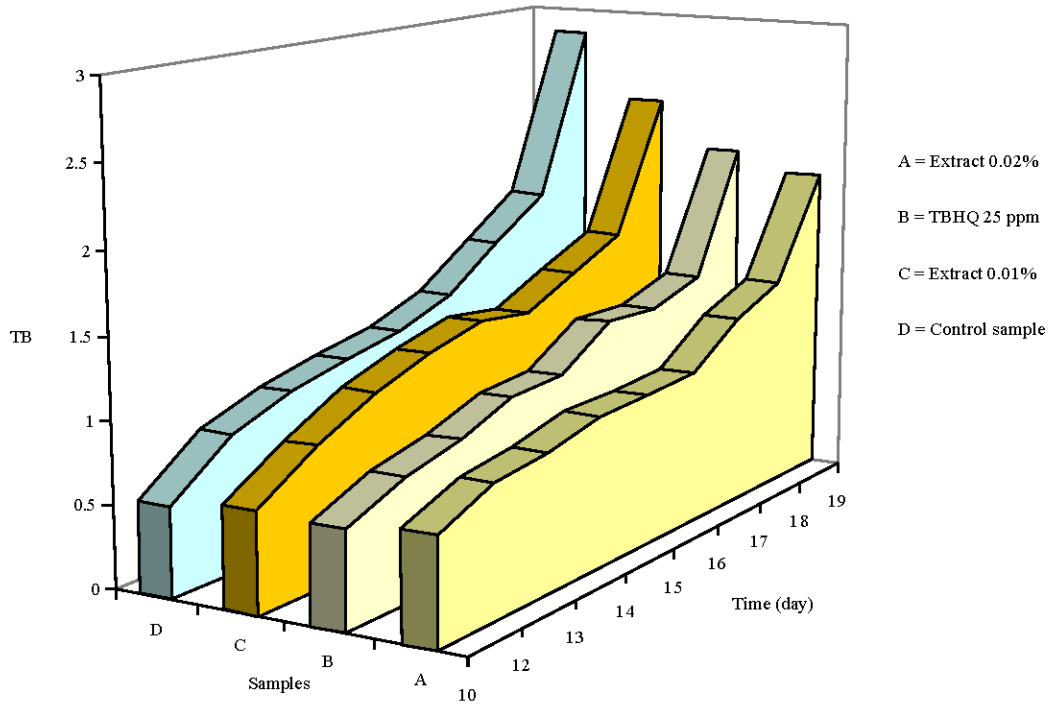


Fig. 4: Antioxidant effect of *F. angulata* extracts 0.01%, 0.02% with TBHQ 25 ppm and control sample

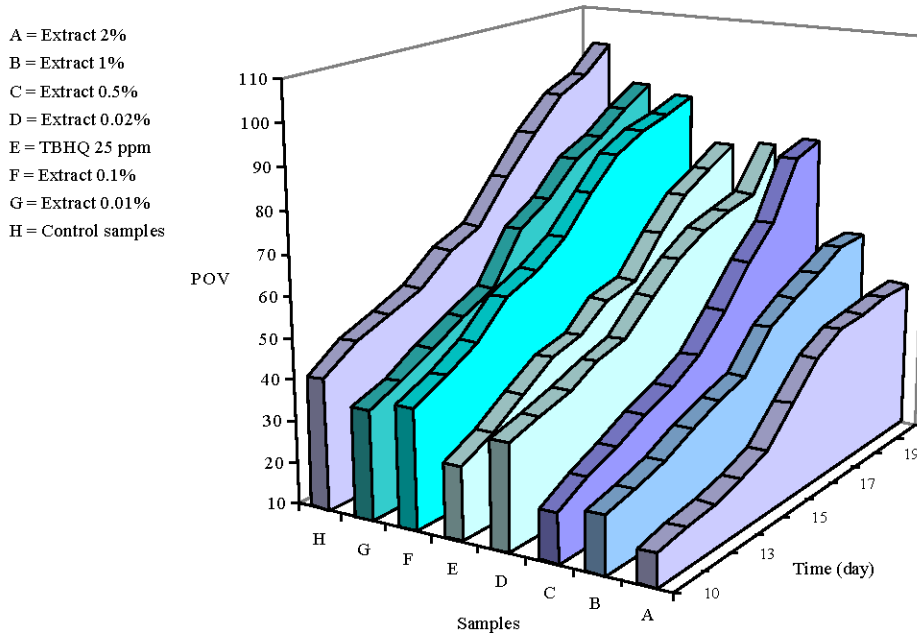


Fig. 5: Antioxidant effect of different concentration of *F. angulata* extracts with TBHQ 25 ppm and control sample

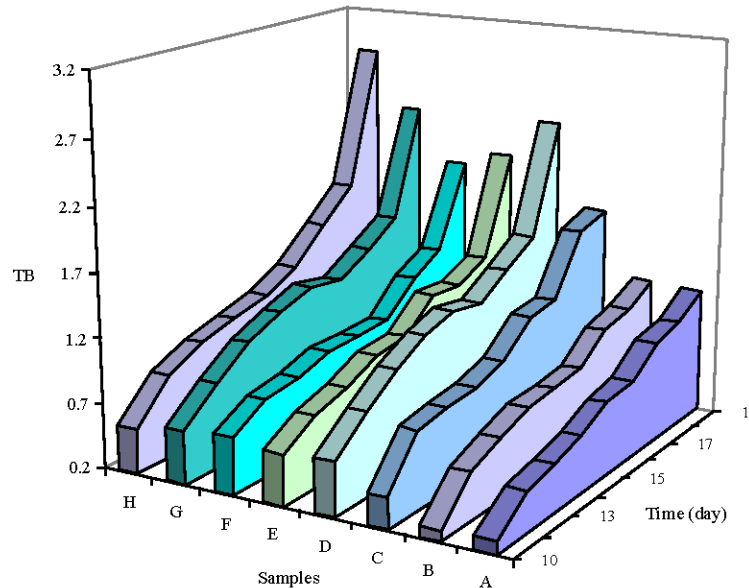


Fig. 6: Antioxidant effect of different concentration of *F. angulata* extracts with TBHQ 25 ppm and control sample

of TBHQ. The oil sample comprised of 0.02% of *F. angulata* extract is comparable with TBHQ (25 ppm) as a synthetic antioxidant (Fig. 3 and 4).

Among the different extract of *F. angulata* samples with 1 and 2% of extract have better performance and difference between these two samples is not significant (Fig. 4 and 5).

According to the result of this study, extract of *F. angulata* has antioxidant property the results show

that this property especially focuses on plant extract on the other hand, the minimum concentration needed for preserving edible oil from oxidation is 0.02%.

In view of some likely ill effects of synthetic antioxidants, some efforts are being made to add natural substance or their extracts to control or lessen the oxidative deterioration. The results of our study clearly indicate that there is a possibility of achieving useful effect of natural antioxidants.

However more studies are needed for extraction and identification of components of *F. angulata*. Further studies to investigate the antibacterial effect of this plant for providing food safety is needed.

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