

A study of the chemical composition and the biological active components of *Nigella Sativa* and *trigonella foenum-graecum L.* seeds

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Background: *Nigella Sativa* (N.S.) is an annual herbaceous plant from Ranunculaceae family producing small black seeds with aromatic odor and taste. Fenugreek (*Trigonella foenum-graecum L.*), belongs to the subfamily papilionaceae of the family Leguminosae (bean family, Fabaceae). The plant is an aromatic herbaceous annual, widely cultivated in Mediterranean countries and Asia.

Aim:- to extract and study the biological active components of fixed oils of *N.Sativa* and Fenugreek seeds.

Materials and methods: Fixed oil of the N.S. and the F.S seeds were extracted and characterized using infrared spectroscopic techniques (Tensor27- PRUKER). Biological activity test was applied on the bacteria (*Bacillus pumilus*, *E.coli*, and *Pseudo M.*).

Results: Both studied fixed oils showed identical antimicrobial activity.

Conclusion:- this study showed an identical similarity between the active biological components of both studied materials (*N.Sativa* and Fenugreek seeds) in spite of their different botanical origin, leading to a matched biological activity. This finding may be useful in replacing one herbal seeds instead of the other according to their availability when applying these seeds for their known therapeutic uses.

Keywords: *Nigella sativa*, fixed oil, *Trigonella foenum*.

I. Introduction :

Nigella Sativa (N.S.) is an annual herbaceous plant from Ranunculaceae family producing small black seeds with aromatic odor and taste^(1,2).

Total oil from N.S. seeds constitute two types of oils, i.e. fixed oil (30-36% w/w) consisting mainly of linoleic acid, linolenic acid and oleic acid⁽³⁻⁵⁾ and volatile oil (0.43-0.72% w/w) based on the seed weight⁽⁶⁾. Besides being used as a spice and a condiment, N.S. seeds have been used for medicinal purposes in many Middle Eastern and Far Eastern countries for more than two thousand years⁽⁷⁾. It is very popular in various traditional systems of medicine like Unani and Tibb, Ayurveda and Siddha. Seeds and oil have a long history of folklore usage in various systems of medicines and food. The seeds of *N. sativa* have been widely used in the treatment of different diseases and ailments. In Islamic literature, it is considered as one of the greatest forms of healing medicine. It has been recommended for using on regular basis in Tibb-e-Nabwi (Prophetic Medicine). It has been widely used as antihypertensive, liver tonics, diuretics, digestive, anti-diarrheal, appetite stimulant, analgesics and in skin disorders^(8,9).

Fenugreek (*Trigonella foenum-graecum L.*), belongs to the subfamily papilionaceae of the family Leguminosae (bean family, Fabaceae). The plant is an aromatic herbaceous annual, widely cultivated in Mediterranean countries and Asia. It is believed to have originated in south-eastern Europe or south-western Asian countries⁽¹⁰⁾.

The seeds are reported to have restorative and nutritive properties⁽¹¹⁾. Fenugreek seeds (F.S.) are used in remedies for diabetes and hypercholesterolaemia in Indian, Arabic and Chinese medicine⁽¹²⁾.

The seeds contain about 7% fixed oil consisting mainly of linoleic, oleic and linolenic acids. Fenugreek seeds from Andhra Pradesh contained 5.00-6.45% fatty oil⁽¹³⁾.

Aim:- to extract and study the biological active components of fixed oils of *N.Sativa* and Fenugreek seeds.

II. Materials and methods:

The *N.S.* and Fenugreek seeds were purchased from a local herb store in Baghdad, Iraq and authenticated by a botany specialist. The specialist classified the seeds according to their family and species.

Fixed oil of the *N.S.* seeds were extracted according to the following procedure⁽¹⁴⁾.

The *N.S.* seeds were finally powdered in a mixer. Two hundred and fifty grams of powdered seeds were extracted with one liter (1L) of 95% Hexane at 70°C for five hours in soxhlet apparatus. The extract was concentrated under reduced pressure in a rotary evaporator at 70°C to remove all the hexane. Fifty milliliters of fixed oil were obtained.

Fixed oil of the F.S. were extracted according to the following procedure⁽¹⁵⁾.

The F.S. were finally powdered in a mixer. One hundred grams of powdered seeds were extracted with three hundred milliliters of 99% Chloroform at 70°C for six hours in soxhlet apparatus. The extract was concentrated under reduced pressure in a rotary evaporator at 65°C to remove all the solvent. Only six milliliters of fixed oil were obtained.

Both fixed oil were characterized using infrared spectroscopic techniques (Tensor27- PRUKER)

Biological activity test: used diffusion method to examination the activity of fixed oils (The *N.S.* and Fenugreek seeds)⁽¹⁶⁾, bacterial types activates in nutrient broth were (*Bacillus pumilus*, *E.coli*, and *Pseudo M.*).

Detection of active compounds: Made of many qualitative detections to defined the active chemical compounds in the fixed oils (The *N.S.* and Fenugreek seeds).

III. Results:

The present study shows the FTIR spectrum for both fixed oils (The *N.S.* and Fenugreek seeds), figures (1)(2) which confirmed the following group as show in table (1).

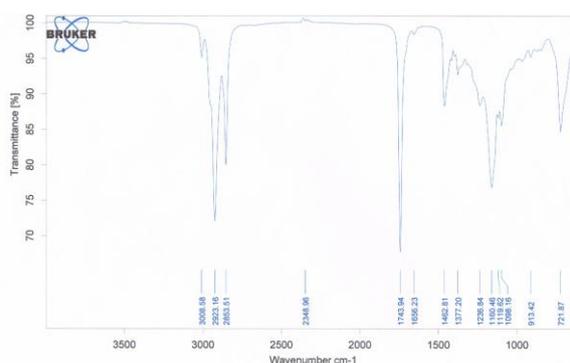


Figure (1) IR Spectrum of the fixed oil of *Nigella Sativa* seed.

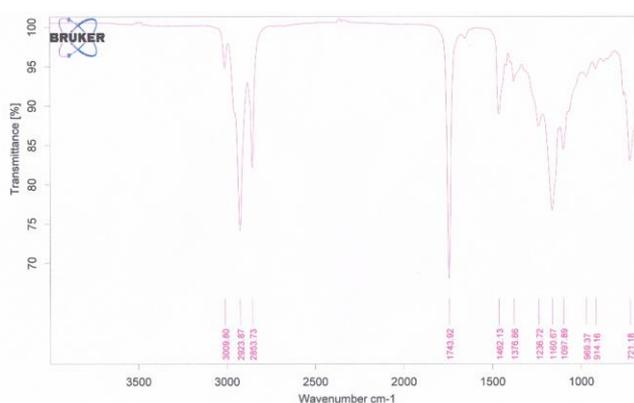


Figure (2) IR Spectrum of the fixed oil of Fenugreek seed.

Both studied fixed oils showed identical antimicrobial activity.

IV. Discussion:

The active components of fixed oils for both (The *N.S.* and Fenugreek seeds), that have been detected, found that they share the same groups, as follows: Tannins, Carbohydrate, Glycosides, Phenols, Resins, Flavonoids, Alkaloid, Terpens.

Both studied fixed oils from the two botanically different seeds gave identical IR spectrum as shown in figures (1) (2) that proves the similarity of their constituents. The IR spectrum of the fixed oils for both (The *N.S.* and Fenugreek seeds), showed the following bands: stretching band at (2853, 2923) cm^{-1} for (-CH) aliphatic, stretching band at (3009) cm^{-1} for (=CH), stretching band at (1462, 1656) cm^{-1} for (C=C), stretching band at (1743) cm^{-1} for (C=O) of the ester⁽¹⁷⁾.

As found in the results, the bacteria involved in this work (*Bacillus pumilus*, *E.coli*, and *Pseudo M.*) showed no sensitivity toward both studied oils. This might be attributed to the biological nature of the chosen bacteria, or the amount of dose given. Maybe different results can be obtained if alliterating the dose or selecting different bacteria.

V. Conclusion:-

this study showed an identical similarity between the active biological components of both studied materials (*N.Sativa* and Fenugreek seeds) in spite of their different botanical origin, leading to a matched biological activity.

This finding may be useful in replacing one herbal seeds instead of the other according to their availability when applying these seeds for their known therapeutic uses.

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