



## Effect of alcoholic extract of medicinal plants *Nigella sativa* and *Foeniculum vulgare* in the growth of *Staphylococcus aureus*

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Received: October 16<sup>th</sup> 2020; Accepted: November 13<sup>th</sup> 2020

### Abstract

The study included knowing the impact of alcoholic extract of two types of medicinal plants (*Nigella sativa* and *Foeniculum vulgare*) on frustration on growth of bacteria *Staphylococcus aureus*. It implicated to get the alcohol extract of this plants and inject it into the growth medium containing bacteria through this experiment, it was found that the alcohol extract of these two plants has a high capacity to inhibit growth and limit the spread of the dish, it gave good result that reduce the spread of germs. The inhibitory efficacy *Nigella sativa* and *Foeniculum vulgare* plants extract was studied by means of spreading by drilling on a number of pathogenic bacteria, which included *Staphylococcus aureus*, it appeared that the alcoholic extract of plants inhibited the growth of all laboratory microorganisms. The used of medications and medical herbs in the treatment of many diseases from the wide group of people in the local communities, which requires effort to make and replace research studies that are looking at the properties of these vital materials, which will contribute to the useful of this medical plants and avoiding of chemical material to use of treatment of human diseases it cause them of this bacteria.

**Keywords :** *Nigella sativa*, *Foeniculum vulgare*, Bacteria, Alcoholic Extract.

### Introduction

Since of Thousands of years human benefit from herb plants that grow in his surrounding environment, not only in them food but in the treatment too in the most difficult disease and the role of Arabs in the medicine of use chemicals material in the drug. There are many studies on the use extracts to inhibit or kill germs when science is impotent to cure some diseases as it is an economic, the greatly efficient action and the competence of the plant extracts different of depending on the way of extract and type of solvent used for extraction and the organism use experiment. Plants have a many active pharmacological ingredients like glycoside-alkaloid- tannin- soap and resin, these materials are present in many part plants have an effective effect in inhibit the growth of *Staphylococcus aureus*. its belongs to the family rich of medical and nutrient elements, the seeds of *Foeniculum vulgare* are more consumed material of the herbal medicine center, its involved in the grounding of plenty of medical herbal mixtures includes many stragulation complexes with estrooid influence,

soaps and flavonoids that have a like role to hormones, the seeds of *Foeniculum vulgare* are suitable in slow digestion it cause its antishrinking charecteries which are diuretic and increase appetite and the production of intestin juice.

***Staphylococcus aureus*:** *Staphylococcus aureus* is extant in the nose and on the skin and more found in the people and patients who work in a hospital. *Staphylococcus aureus* is the greatest dangerous of all the many common *Staphylococcus* bacteria, these gram positive coccal shape frequently cause skin, nose, heart valve and bone. This bacteria are spread in the all place by having direct interaction with an infected person through using unclean thing or by means inhaling infected drops spread by cough or sneeze (Larry M. Bush *et al.*, 2019)

***Nigella sativa***

The herb plant belong to the anise family and its scientific name is *Nigeria Sativa* has numerous general names its different from country to another and the most well-known of these designations are seeds.

**Classification of *Nigella sativa*:**

Table 1. shows classification of plant

|          |                  |
|----------|------------------|
| Kingdom: | Plantae          |
| Clade:   | Tracheophytes    |
| Clade:   | Angiosperms      |
| Clade:   | Eudicots         |
| Order:   | Ranunculales     |
| Family:  | Ranunculaceae    |
| Genus:   | <i>Nigella</i>   |
| Species: | <i>N. sativa</i> |

Figure 1. shows of *Nigella sativa***Phytochemicals composition of *Nigella sativa*:**

The seeds contain (40%) of the fixed oil, and (1.4%) volatile oil, and contain numerous vitamins-minerals and proteins. Most of the pharmacological impact are due to the volatile oil, its liquid substance that has an aromatic odor and a pale yellow color and contain numerous essential fatty acids essential for the health of the mucous membranes – skin and hair and also the progression of producing hormones in the human body, as it contains Sugars, starches, and minerals like phosphates- phosphorous- iron, and calcium. In addition its contains nigelone- acrylline material and antioxidant like vitamins A and C, and also contains glutathione which play important role in defensive the body against the dangerous of free radicals also containing arginine acid are necessary for the body growth as well as digestive and antacid hormones and enzymes.

***Foeniculum vulgare*:** *Foeniculum vulgare* is herb plant and medicinal, its belonging to the family Apiaceae. In English famous (Fennel) (Bernath et al., 1996). It's an herbaceous plant and aromatic, height plant lengths about (1 – 2) m, its grow in different parts of Europe - Mediterranean and Asia. Fennel is a permanent plant with stems fluted, sporadic leaves, dark green, petiole contain

sheath; flowers are regular or irregular, bisexual, yellow in the form of oval beads (Pourabbas et al., 2011). *Foeniculum vulgare* is small seeds with a length of about 8 mm and a width of 3 mm with an aromatic odor and sweet taste, the seeds are narrow and long cylinder. The crack groove light green surface (Ahmadi et al., 2007). The extracted from *Foeniculum vulgare* seeds showed the ability to inhibition of bacterial growth *Staphylococcus aureus* Mohsenzadeh (2007).

It was exposed in many studies that *Foeniculum vulgare* seeds extracts inhibits the growth of bacteria multi-drug resistant as *Acinetobacter baumannii*, the aromatic secondary metabolites present in the extracts were main accountable of this activity (Kwon et al., 2002). Fennel contains a lot of volatile oils such as Vincon oil, which is accountable for the many medical important of fennel, alpha oil and limonene oil it's the accountable to distinctive smell of fennel, contains anisic acid-various minerals-vitamins of calcium-potassium-sulfur- phosphorous and vitamins such as vitamins A, B, C. The water content of seeds is (6.3%) water, (10%) fat, (9.5%) protein, (13.4%) minerals, (18.5%) fibers and (42.3%) carbohydrates (Rather et al., 2016).

**Classification of *Foeniculum vulgare*****Table 2. Classification of Plant**

|                           |                   |
|---------------------------|-------------------|
| <b>Kingdom:</b>           | <b>Plantae</b>    |
| <b>Clade:</b>             | Tracheophytes     |
| <b>Clade:</b>             | Angiosperms       |
| Clade:                    | Eudicots          |
| Clade:                    | Asterids          |
| Order:                    | Apiales           |
| Family:                   | Apiaceae          |
| Genus:                    | <i>Foeniculum</i> |
| Species:                  | <i>F. vulgare</i> |
| <i>Foeniculum vulgare</i> |                   |

**Figure 2. shows *Foeniculum vulgare*****Materials and Methods**

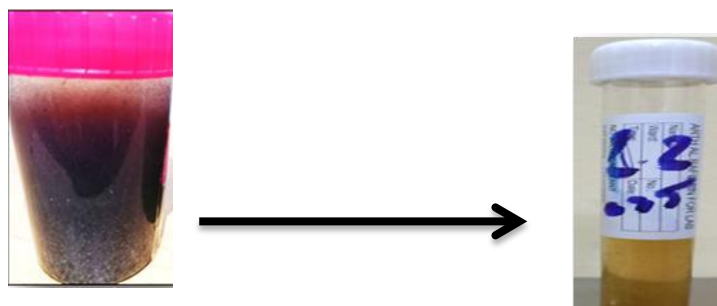
Collected enough seeds from the *Nigella sativa* and *Foeniculum vulgare* seeds from the supermarkets then cleaned with ethanol alcohol to removing dirt and dust and damaged parts, then devastating them with the mill and keep in the refrigerator even use.

**Isolated bacteria used in the study:** Clinical isolates were obtained the bacterial *Staphylococcus aureus* which isolated from otitis media from laboratory.

**Preparing the alcoholic extract from *Nigella sativa*:** 10 grams of crushed seed was dissolved and add to 250 ml of ethanol alcohol which was used to complete the blending process, the mixture was filtered using filter paper, after filtering the

precipitate was separated using 2500 cycle/5minute of centrifuge, after collecting the floating liquid, evaporate the ethanol by means placing it in a water bath of a temperature of 50 - 60 °C.

**Preparing the alcoholic extract from *Foeniculum vulgare*:** 10 grams of powder seeds was dissolved and add to 250 ml of ethanol alcohol which was used to complete the mixing process , the mixture was filter using filter paper , after filtering the precipitate was separated using a 2500cycle / five minute of centrifuge , after collecting the floating liquid, evaporate the ethanol directly by placing it in a water bath of a temperature of 50 - 60 °C.

**Figure 3. shows plant extract**

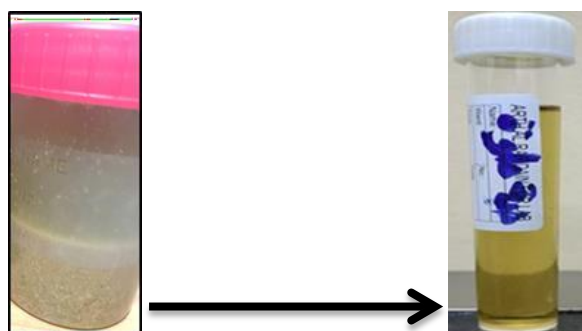


Figure 4. show plant extract

**Effect of alcoholic extracts of *Nigella sativa* and *Foeniculum vulgare* on bacteria:** Many concentrations of *Nigella sativa* and *Foeniculum vulgare* powder were applied to a petri dish containing suspensions of bacterial with suitable concentrations and a witness dish was used control from the center of Moller - Hinton agar, stir the petri-dishes well and leave even hardened and then incubate in 37-38 °c for one day.

**Effective test for alcoholic extract:** The bacteria isolates are activated in the food medium prepared ,the method of spreading with agar was used , method diffusion agar put the medium into the petri-dishes and after the hardening spread the bacterial suspension by means cotton swabs and then leave the plates for fifteen minutes to drink in the culture medium and incubate petri-dishes at 37°C for one days and then we record the result measured diameters of the inhibition zone milliliters.

### Results and Discussion

This study was done to determine the impact of alcohol extract on growth of *Staphylococcus aureas* isolated from otitis media infections, the alcohol extract contain many compounds this compound soluble in alcoholic solutions ,the study shows that alcoholic extract was effective by using agar diffusion process to inhibition of *Staphylococcus aureas*. The study also showed that staphylococcus aureus ( gram positive ) initial effect of organic extracts has been studied and the member ship of the *Nigella sativa* and *Foeniculum vulgare* on the positive bacteria and pathogenic which previously .Used in similar studies (Salman, 2005).The seed of complete blessing had no effect on the growth of each the bacterial varieties used in this study, for unspecified reasons but it can be

assumed that the active substance are concentrated in the heart of the pill you need to edit the effect and this may be confirmed by the effect strong organic extract to grow each bacterial cultivars tested. As for the results obtained from the use the organic extract of the seeds of *Nigella sativa* is the appear any inhibiting effect of the growth of the tested bacterial species. The anti-bacteria activity of *Foeniculum vulgare* seed extracts expressed as the presence or absence of inhibition zone of methanolic extract of *Foeniculum vulgare* .The high antibacterial activity of fennel alcohol seed extracts is probably due to the high concentration of secondary metabolites that are very much soluble in alcohol( Dusko *et al.*, 2006). This is due to the presence of compounds such as, linoleic acid, undecanal, 1, 3- benzenediol, oleic acid and 2, 4-undecadienal in the extract. It is reported that fennel seed extract contain 5-hydroxy-furanocoumarin which contributes in antimicrobial property of this plant (Esquivel-Ferrino *et al.*, 2012) The alcohol extract of the medicinal plant *Nigella sativa*, was more effective on bacteria. Beyond antibiotic resistance research for infection control, scientists are increasingly investigating the antimicrobial properties of plant extracts (Taskova *et al.*, 2002; Kariba, 2002; Malika *et al.*, 2004; Imelouane *et al.*, 2009). Several scientific reports have described the inhibitory effect of plants on a variety of microorganisms, although considerable variation for resistance of different microorganisms to a given plant and of the same microorganisms to different plants (Arora & Kaur, 1999). Although the antimicrobial activities of *Nigella sativa* extract has been reported (Hanafy & Hatem, 1991; Morsi, 2000) the antimicrobial activities of *Nigella sativa*.

Table 3. show Antibacterial activity of seeds alcoholic extract

| Name of plant             | alcoholic extract inhibition zone |
|---------------------------|-----------------------------------|
| <i>Foeniculum vulgare</i> | +                                 |
| <i>Nigella sativa</i>     | +                                 |

## Conclusion

This study confirmed of anti-microbial characteristic of *Nigella sativa* and *Foeniculum vulgare* as a potential anti-microbial agent these seeds of two these extracts possessed the most anti-microbial activity against various micro-organisms and this could be used as an topical pharmaceutical preparations.

## References

- Ahmadi A, Nasiri Nejad F, Parivar K (2007) Effect of aqueous extract of the aerial part of the *Ruta graveolens* on the spermatogenesis of immature Balb/C mice. *Razi J Med Sci* 14: 13-20.
- Arora, D. and J. Kaur, (1999). Antimicrobial activity of spices. *Int. J. Antimicrob. Agents*, 12: 257–262.
- Bernath J, Nemeth E, Kattaa A, Hethelyi E (1996) Morphological and chemical evaluation of fennel (*Foeniculum vulgare* Mill.) populations of different origin. *J Essent Oil Res* 8: 247-253.
- Dusko BL, Comic L, Sukdolak S (2006) Antibacterial activity of some plants from family Apiaceae in relation to selected phytopathogenic bacteria. *Kragujevac J Sci* 28: 65-72.
- Esquivel-Ferrino PC, Favela-Hernandez MJM, Garza-Gonzalez E, Waksman N, Rios MY, et al. (2012) Ant mycobacterial activity of constituents from *Foeniculum vulgare* var. dulce grown in Mexico. *Molecules* 17: 8471-8482.
- Hanafy, M.S. and M.E. Hatem, (1991) . Studies on the antimicrobial activity of *Nigella sativa* seed (black cumin). *J. Ethnopharmacol.*, 34: 275–278.
- Imelouane, B., A. Elbachiri, M. Ankit, H. Benzeid and K. Khedid, (2009) Physico-chemical compositions and antimicrobial activity of essential oils of Eastern Moroccan *Lavandula dendata*. *Int. J. Agric. Biol.*, 11: 113–118.
- Kariba, R.M., (2002). Antimicrobial activity of *Hymenodictyon parvifolium*. *Fitoterapia*, 73: 523–525.
- Kwon, YS, Choi WG, Kim WJ, Kim WK, Kim MJ, et al. (2002) Antimicrobial constituents of *Foeniculum vulgare*. *Arch Pharmacol Res* 25: 154-157.
- Larry, M. Bush , MD, FACP, Charles E. (2019) *Staphylococcus aureus* Infections . Schmidt College of Medicine, Florida Atlantic University. Last full review/revision Jun 2019. Topic Resources.
- Malika, N., M. Faid and E.A. Chakib (2004). Antimicrobial activities of natural honey from aromatic and medicinal plants on antibioresistant strains of bacteria. *Int. J. Agric. Biol.*, 6: 289–293.
- Moura LS, Carvalho RN, Stefanini MB, Ming LC, Meireles MAA (2005) Supercritical fluid extraction from fennel (*Foeniculum vulgare*): global yield, composition and kinetic data. *J Supercrit Fluids* 35: 212-219.
- Mohsenzadeh M (2007) Evaluation of antibacterial activity of selected Iranian essential oils against *Staphylococcus aureus* and *Escherichia coli* in nutrient broth medium. *Pak J Biol Sci* 10: 3693-3697.
- Morsi, N.M., 2000. Antimicrobial effect of crude extracts of *Nigella sativa* on multiple antibiotic resistant bacteria. *Acta Microbiol. Polonica*, 49: 63–74.
- Pourabbas S, Kesmati M, Rasekh A (2011) Study of the the anxiolytic effects of fennel and possible roles of both gabaergic system and estrogen receptors in these effects in adult female rat. *Physiol Pharmacol* 15: 134-143.
- Rather MA, Dar BA, Sofi SN, Bhat BA, Qurishi MA (2016) *Foeniculum vulgare*: A comprehensive review of its traditional use, phytochemistry, pharmacology, and safety. *Arab J Chem* 9: 1574-1583.
- Salman, M.T., Khan, R. A and Shukla, I., (2005) A. Antimicrobial activity of *Nigella sativa* oil against multidrug resistant pseudomonas aeruginosa from clinical , India.
- Taskova, R., M. Mitova, H. Najdenski, I. Tzvetkova and H. Duddeck (2002). Antimicrobial activity and cytotoxicity of *Carthamus lanatus*. *Fitoterapia*, 73: 540–543.