

Antibacterial study of two medicinal plants (*Allium sativum*) and (*Lavandula angustifolia*)

Author Detail: Bouatrous Yamina

Department of Natural Sciences and Life Sciences Faculty of Exact and Natural Sciences and Life, University Mohamed Khider Biskra , Algeria

Summary

The objective of this study was to evaluate the antibacterial activity of essential oils and infused two herbal traditional pharmacopoeia of Algeria (garlic and lavender).

The antibacterial effect was evaluated by the diffusion test on agar the three bacterial strains. The results show that only the mixing between the infused oils and have the essential oils of lavender with 1v/2v proportions and 1v/3v respectively had a significant antibacterial effect only *Echerchia coli* with inhibition zone 20mm and *Staphylococcus aureus* with inhibition zone of 22 mm area. It was also found that the garlic juice also has a significant effect on the different types of bacteria in the raw state without dilution.

Keywords: Antibacterial, *Allium sativum*, *Lavandula angustifolia*

Introduction

Herbal medicine has existed since prehistoric times. Neanderthals were buried with plants known now that they have medicinal properties. The first peoples have probably discovered these properties empirically over the centuries, and each generation they have thus accumulated knowledge about medicinal plants. This knowledge continues to grow today in parts of the world where indigenous cultures have escaped the destructive influence of modern society. An antimicrobial therapy is a chemical substance which kills microorganisms such as bacteria, viruses, fungi and protozoa. These are micro-organisms that cause infections commonly observed in humans [1].

Garlic is an aromatic plant known since antiquity. Although nowadays it is primarily used for its culinary virtues, paying its pungent flavor to various dishes was assigned various functions over time. Considered as well as sacred, magical or protective according to some, it was also despised because of its strong smell. Many pharmacological and therapeutic properties attributed to it today. It is interesting to look back on its history to understand the origin of these beliefs, but also to observe that science has been able to show [2]. Generally attributed to garlic qualities: antibacterial, antibiotic, anticancer, hypolipidemic, hypotensive, inhibiting platelet, expectorant and immunostimulatory aggregation! It is for these reasons that it would be prescribed in hypertension, hypercholesterolemia, bronchitis, sore throat or urinary calculi in [3, 4] Garlic also have antifungal properties and act against the digestive mycosis [5]. Given the many qualities that he assumes, garlic has been much studied. To try to understand the medicinal capabilities that are granted, we must examine its composition.

Lavender plants are gas whose odor is by simply touching because the location is very essential oils externally, they form in hairs to species, and are located under the cuticle is lifted. Glands aromatic oils present on all aerial parts of the plant, focus on flowers that are diuretic, carminative, vulnerary, expectorant and soporific. But it is the essential oil that remains the most widely used especially to treat mild sleep disorders and respiratory problems: cough, cold, stuffy nose, asthma, whooping cough, influenza.

It is said digestive, stomachic, diuretic, tonic and energy. It has on the skin antiseptic and healing action and is more parasiticide with effective action against lice, scabies and smart, and repulsive: it away especially mosquitoes. It is also a powerful fungal and antidiarrhetic [6]. It is also bactericidal against staphylococci and streptococci, as well as against the influenza virus.

The chemical composition and quantity of essential oil of lavender vary depending on growing conditions, season, crop variety and even extraction technique [6]. This study is an assessment of antibacterial power of extract from two medicinal plants (garlic, lavender) who frequently used by traditional medicine.

Material and Methods

- Plant material

Was used in this study two different medicinal plants, one for garlic that is used in food especially in Algeria (fresh bulb) kitchen and the other is the lavender that grows wild in the region Biskra (dry flowers).

- Microbial material

Tested strains from the collection of Bachir Ben Nacer hospital Biskra They are listed in Table 1.

Table (1): The different strains used and their gram test

souche	Test Gram
<i>Echerichia coli</i> ATCC 25922	Négatif
<i>Staphylococcus aureus</i>	positif
<i>Saccharomyces cerevisiae</i>	positif

- Study conduct

• **Oils Garlic**

The steps for preparing these oils are:

Weigh 15 g of fresh, chopped or diced plant.

Take 20 ml of sunflower oil, to mix with the plant in an airtight container. Marinate at room temperature (room temperature) overnight at 24 h or 48 h maximum. After steeping, the oil mixture - plant is filtered, then stored hermetically. By this method of extraction is obtained not infused oils and essential oils as they require a vacuum pump to separate essential oils.

• **Fresh juices of garlic**

The juice or plant metabolic water, the extracted liquid is any part of the plant, leaving as residue the cellulosic fibers. Garlic contains less juice for this reason cloves minced must confront pressure to remove the maximum amount of juice.

• **Oil Lavender**

The extraction of essential oils of lavender was made by the method of classical hydrodistillation in the laboratory of the Department of Natural Sciences and Life Biskra.

Simple hydrodistillation directly involves immersing the plant material to be treated, intact or crushed in a heating mantle filled with water, which is then boiled. Heterogeneous vapor are condensed on a cold surface and the essential oil is separated by difference in density [6].

• **Test of antibacterial activity**

- Preliminary Test

Evaluation of the antibacterial activity of an extract passes through the stage of disks, which is simple and not expensive and most used in routine bacteriology laboratories tested for antibiotic susceptibility. The purpose of these initial experiments is the search for antibacterial infused oils and finds the exact doses, lack of references using the same techniques.

* Test only infused undiluted oils.

* Test the activity of ethanol at 80 ° and palm oil, vis-à-vis bacteria.

- The Aromatogram or method of Discs:

The study of the antibacterial activity by the technique is identical to that of the antibiogram, the only difference is the replacement of antibiotics by aromatic extracts. The discs are made from paper Whatman N° 3 (or other type of blotter paper), with a diameter of 5.5 mm, depending on the diameter of the punch. Then they are put into a test tube (or more if necessary), and autoclaved once agar Muller - Hinton are seeded, the disks impregnated with each sample are arranged on the surface of the agar using a clamp bunsen sterilized for 18 to 24 hours at 37 ° C, for all the boxes, and at ambient temperature (room temperature) to the plates containing impregnated disks garlic juice by measuring the diameters of clear halos around the disks, or zones of inhibition.

- Determination of the Minimum Inhibitory Concentration (MIC): This technique is practiced on solid medium, which allows testing several bacterial strains in the same box (it is possible to inoculate thirty strains in one box by the method of keys. It consists in dilutions of aromatic extracts (oils or juice), and incorporated into the agar melted and cooled to 45 ° C, and test these settings on the bacterial strains studied. This test provides a range of values of the minimum inhibitory concentration of each strain.

Results and Discussion

Table (2): Diameter (mm) of inhibition zones oils (H) and undiluted juice of two plants studied.

Bactérie	Huile infusée ail	Jus ail	H essentielle lavande
<i>Echerchia coli</i> ATCC 25922	-	17	-
<i>Staphylococcus aureus</i>	-	12	6.5
<i>Saccharomyces cerevisiae</i>	4	18	8

It was observed according to the table (2) that the effect of infused oils has shown the diameters are too small relative to the diameters of inhibition zones of inhibition found with antibiotics generally, due to their insolubility in the culture medium. For this it should be dissolved in the ethanol infused oils, to enable the active components of disseminated into the agar and exert the desired activity, without the solvent can affect bacteria or oil. Against by the juice of garlic has an observable effect on the diameter of some inhibition or bacterial strain treated area

Table (3): Test of anti bacterial activity of ethanol 80 °

	<i>Echerchia coli</i>	<i>Staphylococcus aureus</i>	<i>Saccharomyces cerevisiae</i>
Ethanol *	+	++	+

* 4 ml of ethanol in 16 ml of culture medium, - no growth, + presence of growth, ++ good growth

This table shows that the ethanol at 80 ° does not have a powerful antibacterial. With the agar diffusion method and disc method, ethanol 80 ° had no significant effect, that is to say, no zone of inhibition.

Table (4): Testing the antibacterial activity of sunflower oil

	10 mg/ml	5mg/ml	2.5mg/ml	0.625mg/ ml
<i>Echerchia coli</i>	+	++	+	+
<i>Staphylococcus aureus</i>	+	+	++	+

+ Presence growth ++ good growth

The results achieved with this experiment show that sunflower oil has no antibacterial effect some of the strain investigated.

Table (5) Diameter (mm) of inhibition zones mixture infused oils (Hi) and the garlic essential oil (Hh) of lavender.

	1Hi/1Hh	2Hi/1Hh	3Hi/1Hh	1Hi/2Hh	1Hi/3Hh
<i>Echerchia coli</i>	+	++	+	-	-
<i>Staphylococcus aureus</i>	+	+	++	-	-
<i>Saccharomyces cerevisiae</i>	+	+	-	-	+

According to Table (5) it was observed that the mixing between the garlic-infused oils and essential oils of lavender has a significant effect for all bacterial strains on 1volume doses infused with essential oils 2volume report and oils 1huiles same answer when the volume infused and 3 volumes of essential oils are used. This phenomenon of response based on the complementary action of active agents present in the oils of two different plants. Finally, the activity of an extract is probably due to synergy between the presence of a number of components, which, when separated individually become inactive. However, most of these small molecules have a low antibiotic activity compared to common antibiotics produced by bacteria and fungi.

In fact, it has been reported that essential oils from plants, not extracts, have the greatest efficacy in the treatment of infectious diseases [7]. In fact, essential oils have the advantage of not generating bacterial resistance of the contents in a wide range of bioactive compounds [8]. Several studies have also reported that aqueous extracts of different plants show no antibacterial activity, while the organic extracts and essential oils from these plants very significantly inhibit the growth of the strains tested. [9] According to [10] water-soluble substances exert compared to water-insoluble substances weaker effect. This probably relates to the ability of soluble molecules intercalate into membranes of bacterial cells and damage.

Conclusion

The search for new antimicrobial substances is purely natural capital concern of most people and researchers today. For this evaluation of the antibacterial activity of infused, or two herbs macerated garlic oil and lavender, is made with both methods having no linear relationship. This feature was found after the tests, but other studies mention that [11, 12]. This study allowed us to confirm the antibacterial effects of two plants studied in this work by certain pathogens, but it would be interesting to test on a larger pathogens human range.

References

- [1]-Lori Lyons, Devan Nambiar.2005. Un guide pratique des plantes médicinales, *Réseau canadien d'infotraitements sida (CATIE)*
- [2] -Anonyme.2010. L'ail, une plante aux multiples vertus, Filière Nutrition et diététique, *HEDS Haute école de santé Genève*
- [3]-Xavier Gruffat, pharmacien. (2009). Ail – Ail blanc, plant médicinales. *Créapharma, La réponse à toutes vos questions de santé*. [web] Accès: <http://www.creapharma.ch/ail.htm>
- [4]- Jean-Michel Hurtel (2001).L'ail allium savitum. *Plantes et médecine*. [web] Accès : <http://www.phytomania.com/ail.htm>
- [5]- Bodo. S.année universitaire 2008-2009. Lavande officinale *Lavandula angustifolia*, Faculté libre des Sciences et Technologie.
- [6]- Bruneton J (1999) Pharmacognosie, phytochimie, plantes médicinales. Techniques et Documentations Lavoisier.
- [7]- Rios J L and Recio M C (2005). Medicinal plants and antimicrobial activity. *Journal of Ethnopharmacology*, **100**, 80-84.
- [8]- Maggi F, Bramucci M, Cecchini C, Coman M M, Cresci A, Cristalli G, Lupidi G, Papa F, Quassinti L, Sagratini G and Vittori S (2009). Composition and biological activity of essential oil of *Achillea ligustica* All. (Asteraceae) naturalized in central Italy: Ideal candidate for anti-cariogenic formulations. *Fitoterapia*, **80**, 313-319.
- [9]- Candan F, Unlu M, Tepe B, Daferera D, Polissiou M, Sökmen A and Akpulat H A (2003). Antioxidant and antimicrobial activity of the essential oil and methanol extracts of *Achillea millefolium* subsp. *millefolium* Afan. (Asteraceae). *Journal of Ethnopharmacology*, **87**, 215-220.
- [10]- Fernandez-Lopez J, Zhi N, Aleson-Carbonell L, Perez-Alvarez J A and Kuri V (2005). Antioxidant and antibacterial activities of natural extracts: application in beef meatballs. *Meat Science*, **69**, 371-380.
- [11]- Albano S M and Miguel M G (2010). Biological activities of extracts of plants grown in Portugal. *Industrial Crops and Products*, 1-6.
- [12]- Bouzid W, Yahia M, Abdeddaim M, Aberkane M C et Ayachi A (2011). Evaluation de l'activité antioxydante et antimicrobienne des extraits de *L'Aubepine Monogyne*. *Lebanese Science Journal*, **12** (1), 59-69.
- [13]- Sarker S D, Latif Z and Gray A I (2005). Natural Product Isolation. *In*: Sarker S D, Latif Z and Gray A I. Natural products isolation. Humana Press (Totowa), pp: 1-23.