

# STUDY OF ANTIFUNGAL ACTIVITY OF DIFFERENT TYPE OF FUSARIUM IN PELARGONIUM GRAVEOLENS AND MENTHA PULEGIUM

<sup>1</sup>M. MEHANI, <sup>2</sup>C. MORCIA, <sup>3</sup>V. TERZI

<sup>1</sup>Faculty of Natural Sciences and Life, University Ghardaia, Ghardaia 47000 (Algeria) and Univ Ouargla, Fac. of Applied Sciences, Dept. Process Engineering, 30000 Ouargla (Algeria)

<sup>2</sup>CONSIGLIO PER LA RICERCA E LA SPERIMENTAZIONE IN AGRICOLTURA, CRA-GPG, Genomics Research Centre, Via San Protaso 302, 29017-Fiorenzuola d'Arda (PC), Italy

**Abstract-** Essential oils have many therapeutic properties. In herbal medicine, they are used for their antiseptic properties against infectious diseases of fungal origin, against dermatophytes, those of bacterial origin. The aim of our study is to determine the antifungal effect of essential oils of two *Pelargonium graveolens* and *Mentha pulegium* on some pathogenic fungic. It is a medicinal plant used in traditional therapy. Essential oils have many therapeutic properties. In herbal medicine, they are used for their antiseptic properties against infectious diseases of fungal origin, against dermatophytes, those of bacterial origin. Humans use plants for thousands of years to treat various ailments, in many developing countries; much of the population relies on traditional doctors and their collections of medicinal plants to cure them. The test adopted, is based on the diffusion method on solid medium (Antibiogram), this method allows to determine the susceptibility or resistance of an organism according to the sample studied. Our study reveals that the essential oil of the plants *Pelargonium graveolens* and *Mentha pulegium* have a different effect on the resistance of germs.

**Keywords-** Essential oil, fungal, antibiogram, *Pelargonium graveolens* and *Mentha pulegium*

## I. INTRODUCTION

Throughout history, the plant kingdom has provided the essential human resources to its feeding, hygiene and health. Since ancient times, the fragrances of these same plants are associated with mystic rites, artistic and aesthetic. For this, the return to nature has become indispensable and it must follow certain conditions for its use in the wide world of anti-infectives, which expands from one day to another with the most powerful substances, more toxic and more expensive. The main requirement for this revival is a rigorous and rational scientific study of the antimicrobial activity of various natural extracts.

A large number of plants (aromatic, medicinal plants, spices and others) have very interesting biological properties that are different fields of applications, namely medicine, pharmacy, cosmetics and agriculture [1].

The bacteria belonging to the wide range of microorganisms also include viruses, fungi and parasites. Bacterial pathogens for humans are at the origin of many infectious diseases [2].

The antibiotics consider the almost universal solution to serious infections, but drug efficacy is decreases. Bacteria and viruses have gradually adapted to resist medications and their increasingly [3].

The MAP are plants that have grown or have picks in his natural environment for its medicinal and had an infinite variety of jobs, to report the therapeutic area, food, cosmetics, industrial, etc.. Herbs can play an important role in conserving biodiversity. These plants are actually very familiar to rural people who are very sensitive to their scarcity and their disappearance. Indeed, medicinal plants play an

important role of health care population and represent a significant source of income for many families in the countryside and cities [4].

Our research aims to study the biological activity of extracts of two medicinal and aromatic plants (*Pelargonium graveolens* and *Mentha pulegium*) chosen for therapeutic characteristics in traditional medicine.

## II. WORK METHODOLOGY

### Plant Material

The plant material consists of the aerial parts of two plants *Pelargonium graveolens* and *Mentha pulegium* of the Ghardaia region, harvesting of *Pelargonium graveolens* was conducted in the month of December 2013 in the region of Mansora wilaya of Ghardaia. In against *Mentha pulegium* was harvested in the Sabsabe area which was conducted in February 2014. The plant material was dried in the shade, away from humidity and ambient temperature.

### *Pelargonium graveolens*

Rose-scented geranium (*Pelargonium graveolens* L'Hér.) is widely known as one of the medicinal herbs with the highest antioxidant activity. Essential oils are a folk medicine and recently their use has expanded worldwide to include therapy against various kinds of inflammatory diseases. A great number of new drugs discovered in the last few decades are originate from natural sources [14]. Natural products have been increasingly used for the prevention and treatment of various conditions [15,16]. Geranium essential oil has historically been used in the treatment of dysentery, hemorrhoids, inflammation, heavy menstrual flows and even cancer [17]. The French medicinal community currently

treats diabetes, diarrhoea, gallbladder problems, gastric ulcers, liver problems, sterility and urinary stones with this oil [18,19].

### **Mentha pulegium L.**

*Mentha pulegium* L. is a herbaceous perennial that belongs to the Lamiaceae family, commonly known as pennyroyal/European pennyroyal, native to North Africa, Europe, Asia Minor and the Middle East [20]. It grows wild in humid areas of the plains and mountains. In Algeria, *M. pulegium* L. is known as the Arabic name "Fliyou". It is among the top five national mints and most widely used and commercialized [21]. The genus *Mentha* includes 25–30 species that grow in the temperate regions of Eurasia, Australia and South Africa. The mint species have a great importance, both medicinal and commercial. Indeed, leaves, flowers and stems of *Mentha* spp. are frequently used in herbal teas or as additives in commercial spice mixtures for many foods to offer aroma and flavour. In addition, *Mentha* spp. has been used as a folk remedy for treatment of nausea, bronchitis, flatulence, anorexia, ulcerative colitis, and liver complaints due to its anti-inflammatory, carminative, antiemetic, diaphoretic, antispasmodic, analgesic, stimulant, emmenagogue, and anticatharrhal activities [22].

### **Extraction of essential oils by hydrodistillation**

The hydrodistillation of *Schinus molle* (leaves dry) is performed using a Clevenger-type device (1928) [10]. The setup used is shown in Figure 1.



Fig.1 Installation of hydrodistillation (Clevenger apparatus) - [10]

The extraction procedure comes down to boil a quantity of 100 g of dry plant for 2 h with water in a 1 liter flask (Fig. 1). The distillation was carried out with a recycling cohobage commonly known as described in the Ph.Eur [11].

The essential oil yield was determined from fresh plant material [12], are defined as follows:

$$\text{RHE a} = \text{HE mass} / \text{Mass dry plant material}$$

### **Study of the Antifungal Activity of Essential Oil**

For the realization of the antifungal activity was adopted method of direct contact. To prepare the different concentrations were taken different concentrations of essential oil of *Pelargonium graveolens* and *Mentha pulegium* (50, 10, 5, 2.5, 1.25,  $\mu\text{l}$ ) and adjust to 20 ml PDA then stirred for 5 minutes to homogenize the medium PDA with essential oil.

## **III. RESULTS AND DISCUSSION**

### **1. Antifungal activity of *Pelargonium graveolens* and *Mentha pulegium***

Antifungal activity is revealed by the absence or presence of mycelial growth. The results of antifungal activity diameter of the essential oil of two medicinal plants that are *Pelargonium graveolens* and *Mentha pulegium* are presented in the following graphs. Graphs N° 1 and 2 show mycelial growth (mm) of *Fusarium sporotrichioides* according to incubation time and the concentration of essential oil of *Pelargonium graveolens* and *Mentha pulegium*.

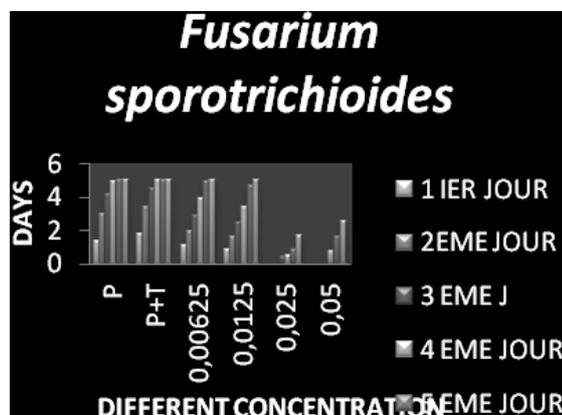


Fig. 02 : Antifungal Activity of *Fusarium sporotrichioides* of *Pelargonium graveolens*.

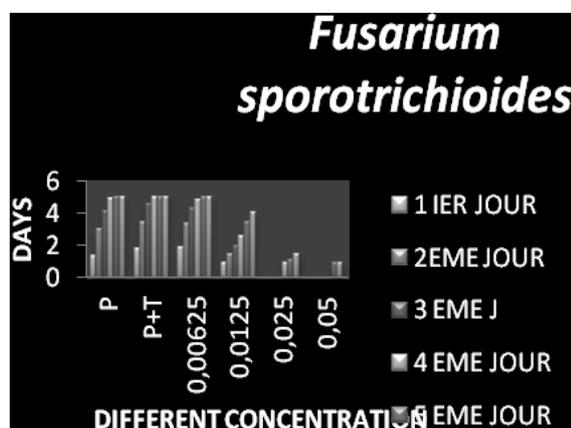


Fig. 03 : Antifungal Activity of *Fusarium sporotrichioides* of *Mentha pulegium*

With different concentrations of essential oil extracted from pelargonium graveolens and Mentha pulegium, we observe that mycelial growth of *Fusarium sporotrichioides* is remarkable after 72 hours for the control and different concentrations of essential oil of pelargonium graveolens and Mentha pulegium namely 0.0125, 0.025 and 0,05 $\mu$ l.

2. Antifungal activity of *Fusarium graminearum* in Pelargonium graveolens and Mentha pulegium

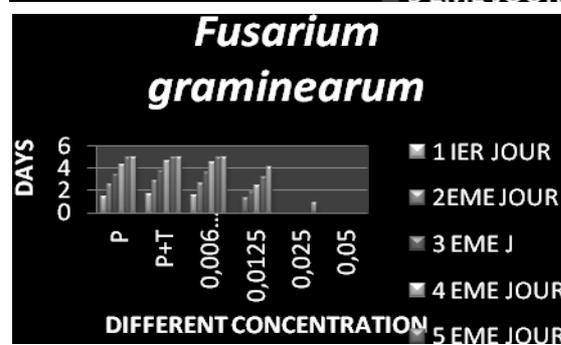
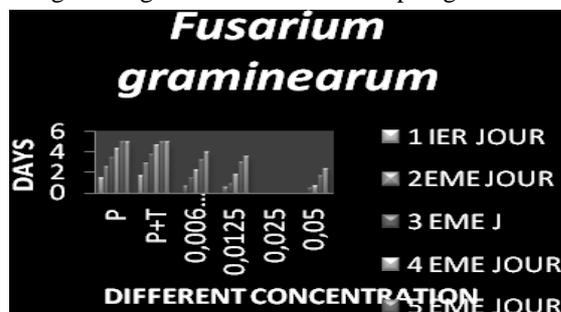


Fig. 05 : Antifungal Activity of *graminearum* of Pelargonium graveolens

Fig. 06 : Antifungal Activity of *Fusarium graminearum* of Mentha pulegium

According to the graph N 04, 05 and 06 which represent the antifonguique activity of *Fusarium graminearum* depending on the incubation time and the concentration of essential oil of Artemisia herba-alba, Pelargonium graveolens and Mentha pulegium one notices that there is an increase of mycelial growth with the incubation time with the exception concentration 0.025  $\mu$ l / 20 ml of PDA that it presents no mycelial growth of *Fusarium graminearum*.

3. Antifungal activity of *Fusarium langsethiae* in Pelargonium graveolens and Mentha pulegium

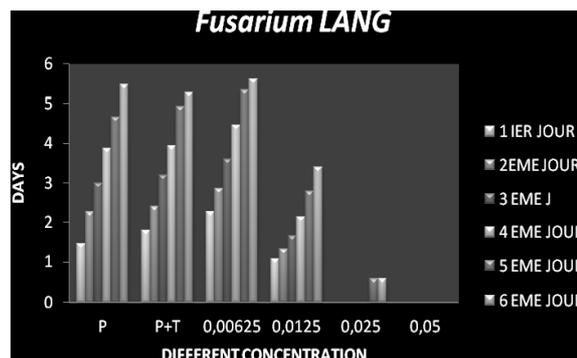
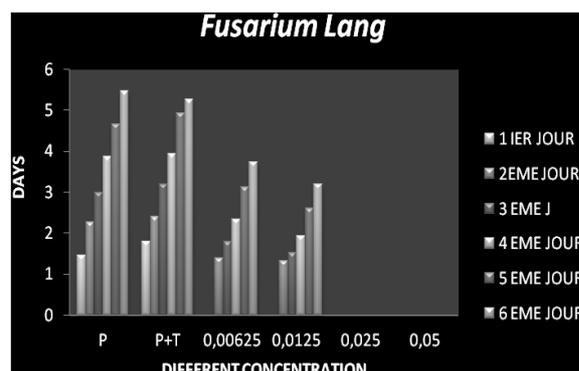


Fig. 08 : Antifungal Activity of *Fusarium langsethiae* of Pelargonium graveol langsethiae of Mentha pulegium

With different concentrations of essential oil extracted from pelargonium graveolens and Mentha pulegium, we observe that mycelial growth is remarkable after 72 hours for the control and the different essential oil concentrations in two plants 0 0062 and 0.0125  $\mu$ l by cons 0.025 and 0.05  $\mu$ l we observed no mycelial growth of *Fusarium langsethiae* in both plants Mentha pulegium and pelargonium graveolens.

## CONCLUSION

All of these results are only a first step in the search of substance biologically active natural source. Additional tests are required and must be able to confirm the performance highlighted, for it would be interesting also to further phytochemical and biological investigations on these plants including the purification of the extracts obtained in order to isolate the molecules responsible for the antifungal activities, which will expand the therapeutic arsenal of herbal plants. In Focus, for improved further research active molecules spontaneous plants of this study, it is desirable to: Protect plants against the disappearance. The use of volatile formulations of aromatic and medicinal plants can have many advantages over existing products syntheses. Substances of vegetable origin are valuable sources of active material. These products of natural origin can play a very important role in control programs against fungic in the future. This study once again allows the development of the operation of the essential oil in the fields, pharmaceutical and cosmetics and as a preservative in the field of food industry. These preliminary results may be supplemented by other more detailed study (antioxidant is testing, performance testing on other bacterial strains, etc.).

## REFERENCE BIBLIOGRAPHIC

- [1] Ahmed, A.A., Abou El-Ela, M., Jakupovic, J., Seif El-Din, A.A., Sabri, N. Phytochemistry (1990), 29, 3661–3663.
- [2] Benjumea, D., Abdala, S., Hernandez-Luis, F., Pe´rez-Paz, P., Martin-Herrera, D. J.Ethnopharmacol. (2005), 100, 205–209.
- [3] Darias, V., Bravo, L., Barqui´n, E., Marti´n-Herrera, D., Fraile, C. J. Ethnopharmacol.(1986), 15, 169–193.

- [4] Dhingra, V., Rao, K.V., Narasu, L. Life Sci. (2000), 66, 279–300. [5] El-Massry, K.F., El-Ghorab, A.H., Farouk, A. Food Chem. (2002), 79, 331–336.
- [6] Heywood, V.H., Humphries, C.J., 1977. Anthemideae – systematic review. In: Heywood, V.H., Harborne, J.B., Turner, B.L. (Eds.), *The Biology and Chemistry of the Compositae*, vol. 2. Academic Press, London/ New York/San Francisco, pp. 851–898.
- [30] Kim, J.H., Kim, H.-K., Jeon, S.B., Son, K.-H., Kim, E.H., Kang, S.K., Sung, N.D., Kwon, B.-M. Tetrahedron Lett. (2002), 43, 6205–6208.
- [8] Kim, K.S., Lee, S., Lee, Y.S., Jung, S.H., Park, Y., Shin, K.H., Kim, B.-K. J. Ethnopharmacol. (2003), 85, 69–72.
- [9] Kordali, S., Kotan, R., Mavi, A., Cakir, A., Ala, A., Yildirim, A. J. Agric. Food. Chem. (2005), 53, 9452–9458.
- [10] Ribnicky, D.M., Poulev, A., Watford, M., Cefalu, W.T., Raskin, I. phymed. (2005).
- [11] Setzer, W.N., Vogler, B., Schmidt, J.M., Leahy, J.G., Rives, R. Fitoterapia (2004), 75, 192–200.
- [12] Tan, R.X., Zheng, W.F., Tang, H.Q. Planta Med. (1998), 64, 295–302.
- [13] Nabli M. A., Essai de synthèse sur la végétation et la phyto-écologie tunisiennes, tome I. Ed. MAB 1989 (Faculté des sciences de Tunis) ; 186-188 p.
- [14] Newman DJ, Cragg GM: Natural products as sources of new drugs over the last 25 years. J Nat Prod 2007, 70:477.
- [15] Thomas KJ, Nicholl JP, Coleman P: Complement. Ther Med 2001, 9:2.
- [16] Mainardi T, Kapoor S, Bielory L: Complementary and alternative medicine: herbs, phytochemicals and vitamins and their immunologic effects. J Allergy Clin Immunol 2009, 123:294.
- [17] Kang HY, Na SS, Kim YK: Effects of oral care with essential oil on improvement in oral health status of hospice patients. J Korean Acad Nurs 2010, 40(4):473-481.
- [18] Amabeoku GJ M: Antidiarrhoeal activity of *Geranium incanum* Burm of(Geraniaceae) leaf aqueous extract in mice. J Ethnopharmacol 2009, 123(Issue 1, 4):190-193.
- [19] Elmann A, Mordechay S, Rindner M, Ravid U: Anti-neuroinflammatory effects of geranium oil in microglial cells. Journal of Functional Foods 2010, 2(1):17-22
- [20] A. Zargari, Herbal Medicines. 1st Edt, Publication of Tehran University, Tehran. 1990. 14-18.
- [21] A. El Fadl, and N. Chtaina, Etude de base sur la culture de la menthe du Maroc. Programme Régional de lutte intégrée contre les organismes nuisibles (Integrated Pest Management) au Proche Orient. 2010, Report, Office National de sécurité sanitaire des produits alimentaires (ONSSA).
- [22] H. Hadjlaoui, T. Najla, N. Emira, S. Mejdj, F. Hanen, K. Riadh, B. Amina, World J.Biotechnol. Microbiol. 2009, 25, 2227–2238.

★ ★ ★