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A Study on Chemical and Antibacterial activity of Plant Essential Oil against Gram Positive Bacteria

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Abstract

In nature large number of plant species are present among them several plant species possess essential oil which is very useful in various way. Plant essential oils are commonly used as a conventional source in several industries and show good antimicrobial property, these plant essential oils are also used as flavoring agent, essence, perfumes, dyes and paint industries and most importantly in the field of medical science. These essential oils derive their antibacterial effect from their individual chemical composition. Each single, pure essential oil consists of several chemicals and many of these have antimicrobial activities, and show synergistic effects. There are various essential oils acquires antibacterial, antifungal, insecticidal and antioxidant properties apart from these properties a number of essential oils were also being used in aromatherapy ,food preservation and fragrance industries and because of their numerous properties. There has been an enlarged concern on antimicrobial properties of extracts of various plants contains essential oils. Hence to analyse the antibacterial activity of essential oils from various plant species like Cinnamomum zeylanicum, Abutilon Indicum, Bothriochloa Pertusa and Mentha Spicata they are studied/treated against Gram Positive bacteria and it was found that they will show commendable activity against Staphylococcus Aureus and Bacillus Subtilis.

Keywords: Antioxidant, antibacterial, essential oils, aromatic plants, gram positive bacteria.

Introduction

Plant essential oils having pleasant and distinctive smell they are aromatic, volatile liquid which is extracted from various parts of plants species. These are the essential, Protective, nutritive fluids of the plant. The extract which is obtained from the plants is an existing liquid which is 55 to 75 times stronger than herbs commonly known as oil. Because of their compact size plant essential oils were simply passing through cell membranes, including the blood or brain as a barrier. Not a long ago it was observe that various plant species have gained a special attention because of their antimicrobial activity which increase resistance to antibiotics acquired by some micro organisms[1-3].

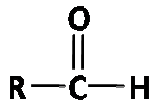
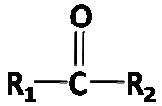
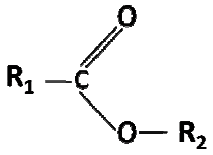
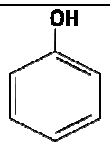
Those plants which having natural antimicrobial property they are not only used as food preservative but they may resist against several other diseases which may generated due to microbial activity hence in this case essential oils plays an important role to cure them against microorganisms. Several plant species and their herbs are extracted which are used against microorganisms and for this purpose their structural constitution, composition and functional groups of the oils play an important role to regulate their antimicrobial activity. The main component of essential oils contain several chemical functional groups[4] like phenols, ethers, carbohydrates, aldehydes, alcohols, and ketones all these are accountable for biological activity of numerous plants which is shown in the table. Due to these properties, it was also found that during ancient time numerous number of plant spices has been used as flavoring agents and preservatives in food. Because of great importance of essential oils they are used against various diseases as antibacterial agents, hence in our present study to confirm antibacterial activity of plant essential oils like *Cinnamomum zeylanicum*[5], *Bothriochloa Pertusa, Mentha Spicata*[6] and *Abutilon Indicum*[7] they are treated against Gram Positive bacteria[8] i.e. *Staphylococcus Aureus* and *Bacillus Subtilis.*

Material and Methods

Essential oils of these plants were obtained by steam distillation of plants. Steam distillation is the process with the help of which essential oils are converted in the form of vapor and then condenses the vapor back into a liquid. These essential oils are purified by distillation under reduced pressure. To inspect inhibitory effect of these essential oils they were treated against *Staphylococcus Aureus* and *Bacillus Subtilis* with the help of agar[9] diffusion method.

The agar diffusion technique was followed by using special microbial filter paper with agar used as a medium. The experiment was performed in set of three, an average diameter of zone of inhibition was registered, and all the bacteria were grown on nutrient agar the results are shown in the table.

Table-1
Chemical Compounds and their properties

Compound	Functional Group	Properties
Aldehyde		Spasmodic, Sedative, Antiviral, Antibacterial
Ketones		Mucolitic, antibacterial , neurotoxic,
Ester		Spasmodic, Sedative, Antifungal, Antibacterial
Ether		Expectorant, Stimulant
Phenolic Ether		Diuretic, Expectorant, Carminative, Antibacterial
Phenol		Antimicrobial, Antibacterial, Stimulant
HydroCarbons	Only contain C and H	Antimicrobial, Antibacterial, Stimulant
Alcohol	R – OH	Antimicrobial, antiseptic, spasmodic

Results and Discussion

From the last few decades it was found that some chemical [10] groups are present in essential oils which are capable of much antibacterial activity[11] which is safe and effective against various antimicrobial[12] agents and which can be treated with a wide variety of bacterial infections. Many Plants have been used for this purposes and it is necessary to investigate some plants which has been remarkably used in medical treatment or antimicrobial activity. Our study showed that various chemical and functional groups are present in essential oils which inhibited bacterial growth against *Staphylococcus Aureus* and *Bacillus Subtilis.*

The result obtained showed that essential oil of *Cinnamomum zeylanicum*[13], *Abutilon Indicum*, *Bothriochloa Pertusa* and *Mentha Spicata plants.* Out of 4 essential oils tested, all oils showed antibacterial activity against bacteria out of which two plant species i.e. Bothriochloa Pertusa and Mentha Spicata will show significant inhibitory effect against Staphylococcus Aureus and Bacillus Subtilis even at low concentration.

Table-2
Antibacterial activity of essential oil against gram positive bacteria

Essential Oils	Area of inhibition in mm	
	Staphylo-coccus Aureus	***Bacillus Subtilis***
Cinnamomum zeylanicum	11	8
Abutilon Indicum	15	9
Bothriochloa Pertusa	16	10
Mentha Spicata	22	13

Conclusion

In essential oils several chemical groups are present which showed effective antibacterial activity against various bacteria, hence our study showed that plant essential oil of *Cinnamomum zeylanicum, Abutilon Indicum*, *Bothriochloa Pertusa* and *Mentha Spicata* out of which *Bothriochloa Pertusa* and *Mentha Spicata* can be a good source of antibacterial agent and they might be utilize as natural antibiotic for the treatment of various communicable or transferable diseases which are caused by these two germs Staphylococcus Aureus and Bacillus Subtilis.

References

1. Lattaoui N. and Tantaoui Elaraki A., Individual and combined antibacterial activity of three thyme essential oils, *Rivista Italiana EPPOS*, **13** (**1994**)

2. Nychas G.J.E., Natural Antimicrobials from Plants. In New Methods of Food Preservation, Gould, G.W., *Ed. Blackie Academic Professional: London, UK*, 58-89 (**1995**)

3. Burt S., Essential oils: their antibacterial properties and potential applications in foods a review, *Int. J. Food Microbiol*, **(94)**, 223-253 (**2004)**

4. Rahman M.M., Sultana T., Ali M. and Rahman M.M., Chemical composition and antibacterial activity of the essential oil and various extracts from Cassia sophera L. against Bacillus sp. from soil, *Arabian Journal of Chemistry,* **(45)**, 1016 (**2013**)

5. Gende L.B., Floris I., Fritz R. and Guaras M.J., Antimicrobial activity of cinnamon (Cinnamomum zeylanicum) essential oil and its main components against Paenibacillus larvae from Argentine, *Bulletin of Insectology,* **(4)**, 1721-8861 (**2008)**

6. Adam K., Sivropoulu A., Kokkini S., Lanaras T. and Arsenakis M., Antifungal activities of *Origanum vulgare* subsp. *hirtum*, *Mentha spicata*, *Lavandula angustifolia* and *Salvia fruticosa* essential oils against human pathogenic fungi, *J. Agr. Food Chem,* **(46)**, 1739-1745 *(***1998)**

7. Rahuman A., Gopalakrishnan G., Venkatesan P. and Kannappan Geetha, Isolation and identification of mosquito larvicidal compound from *Abutilon indicum* (Linn.) Sweet, *Parasitology Research,* (**102**), 981-988 **(2008)**

8. Rahman M.U., Gul S. and Ejaz AO., Antimicrobial activities of *Ferula assafoetida* oil against Gram positive and Gram negative bacteria, *J Agri Env Sci*.**, (4),** 203–6 **(2008)**

9. Griffin G.S., Markham L.J. and Leach N.D., An Agar dilution method for the determination of the minimum inhibitory concentration of essential oils, *J. Ess. Oil Res,* **(12)**, 149-255 (**2000**)

10. Jayaprakasha G.K. and Rao L., Chemistry, Biogenesis, and Biological Activities of Cinnamomum zeylanicum. *Critical Reviews in Food Science and Nutrition*, **(51)**, 547-562 **(2011)**

11. Kalemba D. and Kunicka A., Antibacterial and antifungal properties of essential oils, *Curr. Med. Chem,* **(10),** 813-829 (**2003**)

12. İşcan G., Kirimer N., Kürkcüoğlu M. and Demirci F., Antimicrobial Screening of Mentha piperita Essential Oils, *J. Agric. Food Chem*, (**50),** 3943–3946 **(2002)**

13. Joshi B., Lekhak S. and Sharma A., Antibacterial Property of Different Medicinal Plants: Ocimum sanctum, Cinnamomum zeylanicum, Xanthoxylum armatum and Origanum majorana Kathmandu University, *Journal of Science, Engineering and Technology,* **(5)**, 143-150 (**2009**)