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Allelopathic effect of the oil and liquid extract of *Parthenium hysterophorus* on microorganism

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Abstract

Basically in this work study of allelopathic effect of oil and liquid extract of any weed on microorganism like *E. coli*, *Pseudomonas*, *B. subtilis*, *S. aureus*, *Parthenium hysterophorus* plant were use for the isolation of liquid and oil extraction, cause parthenium have a wide variety of medicinal and adverse effect over microorganism. Basically *P. hysterophorus* show allelopathic effect over various crops and sometime increase production rate as well as reduce the growth. It was observed that the organic solvent increased the activity of liquid extract of the potent isolates by many times. we were seen comparative effect of antibiotics, oil, liquid, Ethanol and this study is a very helpful for herbal drug formulation and antibiotics as well as vaccine formulation.

Keywords: *Parthenium hysterophorus*, liquid and oil extraction, allelopathic, antibiotics [2, 3, 4, 7].

Introduction

Weeds are the most costly category of agricultural pests, causing great yield loss and labor expense. Agricultural weeds can emerge rapidly, resulting in reduction of crop plant growth and quality by competing for nutrients and water provided to crops and producing chemicals that suppress crop growth. *Parthenium hysterophorus* is one of the best known plant invaders in the world linking allelopathy to exotic invasion. The antagonism between weeds and crops in the field of agriculture is a complex interaction which could be allelopathic effect, physical competition, or both. Allelopathy is an interference mechanism in which live or dead plant materials release chemical substances, either inhibit or stimulate the associated plant growth [1]. Several studies [2-5] have been indicating that a number of weeds have an allelopathic effects on seed germination and growth of economically important crops. The study of allelopathy is a difficult, as there is a difficulty in separating those of competition, because growth and yield may be influenced by each [6]. For example, adverse effect of plant residues on seed germination and plant growth could be the result of immobilization of large amounts of nutrients by micro-organisms involved in decomposition, by allelochemicals, or both [7]. Aqueous extracts of *Parthenium* leaf and flower inhibited seed germination and caused complete failure of seed germination of crops when the leaf extract concentration of *Parthenium* weed was increased. Again, yield decline in agricultural crops and reduction in forage production has been reported due to allelopathic effect of *Parthenium*.

Contact with this plant causes dermatitis and respiratory malfunction in humans, dermatitis in cattle and domestic animals, due to the presence of toxin *Parthenon*. Allelopathy is the biochemical interactions between all types of plants including microorganisms. Important point on allelopathy involves the addition of something to the environment, thus separated from competition, which involves removal of requirements for growth (light, water and nutrients). Allelopathic chemical release from plant as Vapour- root and leaf (through stomata), Foliar leachate, Root exudates, Break down or dead part of plant body, Seed extract.

Material and Method

The microorganism like *Escherichia coli*, *Pseudomonas aeruginosa* and *Bacillus subtilis* collected from college laboratory and *Staphylococcus aureus* from Amar pharmaceuticals Kanpur.

Plant Material

Basically fresh plant material collected from in month of January in 2018 from various roadside Kanpur regions have been preserved for the future use. Shade dried leaves were coarsely powdered and subjected to successive extraction by using Soxhlet Apparatus. The Extraction was done with the leaves for liquid extract and oil extraction.

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Procedure of Experiment

Use of liquid extract (distilled water and ethanolic extract) and oil from *Parthenium hysterophorus* leaves simultaneously use on various microorganism and see the effect of the various extract on the growth of microorganism and check the zone of inhibition due to both(extract and oil).

Formulation of Distilled Water Extract

Basically formulation of liquid extract make in distilled water, distilled water extract there is use of grounded and harvested leaves and form. 1gm extract in 1ml of water mix well in eppendroffs and quantity maintain according to use first mix well on vortex shaker after that centrifuge up to 8000rpm for 5-8 min kept tube for overnight after that it will ready for use.

Formulation of Alcoholic Extract

For making alcoholic extract firstly we crude extract of different solvents were tested *in vitro* allelopathic effect against four pathogenic bacteria used for the study were

Escherichia coli, *Pseudomonas aeruginosa*, *Bacillus subtilis*, *Staphylococcus aureus*. For making alocholic extract we take Leaves of *Parthenium hysterophorus*. 16gm mix it with 1ml of 70% ethyl alcohol in eppendroff tube. After that eppendroff tube is on vortex shaker then centrifuge up to 12000 rpm for 10 min after centrifuge we kept eppendroff tube for drying the supernatant for 1-2 days. After that mix Tris HCl into dried mixture again mix it well through by votex shaker and form a complete alcoholic liquid extract and then we ready for use on cultured petridishes.

Oil Extraction

Basically oil can be extract through method water distillation steam and water distillation, Soxhlet extration [7].

Primary Screening Through Antibiotic Test on Pure Culture

In this section we perform disc diffusion method and press or paste the antibiotic strip on nutrient agar plates.

Table 1: Showing the disk potency of antibiotics and zone of inhibition in mm according to references [11].

Antibiotics	Disk potency	Inhibition zone diameter to nearest mm		
		Resistant	intermediate	susceptible
Ampicillin (AM)	10µg	11 or less	12-13	14 or more
Tetracycline (TM)	30µg	14 or less	15-18	19 or more
Streptomycin (S)	10µg	11 or less	14-15	16 or more
Sulfisoxazole (G)	120µg	12 or less	13-16	19 or more

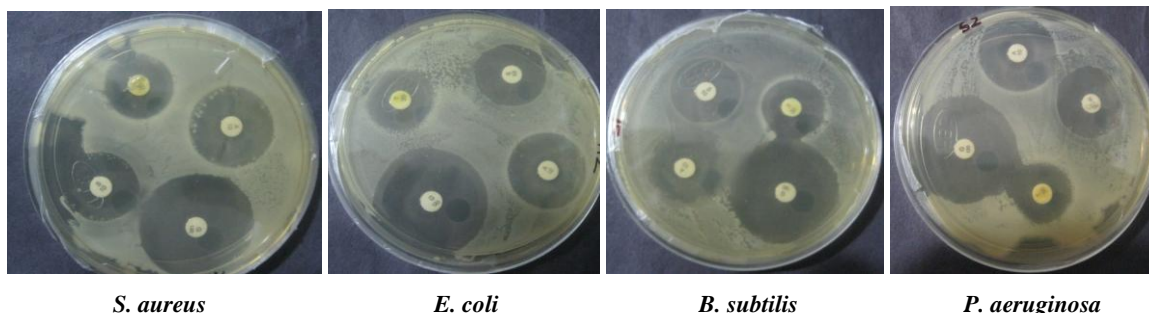


Fig 1: Shows measurements produce by antibiotic disk

Table 2: Shows measurements produces by antibiotic disk

Starins	Ampicilin	Tetracycline	Streptomycin	Sulfisoxazole
<i>E. coli</i>	32mm	25mm	25mm	23mm
<i>P. aeruginosa</i>	30mm	18mm	23mm	27mm
<i>B. subtilis</i>	22mm	18mm	27mm	26mm
<i>S. aureus</i>	30mm	29mm	24mm	25mm

Secondary Screening of Distilled Water, Ethnolic Extract and Oil on Test Microorganism

We have perform disc diffusion method or well diffusion

methods for screening of test sample like distilled water, ethanolic extract and oil of *parthenium hysterophorus* on culture plate of four microorganisms viz.

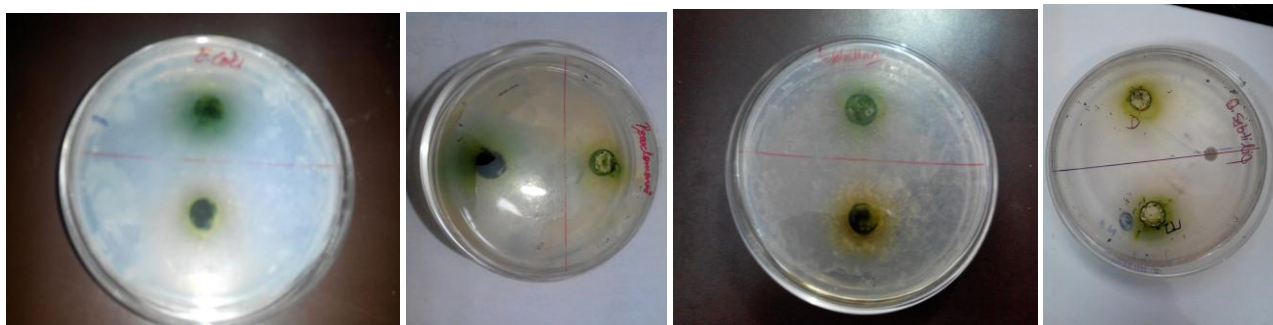
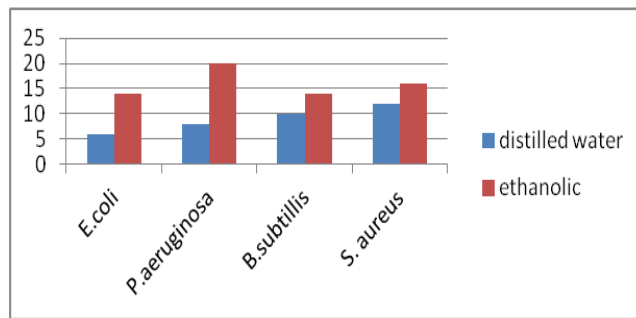


Fig 2: Distilled water and Ethanolic extract

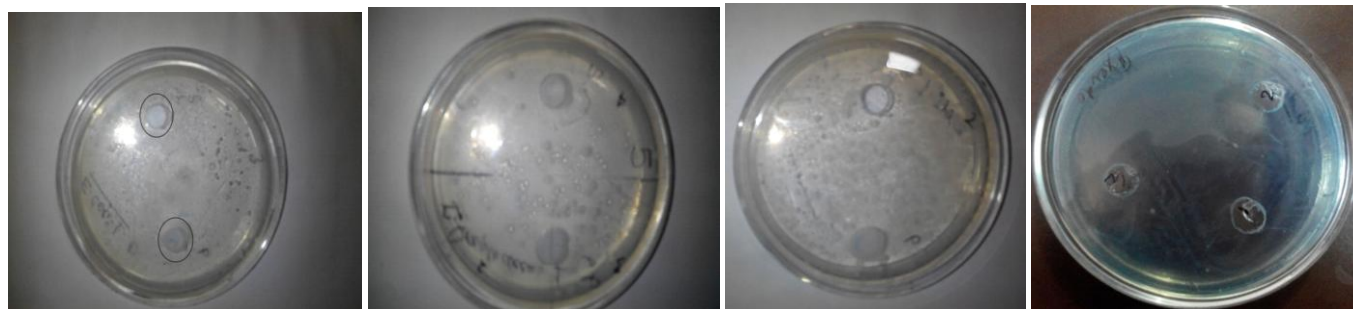
Table 3: showing the result of the antibiogram after treatment of distilled water and Ethanolic extract.

Microorganism strain	Zone of inhibition diameter in mm	
	Distilled water extract	Ethanolic extract
E. coli	6mm	14mm
P. aeruginosa	8mm	20mm
B. subtilis	10mm	14mm
S.aureus	12mm	16mm

The above table data is showing the allelopathic effect of extracts against various microorganisms. The maximum inhibition zone is of 20mm.



Effect of oil on pure culture of microorganism:



E. coli

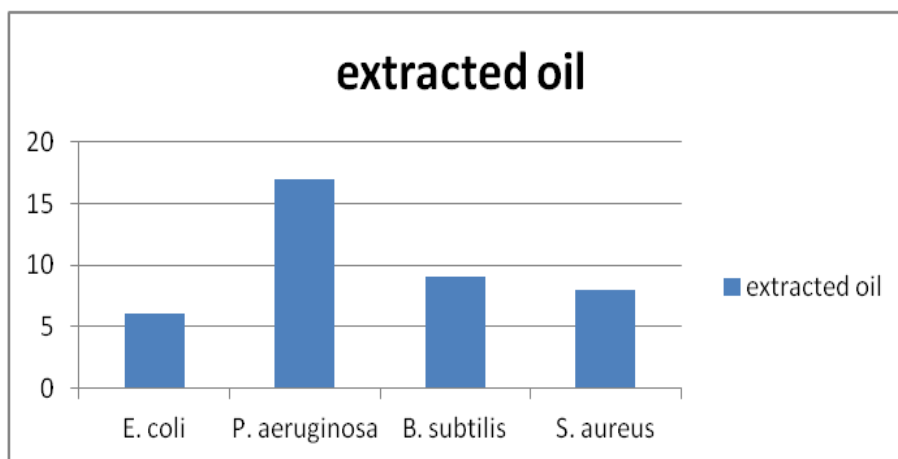
S. aureus

B. subtilis

P. aeruginosa

Fig 3: Zone of inhibition

Extarcted oil



Result and Discussion

Our project work we had seen that various type zone of inhibition that is due to allelochemicals effect and there

potency against the microorganism/pathogens the comparative analysis shows following result:

Comparative Analysis of zone of inhibition

Microorganism strains	Zone of inhibition in mm against antibiotics and various extracts				
	Antibiotics		Distilled water extract	Ethanolic extract	Oil
	Ampicilin	Tetracyclin			
E.coli	32mm	25mm	6mm	14mm	6mm
P. aeruginosa	30mm	18mm	8mm	20mm	17mm
B. subtilis	22mm	18mm	10mm	14mm	9mm
S. aureus	30mm	19mm	12mm	16mm	8mm

Discussion

Result of our work shows that weed has inherent ability to induce allelopathic effect on growth of microorganism and similar effect shows on various plant and seed germination were reported by other authors, in present study shows that the *Parthenium hysterothorus* shows better inhibitory effect in ethanolic extract in comparasion with distilled water extract

and oil which were less effective on the basis of data obtained in the present investigation, conclusion may be drawn that the ethanolic extract of *Parthenium hysterothorus* can be used as novel bacteriacidal against *Pseudomonas aeruginosa* but for large scale bioactive component identification is important.

Conclusion

This study shows the allelopathic effect and antimicrobial actions and medicinal potentials of the aqueous and ethanolic extracts of the leaves of *Parthenium hysterophorus*. This approach to the management of these plant or weed this weed can be economic viable if adopt. Finally, our study gives a broad idea about new vaccines and herbal drug formulation through this plant. The extract made from the leaves of young *parthenium* plants had the strongest overall inhibitory effects on the growth of microorganism. Based on these results it can be deduced that the allelochemicals are released from the *Parthenium* plants through leaching from leaves also in nature. This is further supported by the fact that the *Parthenium* roots and stems did not have significant inhibitory effects so I had not use stem and root extracts. I can assume that the osmotic differences were not great enough to cause any significant effects, and thus I feel that there is no need to consider them. However if greater accuracy was required, it would have been essential to consider the osmotic factors as well.

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