



RESEARCH ARTICLE

MICROBIOLOGY

## A COMPARATIVE STUDY ON ANTIBACTERIAL ACTIVITY OF COMMON WEEDS

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### ABSTRACT

In this study a comparison on antibacterial potency of common weeds i.e. *Antigonon leptopus*, *Croton sparsiflorus* and *Lantana camara* were conducted. Antibacterial efficacy on the microorganisms, *Bacillus subtilis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* were investigated. For this purpose, the leaf extracts of the plants were prepared using Acetone, Chloroform, Hexane and Methanol. The prepared extracts were analyzed for its bio-efficacy through Disc diffusion method. Among the solvent studied, Methanolic extract alone given positive results. The Hexane and Chloroform extract of all the three plants showed poor response in resisting bacterial growth. Among the plant studied, methanolic extract of *Lantana camara* possess greater activity than *Croton sparsiflorus* and *Antiaonon leptopus*.



## KEYWORDS

Antibacterial efficacy, *Antigonon leptopus*, *Croton sparsiflorus*, *Lantana camara*, Weeds.

## INTRODUCTION

A weed is commonly defined as a plant that grow out of place and is competitive, persistent and pernicious (James, *et al.*, 1991). Weeds have been a part of civilization and many ancient documents speak of humans battling weeds in the crops they grow. Weeds are also found to be resistant to most of the microbial disease when compared to the crops which shows disease symptoms. The resistance nature and their sustenance towards the microbial disease made us to have an interest to know the potency behind. Hence, the present study is conducted to screen the antibacterial potency of common weeds.

A major part of total population in developing countries till uses folklore medicine obtained from plant resources (Fabricant and Farnsworth, 2001). Biologically active compounds present in plants have always been of great interest. In recent years interest to evaluate plants possessing antibacterial activity for various microbes is growing. This develops more interest as resistance to new antibiotics by microorganisms has increased. In this context, to explore the antibacterial potency unexplored plants, it has been planned to study the antibacterial activity of the selected weeds (*Antigonon leptopus*, *Croton sparsiflorus* and *Lantana camara*).

The weed, *Antigonon leptopus* belonging to family Polygonaceae is native to Mexico and commonly found in tropical Asia, Africa, Caribbean and Americas (Raju *et al.*, 2001). The plant is traditionally used for prevention and treatment of cough and flu related pain. *Lantana camara* belonging to family Verbenaceae is one of the major weed infesting several parts of India. The oil extract of the plant is used for the treatment of various human diseases like skin itches, leprosy, cancer, chicken pox, rheumatism

etc., (Ghisalberti, 2000). *Croton sparsiflorus* belonging to family Euphorbiaceae is found to spread over the waste lands of Southern India. Although many studies are available on the other species of *Croton* there was no study available on the species *C. sparsiflorus*. The selected weeds are not fed by cattle hence; it is available in plenty by hindering the growth of other valuable plants. For the present study, it has been proposed to select three common weeds belonging to three different families.

## MATERIALS AND METHODS

### (i) Source of Plant Materials:

The leaves of *Antigonon leptopus*, *Croton sparsiflorus* and *Lantana camara* were collected from barren lands of Chennai in Tamil Nadu. The leaves collected were inspected for their pathogenic infections. Healthy materials were selected after examining the leaves carefully. The leaves were washed in running tap water for removing the surface contaminants. The washed materials were dried at room temperature for two to three days under shade. After drying the materials were powdered using Electric blender.

### (ii) Source of Microorganisms:

Microbial cultures of *Bacillus subtilis* (MTCC121), *Escherichia coli* (MTCC443), *Klebsiella pneumoniae* (MTCC1320) *Pseudomonas aeruginosa* (MTCC1934) and *Staphylococcus aureus* (MTCC96) were obtained from Microbial Type Culture Collection and Gene Bank, Chandigarh, India.

### (iii) Preparation of Plant Extract:

The extracts were prepared using Soxhlet apparatus. Around 15 grams of each



powder made into three bags containing 5 grams each were used in Soxhlet for extract. Around 150ml of Acetone, Chloroform, Hexane and Methanol were used. The plant extracts were filtered through Whatmann No.1 filter paper and concentrated using rotary evaporator. The evaporated extracts were stored in refrigerator for further use. The stored product was reconstituted again using respective solvents for required concentration. The pooled extracts were reconstituted and extracts were loaded into sterile readymade discs (Himedia, Bombay) in different volumes of 15  $\mu$ l, 20  $\mu$ l and 25  $\mu$ l / disc respectively and allowed to dry for 24 hours at room temperature.

#### (iv) Kirby-Bauer's Disc diffusion method

Mueller Hinton agar plates were spread with 100  $\mu$ l of actively growing broth cultures of the respective bacteria and are allowed to dry for 10 minutes. The sterile readymade discs loaded with each extract individually (15  $\mu$ l/disc, 20  $\mu$ l/disc and 25  $\mu$ l/disc) were imposed on the inoculated plates. The plates were then incubated at 37°C for 36 hours. The development of the inhibition zone around the extract loaded disc was recorded. Sterile disc with respective solvent of 25  $\mu$ l was used as negative control and Streptomycin at 10mg/disc was used as positive control.

## RESULTS

The Acetone and Methanolic extracts of the plant, *Antigonon leptopus* have shown some efficacy against the microbes studied. However, the Chloroform and Hexane extracts of the plant showed no activity against any of the bacteria

studied. Between Acetone and Methanolic extracts of the plant, methanolic extract showed better activity against the microbes. Among the bacteria studied, *Escherichia coli*, *Staphylococcus aureus* and *Klebsiella pneumoniae* showed higher response for the methanolic extract of *Antigonon leptopus*.

The plant extract of different solvents of *Croton sparsiflorus* showed activity against all organisms tested except hexane extract showing no activity to any of the bacteria studied. Except methanol extract for the plant *Croton sparsiflorus* all other extracts showed very mild zone of inhibition against the bacteria tested. The bacteria *Klebsiella pneumoniae* and *Staphylococcus aureus* showed no inhibitory zone against any of the extract except methanol. Maximum zone of inhibition was recorded for the methanolic extract of the plant against the bacteria *Bacillus subtilis* and *Staphylococcus aureus*.

The plant extract of different solvents of *Lantana camara* showed activity against all organisms tested except chloroform and hexane showing no activity against any of the bacteria studied. When compared to Acetone extract of the plant, methanolic extract for the plant *Lantana camara* showed higher zone of inhibition against all the bacteria tested. Maximum zone of inhibition was recorded for the methanolic extract of the plant against the bacteria *Escherichia coli*. The zone of inhibition recorded for each bacteria against respective weeds for different solvents is presented in TableNo.1.

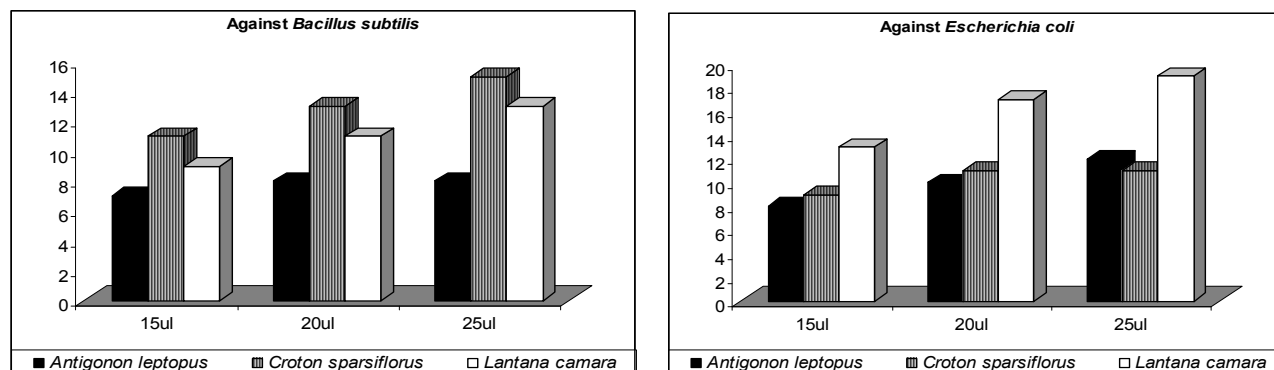
**Table 1**  
**Zone of inhibition recorded (mm in Diameter) for different solvent extracts of Common weeds**

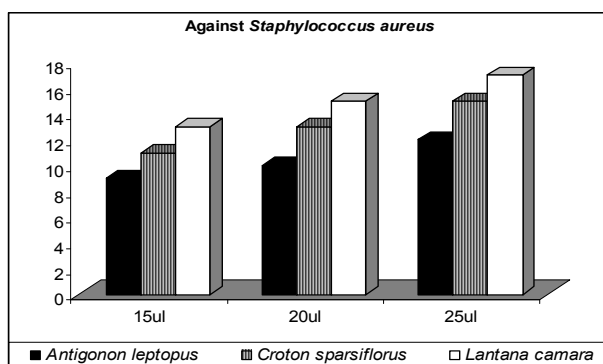
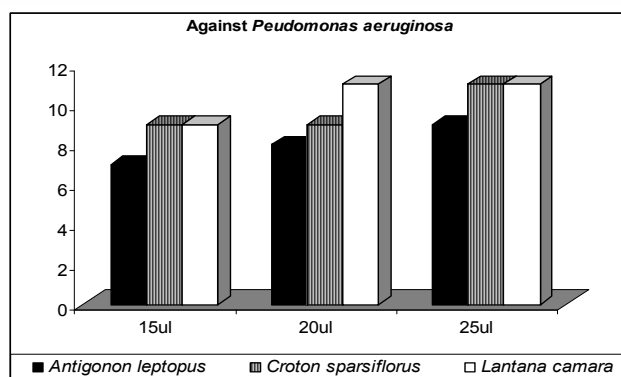
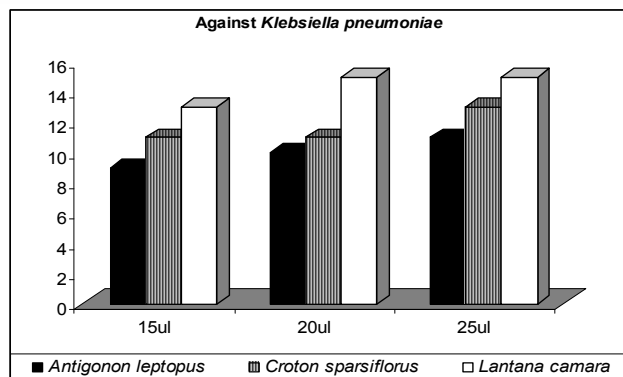
S. No.	Species	Acetone			Chloroform			Hexane			Methanol		
		15µl	20µl	25µl	15µl	20µl	25µl	15µl	20µl	25µl	15µl	20µl	25µl
<b>Antigonon leptopus</b>													
1	<i>Bacillus subtilis</i>	-	7	7	-	-	-	-	-	-	7	8	8
2	<i>Escherichia coli</i>	7	7	9	-	-	-	-	-	-	8	10	12
3	<i>Klebsiella pneumoniae</i>	7	9	11	-	-	-	-	-	-	9	10	11
4	<i>Pseudomonas aeruginosa</i>	7	7	9	-	-	-	-	-	-	7	8	9
5	<i>Staphylococcus aureus</i>	7	7	8	-	-	-	-	-	-	9	10	12
<b>Croton sparsiflorus</b>													
1	<i>Bacillus subtilis</i>	-	7	9	-	7	7	-	-	-	11	13	15
2	<i>Escherichia coli</i>	-	-	7	-	-	7	-	-	-	9	11	11
3	<i>Klebsiella pneumoniae</i>	-	-	-	-	-	-	-	-	-	11	11	13
4	<i>Pseudomonas aeruginosa</i>	-	7	9	-	7	9	-	-	-	9	9	11
5	<i>Staphylococcus aureus</i>	-	-	-	-	-	-	-	-	-	11	13	15
<b>Lantana camara</b>													
1	<i>Bacillus subtilis</i>	7	9	9	-	-	-	-	-	-	9	11	13
2	<i>Escherichia coli</i>	7	9	11	-	-	-	-	-	-	13	17	19
3	<i>Klebsiella pneumoniae</i>	9	13	15	-	-	-	-	-	-	13	15	15
4	<i>Pseudomonas aeruginosa</i>	7	9	9	-	-	-	-	-	-	9	11	11
5	<i>Staphylococcus aureus</i>	7	9	9	-	-	-	-	-	-	13	15	17

Comparative studies on the zone of inhibition recorded showed that the methanolic extract of *Lantana camara* has higher zone of inhibition for most of the bacteria studied except *Staphylococcus aureus*. The methanolic extract

of *Croton sparsiflorus* showed maximum zone of inhibition for the bacteria, *Bacillus subtilis*. The zone of inhibition recorded for the methanolic extract for all the three weeds is presented in Figure Nos. 1-5.

**Fig. 1 – 5**  
**Graphical representation of Comparison of Zone of inhibition recorded for Methanolic extracts of Common weeds**





## DISCUSSIONS

Usually weed plants are disturbance opportunists: they respond positively and rapidly to land or habitat disturbance. Most crop weeds are of this type since soil preparation for cropping is an extreme form of disturbance. The potency of weed plants to grow at extreme conditions can be exploited properly for mankind. The present study reveals the importance of weed plant in controlling bacterial propagation. The above results confirms in accordance with earlier literature cited below.

The Mexican native plant, *Antigonon leptopus* is found to possess cure for cough and flu-related pain (Mitchell and Ahmad, 2006). Anti-thrombin, analgesic, anti-inflammatory, anti-diabetic property of the plant is reported (Chistokhodova *et al.*, 2002). The plant is validated for urinary problem and diabetes mellitus (Lans, 2006). The present study will provide data on antibacterial activity of the plant.

Although, antimicrobial potency of other species of *Croton* is widely reported by many

authors, the study on the second weed selected, i.e. *Croton sparsiflorus* is not available. The studies on *C. urucurana* (Peres, *et al.*, 1997; Gurgel, *et al.*, 2005), *C. zambesicus* (Abo *et al.*, 1999), *C. stellulifer* (Martins *et al.*, 2000), *C. kongensis* (Thongtan *et al.*, 2005), *C. cajucara* (Alviano *et al.*, 2005) and *C. hutchinsonianus* (Athikomkulachai, *et al.*, 2006) on antibacterial potency was previously reported. However, there was no study available so far on *Croton sparsiflorus* hence the present study is designed to explore its antibacterial potency.

The third selected weed, *Lantana camara* regarding the earlier literature explains the antibiotic property of *Lantana camara* from Phillipine (Gelera *et al.*, 1996), Brazil (Denilson, 2005) and Uganda (Claude *et al.*, 2009). Hence, the present study adds knowledge on antibacterial property of the plant *Lantana camara* from the Southern part of India.

Among different solvents used for the study revealed, that Methanolic extract of the



plants have yielded the constituents which possess antibacterial activity. The potential antibacterial effects of the methanolic extract of few plants are reported by Tanaka *et al.*, (1992); Abdelrahim *et al.*, (2002) and Bhuvanewari *et al.*, (2010).

## CONCLUSION

From this study it is concluded that among the three common weeds studied *Lantana*

*camara* possess greater activity than *Croton sparsiflorus* and *Antigonon leptopus*. Based on this study it is concluded that, under different circumstances the weed plant itself may be cultivated for modern therapeutics to prepare potent antibacterial drugs. Such study will explore other pharmacological activity of unexplored weeds inhabited in and around South India.

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