

INDIVIDUAL AND COMBINED ANTIBACTERIAL ACTIVITY OF LEAVES OF *SALVADORA OLEOIDES* AND *SALVADORA PERSICA*

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ABSTRACT: *Salvadora oleoides* and *Salvadora persica* are medicinally used plants, found throughout India. This study was carried out to evaluate antibacterial activity of individual and combined extract of leaves of these two plants. Methanol extracts of both plant exhibited good antibacterial activity and results were consistent with previous studies. Combined plant extracts exhibited mostly additive or slightly decreased activity against tested bacterial species. It is suggested to find new combination of different extracts as a new formulation to treat various microorganisms.

1. INTRODUCTION

Plants have been used as medicines for various health related problems for thousands of years. Importance of medicinal plants is increasing to maintain good health all over the world. Plant based formulation or drugs becoming more acceptable because synthetic antimicrobial drugs or other drugs facing the problems of the resistance of the microorganisms. Plants are rich source of numbers of phyto-constituents which are important for new drug discovery. Plants are screened for their various biological activities by numbers of researchers. This study was done to evaluate antibacterial activity of individual and combined extract of *Salvadora oleoides* and *Salvadora persica*.

Salvadora oleoides (family: Salvadoraceae) is valuable evergreen tree or shrub. It is widely distributed throughout Gujarat state. It can grow in dry areas, saline or non-saline conditions. It also found in deserts of many states of India like

Rajasthan, Madhya Pradesh, Punjab etc. It is commonly known as Jhal and Pilu. *S. oleoides* is known for various medicinal values and used by local people for various purposes. The leaves and flowers are used as cooling agents and as blood purifiers. Leaves are sweet, sour, appetizer, laxative and carminative. The paste of leaf is useful for treatment of wounds and inflammation. Leaves have anti-ulcer and analgesic activities and also useful to relieve cough (as expectorant) and for treatment of enlarged spleen and fever. Leaves are used as cattle foods [1-4]. High concentrations of phenolic compounds are found in Leaves of *S. oleoides* and it contains many other chemical constituents in the essential oil of both leaves and stems [5]. Leaves contain high concentration of 2-methoxy-4-vinylphenol (25.4%), cis-3-hexenyl benzoate (16.8%), phytol (13.9%), n-hexadecanoic acid (6.9%), and trans-s-damascenone (2.1%)[6].

Salvadora persica (family *Salvadoraceae*) is an evergreen shrub or a small tree. It is widely distributed throughout dry and arid regions of India. It is commonly known as Meswak tree (tooth-cleaning stick) or Tooth Brush Tree [7-9]. The wood sticks of this plant have been used for cleaning the teeth from ancient time and so named toothbrush tree which possess various biological activities such as anti-bacterial, anti-fungal, anti-diabetic, anti-cancer, anti-ulcer, anti-plaque, anti-carries, anti-plasmodial activities[10]. Leaves of *S. persica* are externally used in rheumatism; their juice is given in scurvy. The leaves are bitter, corrective and astringent to the bowels, tonic to the liver, diuretic, analgesic, anthelmintic and used to strengthen the teeth. Leaves are also useful in asthma and cough. It has been reported that leaves contain alkaloid salvadoricine, flavanoids; quercetin and ruffin[9]. Various chemical constituents including benzyl nitrile, eugenol, thymol, isothymol, eucalyptol, isoterpinolene, and β -caryophyllene have been identified by GC-MS analysis of the volatile oil extracted from leaves of *S. persica* by Alali, F., & Al-Lafi T [11]. The plant is also useful as a source of food, fodder, lipids, gum and resins [12].

2. MATERIALS AND METHODS

2.1 Collection of plant materials

Leaves of *Salvadora oleoides* and *Salvadora persica* were collected from local local regions of Banaskantha district, Gujarat, India and authenticated by experts. Leaves were dried at room temperature and then grinded to form powder. Plant powder was stored in air tight bottle till use.

2.2 Extraction of plant materials

Weighted plant powder was taken in flask and added methanol, then kept it for 48 hrs at room temperature. Filtration was done using Whatman filter paper No-1 and then solvent evaporated to form dry extracts. Dry extracts stored properly till use.

2.3 Antibacterial analysis

In vitro antibacterial activity of the crude extracts was carried out by the agar well diffusion method. After getting the turbidity equal to 0.5 McFarland standards, inoculums were aseptically introduced on to the surface of sterile agar plates and sterilized cotton swabs were used for even distribution of the inoculums. Wells were prepared in the agar plates using a sterile cork borer of 8.0 mm diameter. The plant extract was dissolved in DMSO to get desired concentration. The wells were filled with plant extract. The plates are incubated at 37 °C for 48 hours and then zone of inhibition was measured.

3. RESULTS AND DISCUSSION

Table-1: Antibacterial activity of methanol extract of leaves of *Salvadora oleoides* and *Salvadora persica*.

Bacterial Species	Zone of inhibition(mm)					
	<i>Salvadora oleoides</i>			<i>Salvadora persica</i>		
	5 mg/mL	25 mg/mL	50 mg/mL	5 mg/mL	25 mg/mL	50 mg/mL
<i>S. aureus</i>	8.4	8.9	9.3	-	8.8	9.0
<i>B. subtilis</i>	8.8	9.4	10.1	8.5	9.8	10.2
<i>E. coli</i>	8.2	8.6	9.6	8.4	8.6	9.0
<i>P. aeruginosa</i>	-	11.3	11.8	11.0	11.2	11.2

(Zone of inhibition= ± 0.2 mm) (*S. aureus* NCIM5345, *B. subtilis* NCIM2063, *E. coli* NCIM2065, NCIM2200)

Table -2: Antibacterial activity of combined extract of *Salvadora oleoides* and *Salvadora persica*.

Plant extract	Zone of inhibition(mm)			
	<i>S. aureus</i>	<i>B. subtilis</i>	<i>E. coli</i>	<i>P. aeruginosa</i>
<i>S.oleoides</i> + <i>S.persica</i>	9.8	9.6	9.4	12.4

(Both extract mixed in 1:1 ratio at 50 mg/mL concentration)

Studies on combined activity of various plant extracts have been reported by many researchers. Britto, A. J., et al [13] evaluated synergistic effects of a few South Indian spices (Cardamom, Turmeric, Ginger, Pepper, Clove etc.) against antibiotic resistant bacteria. Antimicrobial activity with greater efficacy was observed on combination of plant extracts.

Hsieh, P. C., et al [14] evaluated antimicrobial activities of the combined extracts of *corni fructus*, *cinnamon* and *Chinese chive* in different ratio and result indicated that combined extract showed an entire antimicrobial spectrum and outstanding inhibitory effect. Prakash, M., et al [15] tested synergistic effect of *Catharanthus roseus*, *Lowsonia inermis* and *Cheysanthemum odoratum* against Methicillin resistant *staphylococcus aureus* (MRSA) and results showed that combined extract resulted in better activity than individual extract.

Antibacterial activity of individual extract of *Salvadora oleoides* and *Salvadora persica* was consistent with previously reported studies. Good antibacterial was observed by both plant extracts. Our work also suggested that combination of plant extracts may be new way to fight against diseases causing microorganisms. Combination of extracts of leaves of *Salvadora oleoides* and *Salvadora persica* not exhibited synergistic effect, but mostly additive effect or slightly decreased activity was observed against most tested bacterial species. It is required to carry out screening of different extracts to find synergistic effect.

4. CONCLUSION

Many researchers have already proved the importance of combined effect of different plant extracts against various microorganisms. Our study has also revealed the importance of combination of plant extracts as new formulation

which may be beneficial for treatment of various diseases. It is required to carry out antimicrobial screening of more and more plant extracts in form of combination to find a new formulation.

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