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## Anti-*Streptomyces* Activity of *Myrthus communis* and *Terminalia chebula*, Medicinal Plants of South East Regions of Iran

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**Abstract:** *Streptomyces* sp. are mostly soil-inhabitants and several species are responsible for important diseases in plants, *S. scabies* causal agent of Common Scab disease of potato and human *S. somaliensis* causal agent of Mycetoma. Methanolic extracts of leaves of *Myrthus communis* and seeds of *Terminalia chebula*, which had documented uses in Iranian herbal-medicine, were tested for anti-*Streptomyces* activity against *S. scabies*. For bioassays, concentration of 50 mg mL<sup>-1</sup> of methanolic extracts prepared in dimethyl sulfoxide: methanol (v/v, 1/1) and tested in well diffusion method. Inhibitory zones (IZ) in contrast to controls were measured five days after inoculation at 29°C. Both plants showed high biological activity against *S. scabies*. Future goals include bioassays on human and further plant pathogenic *Streptomyces*.

**Keywords:** Anti-*Streptomyces*, plant extracts, *Myrthus communis*, *Terminalia chebula*, Iranian herbal-medicine, *Streptomyces scabies*

### INTRODUCTION

Resistance in pathogens to the common therapeutic agents is increasing in recent years<sup>[1]</sup>. Isolation of microbial agents less susceptible to regular antibiotics and recovery of increasing resistant isolates is rising throughout the world<sup>[2-6]</sup>. Problem of antibiotic resistance have made many antibiotics virtually obsolete. As the reports show, no antibiotic can last effective too long. Through investigations for new agents, many workers have presented antimicrobial activities of plant extracts. Golan-Goldhirsh *et al.*<sup>[7]</sup> tested extracts of 66 desert plants for antimalarial activity. They found 12 extracts demonstrated strong growth inhibition (>96%) of the malarial parasite, *Plasmodium falciparum*. In south eastern regions of Iran, Mansouri<sup>[8]</sup> tested ethanol extracts of 11 plants against 489 samples of *Staphylococcus aureus* and noticed *Myrthus communis* leaves had the greatest activity, inhibiting the growth of 99% of the isolates. Antibacterial activity of crude extract of *M. communis* against 10 laboratory strains of bacteria was tested by Mansouri *et al.*<sup>[9]</sup>. They noticed that the crude extract inhibited the growth of all tested bacteria except *Campylobacter jejuni*.

Herbal remedies play a fundamental role in traditional medicine in some rural regions of Iran where the plants are often used as the therapeutic agents as antiseptic, anti-inflammatory and in treatment of infectious diseases including candidiasis and dermatophytes<sup>[10]</sup>. In the present study, methanol plant-extracts of two species which had documented uses in Iranian herbal medicine were bioassayed for *in vitro* anti-*Streptomyces* activity against *S. scabies*, the causal agent of Common Scab disease of potatoes.

### MATERIALS AND METHODS

**Plant materials:** Leaves of *Myrthus communis* and seeds of *Terminalia chebula* were collected from southern regions of Iran. The plants were identified in the Plant Systematic Laboratory, College of Agricultural Sciences, Bahonar Univ. of Kerman, Iran, where voucher specimens were deposited.

**Extraction procedure:** Plant parts were dried under shade for about one week and then at 40°C in an incubator for 2-3 days. Dried samples were pulverized with mortar and pestle or electric mill. The fine powder of samples were

extracted three times with methanol<sup>[11]</sup> and the extracts were then concentrated under reduced pressure using rotary evaporator (Buchi, Switzerland) to yield a dense dark-residue. Each sample was then transferred to glass vials and dried further in a glass desecrator before use.

**Preparation of test organism:** *S. scabies*, the causal agent of common scab disease of potatoes, was kind gift of Mr. Ghasemi at Department of Bacteriology, Research Institute of Plant Pests and Diseases, Evin, Tehran, Iran and maintained on yeast- malt extract agar medium.

**Agar well diffusion bioassay:** For bioassays, spores of *S. scabies* were uniformly smeared on yeast malt extract agar (YMEA) medium in glass Petri dishes containing 15 mL of the medium in 4 mm thickness<sup>[12]</sup>. Wells of 6 mm in diameter and about 2 cm apart were punctured in the culture media using sterile cork borers<sup>[13]</sup>. Concentration of 50 mg mL<sup>-1</sup> of each of plant methanol-extracts was prepared in dimethyl sulfoxide (DMSO): methanol (1:1, v/v) solvent (DM solvent) and administered to fullness in each well (approximately 0.1 mL). The plates were then incubated at 29°C for 5 days. After incubation, bioactivity was determined by measuring the Diameter of Inhibition Zones (DIZ) in mm. All samples were tested in triplicate. Controls included solvent without plant extracts, although no antibacterial activity was noted in the solvent employed for the test.

## RESULTS AND DISCUSSION

In well diffusion bioassays, methanolic extracts of leaves of *Myrthus communis* and seeds of *Terminalia chebula* showed high anti-*Streptomyces* activity against *S. scabies* at 50 mg mL<sup>-1</sup>. This is the first report of anti-*Streptomyces* activity of these plants.

Even the nature and number of active anti-*Streptomyces* principles involved in each of the plant extracts of the present research are not clear, but the prominent activity of the extracts on *S. scabies* is well promising regarding their uses in biological control of the pathogen. The results of the present study may form the basis for further investigations to isolate active compounds, elucidate the structures and evaluate them against wider range of bacterial strains with the goal to find new principles. Development of drug-resistant pathogens demands new strategies and the native people's ethno pharmacological-knowledge which has received less emphasis, is a valuable resource which should be utilized to advance biocontrol-oriented objectives. According to Tshibangu *et al.*<sup>[14]</sup> plants have given western pharmacopoeia about 7000 different

pharmaceutically important compounds and a number of top-selling drugs of modern time, e.g., Quinine, Artemisinin, Taxol, Camptothecin, etc. Many reports show the effectiveness of traditional herbs against microorganisms, as a result, plants are one of the bedrocks to attain new principles<sup>[15]</sup>. Conclusively, Iranian medicinal-plants are valuable sources for new biologically active compounds and should receive special attention in research strategies to develop new antimicrobials required in biological control strategies and biotechnologically oriented researches in the near future.

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