

Screening of *Trachyspermum ammi* Antibacterial Activity

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Abstract

Trachyspermum ammi's seeds/leaves aqueous, ethanolic and methanolic extracts were screened for its antibacterial activity against *Bacillus cereus*, *Bacillus subtilis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Lactobacillus acidophilus*, *Micrococcus luteus*, *Staphylococcus aureus*, *Streptococcus pneumoniae* and *Pseudomonas aeruginosa*. Among all the extracts, ethanolic extract of *Trachyspermum ammi*'s seeds were found to be effective against all the test bacteria but its aqueous extract was effective only against *Bacillus subtilis*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*. While its methanolic extract showed inhibitory potential against a number of test bacteria. In case of *Trachyspermum ammi*'s leave extracts, alcoholic extracts exhibited low antibacterial activity and the aqueous extract possess no antibacterial property at all.

Keywords: Antispasmodic; Germicide; Antibacterial agent; *Bacillus subtilis*; *Escherichia coli*

Introduction

Trachyspermum ammi used as a culinary spice in Indian food and also known for its therapeutic use in traditional medicine [1]. Phytochemicals present in *Trachyspermum ammi* extracted oils exhibits strong antibacterial activity against a variety of gram positive and gram negative bacteria [2]. Besides it also possess antifungal, antiseptic and antihelminthic effects [3,4]. The main phenolic compound in *Trachyspermum ammi* is thymol which is reported to be an antispasmodic, germicide and antifungal agent [5]. Active components of its essential oil are thymol and carvacrol which possess antiseptic, antitussive and antifungal properties [6,7]. Preliminary medical trials have reported the traditional therapeutic use of *Trachyspermum ammi* seeds for the treatment of cough, inflammation, diarrhea, headache, hypertension, abdominal pain, bronchitis and influenza [8-10]. The main objective of this study was to determine the antibacterial activity of *Trachyspermum ammi*'s alcoholic and aqueous extracts against a number of bacteria.

Materials and Methods

This research study was conducted to determine the antibacterial activity of *Trachyspermum ammi* leaves and seeds alcoholic and aqueous extract. *Trachyspermum ammi* leaves and seeds were locally purchased from a shop in Satellite town Quetta. Leaves and seeds of *Trachyspermum ammi* were washed, sterilized, air dried and grinded to fine powder with a mortar and pestle.

Preparation of aqueous extract of *Trachyspermum ammi* leaves and seeds

40 gram of *Trachyspermum ammi* leave and seed powder was dissolved in 200 ml of distilled water.

Preparation of alcoholic extract of *Trachyspermum ammi* leaves and seeds

Ethanol and methanol extract of *Trachyspermum ammi* was prepared by dissolving 40 gram of its leave and seed powder in 200 ml of ethanol and methanol respectively.

Preparation of test bacterial cultures

Bacterial cultures were maintained on nutrient agar at 37°C and

antibacterial activity of the extracts were determined by using disc diffusion method [11].

Following bacterial species were used as a test:

- *Bacillus cereus*
- *Bacillus subtilis*
- *Escherichia coli*
- *Klebsiella pneumoniae*
- *Lactobacillus acidophilus*
- *Micrococcus luteus*
- *Staphylococcus aureus*
- *Streptococcus pneumoniae*
- *Pseudomonas aeruginosa*.

Known volume of each extracts were coated on separately on sterile Whatman No. 1 filter paper discs of size 6 mm in size. Microbial inoculum was spread on to the surface of each agar plate and impregnated discs were positioned in the centre of inoculated agar plate which was incubated for 24 h at 37°C and presence or absence of inhibition zone surrounding the disc was used as a measure of antibacterial activity.

Results

Antibacterial activity of aqueous, methanolic and ethanolic extract of *Trachyspermum ammi* seed is given in Table 1. Antibacterial activity of aqueous, methanolic and ethanolic extract of *Trachyspermum ammi* leaves is given in Table 2.

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Bacterial species	Aqueous extract	Methanol extract	Ethanol extract
<i>Bacillus cereus</i>	-	-	+
<i>Bacillus subtilis</i>	+	+	+
<i>Escherichia coli</i>	-	+	+
<i>Klebsiella pneumoniae</i>	-	+	+
<i>Lactobacillus acidophilus</i>	-	+	+
<i>Micrococcus luteus</i>	-	-	+
<i>Staphylococcus aureus</i>	+	+	+
<i>Streptococcus pneumoniae</i>	-	+	+
<i>Pseudomonas aeruginosa</i>	+	+	+

(+) indicates the inhibition of the bacterial growth
 (-) indicates no inhibition of bacterial growth.

Table 1: Antibacterial activity of *Trachyspermum ammi* seeds.

Bacterial species	Aqueous extract	Methanol extract	Ethanol extract
<i>Bacillus cereus</i>	-	+	+
<i>Bacillus subtilis</i>	-	-	-
<i>Escherichia coli</i>	-	-	-
<i>Klebsiella pneumoniae</i>	-	-	+
<i>Lactobacillus acidophilus</i>	-	+	+
<i>Micrococcus luteus</i>	-	-	-
<i>Staphylococcus aureus</i>	-	-	-
<i>Streptococcus pneumoniae</i>	-	+	-
<i>Pseudomonas aeruginosa</i>	-	-	-

(+) indicates the inhibition of the bacterial growth
 (-) indicates no inhibition of bacterial growth

Table 2: Antibacterial activity of *Trachyspermum ammi* leaves.

Discussion

Current study revealed the antibacterial activity of *Trachyspermum ammi* seeds/leaves alcoholic and aqueous extracts against numerous bacteria. Obtained results showed that the alcoholic and aqueous extract of *Trachyspermum ammi* seeds were found to be more effective against the test bacterial species than its leaf extract as indicated in Tables 1 and 2. Methanolic and ethanolic extract of *Trachyspermum ammi* seeds were found to be effective against almost all the test bacterial species i.e. *Bacillus cereus*, *Bacillus subtilis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Lactobacillus acidophilus*, *Micrococcus luteus*, *Staphylococcus aureus*, *Streptococcus pneumoniae* and *Pseudomonas aeruginosa*. However aqueous extract of *Trachyspermum ammi* seeds exhibited antibacterial activity against *Bacillus subtilis*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* as indicated in Table 1. On the other hand methanolic and ethanolic extract of *Trachyspermum ammi* leaves exhibited antibacterial activity against *Bacillus cereus*, *Klebsiella pneumoniae* and *Lactobacillus acidophilus* while the aqueous extract possess no antibacterial property at all as indicated in Table 2. Essential constituents of *Trachyspermum ammi* seed extracts such as diallyl sulfur, phenolics, allicin, luteolin, thymol and cavacrol possess strong antibacterial activity [12-14]. Secondary metabolites such as phenols, flavones, alkaloids, limonoids, glycosides, quinones, essential oils, tannins, coumarins saponins, flavonoids etc. present in the extract inhibits bacterial respiration and intensify plasma membrane permeability causing death of bacterial cells [15-17]. Organic solvents have been found to give more consistent antimicrobial activity compared to water extracts [18]. Phenolic compounds such as thymol is more soluble in polar solvents such as ethanol and methanol therefore such extracts of *Trachyspermum ammi* were found to be more effective [19]. However due to lack of solubility of the active constituents of *Trachyspermum ammi* in water such extracts are not that effective against microbes [20]. The antibacterial activity of *Trachyspermum*

ammi's alcoholic extract was mainly attributed to the activity of thymol [21]. The presence of phytochemicals substantiates the antimicrobial potential of *Trachyspermum ammi*.

Conclusion

Thus extracts from *Trachyspermum ammi* seeds could be used as an effective antibacterial agent since it showed antibacterial activity against a wide range of gram positive and negative bacterial species.

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