Antimicrobial Activity of the Essential Oils of Some Spice Herbs

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Abstract

Essential oils were obtained from fennel seeds, dill, cumin and coriander. Their antimicrobial activity was tested on isolated clinical specimens of patients treated at the University Hospital of the School of Medicine of Botucatu, SP, UNESP. Microorganisms were grown in BHI (Brain Heart Infusion/Oxoid) at 37°C/18 hours and resuspended in 0,5 Mac Farland's Standard (1,5 x 10^8 CFU/mL). The diffusion method was performed, putting 10 µl of the essential oils on paper disks (6mm of diameter) (Blank Disks /CECON) at 37°C/24 hours. After this period, the disks were put on plates containing Mueller Hinton Agar (Oxoid) and inoculated with the microorganisms. After 48 hours at 37°C, inhibitory zones were measured (mm) for the respective oils and strains. The essential oil from *Anethum graveolens* showed antimicrobial activity against *Staphylococcus aureus* (inhibitory zone=18 mm), *Salmonella* sp. (=11 mm) and *E. coli* (10 mm). The *Cuminum cyminum* essential oil was effective against *E. coli*, *P. aeruginosa* and *Salmonella* sp. and their inhibitory zones were 18, 10 and 23 mm, respectively. *Coriandrum sativum* oil was active only against *Salmonella* sp. (18 mm) and *Foeniculum vulgare* inhibited only *E. coli* (9 mm).

INTRODUCTION

The Apiaceae family consists of about 3,000 species and about 400 genera, distributed mainly in the temperate regions of the northern hemisphere. In Brazil, some species are used due to their economic importance, including those utilized as foods and in medicine, these possessing notable biological activities, in particular the antimicrobial action of their essential oils. Fennel (*Foeniculum vulgare* Mill) is a perennial herbaceous plant, and in Brazil its seeds are used in domestic medicine and produce an aromatic essential oil used in the manufacture of liquorice-like drinks and perfume. It possesses a carminative and stimulant action. Endro, anet or dill (*Anethum graveolens* L.) is an annual plant indigenous to the western Mediterranean, reaching 75 cm in height; the plant was much used by the Romans, Egyptian and Jews. Its leaves are rich in essential oil containing limonene and carvone. The seeds are used to preserve pickles, cheeses and mushrooms, and its essential oil is used to flavour drinks. It possesses antispasmodic, carminative, emmanagogue and diuretic properties. Cumin (*Cuminum cyminum* L.) originates from Egypt and Ethiopia and is much cultivated in Arabia, Malta, Sicily, India and China. The seeds are used to flavour foods and liquors and the oil is utilized as a perfume and cosmetic. It possesses emmanagogue and carminative activity and stimulates the production of maternal milk. The essential oil yield of cumin is 2.5 to 4% of the weight of the fruits and the main constituent is cuminol. *Coriandrum sativum* L. (coriander), which originates from the south of Europe and Africa, grows to a height of 30 cm to one meter. The essential oil of the seeds is rich in linalool, which is used in the food industry for the manufacture of liquors and candies and in the pharmaceutical industry to correct the disagreeable flavor and aroma of some medicines. In medicine the drug is used as a tonic to combat intestinal gases and to assist in digestion. The aim of the present work was to evaluate the antimicrobial activity of the essential oils of the seeds of the above mentioned plants.

MATERIAL AND METHODS

The essential oils of the seeds of fennel (*Foeniculum vulgare* Mill.), anet or dill (*Anethum graveolens* L.), cumin (*Cuminum cyminum* L.) and coriander (*Coriandrum sativum* L.) were obtained by hydrodistillation using a Clevenger apparatus, in which seeds of each species (100 g) were placed with sufficient distilled water to cover the material. Extraction continued for 3 consecutive hours after the water had begun to boil. The essential oils were tested against *Staphylococcus aureus*, *Enterococcus* sp., *Pseudomona aeruginosa*, *Escherichia coli*, and *Salmonella* sp., isolated from human clinical cases at the Hospital of the College of Medicine, UNESP-Botucatu/S.P. The microorganisms were cultured in BHI (Brain Heart Infusion) for 18 hours at 37º C, and resuspended in 0,5 Mac Farland Standard (5×10^8 CFU/mL). The diffusion method was used, putting 10 μL of essential oil on paper disks (6 mm of diameter) (Blank Disks/CECON) at 37ºC/24 hours. The microorganisms had been standardized in scale 0.5 Mac Farland and inoculated directly in boards with Müeller-Hinton Agar. After the inoculation of each microorganism, the test disks were incubated at 37ºC for 48 hours, after which time the halos of inhibition were measured.

RESULTS AND DISCUSSION

The essential oil of *Anethum graveolens* showed antimicrobial activity against *Staphylococcus aureus* (gram +), with an inhibitory zone of 18 mm, *Salmonella* sp. (gram -), with an inhibitory zone of 11 mm and against *E. coli* (gram -), with an inhibitory zones of 10 mm; the essential oil of *Cuminum cyminum* was active against the gram - organisms *E. coli*, *P. aeruginosa* and *Salmonella* sp., with inhibitory zones of 18 mm, 10 mm and 23 mm, respectively; the essential oil of *Coriandrum sativum* was active only against *Salmonella* sp. (gram -), with an inhibitory zone of 18 mm, while *Foeniculum vulgare* was active against *E.coli* (gram -), with an inhibitory zone of 9 mm. The lesser diameter of the inhibitory zones deserves additional study. It could be the consequence of lesser diffusion of the essential oil in the agar. The method was demonstrated to be useful for the fast evaluation of the antimicrobial activity of the essential oils of plant herbs.

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