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Antimicrobial Effect of Seed Extract of Coriander

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Abstract

In this study, antimicrobial effects of seed extract of coriander (Coriandrum sativum) on some microorganisms including pathogens were investigated. For this purpose extract of cardamom seed which is prepared in diethyl ether were tested on bacterial and fungal cultures such as Pseudomonas aeruginosa, Mycobacterium smegmatis, Klebsiella pneumoniae, Staphylococcus aureus, Escherichia coli, Salmonella typhimurium, Enterococcus faecalis, Micrococcus luteus and Candida albicans by the paper disc agar diffusion method. According to findings, it is determined that inhibitory activity was detected on M. smegmatis, K. pneumoniae, S. aureus, E. coli, E. faecalis, M. luteus and C. albicans where no such activity was detected on P. aeruginosa. While S. aureus was detected to be the most sensitive strain, the least inhibitory effect was found on E. coli.

Keywords: antimicrobial effect, extract, coriander

1. Introduction

Coriander is the dried fruit of the tall perennial herbaceous plant, Coriandrum sativum, and belonging to the family Apiaceae. This herb is cultivated commercially in Europa ,Asia and Africa. The leaves are lanceolate, green or dark green, glabrous on both surfaces with acuminate apex. The fruit are , ovoid. Thecoriander seeds have a warm, slightly pungent and highly aromatic flavour. Therefore, it is used as a spice in meat products such as Bologna and Frankfurter.

The chemical composition of coriander varies considerably with variety, region and age of the product. The content of volatile oil in the seeds is strongly dependant on storage conditions, but may be as high as 8%. The volatile oil contains about 1.5% α-pinene, 0.2% β-pinene, 2.8% sabinene, 1.6% myrcene, 0.2% α-phellandrene, 11.6% limonene, 36.3% 1,8-cineole, 0.7% γ-terpinene, 0.5% terpinolene, 3% linalool, 2.5% linalyl acetate, 0.9% terpinen 4-01, 2.6% α-terpineol, 31.3% α-terpinyl acetate, 0.3% citronellol, 0.5% nerd, 0.5% geraniol, 0.2% methyl eugenol and 2.7% trans-nerolidol. The basic coriander aroma produced by a combination of the major components, 1,8-cineole and α-terpinyl acetate.

Coriander oil is used in food, perfumery, and liquor a pharmaceutical industries as a flavour and a carminative. In medicine, it is used as a powerful aromatic, antiseptic, stimulant, carminative, stomachic, expectorant, anti-spasmodic and diuretic. In some parts of the world, especially the Near East and Saudi Arabia, coriander is used mostly in the preparation of "Gahwa" a strong coriander coffee concoction.

In Turkey, consumption of coffee containing coriander seed is common in southeast regions. In studies carried out in Romanian, the antimicrobial activities of different plants and their extracts used as spices or aromatic herbs including *Nigella sativa*, nettle, onion, garlic, peppermint, cumin, cinnamon and thyme have been investigated.

This study was carried out to determine whether seed extract of coriander

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(Coriandrum sativum) has inhibitory activity on some pathogens and saprophytic microorganisms.

2. Materials and Method

The coriander (*Coriandrum sativum*) seed, material of this study were obtained from whole sales and retail organic food stores. Samples were ground in a breaker until they would pass a 1 mm sifter and they were preserved in cloth bags in the laboratory until extraction procedure.

Microorganisms

Standard strains of microorganisms used in the present study (*Pseudomonas aeruginosa*, *Mycobacterium smegmatis*, *Klebsiella pneumoniae* , *Staphylococcus aureus*, *Escherichia coli*, *Salmonella typhimurium*, *Enterococcus faecalis*, *Micrococcus luteus* and *Candida albicans*) .

Preparation of model extracts

The method suggested by Şimonați and Mihuță was used to prepare model extracts. For this purpose, 200 g of ground samples of coriander seeds were soaked in 500 ml of diethyl ether for 6 h. During this period the mixture was agitated every 15 min intervals and following filtration, diethyl ether was removed using an evaporator (60 ^{o}C). In analysis, dark brown and green colored, oily extracts were used without any dilution. Sample extracts were kept in freezer (+4 ^{o}C) until analysis were concluded.

Antimicrobial activity test

The diethyl ether extracts of coriander seed, were transferred into sterile bottles containing filter paper (Whatman No:1; 6 mm diameter). Bottles were then placed into a water bath (50 ^{o}C) for complete removal of diethyl ether with periodical shakings to allow an even distribution of the extract between discs.

All strains used in the study were inoculated to TSB agar and incubated at 35±0.1 ^{o}C for 24 h and were allowed to grow until they reach 10^{8}-10^{9} cfu/ml. The 0.1 ml of inoculum from the prepared culture was transferred to MHA medium. The inoculum was spread to surface of plates with a sterile swab and the inoculated plates were dried at room temperature. Paper discs embedded within a plant extract were placed on previously inoculated plates and were incubated at 35±0.1 ^{o}C for 48 h. After incubation the zones of growth inhibition around disks were measured in mm. Antibacterial activity studies were carried out for each test strains in duplicate and average measurement were calculated.

3. Results and Discussion

The results of the antimicrobial activity assays indicated that coriander seed had inhibitory activity on *M. smegmatis, K. pneumoniae, S. aureus, E. coli, E. faecalis, M. luteus,* and *C. albicans*; however no inhibitory activity was observed against *P. aeruginosa*. Examining Table 1; *S. aureus* which is an important pathogen in food-poisoning has been identified as the most sensitive strain against cardamom. Results of antimicrobial activity assays are represented in Table 1 and Figure 1.

Table 1. Antimicrobial activity of seed extract coriander

Test strains	Inhibition zone (mm)
P. aeruginosa (ATCC 27853)	-
M. smegmatis (CCM 2067)	21
K. pneumoniae (FML5)	14
S. aureus (ATCC 25923)	30
E. coli (ATCC 25922)	13
S. typhimurium (KUEN 1357)	17
E. faecalis (ATCC 15753)	15
M. luteus (A 2971)	18
C. albicans (ATCC 60192)	20

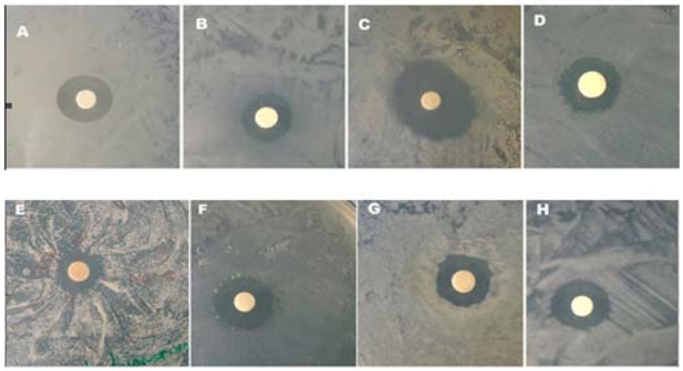

Figure 1. The inhibition zones of seed extract of coriander, which were determined with standard test strains.
A) *M. smegmatis* B) *K. pneumoniae* C) *S. aureus* D) *E. coli* E) *S. typhimurium* F) *E. faecalis* G) *M. luteus* H) *C. albicans*

3. Results and Discussion

The beneficial health effects of extracts from many types of plants that are used as seasoning agents in foods and beverages have been claimed for centuries. In this study, the purpose was to examine the inhibitory effects of coriander seed extract, some pathogens causing food poisoning and different illnesses in humans, and some microorganisms causing spoilage in foods were used as test strains. For this purpose, the diethyl ether extracts of coriander seeds were tested on *P. aeruginosa*, *M. smegmatis*, *K. pneumoniae*, *S. aureus*, *E. coli*, *S. typhimurium*, *E. faecalis*, *M. luteus* and *C. albicans* with disc diffusion method as in vitro.

In this study, extract of coriander seed displayed a variable degree of antimicrobial activity on different microorganisms. *S. aureus* was found to be more sensitive strain then the others. On the other hand *P. aeruginosa* was found to be most resistant bacteria against the cardamom seed. Examining findings, the widest inhibition zone was formed around *S. aureus* followed by *M. smegmatis*, *C. albicans*, *M. luteus* and *S. typhimurium*. The least inhibitory effects were observed for *E. coli*, *K. pneumoniae* and *E. faecalis* (Table1).

Some investigators noted that sensitivity of microorganisms to chemotherapeutics differs according to type of strain . Similiar results have been observed in our study.

Antimicrobial characteristics of the herbs are due to various chemical compounds including volatile oils, alkaloids, tannins and lipids that are presented in their tissue. The inhibitory effect of cardamom seeds detected in the present study may be due to the presence of volatile oils. In conclusion, our results indicated that extract of the coriander seed which was prepared using diethyl ether, has a strong inhibitory activity on some pathogens. According to us, using coriander as antimicrobial additives in food may be useful.

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