

The Antibacterial Activity of Aqueous Extracts of Coriander & Mustard on Some Bacterial Isolates

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Received 25/4/2006; Accepted 8/5/2006

Abstract

This study was designed to investigate the activity of herbal decoctions on different bacterial isolates. The antibacterial activity of herbal extracts was evaluated against *Staphylococcus aureus*, *Streptococcus pneumoniae*, *E. coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. Decoctions of Coriander (*Coriandrum Sativum*) & Mustard (*Brassica Nigra*) were prepared according to traditional herbal recipes. Simple disk – diffusion method was employed over all the decoctions exhibited a positive effect on the bacteria by decreasing and inhibiting the bacterial growth.

التأثير البكتيري المضاد للمستخلصات المائية للكرزبرة والخردل على بعض العزلات البكتيرية

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المستخلص

تتضمن هذه الدراسة تحديد فعالية المستخلصات المائية النباتية على أنواع بكتيرية مختلفة. ولقد تم قياس الفعالية المضادة للبكتريا لكل من البكتريا المكورات العنقودية، المكورات السبحية الرئوية، ايشيريشيا القولون، عضيات الكلبسيلا الرئوية والزوائف الزنجارية. وقد كانت المستخلصات النباتية للأنواع النباتية التالية الكرزبرة، الخردل قد حضرت حسب الوصفات العشبية المحددة وباستخدام طريقة انتشار الأقراص وقد أظهرت النتائج فعالية ايجابية لهذه المستخلصات بتحديد وتقليل النمو البكتيري

Introduction

The seed of coriander, *Coriandrum sativum* L. [Fam. Apiaceae], is commonly used as a food and spice around the world, especially in India where it is particularly valued for its healing powers as a digestive herb. Coriander seed has been used as a medicine for thousands of years including in ancient Greece, Rome, China and India, and the same digestive indications are recorded in each tradition. Coriander seed has several medicinal virtues and is listed in the German Commission E Monographs for alleviating digestive complaints and stimulating appetite. The German Pharmacopoeia also recognizes coriander seed as a source of essential oils that can effectively treat mild stomach cramps, flatulence and colicky symptoms in the intestinal tract. The essential oil is considered spasmolytic, stomachic (stimulates digestive juices and aids digestion), carminative (reduces gas and bloating) and also has antibacterial and antifungal activity^(1, 2). *Brassica alba* and *Brassica nigra* of the botanical family Cruciferae are well known by the names Black Mustard and White Mustard. Their seeds are the parts used. Seeds contain both a fixed and an essential oil, used as a condiment, illuminant, lubricant, and soap constituent. Mustard plaster is used externally for many afflictions, as arthritis and rheumatism⁽³⁾. Seed decoctions are used for indurations of the liver and spleen. It is also used for carcinoma, throat tumors. Mustard relieves congestion by drawing the blood to the surface as in head afflictions, neuralgia, spasms. Hot water poured on bruised seeds makes a stimulant foot bath, good for colds and headaches⁽⁴⁾. Old herbals suggested mustard for alopecia, epilepsy, snakebite, and toothache. Mustard Oil is said to stimulate hair growth. Mustard is also recommended as an aperient ingredient of tea, useful in hiccough. Mustard flour is considered antiseptic. Oil also useful in pleurisy and pneumonia⁽⁵⁾.

Materials and Methods

Aqueous extracts of coriander & mustard were tested *in vitro* to evaluate their efficacy as antibacterial against *Staphylococcus aureus*, *Streptococcus pneumoniae*, *E.coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. All the bacterial isolates used in this study were isolated from clinical cases. Standard cultural and biochemical tests were used to identify all bacterial isolates.

The plants material consisted of seeds these parts purchased from local market and powdered using a mechanical grinder. The method mentioned by⁽⁶⁾ was followed for extraction of plant sample, 50 gram of The dried plants extracts were dissolved in 250ml of distilled water, then the extracts mixed by electrical mixer for 60 min. and left for 24 hour after that the extracts filtered by several layers of gauze and by Buckner flask by using Whatmann No.1 filter paper. A simple disk-diffusion method was employed, Mueller-Hinton agar was used as a basal medium and employed for the bacteria except *Streptococcus pneumoniae* which was cultured on Mueller-Hinton agar with 5% defibrinated blood agar, two blank filter paper circles which had been soaked in different control (deionized water, distilled water) were placed equidistant from one another and from the edges of each plate. Care was taken to randomize the combinations of treatments per each plate to reduce the possibility of interactions between treatments. Additionally, a plate was cultured to check for contamination. All plates were then incubated for 48 hour at 37°C. After incubation, the zones of decreased or inhibition growth around each filter paper disk were measured and the results reported in millimeters. A zone was considered to begin at the edge of the filter paper and end at the margin of inhibition growth. Ampicillin and cephotaxim disks were used as a positive control for all bacterial strains.

Results & Discussion

- **Table (1)** was represented the main effects of aqueous extract of coriander (*Coriandrum sativum*):

The antibacterial effect of the aqueous extract of coriander (*Coriandrum sativum*) in a concentration 2-64 mg/ml & the effect of Ampicillin in a concentration of 10µg/disc against *Staphylococcus aureas* was alike. This result was agreed with fact that claim the coriander showed moderate activity against *Staphylococcus aureas* by Shigeharu Inouye ⁽⁷⁾ & Ono H, et.al ⁽⁸⁾ whom demonstrate the antibacterial activity of coriander against *Staphylococcus aureus*. On the other hand the effect of aqueous extract of coriander in a concentration of 1-8mg/ml exerted same effect exerted by Ampicillin in a concentration of 10µg/disc against *Streptococcus pneumoniae*. This result was confirmed by Shigeharu Inouye, et. al ⁽⁷⁾. However the effect of aqueous extract of coriander in a concentration of 0.25-8mg/ml was more likely near from that of Ampicillin in a concentration of 10µg/disc against *E.coli*. This result was disagreed with result that say, the coriander showed negative effect ⁽⁷⁾ and positive effect ⁽⁸⁾ against *E. coli*. The effect of the aqueous extract of coriander in a concentration of 0.5-128mg/ml against *Klebsiella pneumoniae* was similar to that of Ampicillin in a concentration of 10µg/disc. This result confirms the antibacterial activity of coriander against *Klebsiella pneumoniae* by Satchell FB, et. al ⁽¹⁰⁾. The effect of aqueous extract of coriander in a concentration of 16-128 mg/ml was approximately related to that of Ampicillin in a concentration of 10µg/disc against *Pseudomonas aeuroginosa*. This result was agreed with (Elgayyar M, et, al) ⁽¹¹⁾ whom recognize this antibacterial effect of coriander against *Pseudomonas aeuroginosa*. When the concentration of aqueous extract of coriander was increased to 128mg/ml against *Staphylococcus aureus*, *Streptococcus pneumoniae* and *E.coli* it's effect became significantly better than Ampicillin (P<0.01).

The effect of aqueous extract of coriander also was compared with these of Cephotoxim against bacteria and as the followings:

In a concentration of 64-128mg/ml of aqueous extract of coriander, the effect was more like the effect of that of Cephotoxim in a concentration of 30µg/disc against *Staphylococcus aureas*, *Streptococcus pneumoniae* and *E.coli*, On the other hand, the effects of all concentrations of the aqueous extract of coriander are better than negative control (P<.0001) against all speices of examined bacteria.

- **Table (2)** was represented the main effects of aqueous extract of mustard (*Brassica Nigra*): The aqueous extract of *Brassica Nigra* in a concentration 0.25-0.5mg/ml against *Staphylococcus aureas* was related to the effect of Ampicillin in a concentration of 10µg/disc. On the other hand, the effect of aqueous extract of *Brassica Nigra* in a concentration of 0.25-2mg/ml also was related to effect exerted by Ampicillin in a concentration of 10µg/disc against *Streptococcus pneumoniae* and *E.coli*. this was the same result that fixed by Nadarajah D, et.al ⁽⁹⁾. The concentration of *Brassica Nigra* at 0.25-1mg/ml was approximately similar to that of Ampicillin concentration of 10µg/disc against *Klebsiella pneumoniae*. While the effect of the aqueous extract of *Brassica Nigra* in a concentration of 0.5mg/ml against *Pseudomonas aeuroginosa* is similar to that of Ampicillin in a concentration of 10µg/disc. This result was confirm by (Chen HC, et.al) ⁽⁹⁾, however when the concentration increased to 128mg/ml, it's effect became significantly better than Ampicillin (P<0.01). The effect of aqueous extract of *Brassica Nigra* was compared with the effect of Cephotoxime Table (2). The effect of the aqueous extract of *Brassica Nigra* in a concentration 0.25-16mg/ml was within the range of that of Cephotoxim in a concentration of 30µg/disc against *Staphylococcus aureas*, also this result was seen regarding the aqueous extract of *Brassica Nigra* in concentration 0.25-64mg/ml to that of Cephotoxime of 30µg/disc against *Streptococcus pneumoniae*. the other effect of the aqueous extract of *Brassica*

Nigra in concentration 32-128 mg /ml is to that of Cephotaxime in concentration 30 µg/disc against *E.coli* and *Klebsiella pneumoniae* was approximately related. Lastly we can see that the extract in concentration 128 mg /ml is somewhat similar to that of Cephotaxime in

concentration 30 µg/disc against *Pseudomonas aeruginosa*. The effects of all concentration of the aqueous extract of mustard are better than negative control ($P<.0001$) against all species of examined bacteria.

Table (1): The effect of aqueous extract of coriander against the growth of bacterial isolates

Concentration mg / ml	Inhibitory zone diameters (mm) (mean ± SD)				
	<i>Staph. aureas</i>	<i>Streptococcus Pneumoniae</i>	<i>E. coli</i>	<i>Klebsiella Pneumoniae</i>	<i>Pseudomonas aeruginosa</i>
128	15.5 ± 0.5	16.5 ± 0.5	15.3 ± 0.5	13.0 ± 0.5	10.0 ± 0.5
64	15.0 ± 0.5	16.0 ± 1.0	15.0 ± 1.0	12.8 ± 1.0	9.3 ± 0.5
32	14.8 ± 1.0	15.8 ± 0.5	14.7 ± 0.5	12.4 ± 0.5	8.5 ± 1.0
16	14.3 ± 0.5	15.5 ± 0.5	14.5 ± 0.5	12.0 ± 0.5	8.0 ± 0.5
8	13.5 ± 0.5	15.0 ± 1.0	14.0 ± 0.5	11.0 ± 0.5	7.5 ± 0.5
4	13.0 ± 0.5	14.9 ± 0.5	13.9 ± 1.0	10.4 ± 1.0	7.5 ± 0.5
2	13.0 ± 1.0	14.5 ± 1.0	13.3 ± 1.0	9.5 ± 1.0	6.4 ± 0.5
1	12.0 ± 0.5	13.5 ± 0.5	12.9 ± 0.5	9.0 ± 0.5	5.5 ± 1.0
0.5	10.0 ± 0.5	12.5 ± 0.5	12.4 ± 1.0	8.0 ± 1.0	5.0 ± 0.5
0.25	8.0 ± 1.0	11.5 ± 0.5	10.0 ± 0.5	7.0 ± 0.5	3.0 ± 0.5
Ampicillin 10 µg / disc	15.0 ± 0.5	15.0 ± 0.1	14.0 ± 0.5	14.0 ± 0.5	14.0 ± 1.0
Cephotaxim 30 µg/disc	19.0 ± 0.5	18.5 ± 0.1	19.0 ± 0.5	18.0 ± 0.5	18.0 ± 1.0
Negative control 100%	0.0 ± 0.0				

Table (2): The effect of aqueous extract of mustard against the growth of bacterial isolates

Concentration mg / ml	Inhibitory zone diameters (mm) (mean \pm SD)				
	<i>Staph. aureas</i>	<i>Streptococcus Pneumoniae</i>	<i>E. coli</i>	<i>Klebsiella Pneumoniae</i>	<i>Pseudomonas aeruginosa</i>
128	14.0 \pm 0.5	12.5 \pm 0.5	11.0 \pm 0.5	11.5 \pm 0.5	10 \pm 0.5
64	13.6 \pm 1.0	11.5 \pm 0.5	10.5 \pm 1.0	11.0 \pm 0.5	9 \pm 0.5
32	13.3 \pm 0.5	11.0 \pm 1.0	10.0 \pm 0.5	10.0 \pm 1.0	8.5 \pm 0.5
16	12.6 \pm 0.5	11.0 \pm 0.5	9.6 \pm 0.5	9.0 \pm 0.5	8 \pm 0.1
8	11.5 \pm 0.5	10.5 \pm 1.0	8.3 \pm 1.0	8.0 \pm 0.5	7.4 \pm 0.5
4	11.0 \pm 0.5	10.0 \pm 0.5	7.0 \pm 0.5	7.5 \pm 0.5	7 \pm 0.5
2	10.5 \pm 0.5	9.6 \pm 0.5	6.5 \pm 1.0	7.0 \pm 0.5	6.37 \pm 1.0
1	10.0 \pm 0.5	9.2 \pm 0.5	6.0 \pm 0.5	6.0 \pm 1.0	6 \pm 0.5
0.5	9.00 \pm 1.0	9.0 \pm 0.5	6.0 \pm 0.5	5.5 \pm 1.0	5.3 \pm 0.5
0.25	8.00 \pm 0.5	8.6 \pm 1.0	5.5 \pm 0.5	5.0 \pm 0.5	4.1 \pm 1.0
Ampicillin 10 μ g / disc	15.0 \pm 0.5	15.0 \pm 1.0	14.0 \pm 0.5	14.0 \pm 0.5	14.0 \pm 0.5
Cephotaxim 30 μ g/disc	19.0 \pm 0.5	18.5 \pm 0.5	19.0 \pm 0.0	18.0 \pm 1.0	18.0 \pm 0.5
Negative control 100%	0.0 \pm 0.0				

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