

## SCREENING OF ANTIBACTERIAL ACTIVITY OF *CINNAMONIUM ZEYLANICUM* (CINNAMON BARK)

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**ABSTRACT:** Seventy isolates belonging to 3 different species of gram-negative bacilli: *E.coli*(30), *K.pneurnoniae*(05), and *P.aeruginosa*(05), and I specie of gram-positive cocci: *S.aureus*(30), were used for screening of antibacterial activity of aqueous infusion, decoction and essential oil of cinnamon by standard disc diffusion method. The oil of cinnamon exhibited highest antibacterial activity against *S.aureus* with mean zone of inhibition 34.60mm :t 7.00 standard deviation. The antibacterial activity against remaining species; *E.coli*, *P.aeruginosa* and *K.pneurnoniae*; noted as 23.30:t 3.00, 14.80:t 2.04 and 20.80:t 0.98 in terms of mean zone of inhibition in mm:t standard deviation, respectively. Decoction of cinnamon bark was found weakly effective against *S.aureus* with mean zone of inhibition 7.83mm :t 0.78 standard deviation while no effect was found against gram-negative bacteria. However, all isolates were found resistant to aqueous infusion of cinnamon bark.

**KEY WORDS:** Cinnamon bark, Antibacterial activity, essential oil, *E.coli*, *S.aureus*

### INTRODUCTION

*Cinnamonium zeylanicum* (Cinnamon) is one of the oldest known spices. Its medicinal uses have been recorded around 2700 BC and somewhat later in ancient Greek and Latin text (Leung and Foster, 1996). It has also been used to treat gastrointestinal disturbances, bronchial asthma and asthenia of blood (Chang and But, 1986). The British Herbal Pharmacopia (2000) indicates its use for flatulent dyspepsia, flatulent colic and diarrhea. The German Standard License for cinnamon bark tea infusion recommends it for a feeling of distention, flatulence, and mild cram-like gastrointestinal disorders due to reduced production of gastric juice. Moreover, two animal studies suggested that an extract of cinnamon bark taken orally may help to prevent stomach ulcers (Akira *et at.*, 1986; Tanaka *et at.*, 1989). In another study, Khan *et at.*, (2003) reported that intake of 1, 3, or 6 g of cinnamon per day reduces serum glucose, triglyceride, LDH, and total cholesterol in people with type 2 diabetes.

Cinnamon oil and extract also have antifungal (Singh *et at.*, 1995), antiparasitic (Oishi *et at.*, 1974) and antibacterial properties (Nir *et at.*, 2000). In view of this, the present study was conducted to evaluate the antibacterial activity of aqueous infusion, decoction and essential oil of cinnamon bark against *E.coli*, *P.aeruginosa*, *K.pneumoniae*, and *S.aureus*. These forms (aqueous infusion and decoction) were selected to provide a domestic remedy for self-medication because the extracts, which are generally used for the evaluation of antibacterial activity, are unavailable to

persons in domestic settings while selected forms could be prepared easily at home for self-medication.

### MATERIAL AND METHODS

#### Maintenance of isolates

A total of 70 isolates belonging to 4 species: *E.coli* (30), *P.aeruginosa* (05), *K.pneumoniae* (05), and *S.aureus* (30), isolated from clinical specimens, were maintained on nutrient agar (Merck).

#### Base medium

Mueller-Hinton agar (MHA) (Merck) was used as base medium and Mueller-Hinton broth (MHB) (Merck) was used for the preparation of inoculum.

#### Preparation of aqueous infusion

Aqueous infusion of cinnamon bark was prepared by steeping 20 g in 100 ml sterile distilled water in a sterile flask. The flask was kept for two days with occasional shaking. The contents of flask were filtered.

#### Preparation of aqueous decoction

Aqueous decoction was prepared by boiling 20 g cinnamon bark in 100 ml sterile distilled water for 15 minutes. The flask was then plugged and removed from heat and allowed to cool. After cooling the contents of flask were filtered.

#### Preparation of 0.5 McFarland Nephelometer Standard

The 0.5 McFarland Nephelometer was prepared by mixing 0.5 ml of 0.08 M barium chloride and 99.5ml

TABLE 1: Antibacterial Activity of Aqueous Infusion, Decoction, and Oil of Cinnamon Bark

Name of organisms	No. of isolates	Mean zone of inhibition in mm :t standard deviation		
		Infusion	Decoction	Essential oil
<i>E. coli</i>	30			23.30:t 3.00
<i>P.aeruginosa</i>	05			14.80 :t 2.04
<i>K.pneumoniae</i>	05			20.80 :t 0.98
<i>S.aureus</i>	30		7.83 :t 0.78	34.60:t 7.00

of 0.36 N sulphuric acid. It was stored in dark at room temperature and was vortexed prior to use.

#### Preparation and standardization of inoculum

Four to five colonies from pure growth of organisms were transferred to 5 ml of MHB. The broth was incubated at 35-37°C for 18-24 hours. The turbidity of the culture was compared to 0.5 McFarland Nephelometer Standard to get bacterial density of 150x10<sup>6</sup> CFU/ml. The standardized inoculum suspension was inoculated within 15-20 minutes.

#### Screening of antibacterial activity

Screening of antibacterial activity was performed by standard Kirby-Baure NCCLS disc diffusion method (Cheesbrough, 2000).

#### Incubation

All the inoculated plates were incubated at 35-37°C for 24 hours.

#### Interpretation

Zone of inhibition were measured in millimeter (mm).

#### Statistical analysis

Mean zones of inhibition and standard deviations were calculated.

## RESULTS' AND DISCUSSION

Many spices and their oils have been found to possess antibacterial properties (Davidson *et al.*, 1983). Cinnamon bark is also one of them (Nir *et al.*, 2000). The major antimicrobial components in cinnamon have been reported to be eugenol and cinnamic aldehyde (Davidson *et al.*, 1983). *In vitro* studies have shown the effectiveness of cinnamon extract against *H.pyiori* and decrease in its urease activity (Nir *et al.*, 2000). Moreover, the oil of cinnamon significantly

decreases the production of enterotoxin A and B by *S.aureus* (Smith-Palmer *et ai.*, 2004).

The aqueous decoction of cinnamon bark also has an *in vitro* inhibitory action against fungi (Chang and But, 1986). For instance, 1 % of cinnamon extract has significant inhibitory effect on the growth of *Aspergillers paraciticus* spores and aflatoxin production (Bullerman, 1974).

The organisms used in the present study have been reported to be involved in a number of infections. For example, *E.colii* may give rise to infections in wound, biliary tract, and abdominal cavity. It may also cause septicemia, neonatal meningitis, infantile gastroenteritis, tourist diarrhea, and hemorrhagic diarrhea. Other known infections caused by *E.colii*, include chronic renal failure and pancreatitis (Kaminstein, 2002). Another specie used in the study, *K.pneumoniae*, can cause fatal acute bacterial myocarditis (Douglas *et ai.*, 2002), nosocomial infections (Martin *et ai.*, 1971), perirenal abscess (Kohzo *et ai.*, 2005), pneumonia (Ko *et ai.*, 2002 ; Cortes *et ai.*, 2002), liver abscess (Lee *et ai.*, 2005), metastatic infection (Ma *et ai.*, 2005), and bloodstream infections (Larson *et ai.*, 2005). The remaining gramnegative specie used in the study, *P.aeruginosa*, is also one of the principal agent of nosocomial infections, bacteremia, cystic fibrosis, soft -tissue infections (Baltch and Smith, 1995), and infections in burns (Robert and Jay, 1999). Similarly, *S.aureus* can cause septicemia (Joseph *et ai.*, 1995), bacteremia (Piet *et ai.*, 2005), which may be complicated by endocarditis, metastatic infection, or the sepsis syndrome. Furthermore, *S.aureus* can also cause toxic shock syndrome (Wergeland *et ai.*, 1989; Lowy, 1998).

In the present study, the antibacterial activity of aqueous infusion, decoction and oil of cinnamon bark was determined. It was found that oil of cinnamon exhibited highest antibacterial activity against *S.aureus* with mean zone of inhibition 34.60 mm :t 7.00 standard deviation while good effect was noted against *E.coli*, *P.aeruginosa* and *K.pneumoniae* with 23.30 :t 3.00, 14.80 :t 2.04 and 20.80 :t 0.98 in terms of mean zone of inhibition in mm :t standard deviation, respectively. Decoction of cinnamon bark was found weakly effective against *S.aureus* with mean zone of inhibition 7.83 mm :t 0.78 standard deviation and no effect was found against gramnegative bacteria. However, all isolates were found resistant to aqueous infusion of cinnamon bark (Table 1 ).

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