

Antibacterial Activity of Kernal Extracts from Three Mango Cultivar s 'Totapuri', 'Langra' and 'Sundri'

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ABSTRACT

Antibacterial activity of two extracts aqueous and methanol extract of three varieties of mango seeds was done against gram negative E coli bacterial strain. Antibacterial activity was studied by “agar disc diffusion” method. The methanolic extract of langra and aqueous extract of sindhri showed highest antibacterial activity against *E coli* suggesting that the phytochemicals present in these three varieties of mango can be used as an alternate source of medicine for treatment of bacterial infections. Comparative analysis has been done against three commercial antibiotics Rifampicin, Gentamicin and *Apoxicillin*. The present study suggests that the kernel of *Mangifera indica* can be used as an effective potential candidate for the development of new strategies to treat bacterial infections.

KEY WORDS: MANGIFERA INDICA, E COLI, METHANOLIC EXTRACT, AQUEOUS EXTRACT

INTRODUCTION

Mangifera indica L. (Eng. Mango; Beng: Aam) of the family Anacardiaceae, is the king of fruit in India and has also been adopted almost all over the tropical and subtropical countries. There are about 500 known mango varieties available some of them which evolved from different geographical region of the world. Almost 69 species of *Mangifera* mostly restricted to tropical regions of Asian continent (Jeeva, 2009). The infectious disease continues to be a major health problem nowadays worldwide though a wide range of synthetic antibiotics is available in the market. Synthetic drug shows adverse side effects at continued use (Rajan et al., 2011; Sahu et al., 2006). This increasing trend of undesirable side effects of certain antimicrobial chemical agents, and

quick development of drug resistance pathogens triggers to search for better agents that will be cheaper and less side effects for treating infectious diseases. Antibiotics can be defined as “a chemical substance derived from living micro-organism which has power to kill or inhibit the growth of other microorganisms”. *Mangifera indica*. Verna. Aam, Eng (mango tree) is a large evergreen tree with widely spreading branches and dark coloured bark.

The mango fruit is one of the most prized desert fruit of the tropics and is known as “king of all fruits”. The use of seed kernel for the treatment of diarrhoea and dysentery has been reported since ancient period (Sharma, 2003; Kiruba et al., 2006; Rajan et al., 2011). The antibacterial activity of the seed kernel may be due to the phytochemical constituents such as polyphenols, phenolic acids present in the mango seed kernel (Sandhu and Lim, 2007; Barreto et al., 2008). It has been reported that antimicrobial activity may be due to the presence of active metabolites like tannin (Rajan et al., 2011; Singh, 1986; Ponce et al., 1994). Different Extracts of mango seed kernel have been reported as antidiarrhoeal (Kabuki et al., 2000; Kaur et al., 2010), antibacterial (Sairam et al., 2003), and anti-inflammatory activity (Bussmann and

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Sharon, 2006). From the ancient past mango seed kernel powder are usually used as a home remedy by indigenous peoples against gastrointestinal disorders and also for the treatment of various diseases throughout the world (Parvez, 2016; Bekoe et al., 2017; Khadare, 2016).

The mango variety Langra is the great pride in Northern Indians. The variety totapuri resembles a parrot, hence its name (as “tota” means “parrot” in Hindi) has small green appearance and beak at the end of the fruit. The ‘Sindhri’ mango is a mango cultivar grown in Sindhri, a town in Sindh, Pakistan. *E. coli* are natural inhabitants of the human large intestine as well as intestine of warm-blooded animals. Most of the strains are beneficial, but some strains are pathogenic and are responsible for diarrheal infections, neonatal meningitis, septicemia, and urinary tract infections (UTIs) etc., (Makvana and Krilov, 2015). In this study an attempt has been taken to study the antimicrobial activity of the aqueous and methanolic kernel extract against pathogenic *E. coli* bacteria.

MATERIAL AND METHODS

Plant material: To study the antimicrobial activity of mango kernels, three varieties of mango namely, Langra, Sindhri, Totapuri were taken from market of different locations at Balangir District.

Preparation of mango seed kernels: The seed kernels of different mango were collected, dried and grinded separately. By using grinder, the kernels were sliced and cut into small pieces and kept at -80°C for 3 days. Excessive moisture has been removed using freeze dryer. The samples were stored at 4°C for future use.

Culturing of the test organism: In this study the test organisms was taken as *E. coli*-(*Escherichia coli*). The test organisms was grown on Luria Bertani (LB) media containing Yeast extract (10g/L), Peptone (10g/L), NaCl (5g/L), Agar 10g. pH was adjusted to 7.0 before sterilization. Then, it was stored at 4°C for further studies (Sambrook and Russell, 2001). *E. coli* cultures were preactivated using LB broth medium before antimicrobial assay. For the preparation of agar media, LB top agar and 1 liter of LB broth were mixed together (3:1). pH was adjusted to 7.0 before sterilization.

Extraction Procedure: The dried powder was used for the study of antimicrobial activity against *E. coli*. Two extraction solvent used was used i.e., methanol and distilled water (separately). 100 gm of dry seeds kernels of *Mangifera indica* were used for extraction with methanol and distilled water in Soxhlet apparatus for eight hour till colorless solvent appeared. Colorless solvent of the extract was evaporated using rotary evaporator. Finally, extract was dried in air at room temperature.

Antibacterial assay: *E. coli* strains were cultured and maintained in Luria Bertani (LB) nutrient broth at 37°C. Agar Slant culture were kept 40°C for future use. The antimicrobial study was performed by using disc diffusion technique. An overnight suspension culture

of *E. coli* were inoculated on the Mueller-Hinton agar media. The sterile discs were soaked with 10 ml of both the extract i.e., methanolic and aqueous extracts of mango seed kernel of three varieties individually respectively for langra (a), sindhri (b) and totapuri (c). Methanol and water was taken as negative control and three commercial antibiotics Rifampicin, Gentamycin and Apoxicillin were taken as positive control. Plates were kept at 37°C for 24 h. Diameter of inhibition zone around the disc was measured to evaluate the antimicrobial activity. Here the three varieties are labeled as ‘a’-for Langra variety, ‘b’-for Sindhri variety – for Totapuri variety (Genus *Mangifera*) ‘met’-for Methanolic extracts, and ‘aq’-for Aqueous extracts.

Determination of relative percentage inhibition: The “relative percentage inhibition” with respect to positive control was calculated as follows.

$$\text{Relative Percentage of inhibition of Test extract} = \frac{100 * (a - b)}{(c - b)}$$

Where,

- a: “Total area of inhibition of the text extract”
- b: “Total area of inhibition of the solvent” (control)
- c: “Total area of inhibition of the standard drug”

Figure 1: Shows zone of inhibition of methanolic and aqueous extract of three kernel varieties

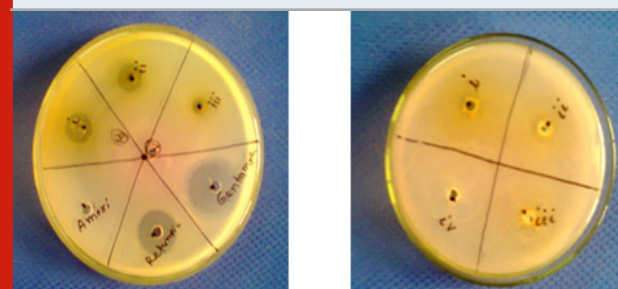


Table 1. Zone of inhibition exhibited by different kernel extracts and antibiotics

Amoxicillin	0
Rifampicin	17.67±0.33
Gentamicin	26±1
Aqueous a	9.67±0.67
Methanolic a	13.67±0.67
Aqueous b	12.33±0.33
Methanolic b	10.33±0.33
Aqueous c	4.23±0.22
Methanolic c	6.57±0.33

RESULTS AND DISCUSSION

In the present study, 100gm each of *Mangifera indica* air-dried kernel of three local varieties langra, sindhri and totapuri and two solvents, methanol and water were

used for the extraction to study the antibacterial activity of *E. coli*. After incubation of the extracts inoculated bacterial plates at 37°C for 24 h, they were evaluated for the antibacterial activity using the diameter of inhibition zone (mm) formed around the disc (Fig. 1).

In this study, the antibacterial activity of different extract of *M.indica* was tested against *E. coli* bacteria. In this antimicrobial assay it was observed that the methanolic extract of sample 'a' showed maximum zone of inhibition against *E. coli* (13.67 mm) followed by the aqueous extract of sample 'b' (12.33 mm). Methanolic extract of sample 'b' has shown fair antimicrobial activity (10.33 mm) against the bacteria. Methanolic extract of sample 'c' exhibited low (6.57 mm) microbial activity while the aqueous extract exhibited no antimicrobial activity against the *E. coli*. It was clear from the present results, that methanolic kernel extract of the variety langra exhibited pronounced activity against the tested bacteria (Table 1).

Figure 2: Comparison of zone of inhibition of different extracts of langra and sindhri varieties mango kernel

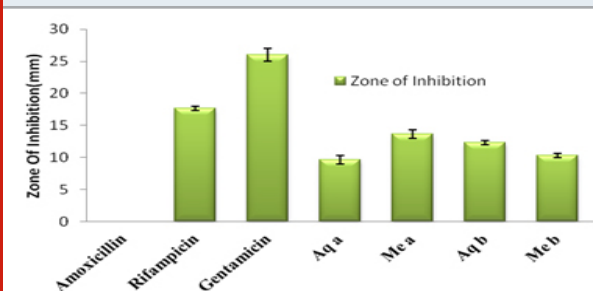
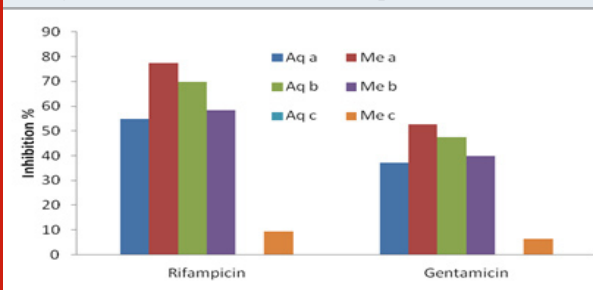


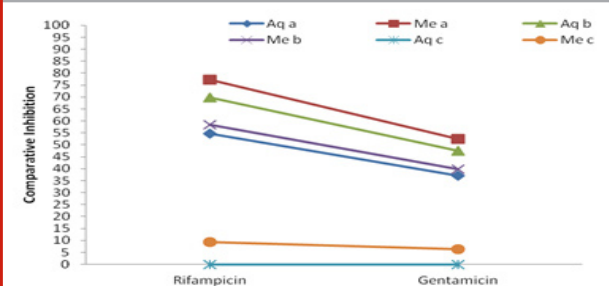
Figure 3: Antibacterial activity of sindhri and totapuri Mango kernel of methanolic and aqueous extract



This study confirms that the methanolic extract of kernel of different mango varieties have high activities against the tested microorganism i.e. *E. coli*. The aqueous extract of the variety Langra and Totapuri exhibited lower inhibitions as compared with the other methanolic extracts (Fig.2) whereas aqueous extracts of variety Sindhri shows relative higher zone of inhibition as compare to its methanolic extracts (Fig 3). The present results contradict the findings of Abdalla et al., (2016), who showed that “aqueous extracts are generally less potent in their bioactivity than organic extracts”. It was found that aqueous extract of variety Sindhri shows

little more inhibitory effect than its methanolic extract, whereas organic extracts of variety Langra shows more effective inhibition zone compare to other extracts (Fig 4).

Figure 4: Comparative inhibition of three methanolic and aqueous mango kernel extract against different antibiotics.



Among the 3 different antibiotics used as control, Rifampicin and Gentamicin shows inhibition zone but amoxicillin cannot inhibit the growth of *E. coli*. It seems that the target *E. coli* strains is Amox® (Table.1) resistant. Crude methanolic extract has been found to exhibit more inhibitory effect against *E. coli*. organic solvents provide more efficiency in extracting antimicrobial agents from kernel (Kaur et al., 2010). These mango varieties exhibit antibacterial activity which makes them interesting wastes for screening natural products. So study should be taken in this field so that natural antibiotics can be made from mango seed wastes. Therefore it is of highly important to pay more attention to develop antibiotics which would fight against causative disease of many dreadful diseases (Sahu et al., 2006).

Methanolic extracts of variety Sindhri has more antibacterial properties to Rifampicin than Gentamycin, against the *E.coli* Amox®. This experiment shows a antibacterial activity of mango kernel extracts varies with solvent type and variety dependent manner. The capacity of inhibition of different extracts is met Langra > aq Sindhri > met Sindhri > aq Langra > met Totapuri. Aqueous extracts of variety 'c' (Totapuri) does not show any antimicrobial properties against *E.coli*.

CONCLUSION

In the present investigation from the results obtained it can be concluded that the production of pharmacologically products from variety 'a' and variety 'b' could represent a viable and environmentally friendly alternative to reduce the use of synthetic chemicals because of their unintended side effects for the control of pathogenic microorganisms. As the results showed beneficial assessment, so the phytochemical compounds found in kernel extracts of *M.indica* can be used as an alternative antibacterial agent in the treatment of diarrhoea caused by the *E. coli*. The presence of bioactive compounds in the kernel extracts might have antimicrobial activity which may be used as drug formulation. In future this organic

waste can be used as a better agent in the medical and pharmaceutical research.

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