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Research Article

Antimicrobial activity of selected Vegetable peels against Water borne Pathogens

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Abstract

The potential of peel extracts from five vegetables such as *Lagenaria siceraria* (Bottle gourd), *Luffa acutangula* (Ridge Gourd), *Moringa pterygosperma* (Drum stick), *Cucurbita maxima Duch* [Pumpkin], *Momodica charantia* [Bitter gourd] contains significant amount of nutrients and the extracts of vegetable 'peel was tested for antimicrobial activity against bacterial water borne pathogens using agar well diffusion assay. The antibacterial activity was species independent. Effectiveness of the extracts against different bacterial strains was measured in terms of zone of inhibition in millimeters. The values determined were compared with the positive control (Ampicillin) with highest antimicrobial activity against all tested microorganisms.

Keywords: vegetable peel, antimicrobial activity, water borne pathogens.

INTRODUCTION

Historically, plants have provided a source of inspiration for novel drug compounds and the use of plant for treating various diseases is an age old practice in a large part of the world especially in developing countries where there is dependence on traditional medicine for variety of diseases. In recent times, there has been increasing interest in the study of bioactive compounds from peels, seeds, leaves, flowers and stem bark due to their antioxidative, antimicrobial and other health promoting properties. Cushnie and Lamb[3] said that bacterial infections contribute largely to general health problems and were responsible for over 50% of deaths in developing countries. Because of increasing threat of infectious diseases, the need of the hour is to find natural agents with novel mechanism of action. Fruits and vegetables are considered as an important part of a good diet. Fruit and vegetable peels are thrown into the environment as agro waste which can be utilized as a source of antimicrobics. It will be economic, eco-friendly wastes can improve the overall economics of processing units. Besides this, the problem of environmental pollution can also be reduced considerably. Fruits, especially tropical fruits have the capacity to produce a large number of bioactive phytochemicals (Nand. K., 1998)[6].

According to World Health Organization, 2003 medicinal plants would be the best source of a variety of drugs and therefore such plants should be investigated to better understanding of their properties safety and efficiently. The use of plants and plant products as medicines could be traced as far back as the beginning of human civilization. Nature has very rich botanical wealth and a large number of desire types of plants that grow in different parts of the country. Various researches have reported that the plant extract have antimicrobial activity, anti-inflammatory activity, antibacterial activity and contain antifertility agents.

The aim of the present study was focused on the antimicrobial activity of vegetable peel wastes with selected water borne pathogens.

MATERIALS & METHODS:

Study Area:

Ananthagiri mandal lies between 18^0 017'14"North Latitude to 83^0 06'43"East in Visakhapatnam dist., A.P, India. The climate conditions are very cool in

the area on account of elevation, green vegetation and think forest. The temperature gets down with the onset of south west monsoon and tumbles to a mean minimum of 4°C by January after which there is reversal trend till the temperature reaches mean maximum of 34°C by end of May, that is April to June are warmest Months. This tribal area which rain season account for 90% of rain fall an average Annual rain fall of 1178.mm.

Sample Collection:
Water samples were collected from Open wells, Bore wells and Springs at different villages from Bora Panchayat, Anantagiri mandal, Visakhapatnam district. Andhra Pradesh.

Microbial analysis and Identification of Bacteria:
The microbiological quality was determined by the standard most probable number (MPN) method, Heterotrophic Plate Count (HPC), Total coliform Count (TCC), Faecal coliform Count (FCC), and Faecal Streptococcal count (FSC) analyzed in 100ml drinking water according to APHA 2005[1].
The pure cultures of the bacteria isolates were subjected to various morphological and biochemical characterization tests to determine the identity of the bacteria isolates with reference to Bergey's Manual of Determinative Bacteriology (Buchanan and Gibbon, 1974)[2].

Collection of Vegetable peels:
Lagenaria siceraria (Bottle gourd), ***Luffa acutangula*** (Ridge Gourd), ***Moringa pterygosperma*** (Drum stick), ***Cucurbita maxima Duch*** [Pumpkin], ***Momodica charantia*** [Bitter gourd] vegetables were collected from local market in Visakhapatnam. The vegetables were washed and peeled using a kitchen vegetable peeler. The peels were dried at 50°C for 72 hours in an oven and vegetable peels waste extract was prepared by dissolving in distilled water (1:1w/v).

Test Pathogens:
The water borne pathogens like ***E.coli, S. aureus, Pseudomonas, Vibrio cholera*** and ***Salmonella*** were isolated from drinking water used in tribal area of Ananthagiri mandal, Visakhapatnam dist., Andhra Pradesh with the help of department of Botany Andhra University.

Antibacterial Activity Assay:
The Antimicrobial susceptibility testing was done by using the Agar well diffusion method to detect the presence of anti bacterial or anti fungal activities of the samples (R.C.Jagessar et al., 2008)[5]. For evaluating the bacterial activity, filter paper discs of 5mm diameter of whatman no.1 were saturated with vegetables peel waste extract prepared in distilled water. These saturated discs were carefully inserted into the nutrient agar plates which were previously spread inoculated with the bacterial cultures [50mleach]. The control sets were maintained with the discs saturated with the distilled water and the antibiotic Ampicillin under aseptic conditions plates were incubated at 37°C for 24 hours. After incubation, plates were observed for growth of microorganisms and zone of inhibition if any was measured in millimeter [mm].

RESULT & DISCUSSION
The highest antibacterial activity of Bottle guard peel with the highest zone of inhibition was observed in *Vibrio cholera* and *Saphylococcus aureus* (18mm) lowest zone of inhibition was observed in *E.coli* and *Pseudomonas aeruginosa* (7mm) and no zone was observed with *Salmonella*. In Ridge guard peel the highest zone of inhibition was observed in *Saphylococcus aureus* (20mm) followed by *Salmonella* (15 mm) and *Vibrio cholera* (12mm) and no zone was observed with *E.coli* and *Pseudomonas aeruginosa*.
In Drum stick peel the highest zone of inhibition was observed in *Salmonella* (21mm) followed by *Pseudomonas aeruginosa* (12mm) and *E.coli* (6mm) and no zone was observed with *Saphylococcus aureus* and *Vibrio cholera*. In Pumpkin peel the highest zone of inhibition was observed in *Pseudomonas aeruginosa* (20mm) followed by *Vibrio cholera* (15mm), *E.coli* (12mm) and no zone was observed with *Saphylococcus aureus* and *Salmonella*.
In Bitter gourd peel the highest zone of inhibition was observed in *Salmonella* (15mm) followed by *Saphylococcus aureus* (12mm), *E.coli* (4mm) and no zone was observed with *Pseudomonas aeruginosa* and *Vibrio cholera*. (table1)
Ridge gourd didn't show antibacterial activity against ***E.coli*** and ***Pseudomonas.*** The higher antimicrobial activity is shown by Pumpkin peel extract that is 20mm against ***Pseudomonas.***
Recently, pharmaceutical and scientific communities have been focusing on medicinal plants and their therapeutic values of natural compounds are reported in many publications to validate the claims of their biological activity. Due to the challenge of emerging incidences of drug-resistant pathogens, attention has been drawn to the antimicrobial activity of plants and their metabolites (Ncube NS et.al. 2008)[7]. In the present study the highest antimicrobial activity was shown by **drumstick peel** extract that is 21mm against ***Salmonella***. Lowest antimicrobial activity was observed in **bitter gourd** extract that is 4mm

against ***E.coli.*** Bitter gourd didn't show antibacterial activity against ***Pseudomonas, Vibrio cholera.*** The extract of drumstick peel waste did not significantly inhibit the growth of ***S. aureus, Vibrio*** and Pumpkin did not inhibit the growth of ***S. aureus*** and ***Salmonella*** shown in Fig: 1.

Vegetable peels which may be effective as antimutagens and are an important part of a mechanism of defense to maintain health. Friedman (1997)[4] indicated that the antimutagenic and anticarcinogenic effect of phenolic compounds might be due to their antioxidant properties. In the present work, it was found that the antibacterial activities are species independent.

CONCLUSION

The hazardous effects of synthetic antioxidants and the emergence of antibiotic resistant strains have revived the search for antioxidant and antimicrobial agents from natural sources. From different studies conducted on peels, it has been found that peels of vegetables hold a tremendous potential to serve as a source of newer, effective, safer and better antimicrobial agents. This investigation has opened up for the possibility of the use of these vegetable peels in the drug development for the treatment of various infectious microbes. These are propitious antimicrobics used in the prevention of diseases caused by pathogenic microbes. Therefore, this study will definitely gives a scope for future utilization of the waste for therapeutic purpose. The results also indicate that selective extraction from natural materials, by an appropriate solvent, is important for obtaining fractions with high antimicrobial activity.

Table 1
Antimicrobial activity of some vegetable peels against water borne pathogens.

Test Organisms	Bottle gourd	Ridge Gourd	Drum stick	Pumpkin	Bitter gourd	Control
E.coli	7	0	6	12	4	18
S. aureus,	18	20	0	0	12	12
Pseudomonas,	7	0	12	20	0	13
Vibrio cholera	18	12	0	15	0	20
Salmonella	0	15	21	0	15	12

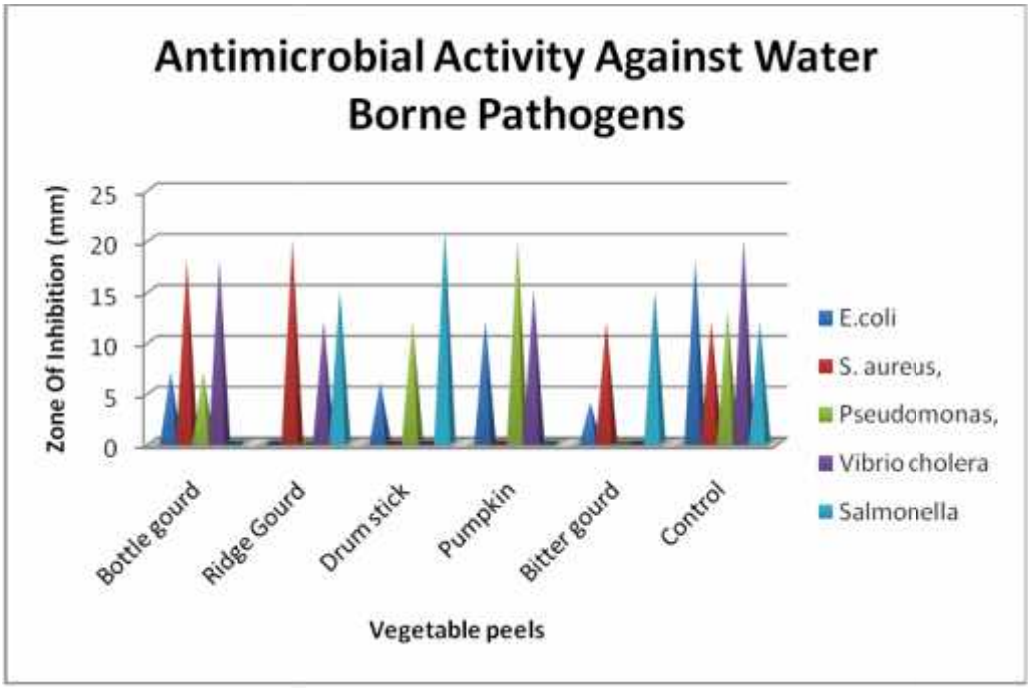

Fig 1

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