

Comparison of Antibacterial Activity of Spices and Fruits against Food Borne Pathogens

¹Adithya.P.K, ²Dr.N.Vidhya

¹Post Graduate and Research, ²M.Sc.,M.Phil.,SLET.,Ph.D.,Professor
Dr. N. G. P. Arts and Science College,
Coimbatore, Tamil Nadu, India, Pin-641 048

Abstract: To compare the antibacterial activity of spices and fruits extract on food borne pathogens.

Methodology: Chilli and pepper as spices and lemon and mousambi as fruits are collected and extracted by using mortar and pestle and a juicer prepared extracts were tested on food borne pathogens, such as *Escherichia coli*, *Staphylococcus aureus*, *Bacillus cereus* and *Vibrio cholerae* with different concentration of the extract (30µl, 50µl and 100µl) by agar well diffusion method.

Result: The antimicrobial screening of chilli, pepper, lemon and mousambi showed the lemon extract were found to be more effective than the other extracts. The pepper extract also have the activity, they show the activity at their higher concentration on gram positive bacteria. But the lemon show activity at their all concentration that taken.

Keywords: Fruits (lemon and mousambi) and Spices (chilli and pepper), antimicrobial activity.

1. Introduction:

Food borne disease is an increasing serious public health problem all over the world. It is an illness caused by eating contaminated food. It's not usually serious and most people get better within a few days without treatment. The symptoms of food poisoning usually begin within one to two days after eating contaminated food, although they may start at any point between a few hours and several weeks later.

A foodborne infection is an inflammation of the stomach and bowels. The most cases are caused by variety of pathogenic bacteria, viruses, prions or parasites that contaminate food ^[1] rather than chemical or natural toxins which are what we usually call poison.

Food poisoning is considered as one of the most common cause of illness and death of developing countries. Most of food poisoning reports are associated with bacterial contamination especially members of gram negative bacteria like *Escherichia coli* ,and *Salmonella typhi*, *Vibrio cholerae* and *Pseudomonas aeruginosa* . Other gram positive bacteria including *Staphylococcus aureus* and *Bacillus cereus* have been also identified as the casual agents of food born diseases or food spoilage. Prevention of food spoilage and their etiological agent is traditionally achieved by the use of chemical preservatives. Despite the proven efficiency of these chemical preservatives in prevention and outbreak control of food poisoning diseases, their repeated applications has resulted in the accumulation of chemical residues in food and feed chain, acquisition of microbial resistance to the applied chemicals and unpleasant side effects of these chemicals on human health. Because of such concern, efforts have been focused on developing a potentially effective, healthy safer and natural food preservatives. Within these contexts is the utilization of plant extracts as antimicrobial agents for food preservation. These plant extracts considered as natural sources of antimicrobial agents, regarded as nutritionally safe and easily degradable ^[2].

Spices and aromatic vegetable materials have long been used in food not only for their flavour and fragrance qualities and appetizing effects but also for their preservative and medicinal properties ^[3]. Since the ancient times, they have been used for preventing food spoilage and deterioration and also for extending the shelf life of foods ^[4]. It has been extensively reported that the essential oils of spices have shown antimicrobial functions against food borne pathogens⁵. In addition, they show other beneficial biological properties, such as antimicrobial and antioxidant activities ^[6,7,8].

Fruits are also show antimicrobial activities against microbes. Lemon and lime are popular citrus fruits and are food ingredients for flavoring and adding acidity. Sudachi is a small citrus fruits and in some areas of japan there is a dietary habit of putting sudachi juice on raw or grilled fish. Lemon or lime juice have been reported to exhibit antibacterial activity against *Vibrio cholerae*.

Black pepper (*Piper nigrum* L.) is a flowering vine of the Piperaceae family that is cultivated for its fruit, which is usually dried and used as a spice and seasoning. In dried form the fruit is referred to as peppercorns. It is a native of south India and popularly known as “King of Spices”. Pepper is most commonly used in curry recipes, as masalas and also included in the prescriptions of Ayurvedic and other traditional medicinal systems. Pepper is also used in folk medicine as aphrodisiac, carminative, stomachic, antiseptic diuretic and for the treatment of cough, rheumatoid arthritis, peripheral neuropathy, melanoderma and leprosy due to the presence of volatile compounds, tannins, phenols and other unknown substances ^[9,10,11]. The spicy tang of pepper is due to the presence of piperamides which are the pungent bioactive alkaloids accumulate in the skin and seeds of the fruit.

In nourishment industry **chilli** is one of the most important spices utilized since antiquated occasions. Capsaicin is a characteristic aggravate that can be found in the product of Chili plant from the *Capsicum* species, Solanaceae family ^[12]. Capsaicin is responsible

for the pungency of their fruit. Capsaicin is an alkyl vanillylamine (capsaicinoid) with the chemical formula C₁₈H₂₇NO₃ and the molecular mass M = 305. The scientific name according to IUPAC is: trans-8-methyl-N-vanillyl-6-nonenamide.

Lemon and lime are popular citrus fruits and are food ingredients for flavoring and adding acidity. Citric acid the major organic acid in these juices was found to be responsible for inhibiting the growth of *Vibrio parahaemolyticus* ^[13].

Mousambi show antibacterial activity against some pathogens. Because the mousambi is also a citrus fruit ^[14].

Within this, study, the present investigation was undertaken to predict the comparison of antibacterial activity of spices and fruits against food borne pathogens by well diffusion method.

2. Materials and Methods:

2.1 Collection of sample:

The fresh fruits and spices were collected from local market of Coimbatore, Tamil Nadu, India.

2.2. Preparation of Spices Extract:

In order to obtain spices extracts, about 5g of spice were taken and using 5ml of ethanol the extract of the spices were taken and grinded by using a mortar and pestle. Then they were sieved through the what'smann filter paper and stored for further use.

2.3. Preparation of Fruits Extract:

The citrus fruits are wiped with ethanol and then squeezed in a juicer. Then they are sieved through a what'smann filter paper ^[15].

2.4. Culture Collection:

Pure culture of bacteria such as *Escherichia coli*, *Staphylococcus aureus*, *Bacillus cereus* and *Vibrio cholerae* were PURCHASE from microbiological laboratory, Kovai Medical Centre and Hospital, Avinashi Road, Coimbatore -641014, Tamil Nadu, India. The test culture was maintain in the selective media, nutrient agar slant and broth.

3. Antibacterial activity by Well Diffusion Method:

The (MHA) Muller Hinton Agar plates were prepared and sterilized and the test culture were swabbed on the MHA plate and then the wells were created by using a well cutter and the extract were added to the wells at different concentration that taken, then incubated for 24 hours and the zone of clearance were measured ^[16].

4. Result:

This study performed to screen the antibacterial activity of fruits and spices to make a nature based product formulation in future. From the two fruit sample taken the lemon only show the activity on the organisms *E.coli*, *Staphylococcus aureus*, *Vibrio cholerae*, and *Bacillus cereus* (Table 1). From the spices extract taken the pepper only show the activity on the Gram positive organism *Bacillus cereus* and *Staphylococcus aureus* (Table 2).

Table.No.1 Zone of inhibition of fruit extracts

Organisms	Extract	30µl	50µl	100µl
<i>Staphylococcus aureus</i>	Lemon	3mm	5mm	7mm
	Mosambi	-	-	-
<i>E.coli</i>	Lemon	1mm	2mm	3mm
	Mousambi	-	-	-
<i>Bacillus cereus</i>	Lemon	-	3mm	5mm
	Mousambi	-	-	-
<i>Vibrio cholerae</i>	Lemon	2mm	3mm	6mm
	Mousambi	-	-	-

Table.No.2 Zone of inhibition of Spices Extract

Organisms	Extract	30µl	50µl	100µl
<i>Staphylococcus aureus</i>	Pepper	-	-	5mm
	Chilli	-	-	-
<i>E.coli</i>	Pepper	-	-	-
	Chilli	-	-	-
<i>Bacillus cereus</i>	Pepper	-	-	3mm
	Chilli	-	-	-
<i>Vibrio cholerae</i>	Pepper	-	-	-
	Chilli	-	-	-

Above the selected organisms *Staphylococcus aureus* and *Bacillus cereus* are sensitive to lemon (30µl, 50µl and 100µl) and pepper (100µl). But the *E.coli* and *Vibrio cholerae* are sensitive to lemon only (Fig.1 to Fig.4).

Fig.1: Antibacterial activity on *Staphylococcus aureus* Plate

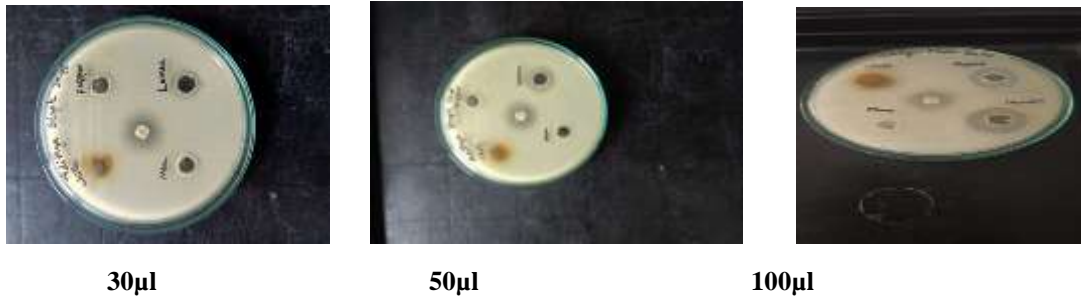


Fig.2 Antibacterial activity on *E.coli* plate



Fig.3 Antibacterial activity on *Bacillus cereus* plate

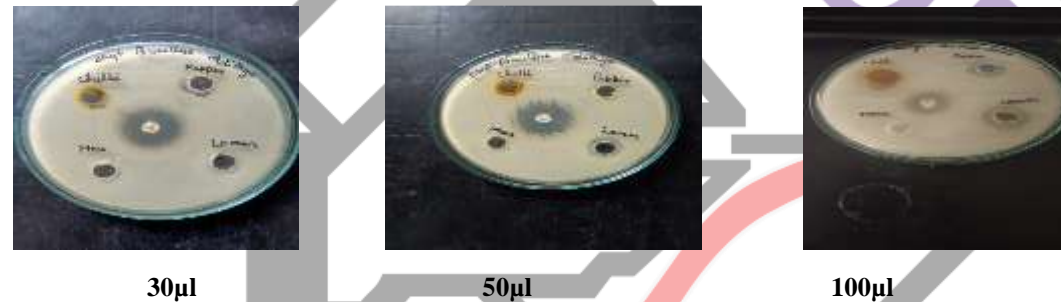
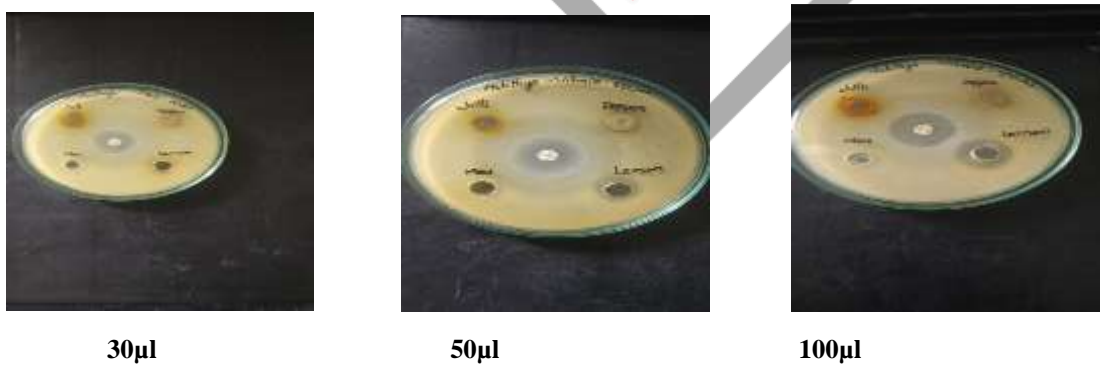


Fig.4 Antibacterial activity on *Vibrio cholerae* plate



From this study efficacy of the four extracts against tested organisms were compared and confirmed that the lemon extract is more effective compared to others and the pepper is effective on gram positive organism at their higher concentration.

5. Discussion:

From the result this antibacterial screening of fruits and spices the lemon and pepper showed efficacy to fight the food borne pathogens. While comparing this two extract the lemon extract were found to be more effective on the selected food borne pathogens.

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