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Antibacterial activity of Tropical Fruits o*n Salmonella typhi*

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ABSTRACT

Background: Typhoid fever is caused by *Salmonella Sp.* and is acquired by ingestion of food or water contaminated by faeces of infected humans or person-to-person contact. It has become more difficult to treat as the antibiotics used to treat them have become less effective, as well as having harmful side effects.

Aim: To search for natural antimicrobial agents in the nature which are harmless and can be used to make drugs with natural ingredients replacing synthetic.

Methodology: Some fruits were picked from farm and fresh juice was extracted which were tested against *Salmonella typhi* using agar well diffusion method.

Results: Kokum and Papaya were seen to have very good inhibitory effect on Salmonella typhi with zone sizes of 34 mm and 30 mm respectively. Pineapple could inhibit *S. typhi* with 16 mm zone size whereas; Cashew did not show any activity against *Salmonella typhi.*

Conclusion: These fruits can be used in making natural antibiotics or antibiotics free from any synthetic or chemical substances against Typhoid Fever and Salmonellosis.

KEY WORDS : Typhoid Fever, *Salmonella typhi*, Tropical Fruits, Antibiotic resistance.

INTRODUCTION

Food borne pathogens are main cause of number of diseases with significant effects on human health and in turn economy. [1] Humans contract the food-borne diseases when they ingest contaminated food. Typhoid fever remain as an important public health problem globally and major cause of morbidity in the developing world of the WHO African, Eastern

Mediterranean, South-East Asia and Western Pacific Regions. As of 2019 estimates, there are 9 million cases of typhoid fever annually, resulting in about 110 000 deaths per year.[2]

Typhoid fever are acute and often life-threatening febrile illnesses caused by systemic infection with the bacterium *Salmonella typhi* and is acquired by ingestion of food or water contaminated by faeces of infected humans or person-to-person contact.[3] In the small intestine, the incubation period is about 10 to 14 days. The bacteria colonize the small intestine, penetrate the epithelium, and spread to the lymphoid tissue, blood, liver, and gallbladder. Symptoms include fever, headache, abdominal pain, anorexia, and malaise, which last several weeks. Bacteria then re-infect the gastrointestinal tract, producing abdominal pain and diarrhoea. After approximately 3 months, most individuals stop shedding bacteria in their faeces. However, a few individuals continue to shed *S. typhi* for extended periods but show no symptoms. In these carriers, the bacteria continue to grow in the gallbladder and reach the intestine through the bile duct.[4], [7] Delay in diagnosis and/or lack of effective antibiotic treatment, increase the risk for developing serious complications like dehydration, bacteraemia, osteomyelitis and reactive arthritis and are associated with higher mortality rates.[5]

An Antimicrobial is an agent that kills microorganisms or inhibits their growth.[1]The discovery and development of antibiotics are among the most successful and powerful achievements of Moderns science and technology for the control of Food-borne diseases. As we all know in recent years, there has been an increasing incidence of multiple drug resistance to human pathogenic microorganisms largely due to the indiscriminate use of commercial antimicrobial drugs commonly used in the treatment of infectious diseases.[6] Antibiotic resistance is one of the biggest threats to global health, food security, and development today.[8] Antibiotics also consist of harmful synthetic substances which can have side effects. Typhoid fever is becoming harder to treat as the antibiotics used to treat them become less effective [10] Therefore objective of this study is to search for natural antimicrobial agents which are harmless and can be used to make drugs with natural ingredients replacing the synthetic drugs.

MATERIALS AND METHODS

1. Collection of Fruits sample

Fruits like Kokum, Papaya, Cashew and Pineapple were collected from farm in Belagavi aseptically during the months of December 2020 to March 2021. Selection of fruits was done randomly which were available in the farm during the Study.

2 Microorganisms

Pure culture of *Salmonella typhi* was obtained from the stock culture of Department of Microbiology, KAHER, JNMC, Belagavi with permission from Head of the Department.

3 Preparation of Extract/ inoculums

Fruits were washed and edible parts were chopped and with the help of Mortar and pestle, the fruits were crushed. The Juice was sieved using sterile muslin cloth with all aseptic precautions being taken care off. The pure extract was used for testing.

4 Inoculation of Sample on Nutrient Agar plates

Bacterial suspension matching with 0.5 Mac Farland was prepared by inoculating a single colony of *Salmonella typhi* in Peptone water and incubating it for two hours. 200µl of this broth was mixed with 30mL of Nutrient agar and then poured into the sterile petri plates. Antimicrobial activity was

evaluated by agar diffusion method. The wells were made using sterile cork borer. The Wells were loaded with 250µl of pure fruit extracts using micro pipette. The plates were than kept in freezer for 20-30mins for diffusion to take place and later the plates were incubated for 24 hours and zone of inhibition was checked after 24 hours.

RESULTS

As we can see in Table No.1, Kokum and Papaya had very good inhibitory effect on *Salmonella typhi* with zone sizes of 34 mm and 30 mm respectively. Pineapple could inhibit *S. typhi* with 16 mm zone size whereas; cashew did not show any activity against *Salmonella typhi*.

Table No: 1 Zone of Inhibition of Fruits against *S. typhi*

	Cashew	**Kokum**	**Pineapple**	**Papaya**
S. typhi	-	34 mm	16 mm	30 m

Figure 1: Picture of various fruits collected for the study

Figure 2 :Shows the items needed for pore plate technique

Figure 3 : Shows the Blood agar with pure growth of *Salmonella typhi* from Stock Culture of Department of Microbiology, KAHER, JNMC, Belagavi

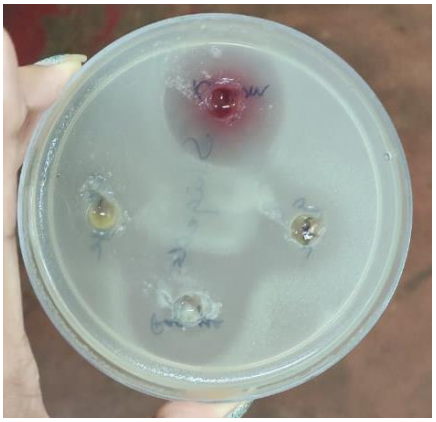

Figure 4: Pour plate (Nutrient agar with Salmonella typhi) depicting the zone of Inhibition of *Salmonella typhi* by various fruits Kokum, Pineapple and Papaya used in the study .

DISCUSSION

Multi drug resistant of antibiotics has enforced search of alternative. In the present study we found that some locally available fruits have antimicrobial agents against *Salmonella typhi.*

Among all tested fruits, Kokum has the best inhibitory effects, Seema V. Nayak et al (2019) also found that Kokum rind extracts could inhibit growth of certain bacteria.[12] Bedkekar Sushma et al (June 2020) also find antimicrobial activity of Kokum against *Enterococcous faecalis,* but in both the studies, different types of extracts were used. In the present study, pure fresh juice extracts were used. In both the cases different extracts were used and they did not show any activity against *S. typhi*.[10]

Pineapple could inhibit growth of *S. typhi* in the present study. Similar to this was done by Samiha Kabir et al (2017) [11] and Dabesor A. P. et al (2017)[17] against *Staphylococcus aureus, E. coli* and *Entero aggregative E. coli (EAEC), K. pneumonia* and *S. aureus* respectively but they used alcoholic extract. In the present study fresh juice was used and seems to inhibit *S.typhi*.

Papaya had good inhibitory effect against *S.typhi* in present study and it was also seen by Nusrat Jahan et al (2018) in their study. But they used raw papaya and also with different extracts.[13]

CONCLUSION

As the rapid increase of drug resistant micro-organisms forces the continuous search of natural alternatives which is freely available and can be used to treat or decrease the symptoms of Typhoid Fever. The results of the present study showed that all the tested fruits against *Salmonella typhi* exhibited varying degrees of antimicrobial activity. This data can provide validation for its medical uses. These fruits can be used in making natural antibiotics or antibiotics free from any synthetic or chemical substances against Typhoid Fever and Salmonellosis.

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