



IN VITRO ANTIMICROBIAL ACTIVITY OF *TANKAN*

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ABSTRACT

Aim of the present antimicrobial activity study was to evaluate the antimicrobial activity of the drug *Tankan*. *Tankan* (Borax) is a salt of tetra Boric acid, an important compound of Boron, which is also known as sodium baborate. *Tankan* is used in Ayurveda since very long time. The antimicrobial activity was carried out by using the Agar disc diffusion method. The antibacterial and antifungal activity of the tested drug was carried out in different concentrations of the drugs (5, 25, 50, 100, 250µg/ml). The tested bacterial strains were *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Streptococcus pyogenes*. The tested fungal strains were *Candida albicans*, *Aspergillus niger* and *Aspergillus clavatus*. The test drug was effective on the tested microorganisms.

KEY WORDS: Antibacterial activity, antifungal activity, *Tankan*.

INTRODUCTION

A microorganism is a microscopic living organism, which may be single celled or multicellular. Microorganisms are very diverse and include all the bacteria and archaea and almost all the protozoa. They also include some fungi, algae, and certain animals, such as rotifers. Many macroscopic animals and plants have microscopic juvenile stages. Some microbiologists also classify viruses (and viroids) as microorganisms, but others consider these as nonliving.^[1,2]

There are two sets of microbial population. One group is beneficial to human beings and other group is harmful to human being. The beneficial group do the wonders; on the other hand harmful ones are often fatal. Control of harmful microbial population is necessary to prevent transmission of disease, infection, decomposition, contamination and spoilage caused by them. In Ayurveda infectious diseases come under the *Agantuka Vyadhi* or *Aupsargika Vyadhi* (External Diseases). *Jwara* (fever), *Kushtha* (Skin disorders), *Shosha* (tuberculosis), *Abhishyanda* (conjunctivitis), etc. diseases are the example of *Aupsargika Vyadhi*.^[3] *Tankan* is used in Ayurveda since very long time. *Tankan* (Borax) is a salt

of tetra Boric acid, an important compound of Boron, which is also known as sodium baborate.^[4] In the native state it exists as an impure saline incrustation of a dirty-white colour. It exists as crystalline tough masses or in the form of translucent irregular masses, and when exposed to air it becomes opaque.^[5] It has a wide range of therapeutic applications, including diseases like *Vrana* (ulcers), *Shvasa* (asthma), *Kasa* (cough), etc.^[6]

The present study was aimed to evaluate the antimicrobial efficacy of *Tankan* against pathogenic microorganisms.

MATERIALS AND METHODS

Preparation of formulations

Tankan was obtained from pharmacy, G.A.U., Jamnagar.

Evaluation Techniques

Dimethyl sulfoxide (DMSO) was used as diluents / vehicle to get desired concentration of drug to test upon standard bacterial strains. Agar cup method is used for the evaluation of antimicrobial property of the tested drug.

Test microorganisms and growth media

In the present study following microorganisms were used: Bacterial strains were *Escherichia coli* (MTCC 443), *Pseudomonas aeruginosa* (MTCC 424), *Staphylococcus aureus* (MTCC 96) and *Streptococcus pyogenes* (MTCC 442) and fungal strains were *Candida albicans* (MTCC 227), *Aspergillus niger* (MTCC 282) and *Aspergillus clavatus* (MTCC 1323). These bacterial and fungal strains were obtained from Institute of Microbial Technology, Chandigarh.

The bacterial and fungal stock cultures were incubated for 24h at 37°C on Nutrient Agar and Potato Dextrose Agar medium (Microcare laboratory, Surat, Gujarat, India) respectively following refrigeration storage at 4°C. The bacterial strains were grown in Mueller-Hinton agar (MHA) plates at 37°C (The bacteria were grown in the nutrient broth at 37°C and maintained on nutrient agar slants at 4°C) where as the yeasts and molds were grown in sabouraud dextrose agar (SDA) and potato dextrose agar (PDA) media, respectively, at 28°C. The stock cultures were maintained at 4°C.

Antimicrobial activity

Determination of zone of inhibition (ZOI) method

In vitro antimicrobial activity testing was carried out by using Agar cup method. Each purified extracts were dissolved in Dimethyl Sulfoxide (DMSO), sterilized by filtration using sintered glass filter and stored at 4°C. For the determination of ZOI, pure Gram positive, Gram negative and fungal strains antibiotics were taken as a standard for comparison of the results. All the extracts were screened for their antibacterial and antifungal activities against the *E. coli*, *P. aeruginosa*, *S. aureus*, *S. pyogenes* and the fungi *C. albicans*, *A. niger* and *A. clavatus*. The sets of five dilutions (5, 25, 50, 100 and 250 µg/ml) of *Tankan* and standard drugs were prepared in double distilled water using nutrient agar tubes. Muller Hinton sterile agar plates were seeded with indicator bacterial strains (10^8 cfu) and allowed to stay at 37°C for 3 h. Control experiments were carried out under similar condition by using Ampicillin, Chloramphenicol, Ciprofloxacin and Norfloxacin for antibacterial activity and Nystatin and Griseofulvin for antifungal activity as standard drugs. The zones of growth inhibition around the disks were measured after 18 to 24 h of incubation at

37°C for bacteria and 48 to 96 h for fungi at 28°C, respectively. The sensitivity of the microorganism species plant extracts were determined by measuring the sizes of inhibitory zones (including the diameter of disk) on the agar surface around the disks, and values <8 mm were considered as not active against microorganisms.^{17,8,9,10]}

RESULTS AND DISCUSSION

Antibacterial activity of test drugs (Zone of Inhibition)

The result of antimicrobial activity of *Takan* in different concentrations (5, 25, 50, 100 and 250 µg/ml) is presented in table I-III. This result is compared with the antibacterial and antifungal activity of the standard drugs presented in table I, II and III. The results revealed that tested drug showed antimicrobial activity against tested organisms. It was observed that the antimicrobial activity of the drug increased when the concentration is more.

The zone of inhibition measured ranged from 12-20 mm for all bacterial strains and ranged from 13-21mm for fungal strains. Test drug did not affect the pathogens at 5 µg/ml concentration where as all the standard drugs showed effect at this level. The effect of *Tankan* showed at concentration of (25, 50, 100, 250 µg/ml) were (14, 15, 17 and 20 mm) against *E. coli* MTCC 443, (12, 14, 17 and 20 mm) against *P. aeruginosa* MTCC 424, (12, 15, 17 and 20 mm) against *S. aureus* MTCC 96, (12, 14, 17 and 19 MM) against *S. pyogenes* MTCC 442, (14, 15, 19 AND 21 mm) against *C. albicans* MTCC 227, (13, 16, 17 and 20 mm) against *A. niger* MTCC 282, (14, 16, 17 and 20 mm) against *A. clavatus* MTCC 1323. [Figure 1 to 6].

The results showed that all samples were effective against all the tested organisms.

CONCLUSION

Tankan (Borax) is a salt of tetra Boric acid, an important compound of Boron. It is used in Ayurveda since very long time. The results of present study showed that *Tankan* was effective against bacterial strains *E. coli*, *P. aeruginosa*, *S. aureus*, *S. pyogenes* and fungal strains *C. albicans*, *A. niger* and *A. clavatus*.

Table I: Antibacterial activity of test drug and standard drugs

Test Organism	<i>Tankan</i>					Standard drugs									
						Ampicillin					Chloramphenicol				
	5	25	50	100	250	5	25	50	100	250	5	25	50	100	250
<i>E.Coli</i> MTCC 443	-	14	15	17	20	14	15	16	19	20	14	17	23	23	23
<i>P. aeruginosa</i> MTCC 424	-	12	14	17	20	-	-	-	-	-	14	17	18	19	21
<i>S. aureus</i> MTCC 96	-	12	15	17	20	10	13	14	16	18	12	14	19	20	21
<i>S. pyogenes</i> MTCC 442	-	12	14	17	19	11	14	16	18	19	10	13	19	20	20

Table II: Antibacterial activity of test drug and standard drugs

Test Organism	<i>Tankan</i>	Standard drugs
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						Ciprofloxacin					Norfloxacin				
	5	25	50	100	250	5	25	50	100	250	5	25	50	100	250
E.Coli MTCC 443	-	14	15	17	20	20	23	28	28	28	22	25	26	27	29
<i>P. aeruginosa</i> MTCC 424	-	12	14	17	20	20	23	24	26	27	18	19	21	23	23
<i>S. aureus</i> MTCC 96	-	12	15	17	20	17	19	21	22	22	19	22	25	26	28
<i>S. pyogenes</i> MTCC 442	-	12	14	17	19	16	19	21	21	22	18	19	20	21	21

Table III: Antifungal activity of test drug and standard drugs

Test Organism	Tankan					Standard drugs									
						Nystatin					Griseofulvin				
	5	25	50	100	250	5	25	50	100	250	5	25	50	100	250
<i>C. albicans</i> MTCC 227	-	14	15	19	21	18	21	24	25	26	18	21	22	22	24
<i>A.clavatus</i> MTCC 1323	-	14	16	17	20										
<i>A.niger</i> MTCC 282	-	13	16	17	20	18	19	24	29	29	19	23	25	25	28

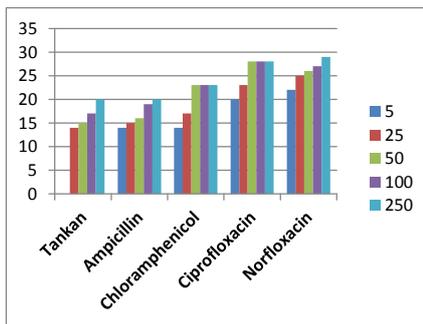


Figure I: Effect of test drug and standard drugs against *E. coli*

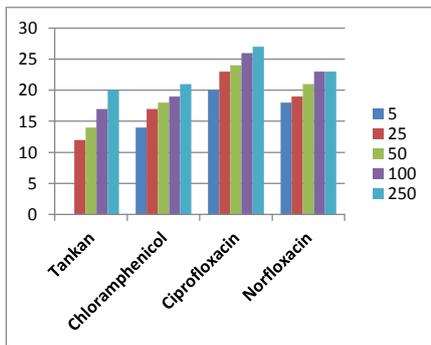


Figure II: Effect of test drug and standard drugs against *P. aeruginosa*

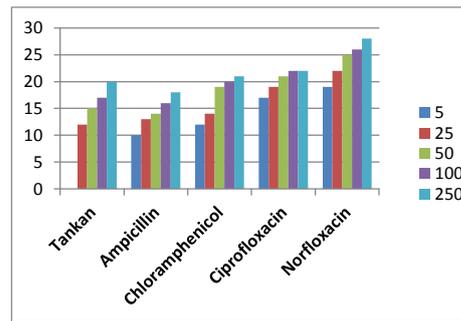


Figure III: Effect of test drug and standard drugs against *S. aureus*

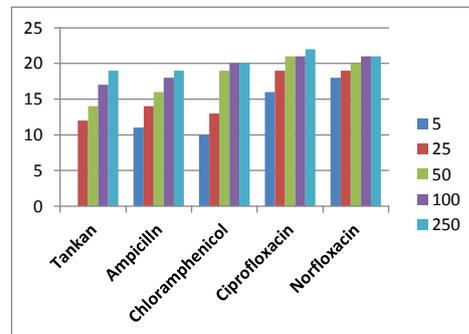


Figure IV: Effect of test drug and standard drugs against *S. pyogenes*

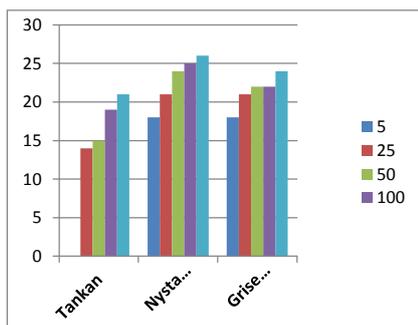


Figure V: Effect of test drug and standard drugs against *C. albicans*

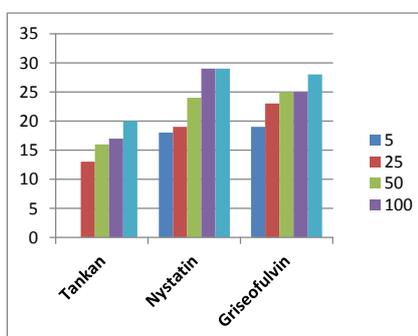


Figure VI: Effect of test drug and standard drugs against *A. niger*

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