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Research Article

ANTI BACTERIAL EFFECT OF SIDDHA PREPARATION *NAAVAL KOTTAI MATHIRAI* AGAINST COMMON URINARY PATHOGENS

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KEYWORDS: Antibacterial activity, Siddha medicine, *Naaval Kottai Mathirai*.

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ABSTRACT

Urinary tract infections are more common, more severe, and carry worse out comes in patients with type 2 diabetes mellitus. They are more often caused by resistant pathogens. The management of UTI in diabetes patients is very difficult. The patients are undergoing for antibiotic treatment for this issue in every occasion. In Siddha system, the diabetes has been successfully treated with traditional Siddha preparations which are poly herbal, herbo-mineral and metallic formulations. Most of the Siddha anti-diabetic preparations are possessing anti bacterial effect along with its anti-diabetic effect. So the management of urinary tract infections in diabetic patients is very easy. *Naaval Kottai Mathirai* is one among the anti-diabetic Siddha herbal preparation which is prepared from the seeds of *Syzygium cumini* (L.) skeels and *Aristolochia bracteolata* Lam. leaf juice. An attempt has been made to screen the antibacterial effect of NKM against the selected pathogens which are commonly responsible for UTI particularly in diabetes by disc diffusion method. The result of this study is really appreciable. The result of this study showed the marked anti bacterial effect against *Escherichia coli* 15mm, *Staphylococcus aureus* 17mm, *Bacillus subtilis* 14mm, *Klebsiella pneumonia* 12mm, *Pseudomonas aeruginosa* 12mm and *Enterococcus faecalis* 11mm. Finally this study concluded that, the drug NKM can be used for diabetes and UTI particularly in diabetic patients. Further studies are needed to explore the novel antibacterial bioactive molecules.

INTRODUCTION

Diabetes mellitus is a major risk factor for urinary tract infections (UTIs) and is also associated with increased risk of certain complicated UTIs such as emphysematous pyelonephritis (EPN), emphysematous pyelitis (EP), emphysematous cystitis (EC), xanthogranulomatous pyelonephritis (XGP), renal/ perirenal abscess, and renal papillary necrosis (RPN). Such conditions are potentially life threatening and require prompt evaluation and management. The increased frequency of UTIs in diabetic patients is likely due to several mechanisms including the presence of glycosuria, neutrophil dysfunction and increased adherence of the bacteria to uroepithelial cells. Factors that increase the risk of UTIs in diabetes include age, metabolic control, diabetic nephropathy, autonomic neuropathy and vascular complications.[1]

Emphysematous complications in the kidney or the bladder are likely to be due to the presence of organisms that rapidly ferment glucose and produce carbon dioxide. Impaired transport of metabolic end products due to impaired tissue perfusion in diabetes may also contribute.[2] Escherichia coli, is the most common pathogens isolated from urine of diabetic patients with UTI. Other organisms includes Enterobacteriaceae such as Klebsiella spp., Proteus spp., Enterobacter spp., and Enterococci.[3] Patients with diabetes are more prone to have resistant pathogens as the cause of their UTI, including extended-spectrum β-

lactamase-positive Enterobacteriaceae.[4] Over 90% of patients with diabetes mellitus has emphysematous pyelonephritis[5] and 67% has emphysematous cystitis.[6]

In diabetic patients, it is generally accepted that infections are frequent causes of morbidity and mortality.[7] Immunologic defects contribute to the increased risk for infection: impaired neutrophil function, low levels of prostaglandin E, thromboxane B2, leukotriene B4, decreased T cell-mediated immune response, etc.[7-9] Other conditions such as incomplete bladder emptying due to autonomic neuropathy and high glucose concentration in the urine allow urinary colonization by microorganisms.[9,10] There is evidence that patients with diabetes have an increased risk of asymptomatic bacteriuria and urinary tract infections (UTIs)[8,9]. UTIs are the most common bacterial infections in diabetic patients.[11] Moreover it is important to recognize and to treat UTIs in diabetic patients because of their possibly severe complications, including bacteriuria, renal abscess and renal papillary necrosis.[9, 10, 12] To treat UTI in diabetics is difficult because of its frequent recurrence, involving greater costs for the medical system and for the patient himself.

UTI is correlated with the symptoms of *Moothira Kiricharam* in Siddha system of medicine which is more common in diabetes. Untreated *Kiricharam* may leads to severe complication. In diabetes the management of *Kiricharam* is more difficult. The patients are undergoing for antibiotic treatment for this issue in every occasion. Nowadays most of the practitioners are prescribing two types of medicines for the management of UTI in diabetes patient in which one for diabetes and another one for UTI. It could not be affordable for all patients. In Siddha system of medicine, most of the polyherbal anti-diabetic formulations are having anti-microbial effect along with anti-diabetic effect. It may help to treat the UTI with diabetes in easy manner because it possess both anti microbial and anti diabetic effect. *Naaval Kottai Mathirai* is herbal anti-diabetic Siddha preparation prepared from the seeds of *Syzygium cumini* (L.) skeels and *Aristolochia bracteolata* Lam. which is used for the management of diabetes. The present study is aimed to screen the anti bacterial effect of anti-diabetic Siddha herbal preparation *Naaval Kottai Mathirai* against the selected human pathogens.

MATERIALS AND METHODS

Plant material and *Naaval Kottai Mathirai* preparation

The seeds of *Syzygium cumini* (L.) skeels (Figure:1) and *Aristolochia bracteolata* Lam. (Figure:2) were collected from *Seeganendal* village, Pudukkottai district, Tamilnadu and duly authenticated by Prof. P. Jayaraman, Director, Plant Anatomy Research Centre, Chennai-45. The authentication number is PARC/2016/3255 and 3256. The collected seeds of *S.cumini* were powdered and grounded by adding the leaf juice of *A. bracteolata* until its waxy consistency and made into 500mg pills (*Pattani size*).

Figure: 1. Seeds of *Syzygium cumini*

Figure: 2. *Aristolochia bracteolata*

Figure: 3. *Naaval Kottai Mathirai*

Anti-bacterial Activity

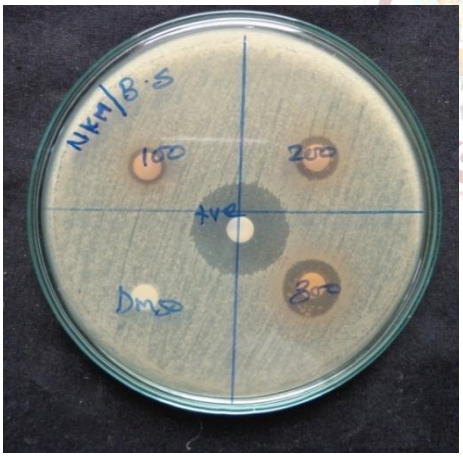
The anti- bacterial activity of the sample NKM was carried out by disc diffusion method. The concentrations of the test compounds were used at the concentration of 100,200,300µg. The target microorganisms were cultured in Muller-Hinton broth (MHB). After 24 h the suspensions were adjusted to standard sub culture dilution. Then the diluted bacterial stains were cultured in petri dishes containing Muller-Hinton Agar (MHA) medium. Disc made of Whatman No.1, diameter 6mm was pre- sterilized and was maintained in aseptic chamber. Each concentration was injected to the sterile disc papers. Then the prepared discs were placed on the culture medium. Standard drug streptomycin (20µg) was used as a positive reference standard to determine the sensitivity of each microbial species tested. Then the inoculated plates were incubated for 24h at 37˚C. The diameter of the clear zone around the disc was measured and expressed millimetres as its anti-microbial property.

RESULTS

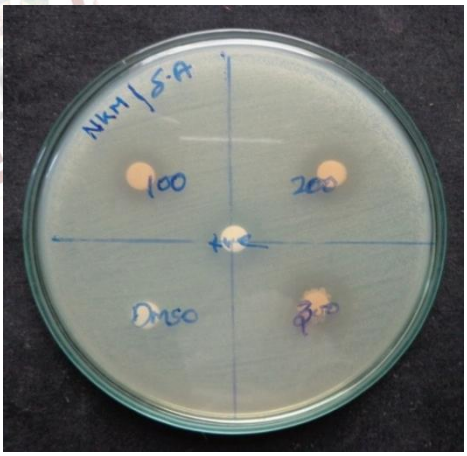
Table 1: Anti- bacterial Effect of *Naaval Kottai Mathirai*

Name of the Microorganism	Anti-bacterial effect of *Naaval Kottai Mathirai* (Zone of Inhibition in mm)			Streptomycin
	100µg/ml	200µg/ml	300µg/ml	20µg/ml
Bacillus subtilis	9	11	14	23
Staphylococcus aureus	11	13	17	18
Enterococcus faecalis	8	10	11	18
Pseudomonas aeruginosa	8	10	12	14
Escherichia coli	10	11	15	25
Klebsiella pneumonia	10	11	12	19

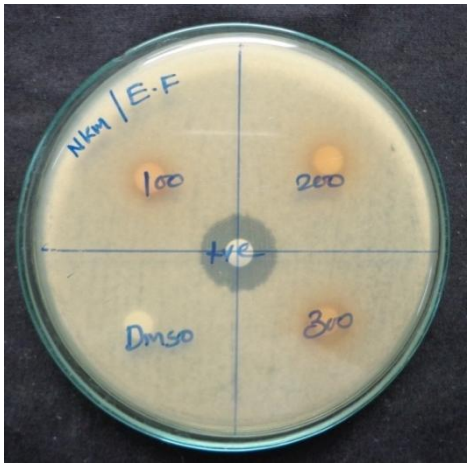
Anti Bacterial effect of *Naaval Kottai Mathirai*



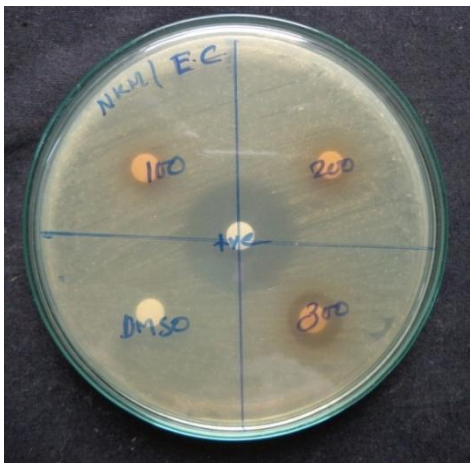
Bacillus subtilis



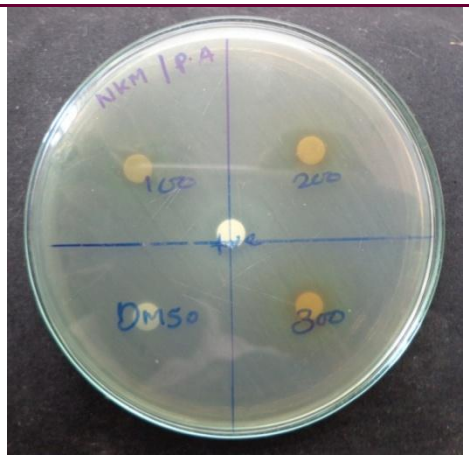
Staphylococcus aureus



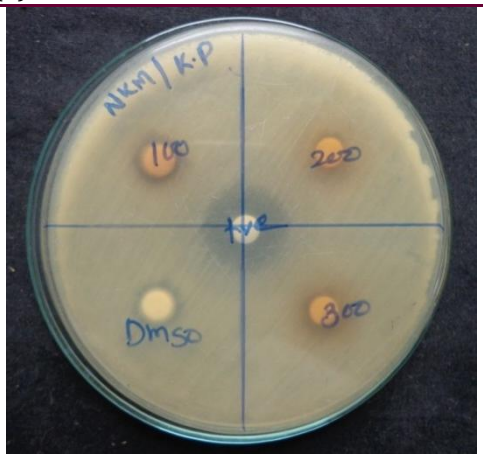
Enterococcus faecalis



Escherichia coli



Pseudomonas aeruginosa



Klebsiella pneumonia

DISCUSSION

Naaval Kottai Mathirai has been used for the management of diabetes by Siddha physicians and traditional practitioner. The urinary tract infections are more common, more severe, and carry worse outcomes in patients with type 2 diabetes mellitus. They are more often caused by resistant pathogens.

The management of UTI in diabetes patients is very difficult. The patients are undergoing for antibiotic treatment for this issue in every occasion. The drug *Naaval Kottai Mathirai* has been performed for anti bacterial effect against the selected human pathogens.

The result of this study showed the significant anti bacterial effect of maximum zone of inhibition were obtained against Escherichia coli 15mm, Staphylococcus aureu 17mm, Bacillus subtilis 14mm, Klebsiella pneumonia 12mm, Pseudomonas aeruginosa 12mm and Enterococcus faecalis 11mm when compared to the standard, Streptomycin (20µg) which exhibited anti bacterial effect by the measurement of Zone of inhibition 25mm, 18mm, 23mm, 19mm, 14mm and 18mm respectively. From this study result the drug NKM can be used for Urinary Tract Infections of Diabetes patients.

In Siddha system, taste plays a major role in selection of drugs, drug combination and treatment. According to Siddha Taste Theory, the bitter taste helps to destroy the micro-organism, to reduce the blood sugar and eliminate the toxins. Astringent taste acts as a blood purifier and helps to treat wounds. In this view, the ingredients of NKM, seeds of *Syzygium Cumini* possess strong astringent taste and *Aristolochia bracteolata* has bitter taste.[13] So as per Siddha fundamental taste theory, this formulation NKM is effective on UTI of diabetic patients.

CONCLUSION

From the in depth of Siddha fundamental taste theory and the result of anti-bacterial activity this study concluded that, the Siddha anti-diabetic herbal preparation *Naaval Kottai Mathirai* can be used as a drug of choice in the management of Diabetes with Urinary Tract Infection.

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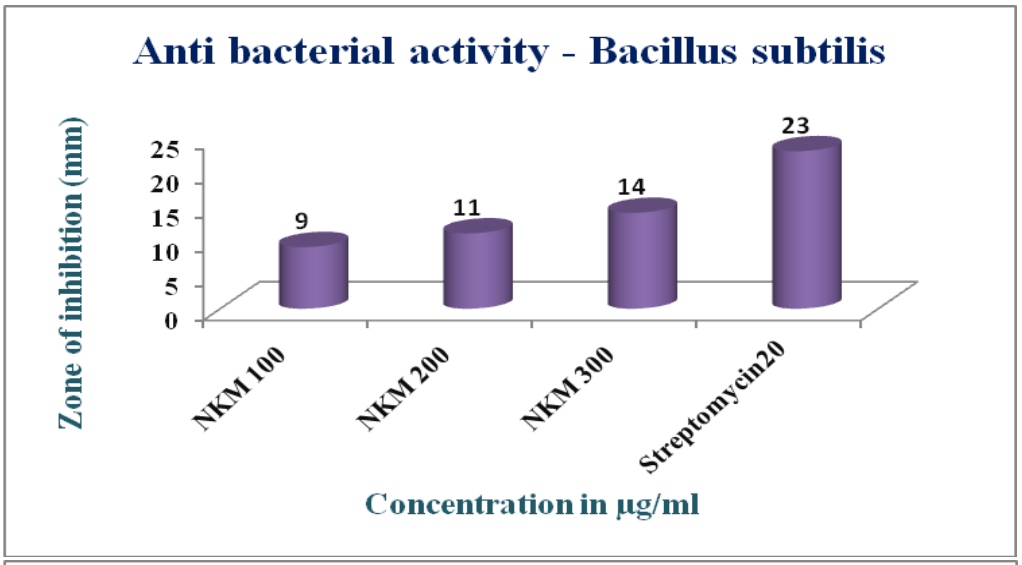
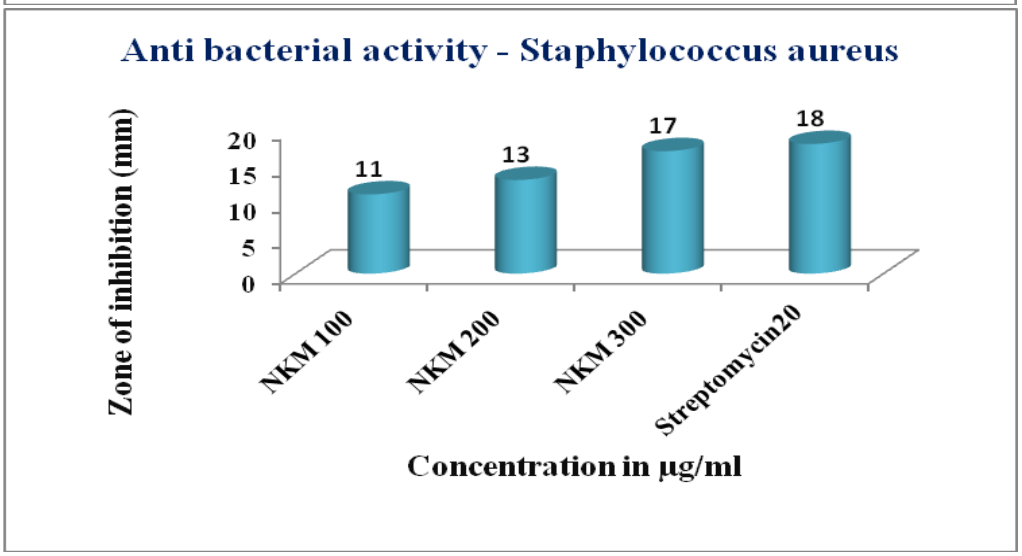
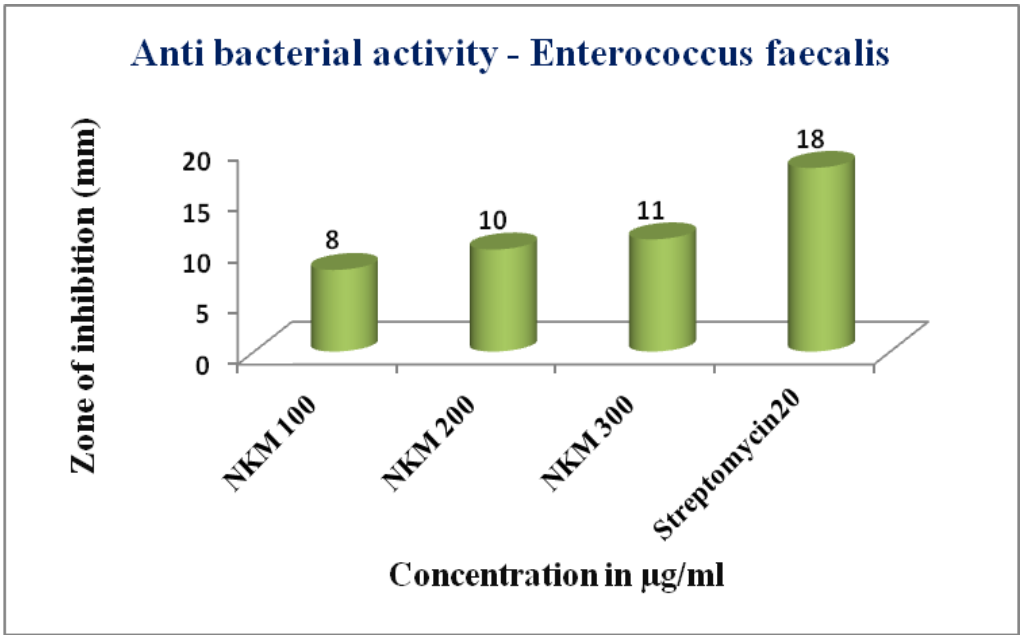
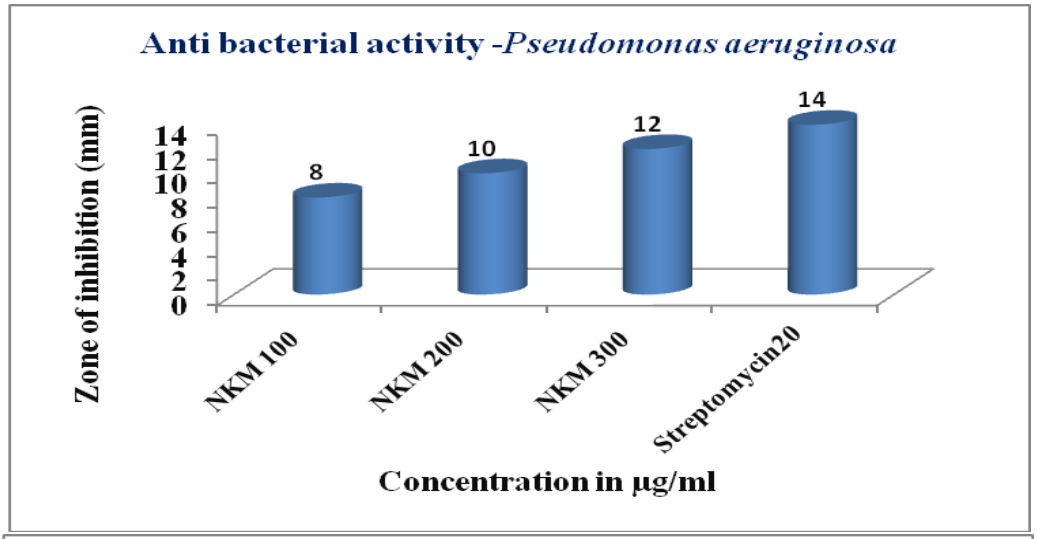
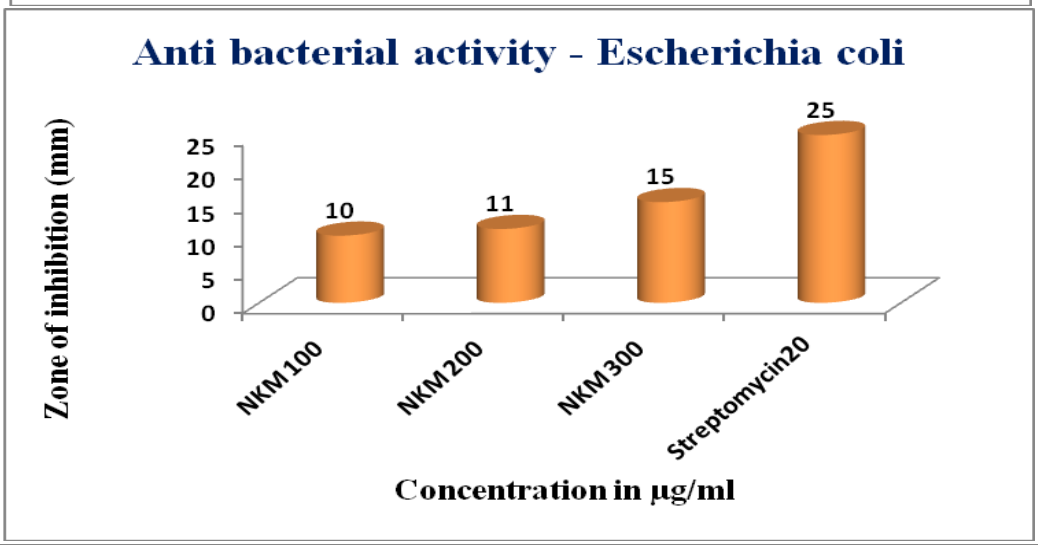
Anti Bacterial effect of *Naaval Kottai Mathirai*

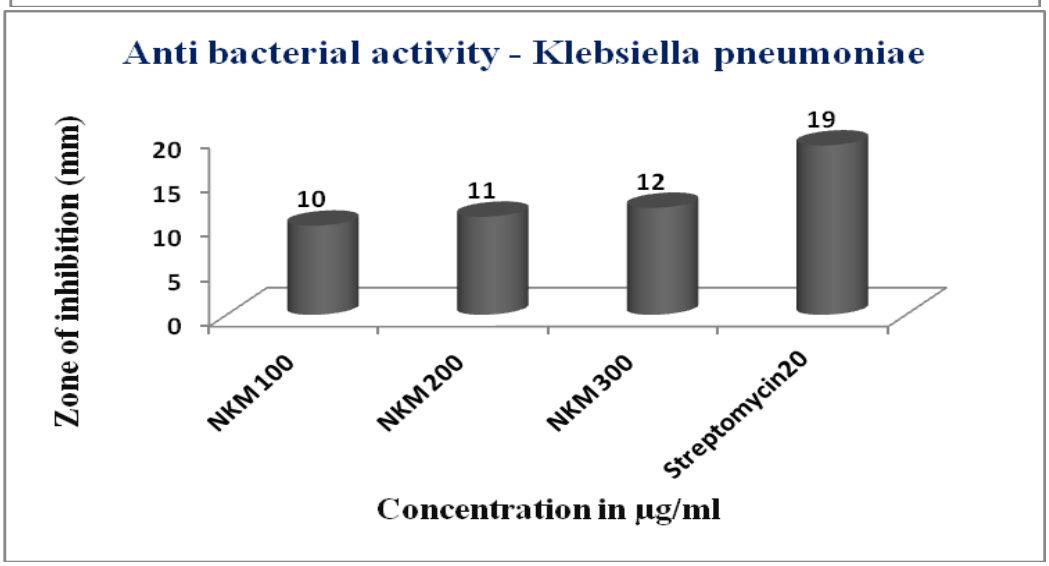







Anti bacterial activity -Pseudomonas aeruginosa
Zone of inhibition (mm)
0
2
4
6
8
10
12
14
8
10
12
14
NKM 100
NKM 200
NKM 300
Streptomycin20
Concentration in µg/ml


Anti bacterial activity - Escherichia coli
Zone of inhibition (mm)
0
5
10
15
20
25
10
11
15
25
NKM 100
NKM 200
NKM 300
Streptomycin20
Concentration in µg/ml


Anti bacterial activity - Klebsiella pneumoniae
Zone of inhibition (mm)
0
5
10
15
20
10
11
12
19
NKM 100
NKM 200
NKM 300
Streptomycin20
Concentration in µg/ml