

# Antibacterial Potential of *Argemone mexicana* Solvent Extracts against *Neisseria*

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## Abstract

**Introduction:** Gonorrhoea is a sexual transmitted infection which is caused by Gram negative bacteria called *Neisseria gonorrhoea* (gonococcus). *N. gonorrhoea* is inherently susceptible to most antibiotics, but through continual usage, resistance has emerged. Plants employ antimicrobial activity of phytochemicals as a protection mechanism against pathogens. It is due to this activity that phytochemicals have landed themselves into the medical field as potential solutions to a rapidly increasing drug resistant spawn of microorganisms. There is an increased multiple antimicrobial resistant patterns in *N. gonorrhoea* due to continual use of specific antibiotics, foreign plasmid acquisition and genetic evolution. Emergence of multidrug resistant strains of the pathogen poses a threat and thus the need to seek alternative medicine.

**Objectives:** To ascertain the effect of *Argemone mexicana* plant extract on *N. gonorrhoea* isolates.

**Methodology:** Fifty *N.gonorrhoea* species isolated from patients presenting at a local STI clinic were screened for antibiotic sensitivity using the Kirby bauer disc diffusion method. The isolates which were resistant were then exposed to the extracts of *Argemone Mexicana* and were analysed as a possible alternative to western medicines.

**Results:** Antibiotic sensitivity patterns and  $\beta$ -lactamase production was tested on a total of 50 *N.gonorrhoea* isolates. Ten organisms which presented with  $\beta$ -lactamase resistance were then used to screen for the activity of the plant extract *Argemone mexicana*. The extracts were from Ethanol, water, chloroform and acetone. Zones of inhibition are as presented in (Table 1). The Ethanolic extracts demonstrated maximum zone of inhibition(15mm).The extract was active against all the examined strains of *N.gonorrhoea*. The significant antibacterial activity was observed more in ethanolic extracts compared to other tested extracts of the plant. Ethanolic (100%), acetone(48%), Chloroform(34%), and water (31%).

**Conclusion:** The increased resistance of most of the synthetic drugs and also the increased side effects of antibiotics and antibiotic resistance of microorganisms has led to the research on use of medicinal plants and new plant derived antibiotics without any side effects [1-3]. The use of natural products as new antibacterial drugs has also been reported by other researchers [2,4,5]. In this study we looked at the effect of *A.mexicana* on *N.gonorrhoea* isolates and ethanolic extracts showed more activity on all the strains including the control strain. While chloroform and acetone extracts did not show much activity. There is need for researchers to venture more into alternative medicines as they are cheaper and easily available for the poor communities.

## Introduction

The abundant use of anti-infective agents resulted in emergence of drug resistant bacteria, fungi and viruses. To overcome the increasing resistance of pathogenic microbes, a variety of medicinal plants worldwide have been screened for their antimicrobial properties. Gonorrhoea is a sexual transmitted infection which is caused by Gram negative bacteria called *Neisseria gonorrhoea* (gonococcus). *N. gonorrhoea* is inherently susceptible to most antibiotics, but through continual usage, resistance has emerged. Plants employ antimicrobial activity of phytochemicals as a protection mechanism against pathogens. It is due to this activity that phytochemicals have landed themselves into the medical field as potential solutions to a rapidly increasing drug resistant spawn

of microorganisms. There is an increased multiple antimicrobial resistant patterns in *N. gonorrhoea* due to continual use of specific antibiotics, foreign plasmid acquisition and genetic evolution

Emergence of multidrug resistant strains of the pathogen poses a threat and thus the need to seek alternative medicine. The impetus for this research area is to find new and effective antimicrobial agents with novel modes of actions. Essential oils derived from aromatic medicinal plants have been reported to exhibit exceptionally good antimicrobial effect against bacteria, yeast, filamentous fungi and viruses [1,2,4]. Medicinal plants used in traditional medicine to treat infectious diseases seem to be an abundant source of new bioactive secondary metabolites [1-3].

### Objectives

To assess the antimicrobial sensitivity/resistant pattern of *N.gonorrhoea* and determine the anti-gonococcal effect of *A. mexicana*.

### Methodology

#### *Agermone mexicana*



Figure 1: Bauer disc diffusion Method was used for susceptibility testing.

Figure 1 Kirby Bauer disc diffusion Method was used for susceptibility testing. The following antibiotics were used ,Ampicillin, Gentamicin, Ciprofloxacin, Imipenem cefotaxime, tetracycline, cephalexin, and erythromycin, aztreonam, nalidixic acid, sulfamethoxazole-trimethoprim. NCCLS 2012 Standards were used.

#### β-lactamase production

Production of β-lactamase was tested using β-lactamase indicator strips. Plant extract sensitivity testing was done using

Table 2: C-Chloroform; A-Acetone; E-Ethanol and AQ-Water.

Pathogens	Zone of inhibition in mm					
	Extracts Conc. in µg	C	A	E	AQ	Amikacin
						30 µg
<i>5 isolates β-lactamase positive</i>	20	nil	nil	4±0.02	nil	15
	40	nil	nil	7±0.01	nil	
	60	nil	nil	8±0.02	nil	
	80	nil	nil	11±0.01	3±0.01	
	100	nil	nil	13±0.02	4±0.01	
<i>5 isolates non β-lactamase</i>	20	1±0.02	2±0.02	4±0.01	nil	20
	40	2±0.01	4±0.01	6±0.01	nil	
	60	4±0.02	5±0.01	7±0.02	1±0.01	
	80	6±0.02	7±0.02	13±0.01	4±0.01	
	100	8±0.01	10±0.01	16±0.01	6±0.01	
<i>N.gonorrhoea control strain</i>	20	4±0.02	4±0.01	10±0.02	nil	11
	40	6±0.01	6±0.02	13±0.01	nil	
	60	7±0.02	7±0.01	14±0.01	3±0.01	
	80	8±0.01	9±0.01	16±0.02	4±0.01	
	100	9±0.02	12±0.02	18±0.01	6±0.01	

chocolate agar plates were holes were pieced through the media and plant extract was poured into the holes for each plated isolate. Zones of inhibition were then measured.

### Results

Table 1: Antimicrobial susceptibility tests.

	Antimicrobial agents	βL producers	Non βL producers	P.Value
1	Gentamicin	50.74%	20.00%	<0.001
2	Amikacin	20.15%	10.31%	<0.001
3	Ciprofloxacin	80.22%	60.50%	<0.001
4	Cephalexin	84.55%	50.80%	<0.001
5	Chloramphenicol	56.23%	30.76%	<0.05
6	Cefotaxime	50%	20.73%	<0.001
7	Ampicillin	84.90%	56.51%	<0.001

Antibiotic sensitivity patterns and β-lactamase production was tested on a total of 50 *N. gonorrhoea* isolates. (Table1). Ten organisms which presented with β-lactamase resistance were then used to screen for the activity of the plant extract *Argemone mexicana*. The extracts were from Ethanol, water, chloroform and acetone. Zones of inhibition are as presented in (Table 2). The Ethanolic extracts demonstrated maximum zone of inhibition (15mm). The extract was active against all the examined strains of *N.gonorrhoea*. The significant antibacterial activity was observed more in ethanolic extracts compared to other tested extracts of the plant. Ethanolic (100%), acetone (48%), Chloroform(34%), and water (31%).

## Conclusion

The increased resistance of most of the synthetic drugs and also the increased side effects of antibiotics and antibiotic resistance of microorganisms has led to the research on use of medicinal plants and new plant derived antibiotics without any side effects [2,4]. The use of natural products as new antibacterial drugs has also been reported by other researchers [1,4,5]. In this study we looked at the effect of *A.mexicana* on *N.gonorrhoea* isolates and ethanolic extracts showed more activity on all the strains including the control strain. While chloroform and acetone extracts did not show much activity. There is need to do further studies on the Minimum inhibitory concentrations and also to test the cytotoxicity of the plant as most of these herbs are either orally administered or inserted into the vagina of the patients. There is need for researchers to venture more into alternative medicines as they are cheaper and easily available for the poor communities.

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