

ANALYSIS OF PHYTOCHEMICAL AND ANTIMICROBIAL ACTIVITY OF *VACHELLIA NILOTICA*

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ABSTRACT *Vachellia nilotica* is a multipurpose tree from ancient time in India. In the present study its leaves and seeds-pods were used for the phytochemical analysis and antimicrobial activity against six different organisms viz; *Bacillus subtilis*, *Bacillus cereus*, *Salmonella typhi*, *Staphylococcus aureus*, *Proteus vulgaris* and *Escherichia coli*. The phytochemical study revealed the presence of flavonoid, tannin, saponin, glycoside, steroids, terpenoid, alkaloids, anthraquinone, phenol and carbohydrate in *Vachellia nilotica* leaves while the absent of terpenoids in seeds and pods. The antimicrobial activity using the agar well diffusion method revealed that *Staphylococcus aureus* and *Salmonella typhi* were more susceptible as compared to others. The extract showed decent activity against all the organisms. It revealed that the extracts can be used to treat the diseases or infections caused by the tested organisms.

KEYWORDS : Antimicrobial activity, Phytochemical analysis, *Vachellia nilotica*

INTRODUCTION

From ancient times, nature has provided basic needs, such as medicines, food, shelters, clothes, modes of transportation and flavours to humans. "Charak Samhita" is the biggest Ayurveda book written by "Rishi Charak", a plant medicinal book in India that describe the use and effectiveness of different plants for different disease.

Vachellia nilotica is known as *Acacia nilotica* (L.) as its taxonomic synonyms [1]. In general, it is known as the babul tree, gum arabic tree or Egyptian acacia. Pods of *Vachellia nilotica* have antioxidant activity and efficiency to protect plasmid DNA [2]. Pods has been proven the use in folk medicine for the diabetes mellitus treatment [3]. *Vachellia nilotica* Seeds are used for antispasmodic activity and also used for antiplasmodial activity [4].

MATERIALS AND METHODOLOGY**Collection of plant:**

The pods and leaves of *Vachellia nilotica* were collected from the area of Matwad village of Navsari district in Gujarat. The pods-seeds and leaves were dried up in sunlight and the powder was prepared using the grinder machine and stored at room temperature and in a dry place.

Collection of test culture:

The sample of *Bacillus cereus*, *Bacillus subtilis* and *Salmonella typhi* was collected from Shree P.M. Patel Institute of P.G. Studies and Research in Science, Anand, Gujarat. and *Staphylococcus aureus*, *Proteus vulgaris* and *Escherichia coli* from B.P. Baria Science Institute, Navsari, Gujarat.

The extraction method for the phytochemical analysis:

The extraction was prepared by using four different solvents viz; distilled water, 70% methanol, chloroform and 70% DMSO (Dimethyl sulphoxide). The extraction was carried out from the powder of *V. nilotica* pods with seeds and leaves in different solvents. The ration of 1gm/5ml was prepared for phytochemical study. Allow it to mix on rotary shaker for overnight and filtered using a muslin cloth. Various phytochemical analysis was carried out using these extracts.

Different concentrations viz; 100mg/ml 200mg/ml, 300mg/ml, 400mg/ml and 500mg/ml were prepared in 70% methanol for the antimicrobial activity using Agar well diffusion method using the same procedure used for phytochemical extraction.

Phytochemical testing

Different phytochemical tests were carried out to identify the compounds present in the plant sample [5], [6].

Agar well diffusion method:

About 20 to 25 ml Moller Hinton agar containing sugar tubes were prepared and inoculated with 10⁷ dilution containing 1 ml pure culture of microorganisms in the sterile condition and allow it to solidify and with using a borer of 10mm bore size, wells were prepared in the sterile

agar petri dish and 100µl Sample of each concentration were inoculated in the different well. As a positive control 1mg/ml Streptomycin and as a negative control 70% methanol was used as a same amount.

RESULTS AND DISCUSSION

The phytochemical study of *Vachellia nilotica* leaves extract indicated the presence of flavonoids, tannin, saponin, glycosides, steroids, terpenoids, alkaloids, anthraquinone, phenol and carbohydrate. In water glycosides, steroids and alkaloids were absent. Saponins and terpenoids were absent in methanol and DMSO extract while chloroform shows only the presence of flavonoids, anthraquinone and phenol. This result was in support with the work of [7]. They

Table 1. Phytochemical analysis of *Vachellia nilotica* leaves and seeds-pods

Test	Leaves				Seeds-Pods			
	W.E.	M.E.	C.E.	D.E.	W.E.	M.E.	C.E.	D.E.
Flavonoids	+	+	+	+	+	+	+	+
Tannins	+	+	-	+	+	+	+	+
Saponins	+	-	-	-	-	+	-	+
Glycosides	-	+	-	+	-	+	+	-
Steroids	-	+	-	+	+	+	-	+
Terpenoids	+	-	-	-	-	-	-	-
Alkaloids	-	+	-	+	-	+	-	+
Anthraquinone	+	+	+	+	+	+	+	+
Phenol	+	+	-	+	+	+	+	+
Carbohydrate	+	+	+	+	+	+	+	+

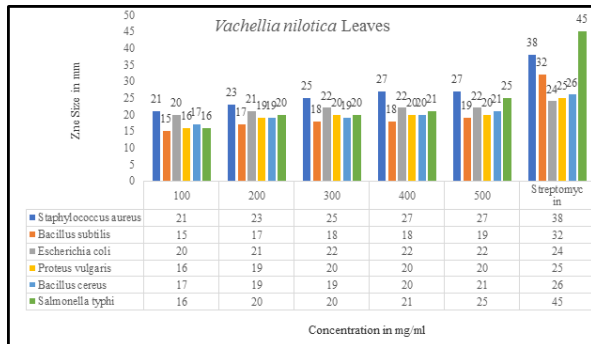
reported the presence of saponin, tannin, flavonoids, phenol, alkaloids and terpenoids in *Vachellia nilotica* leaves extract but disagree at the point of absence of steroids. (Table 1)

The phytochemical study of *Vachellia nilotica* pods and seeds extract revealed the presence of flavonoids, tannin, saponin, glycosides, steroids, alkaloids, anthraquinone, phenol and carbohydrate while terpenoids were absent. Extract prepared in water shows the presence of flavonoids, tannins, steroids, anthraquinone, phenol and carbohydrate. Terpenoids were absent in methanol while terpenoids and glycosides were absent in DMSO extract. Chloroform shows the presence of flavonoids, tannins, glycosides, anthraquinone, phenol and carbohydrates. The presence of flavonoids, glycosides, saponins, alkaloids, and tannin in methanol extract of *Vachellia nilotica* seeds and pods was supported by Abdalla et al., (2020) [6] but disagree with the presence of terpenoids that was supported by Rupal et al., (2016) and Rwarinda et al., (2015) [8], [9].

AGAR WELL DIFFUSION METHOD

The investigation of *Vachellia nilotica* leaves for antimicrobial activity revealed that against *S. aureus* 27 mm of the highest zone has been observed at 400 and 500 mg/ml concentration, against *Bacillus subtilis* 19 mm of the zone has been observed at 500 mg/ml concentration, 22

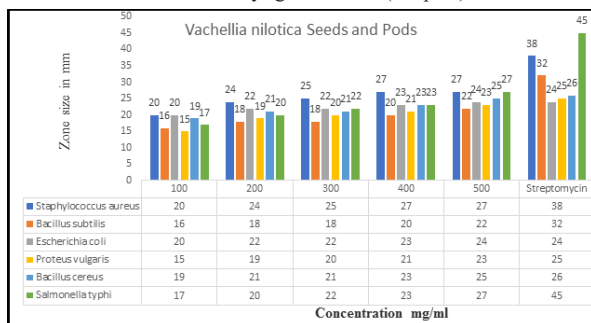
mm highest zone size in *Escherichia coli* at the concentration of 300, 400 and 500 mg/ml concentration, 20 mm highest zone size at the concentration of 300, 400 and 500 mg/ml in *Proteus vulgaris*, against *Bacillus cereus* 21 mm highest zone size at a concentration of 500 mg/ml and 25 mm highest zone size in *Salmonella typhi* at 500 mg/ml concentration. Among all the organisms *Vachellia nilotica* showed the highest zone of inhibition against *S. aureus* at 400 mg/ml and 500 mg/ml concentration with the zone size of 27 mm. So, it revealed that *Vachellia nilotica* leaves extract in methanol described the highest activity against *S. aureus* and also decent activity against others.



Graph 1. *Vachellia nilotica* leaves extract against different organisms

Sharma *et al.*, (2014) [10] used the hot extraction method by taking 100mg/ml concentration. The study against *S. aureus* and *Escherichia coli* indicated the zone of inhibition in methanolic extract was 22.6±1.15 and 17.6±1.15 respectively. In contrast, the study zone of inhibition of the present study was 21mm and 20mm. In comparison to Sharma *et al.*, (2014) [10] experimental results showed similarity in *S. aureus* while superior was observed in *Escherichia coli* (Graph 1).

The investigation of *Vachellia nilotica* Seeds and pods for antimicrobial activity revealed that against *S. aureus* 27 mm of the highest zone has been observed at 400 mg/ml and 500 mg/ml concentration, against *Bacillus subtilis* 22 mm of the zone has been observed at 500 mg/ml concentration, 24 mm highest zone size in *Escherichia coli* at the concentration of 500 mg/ml, 23 mm highest zone size at the concentration of 500 mg/ml in *Proteus vulgaris*, against *Bacillus cereus* 25 mm highest zone size at a concentration of 500 mg/ml and 27 mm highest zone size in *Salmonella typhi* at 500 mg/ml concentration. Among all the organisms *Vachellia nilotica* seeds and pods extract showed the highest zone of inhibition against *Staphylococcus aureus* and *Salmonella typhi* at 400 mg/ml and 500 mg/ml for *S. aureus* and 500mg/ml concentration for *S. typhi* with the zone size of 27 mm. So, it revealed that *Vachellia nilotica* seeds and pods extracts in methanol described the highest activity against *S. aureus* and also decent activity against others (Graph 2).



Graph 2. *Vachellia nilotica* seeds and pods extract against different organisms

Abdalla *et al.*, (2020) [6] used Soxhlet extraction by taking different concentrations. As compared to their study zone of inhibition against *Escherichia coli*, *Staphylococcus aureus* and *Bacillus subtilis* were observed 22mm, 22mm and 24 respectively at 100 mg/ml concentration. In contrast to it 20mm, 21mm and 15mm was observed respectively in this experiment. Which showed similarity in *Escherichia coli* and *S. aureus* while inferior was observed in *Bacillus subtilis*.

5. CONCLUSION

The study of Phytochemicals concluded that flavonoids, tannins, saponins, glycosides, steroids, alkaloids, anthraquinone, phenol and carbohydrate were present in all the tissues of *Vachellia nilotica*. The best phytochemical result among tissues was observed in *Vachellia nilotica* leaves extract. The extracts prepared in methanol and DMSO indicated better results than the water and chloroform extract among both the tissues. In the antimicrobial activity, *Vachellia nilotica* both the tissue indicated the good activity against all the organism among which *S. aureus* and *Salmonella typhi* are more susceptible than any other organisms. The highest activity was found at the concentration of 500mg/ml while lowest was against 100mg/ml that indicates that increasing the concentration also increase the activity against organisms. From the study we can concluded that we can use *Vachellia nilotica* as a treatment of diseases or infections caused by the organisms that were checked for antimicrobial activity.

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