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Anti Inflammatory and Antimicrobial Activity of *Gymnema sylvestre* Leaves Extract

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

We have undertaken to evaluate the pharmacological studies of *Gymnema sylvestre* using pharmacolical methods,disc diffusion, and anti-inflammatory methods. The Alkaloid, Carbohydrate, Protein,Resin, Saponin, and Glycosides were present whereas, steroid, flavanoid, and tannin were absent in phytochemical screening in G. sylvestre extract. The result showed induced paw edema using Carrageenan model. The dose dependent antibacterial was also observed. The present study is important because Gymnema sylvestre plant is important to cure various ailments in traditional medicine Since the diabetes is spreading in all over the world as an epidemic and there is no permanent treatment in allopathy therefore peoples are looking alternative medicine for treatment of diabetes.

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Keywords: Antibacterial; phytochemical; Gymnema sylvestre, antiinflammatory activity.

1. INTRODUCTION

"The leaves of *Gymnema* reported a loss of sweet taste. The major chemical constituents of *Gymnema* are gymnemic acid and gurmarin. It was reported that Gymnemic acids have antidiabetic, antisweetener, anti-inflammatory, antioxidant activities, and antidote properties" [1-5], It helps to promote weight loss possibly through its ability to reduce cravings for sweets and control blood sugar levels. The gurmarin peptide block the ability to taste sweet or bitter flavors and thus reduces sweet cravings" [6]. "The wound healing activity in albino mice. I*n vitro*, the inhibitory effects of DPPH radicals and LDL oxidation and muscle relaxant properties and antiallergic activity were reported" [7-9]. "The radio protective and immune modulatory effect of Gymnemic acid was reported on Swiss albino mice induced by radiation The studies reported the anticancer activity of Gymenema sylvestre on MCF 7 (epithelial cells of human breast cancer and A 549 epithelial cells of human lung cancer under in vitro conditions by MTT assay method" Srikanth et al, [10], and Soni and Agrawal, 2018 [11]. "Leaves and roots of G. sylvestre is mainly used in India in traditional medicine as a natural treatment for diabetes as it helps to lower and balance blood sugar levels. G. Sylvestre helps to promote weight loss possibly through its ability to reduce cravings for sweets and control blood sugar levels. Since the diabetes is spreading in all over the world as an epidemic and there is no permanent treatment in allopathy therefore peoples are looking alternative medicine for treatment of diabetes therefore we have undertaken to screen this plant for antimicrobial and anti-inflammatory activities. We have already reported the anticarcinogenic activity of this plant" [12].

2. MATERIALS AND METHODS

2.1 Extraction Process

2.1.1 Procedure

The *Gymnema sylvestre* leaves were collected from the local garden of Chitrakoot Uttar Pradesh in the month of April 2020 and were identified by competent Botanist Dr. Manoj Tripathi of DRI, Chitrakoot. The leaves were cleaned and dried for few days in shade. Then powder was made with the help of grinder. The extraction was done as per the method reported in earlier paper on the day of experimentation, the desired amount of powder was suspended in double distilled water for the final administration. Phytochemical screening was done as per method reported by Agrawal [11,13].

2.1.2 Antibacterial activity

The test organisms were obtained from the Department of Research, PBCRI Satna (M.P.). Antibacterial screening was done to find out the antibacterial properties of different concentration of 50% methanolic extract of *Gymnema sylvestre* leaves under study Kirby-Bauer Method (Disc diffusion method) was followed to test the antibacterial activity of different concentration of leaves extract.

2.2 Evaluation of Anti-inflammatory Activity Carrageenin-induced Rat Paw Oedema

The mice were divided into five groups (n = 3). Acute inflammation was induced by the sub-plantar administration of 0.1 ml of 1% carrageenin in normal saline in the right hind paw of the mice. The paw volume was measured at 0 h and 4 h after carrageenin injection, using Plethysmometer. The different groups were made as described in the Table 4. The mice were divided into five groups (n = 3). After shaving the fur, the mice were anaesthetized under light ether and 10 mg of sterile cotton pellets were inserted, one in each axilla of the mice. Extract (200, 300 and 500 mg/kg), Phenylbutazone (100 mg/kg) and to group control vehicle were administered orally for seven consecutive days from the day of cotton pellet implantation. The animals were anaesthetized on the eighth day and cotton was removed surgically. The pellets were dried at 60°C. The results were expressed as mean ± S.E.M. The significance statistical analysis was performed by t test and P < 0.01, implied significance organism was recorded.

3. RESULTS

The present study revealed the presence of medicinally important bioactive compound. The phyotochemical screening of 50% methanolic extract of *Gymnema sylvestre* are depicted in Table 1. The result showed the presence of Alkaloid, Carbohydrate, Protein, Resin, Saponin,

Glycosides. Only Starch, steroid, flavanoid, tannin are absent in *G. sylvestre* extract.

3.1 Antibacteriali Assay

50% methanolic extract of *G. sylvestre* at the different concentration i.e. 25%, 50%, 75%, 100% exhibited antibacterial against *Bacillus subtilis*, *Staphylococcus aureus* but the lower activity was observed *E. coli* and *Pseudomonas aeroginosae* at 100%) the Minimum inhibitory concentration (MIC) of Gym. Sylvestre against gram positive bacteria i.e. *Bacillus subtilis, Staphylococcus epidermidis, Staphylococcus aureus* was 25% but against gram negative bacteria Zone of inhibition was observed only in 100% extract. Other concentration i.e. 25% and 50%.

Table 1. Qualitative phyto-chemical screening of (*Gymnema sylvestre* (Retz.) Schult. (Leaf)

S.iNo.	Name of Experiments	Observation	Result
1.	**Alkaloids**		
	a. Mayer'itest	Yellow colour appear	Present
	b. Wagner's test	Brown coloui appear	Present
	c. Dragendorff's test	Orange colour appear	Present
2.	**Carbohydrate**		
	a. Anthrone's test	Dark colour appear	Present
	b. Fehling's test	Green colour appear	Present
	c. Molisch's I est	No redi–violet appear	Present
3.	**Proteins**		
	a. Bieuret's test	Green colour appear	Present
	b. Millon's test	White ppt appear	Present
5.	**Resins**	Turbidity are seen	Present
6.i	**Saponins**	Honey combi– like structure are form	Present
7.	**Starch**	Red colour formed	Absent
8.i	**Flavonoidi**		Absent
	a. Ferrici chloride itest	Reddis pink colour appear	Absent
	b. Alkaline reagent test	On addition of dilute acidi yello colour disappear	Present
9.	**Steroidi**		
	a. Salkowski's reaction	Aired colour is disappear on ithe chloroform layer	Absent
10.	**Glycosidei**		
	a. Borntrager's Test	Colour is change	Present
11.	**Tannin**	Greenish colour appear	Absent
	a) Leadiacetate Test	Reddish brownbulky ppt.are formed	Absent

Table 2. Antibacterial activity of *Gym. sylvestre* against bacterial strains

Name of microorganisms	%Concentration of Extract [zone of inhibition(mm)]			
	25	**50**	**75**	**100**
S.aureus	16	17	16	15
B.subtilis	10	12	13	15
E.iiColi	13	14	13	15
Ps.iaeroginosae	--	--	11	12

Table 3. Antibacterial activity of standard antibiotic (gram positive) against different bacteria

Name of microorganisms	Name Standard antibiotics [zone of inhibition(mm)			
	TE	**OF**	**AZ**	**PC**
S.aureus	15	16	16	14
B.subtilis	14	16	18	14
S.epidermidis	14	18	17	17

TE-I Tetracycline, OF- Ofloxacin, AZ- Azithromycini & PC-Piperacillin

Fig. 1. (a) Zone of inhibition of *Gymnema sylvestre* extract against different strains of bacteria

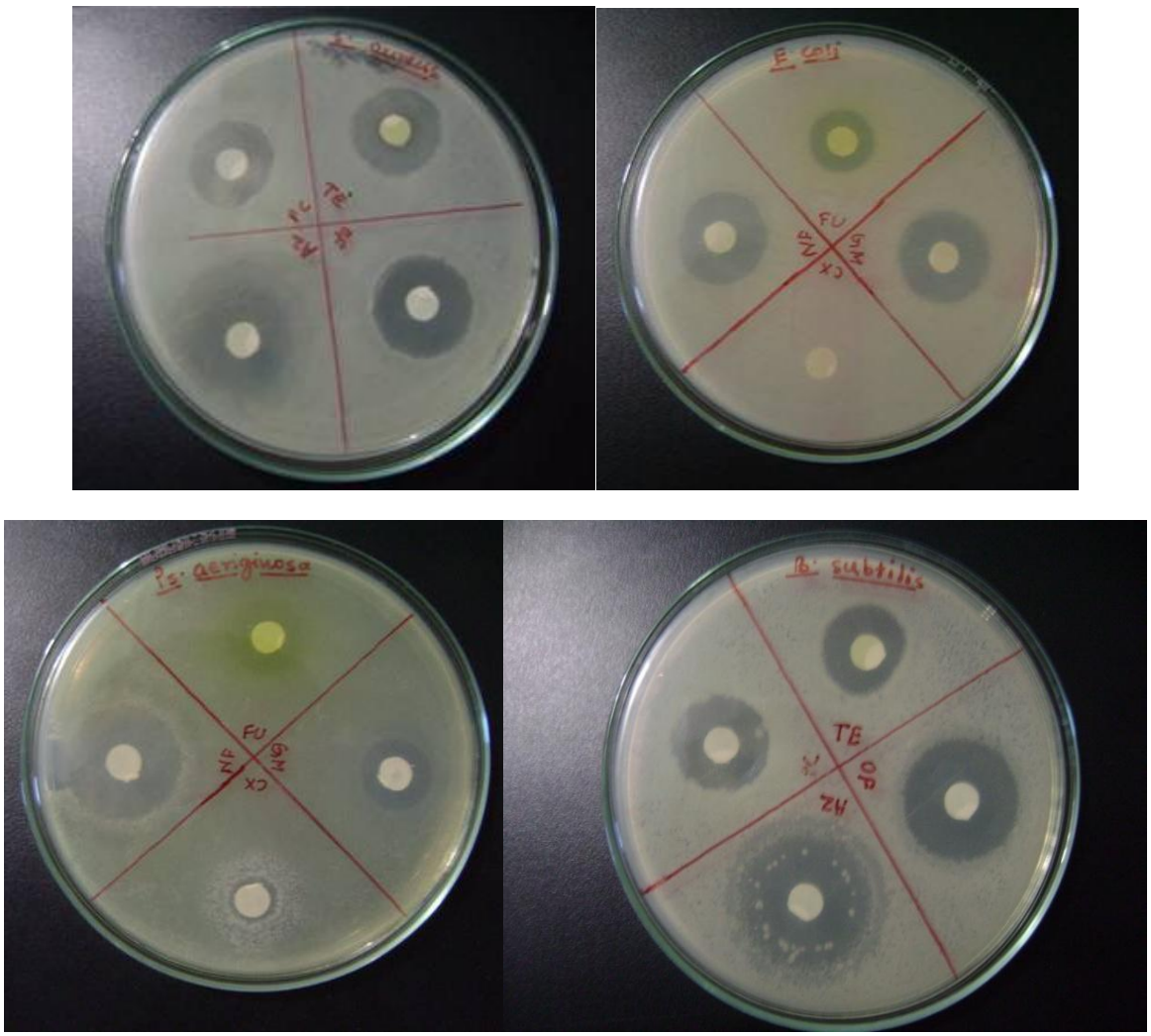


Fig. 1. (b) Zone of inhibition of standard antibacterial against different strains of bacteria

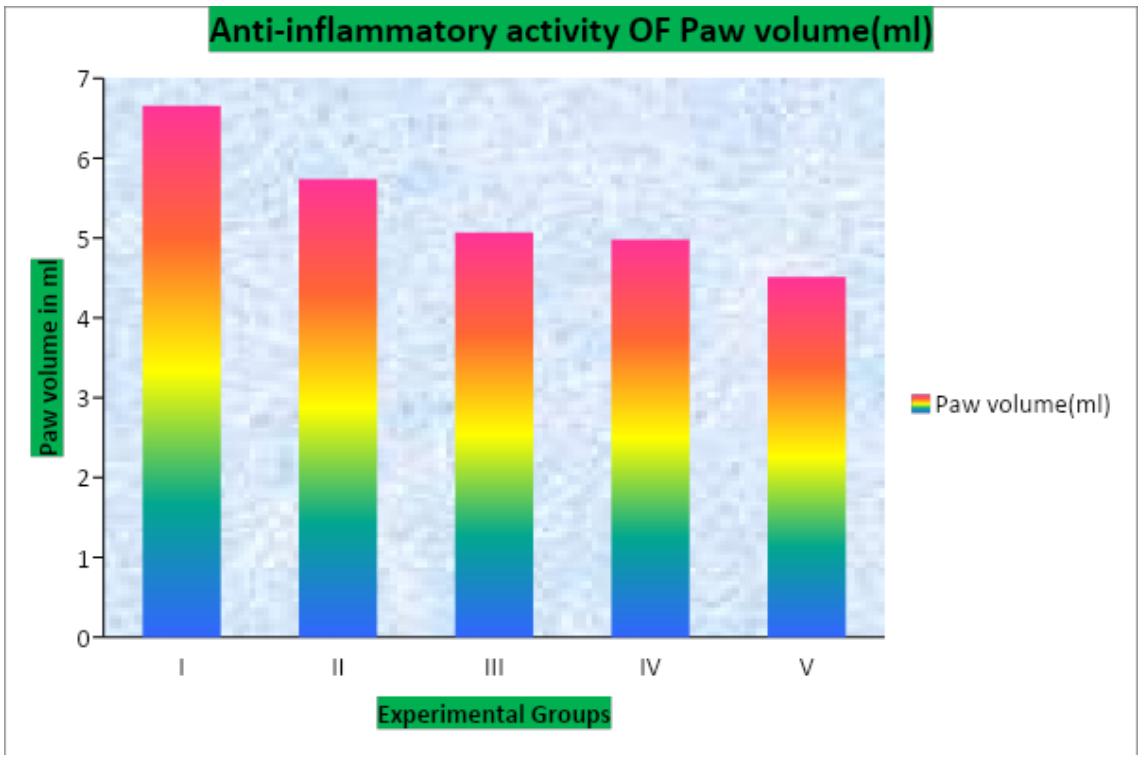
Table 4. Antibacterial activity of standard antibiotic (gram negative) against different bacteria

Name of microorganisms	Name of Standard antibiotics [zone of inhibition (mm)			
	FU	GM	CX	NF
E.coli	12	16	8.0	16
Sh.flexineri	18	18	12	21
P.aeruginosa	14	13	18	20

FU-Nitrofurantoin, GM-iGentamicin, CX- Cefotaxime i& NF- Norfloxacin
S.aureus – Staphylococcs aureus, B.isubtilis – Bacillusi subtilis, S. epidermidis – Staphylococcus epidermidis , E.icoli – Escherichiai Coli ,Sh.iFlexineri – Shigellaiflexineri
P.Aeruginosa – Pseudomonas aeroginosae

Table 5. Valuation of anti-inflammatory activity of *Gymnema sylvestre* leaves extract

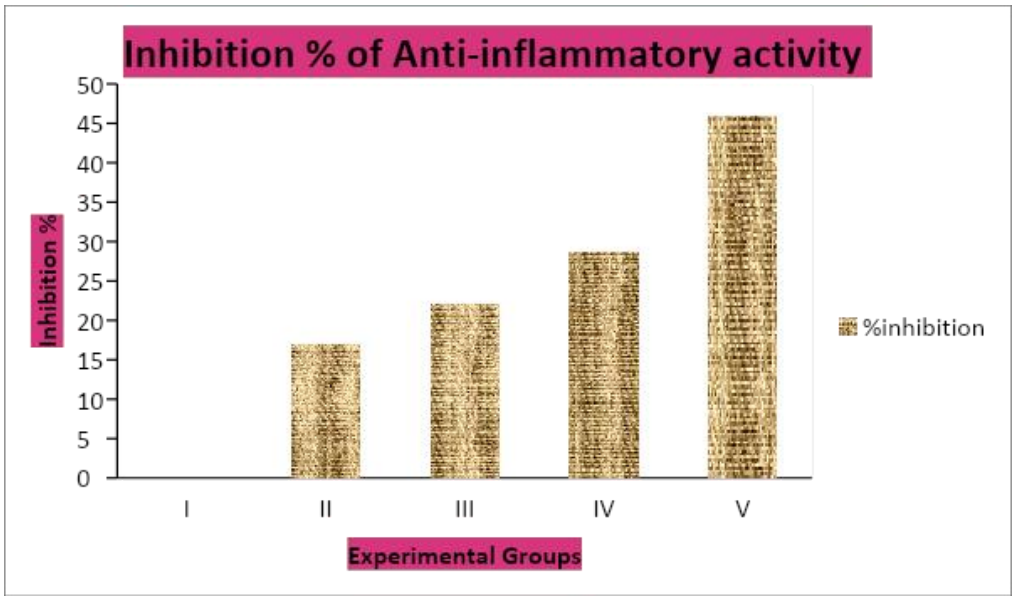
S.No.	Group	Paw volume (ml)	%inhibition
1.	Control	6.66±0.08	
2.	Gymnemai sylvestreis extract(200mg/kg)	5.74±0.11	16.95
3.	Gymnemai sylvestreii extract(300mg/kg)	5.07±0.05	22.16
4.	Gymnema sylvestreis extract(400mg/kg)	4.98±0.08	28.69
5.	Diclofenal sodium(100mg/kg)	4.51±0.12	46.05



Graph 1. Effect of *G. sylvestre* extract on antiinflammatory activity of paw volume(ml)

3.2 Anti-Inflammatory Activity

The result of anti-inflammatory activity of methanol extract of *Gymnema sylvestre* on Carrageenan induced paw edema is shown in Table 5. The methanolic extract of 400mg/kg decreased the paw edema volume by 28.69% within 4 hour after administration, while standard drug decreased the paw edema volume by 46.05% when compared with the paw edema volume of control. The gymnema sylvestre extract at the dose of 200, 300, 400 mg/kg produced significant reduction, when compared to the control group.



Graph 2. Effect of *G. sylvestre* extract on inhibition % of anti- inflammatory activity

4. DISCUSSION AND CONCLUSION

Present study showed that the extract of Gymnema sylvestre extract caused antimicrobial activity against gram positive and gramnegative bacteria. It also showed antiinflammatory activity in mice. It is also support our finding that antimicrobial report of some investigators [14-17]. The study is important for scientific community because this plant is used in traditional medicine to treat various diseases. Leaves and roots of *G. sylvestre* is mainly used in India in traditional medicine as a natural treatment for diabetes as it helps to lower and balance blood sugar levels [3,17]. *G. Sylvestre* helps to promote weight loss possibly through its ability to reduce cravings for sweets and control blood sugar levels. Since the diabetes is spreading in all over the world as an epidemic and there is no permanent treatment in allopathy therefore peoples are looking alternative medicine for treatment of diabetes therefore we have undertaken to screen this plant for antimicrobial and anti-inflammatory activities. We have already reported the anticarcinogenic activity of this plant $ Sonam and Agrawal) [18-21].

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

We hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The animal ethical; approval have been taken from the Animal Ethical committee of Priyambada Birla Cancer Research Institute before commencingSSS the experiments.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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