Bull. Pharm. Sci., Assiut University, Vol. 45, Issue 2, 2022, pp. 585-592.

Bulletin of Pharmaceutical Sciences
Assiut University
Website: http://bpsa.journals.ekb.eg/
e-mail: bullpharm@aun.edu.eg

BULL. PHARM. SCI. Assiut Univ.

PHYTOCHEMICAL SCREENING AND PHARMAOCOLOGICAL EVALUATION OF TECOMA GAUDICHAUDI

V. Alekhya[*1, 2], T. Deepan [2] and S. Ganapaty[1]

[1]*Department of Pharmacognosy, GITAM Institute of Pharmacy, Gandhinagar, Rushikonda, Visakhapatnam-530045, Andhrapradesh, India*
[2]*Department of Pharmacognosy, GIET School of Pharmacy, NH-16, Chaitanya knowledge city, Rajamahendravaram-533296, Andhrapradesh, India*

Tecoma gaudichaudi is a tropical flowering plant in the Bignoniaceae family that is used to treat diabetes. The aim of this research was to evaluate antioxidant, anti-inflammatory, and antibacterial properties. Tecoma gaudichaudi ethanolic extract had considerable antioxidant activity. Antioxidant activity was measured using the DPPH assay, the radical scavenging method, and the superoxide assay. Antibacterial activity and antifungal activity were performed by cup plate method by using Ciprofloxacin as standard for antibacterial and antifungal activity. Ethanolic extract of Tecomo gaudichaudi shows significant antibacterial effect against S. Aureus, B. Subtilis, P. vulgaris and E. coli using ciprofloxacin (50µg/ml) as standard. Three alternative methods were used to calculate IC_{50} values for antioxidant activity. The IC_{50} values for T. gaudichaudi (21 g/ml) and ascorbic acid (12 g/ml) were obtained using the DPPH technique. For anti-inflammatory studies the extracts show remarkable zone of inhibition ranging from 58.97 to 72.35 µg/ml respectively compared to standard indomethacin. Steroids, saponins, flavonoids, triterpenes, and phenols are found in preliminary phytochemical investigation. In conclusion, ethanolic extract of Tecomo gaudichaudi shows significant antioxidant, anti-inflammatory and antibacterial properties.

Keywords: *DPPH, Hydroxy radical scavenging, Antibacterial, Anti-inflammatory, Tecoma gaudichaudi*

INTRODUCTION

Tecoma gaudichaudi DC (Bignoniaceae) is a synonym of *Tecoma castanifolia*, fast-growing shrub commonly found in India. The leaves are 8-15 cm long, flowers are golden yellow, borne in large terminal pinnacle. It is annual flowering plant that is used to heal a variety of diseases.[1.2] Literature survey reveals *T. gaudichaudi* posess various bioactive compounds such as flavonoids, alkaloids, steroids, saponins[3]. *T. gaudichaudi* has been used to treat diabetes, indigestion, infertility and erectile dysfunction[4]. The present study aims at Pharmacognostical, Phytochemical screening and to evaluate antioxidant, anti-inflammatory, antibacterial activities for *Tecomo gaudichaudi*.

MATERIALS AND METHODS

Collection of plant materials

The whole plant (aerial parts and roots) of *Tecoma gaudichaudi* was harvested in the month of September and washed thoroughly with water then dried, grinded to get coarse powder. The plant was authenticated by Prof. M. Venkaiah, Taxonomist, with voucher specimen no AV/TG/2016/2 as *Tecoma Gaudichaudi* DC. The ethanolic extract is taken and concentrated through maceration process and stored in airtight container.

Preliminary phytochemical screening

The extracts were dissolved in specific reagents through standard procedure[5] and analysed for presence of phytochemicals[6,7] such as steroids, triterpenes, saponins, flavonoids, phenols and iridoids.

Received in 3/2/2022 & Accepted in 6/4/2022

*Corresponding author: Veeramaneni Alekhya, E-mail: alekhya.veramaneni@gmail.com

Invitro antioxidant activity

Diphenyl-1-picryl hydrazyl [DPPH] free radical scavenging activity

The DPPH test was used to assess the ethanolic extract of *Tecoma gaudichaudi*. In this method, 3 ml of extract solution in ethanol of various concentrations [5-50 µg/ml] was added to 1 ml of DPPH solution in ethanol. After 30 minutes, the absorbance was measured at 517nm.The reference substance was ascorbic acid [8,9].The DPPH radical scavenging activity was determined using the formula below

DPPH radical scavenging activity

$$= \frac{\text{Abs(control)-Abs (Test)}}{\text{Abs control}} \times 100$$

Hydroxy radical scavenging assay

The hydroxy radical scavenging activity of sample extracts was assessed using the method[10]. In phosphate buffer, different quantities [0.1-1000 µg/ml] of thio barbituric acid and trichloroacetic acid were applied to 1 ml thiobarbituric acid (1%) and 1 ml trichloroacetic acid (2.8%). After 1 hour of incubation at 37°C, the absorbance was measured at 532 nm.

Hydroxy radical scavenging activity

$$= \frac{\text{Abs(control)-Abs (Test)}}{\text{Abs control}} \times 100$$

Superoxide radical scavenging assay

To inhibit the formazon upon phytochemical reduction of nitro blue tetrazoline [NBT], superoxide radical scavenging assay was performed[11]. The sample extract of varying concentration [5-50 µg/ml] test and standard were prepared. Each 3ml reaction mixture contains (phosphate buffer pH 7.4), 100µl of riboflavin solution (20 µg), 200µl of EDTA (12mM), 100 µl of NBT (0.1 mg), 1ml of NADH diluted upto 3 ml with phosphate buffer. The sample mixture was measured for absorbance at 560 nm. The results were expressed as a percentage of inhibition against control.

Anti-inflammatory activity

Carrageenan induced paw edema

Rats used in this experiment were divided into five groups, treated with distilled water. *Tecomo gaudichaudi* prepared in two doses (100& 250 mg/kg body weight) and standard (Indomethacin 20mg/kg). Edema was induced by injection using carrageenan. The volume displacement method[12] was used to measure the edema that occurred. The percentage of edema inhibition was estimated using the formula (1-vt/vc) X 100, where vt and vc are the treatment and control groups mean paw volumes respectively. The data was analysed with a one-way ANOVA approach.

Antimicrobial activity

For antimicrobial testing, the following selective agar media were utilised. Gram positive bacteria like *Staphylococcus aureus* and *Bacillus subtilis*, and Gram-negative bacteria like *Proteus vulgaris* and *Escherichia coli*. Nutrient agar media was utilised to activate the microorganisms. The diameter of the zone of growth inhibition following incubation of test plates for 24 hours at 37°C (bacterial strains) or 48 hours at room *temperature (Candida albicans)* was used to measure the antibacterial activity of plant extract against test strain[13]. Antibacterial activity was measured using the cup plate method.

RESULTS AND DISCUSSION

The phytochemical screening of *Tecoma gaudichaudi* reveals the presence of active chemical constituents. The ethanolic extract of *T. gaudichaudi* subjected to various tests and the results were shown in Table 1

Table 1: Phytoconstituents of *Tecoma Gaudichaudi*

S.no	Phytochemical test	Results
1	Steroids	+
2	Triterpenes	+
3	Saponins	+
4	Steroidal saponin	+
5	Glycosides	_
6	Alkaloids	_
7	Carbohydrates	_
8	test for flavonoids	+
9	Tannins	_
10	Phenols	+
11	Irioids	+
12	Cardiac glycosides	_
13	Mucilage	_
14	Proteins & amino acid	_

+ve: Present, - ve: Absent

Antioxidant activity

Antioxidant activity results were expressed in terms of IC_{50} values using three different methods. The calculated IC_{50} values using DPPH method for *T. gaudichaudi* (21µg/ml) and ascorbic acid (12 µg/ml). The results are expressed in Tab 2 and Fig 1. The IC_{50} values using hydroxy radial scavenging method are 12 µg/ml for extract and 5 µg/ml for ascorbic acid. Results are expressed in Tab 3 and Fig 2. For superoxide radical scavenging assay method, the extract and standard shows IC_{50} of 37 µg/ml and 23 µg/ml respectively. The results are revealed in Fig 3.

Table 2: DPPH activity of *Tecoma gaudichaudi*

Concentration mcg/ml	Percentage inhibition			Mean % inhibition ± SD
	Trial 1	Trial 2	Trial 3	
5	2.3051	2.6086	2.6546	2.5227±0.18
10	18.3199	17.5745	19.3454	18.4132±0.88
15	38.4766	38.3876	39.4768	38.7803±0.60
20	48.4832	48.7768	49.4966	48.9188±0.52
25	59.2637	58.5565	57.3647	58.3949±0.95
30	66.7813	68.4568	67.3226	67.5202±0.85
35	77.7018	78.333	76.7877	77.6075±0.77
40	81.5126	80.4557	80.4967	80.8216±0.59
45	83.5981	82.5468	82.5568	82.90±0.55
50	85.8455	86.9069	85.8049	86.18±0.63

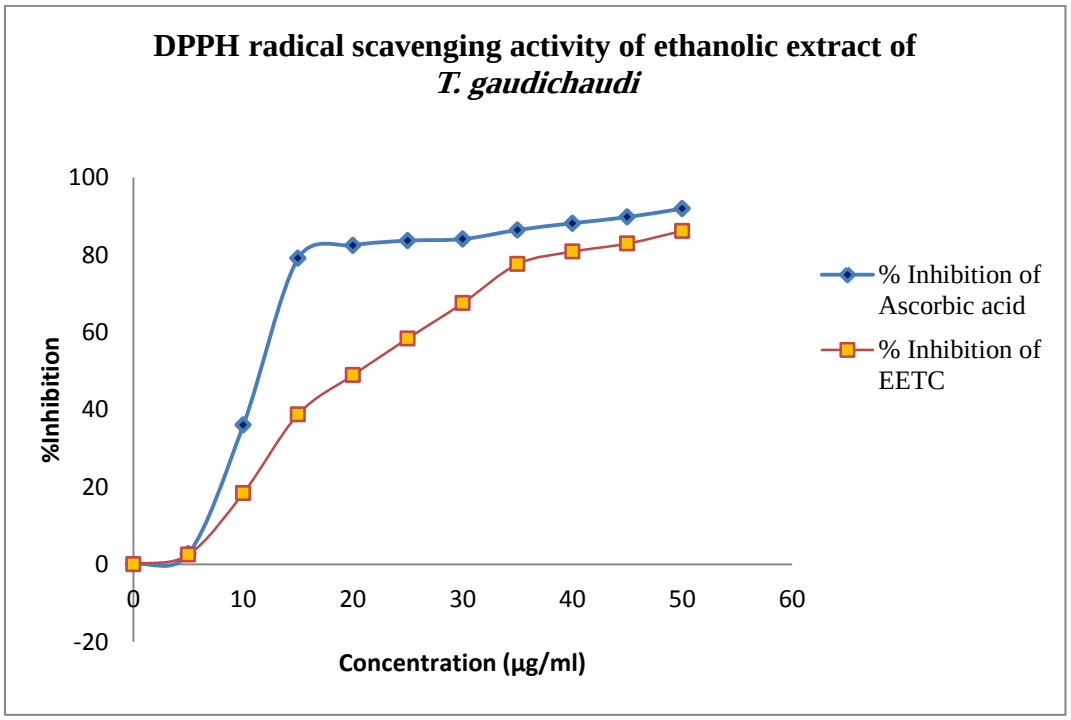

Fig. 1: Scavenging activity of DPPH by *T. gaudichaudi*

Table 3: Hydroxy radical scavenging activity of *Tecoma gaudichaudi*

Concentration mcg/ml	Percentage inhibition			Mean % inhibition ± SD
	Trial 1	Trial 2	Trial 3	
0.1	11.53	11.95	12.56	12.013 ± 0.51
0.5	18.78	19.56	19.67	19.336 ± 0.48
1	26.77	27.39	27.47	27.21 ± 0.38
5	46.66	46.56	47.87	47.03 ± 0.72
10	55.77	55.75	55.64	55.72 ± 0.07
20	58.55	58.54	58.65	58.58 ± 0.06
50	59.32	59.65	59.22	59.396 ± 0.22
100	60.68	60.68	60.66	60.673 ± 0.01
150	63.88	63.78	64.58	64.08 ± 0.43
200	65.45	65.55	65.35	65.45 ± 0.1
250	69.23	69.53	69.33	69.363 ± 0.15
300	71.56	71.66	71.56	71.593 ± 0.05
350	74.77	74.47	74.75	74.663 ± 0.16
400	75.82	75.52	75.62	75.653 ± 0.15
450	77.76	77.66	77.74	77.72 ± 0.05
500	80.46	81.88	80.74	81.026 ± 0.75
700	85.37	84.78	86.22	85.456 ± 0.72
1000	88.89	89.28	89.11	89.093 ± 0.19

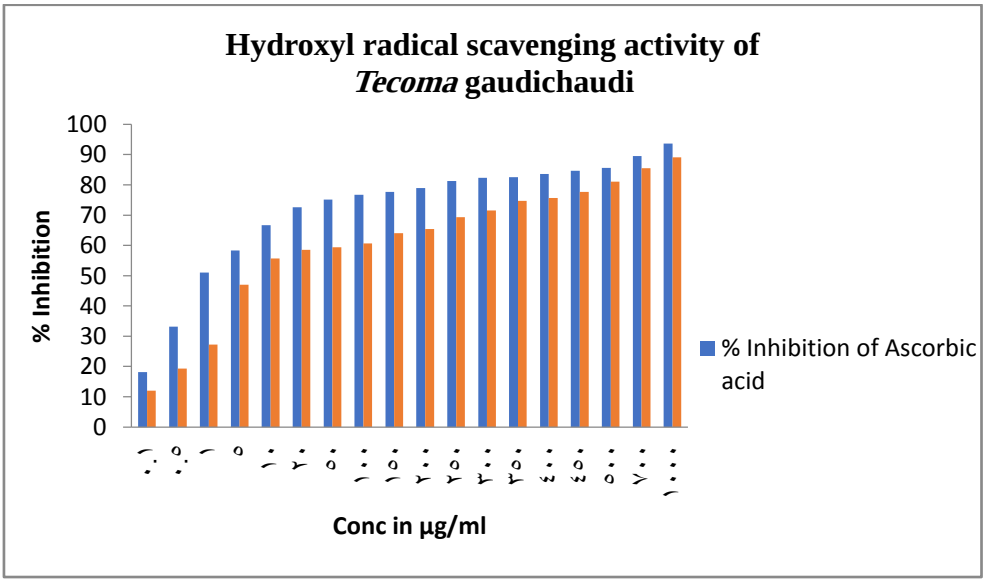

Fig. 2: Scavenging activity of *T. gaudichaudi* by hydroxy radical method

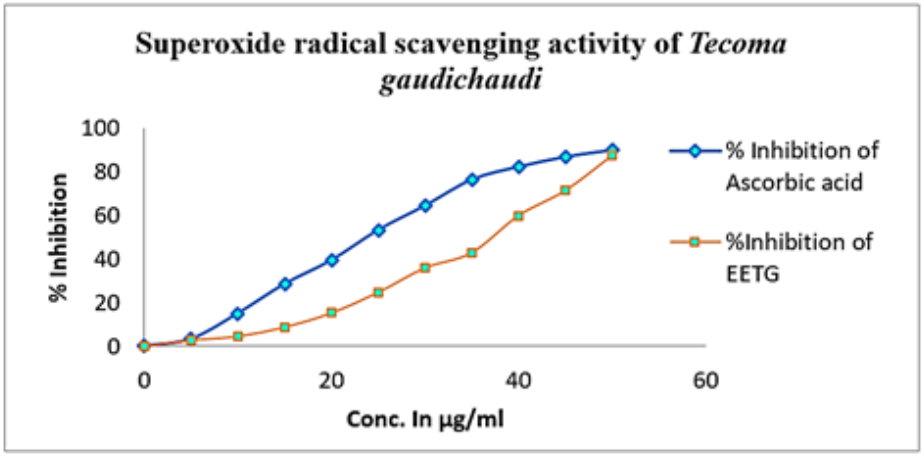

Fig. 3: Superoxide radical scavenging activity of *T. gaudichaudi*

Anti-inflammatory activity

Injection of carrageenan into righthand paw of rats in sub planar tissues causes oedema. The extract of *T. gaudichaudi* administered 1 hr before injection of carrageenan whereas peak inhibitory effect was recorded with a dose of 100mg/kg &250 mg/kg from 1 hr to 6 hrs respectively. In the carrageenan test the maximum inhibition exhibited by the extract was (58.97 ± 0.11) for 100mg/kg and (71.73 ±0.14) for 250mg/kg was comparable to indomethacin (72.35±0.43). The results were shown in Tab 4 and Fig 4 5.

Table 4: Percentage Inhibition of *Tecomo gaudichaudi by* carrageenan induced rat paw edema method

Sample	Dose (mg/kg)	% Inhibition of the paw in time intervals (hrs)					
		1st hr	2 nd hr	3rd hr	4thhr	5thhr	6thhr
Standard (Indomethacin)	20	25.30 ± 0.41	42.90 ± 0.40	57.5 ± 0.43	63.09 ± 0.42	64.29 ± 0.31	72.35 ± 0.43
Test Ext	100	20.64 ± 0.11	37.5 ± 0.12	45.9 ± 0.12	53.21 ± 0.11	56.36 ± 0.23	58.97 ± 0.11
Test Ext	250	25.30 ± 0.12	40.58 ± 0.13	56.2 ± 0.14	62.48 ± 0.13	62.97 ± 0.12	71.73 ± 0.14

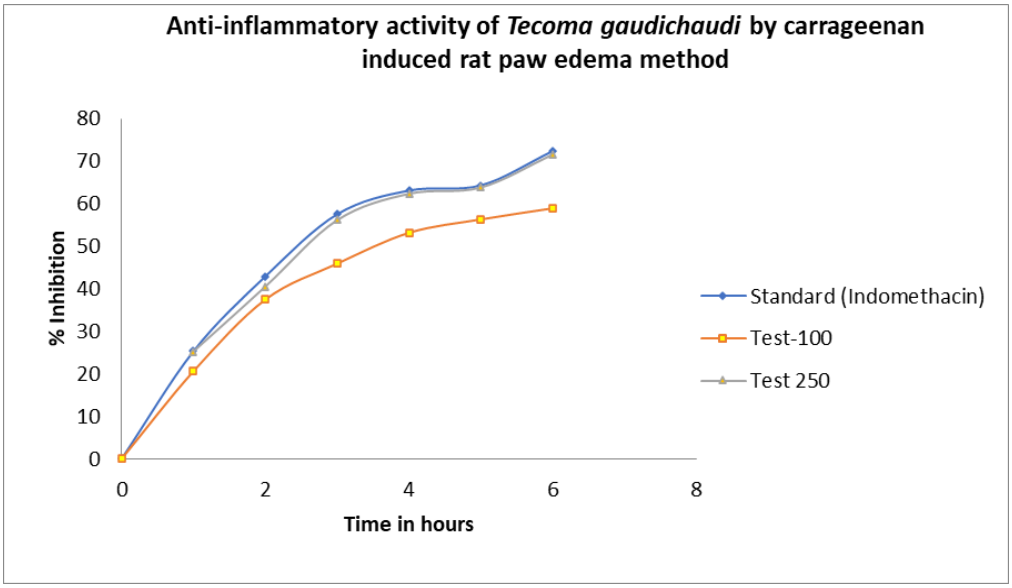

Fig. 4: Anti-inflammatory activity of *T. gaudichaudi*

Tab 5: Zones of inhibition (mm) showing antibacterial activity (*Tecoma gaudichaudi)*

Organism used	Zones of inhibition (in mm)				
	Standard (Ciprofloxacin 50µg/ml)	T_1 (50mg TG)	T_2 (100mg TG)	T_3 (150mg TG)	T_4 (200mg TG)
B. subtilis	24.66	10.5	12.5	12.75	14.5
E. coli	24.51	12.25	13.25	14.25	15.25
S. aureus	24.83	12.25	14	14.5	15
P. vulgaris	24.33	12.5	13	13.5	14.75

TG-*Tecomo gaudichaudi*

Antimicrobial activity

The diameter of the inhibition zone (IZ) of the different extracts differed in terms of degree of inhibition, with the maximum level of inhibition being reported. The bacteria *E. coli, B. cereus, and S. aureus* were the most vulnerable to all plant extracts, whereas *P. aureginosa and C. albicans* were the most resistant. When compared to water and hexane fractions, ethanolic extract had a higher level of antibacterial activity.

Table 5 shows *S. Aureus and E. Coli* have better minimum inhibitory concentration against ciprofloxacin(std). Accordingly, minimum inhibitory concentration of extracts ranged between 50 µg to 200 µg/ml where the standard extract of ciprofloxacin was 50 µg/ml. The results in Table 5 shows good antimicrobial activity but comparatively less antifungal activity.

Conclusion

The current investigation found that *Tecoma gaudichaudi* whole plant showed antioxidant, anti-inflammatory and antimicrobial properties. Further *T. gaudichaudi* had great potential in deep investigation for various biological activities and the work may be useful in developing a new entity with more therapeutic value. Based on the findings of this study, it is concluded that *Tecoma gaudichaudi* has high scavenging and reducing power activities, indicating that it is a significant natural antioxidant source that could be useful in future research.

REFERENCES

1. The ***Ayurvedic Pharmacopoeia of India***, Govt of India, Ministry of Health and Family Welfare, Dept of Ayush, 1, 1-12, (1999).
2. IPNI, ***International Plant Name Index***, Published on the internet http://www.ipni.org, The Royal Botanical Gardens, Kew, Harvard University (2021).
3. C. Shuvasish, D. Suparna and T. Anupam, ″Phytochemistry of the family Bignoniaceae", ***Assam University Journal of Science and Technology***, 7(1), 145-150, (2011).
4. M. Rahmatullah, W. Sammarrai and R. Jagan, ″An Ethnomedical, Pharmacological and Phytochemical review of some bigoniaceae family plants", ***Advances in Natural and Applied Sciences,*** 4(3), 236-253, (2010).
5. J.B. Harborne, ″A Guide to modern techniques of plant Analysis, ***Phytochemical Methods,*** Springer Pvt. ltd., Newdelhi,17, 2, (2005)
6. A. Sofawara, ″Research on medicinal plants and traditional medicine in Africa", ***Journal Alternative and Complementary Medicine***, 2(3), 365-372, (1996).
7. G.E Trease and W.C, Evans, ***Pharmacognosy***, 15 th Edition, London, 15, 53-336, (2002)
8. L. Koleva, TA Van beek, JP Linseen, AD Groot and L N Evstatieva, ″Screening of plant extract for Antioxidant activity: A comparative study on three testing methods", ***Phytochemical Analysis: PCA.,*** 13(1), 8-17 (2002).

9. L. Mathiesan, K. E. Malterud and R. B. Sund, ″Antioxidant activity of fruit exudate and methylated dihydrochalcones from myrica gale", ***Planta Medica,*** 61(6),515-518, (1995).
10. N. Smirnoff and Q.J. Cumbes, ″Hydroxy radical scavenging activity of compatible solutes", ***Phytochemistry***, 28(4), 1057-1060 (1989).
11. C. Beau champ and I. Fridovich, ″A mechanism for the production of ethylene from methianol, The generation of hydroxy radical by xanthine oxidase", ***The Journal of Biological Chemistry,*** 245(18),4641-4646 (1970).
12. K.R. Bhatt, R.K. Mehta and P.N. Shrivatsava, ″A simple method for recording anti-inflammatory effects on rat paw edema", ***Indian Journal of Physiology and Pharmacology***, 21(4), 396-400 (1977).
13. J. J Rojas, V. J Ocha, S. A Ocampo and J. F Munoz. ″Screening for antimicrobial activity of medicinal plants used in Colombian folkloric medicine: A possible alternative in the treatment of non-nosocomial infection, ***BMC Complementary and Alternative Medicine***, 6, 1-6 (2006).

Bull. Pharm. Sci., Assiut University, Vol. 45, Issue 2, 2022, pp585-592

نشرة العلوم الصيدلية
جامعة أسيوط

BULL. PHARM. SCI. Assiut Univ.

الفحص الكيميائي النباتي الأولي والتقييم الفارماكولوجي لنبات تيكوما جاوديكاودي

ف. ألكيا*[١،٢] – ت. ديبان[٢] – س. جاناباتيا[١]

[١]قسم العقاقير، معهد جيتام للصيدلة ، جاندهيناجار، روسهيكوندا، فيسكهاباتننام–٥٣٠٠٤٥ ، اندهرا برادش، الهند

[٢]قسم العقاقير، جيت للصيدلة نه–١٦، مدينة المعرفة شيتانيا، راجامهندرافارام ٥٣٣٢٩٦، ولاية اندرا براديش ، الهند

تيكوما جاوديكاودي هو نبات مزهر استوائي من عائلة بيجونونياسي يستخدم لعلاج مرض السكري. كان الهدف من هذا البحث هو تقييم الخصائص المضادة للأكسدة والالتهابات والبكتيريا. كان لمستخلص تيكوما جاوديكاودي الإيثانولي نشاط كبير مضاد للأكسدة. تم قياس نشاط مضادات الأكسدة باستخدام مقايسة DPPH وطريقة الكسح الجذري ومقايسة الأكسيد الفائق. تم إجراء النشاط المضاد للبكتيريا والنشاط المضاد للفطريات بطريقة لوحة الكوب باستخدام حمض الأسكوربيك كمعيار. أظهر المستخلص الإيثانولي لنبات تيكوما جاوديكاودي تأثيراً قوياً مضاداً للبكتيريا ضد ستاف اويرس، باسيلس سبتيلس، بروتيس فولجارس و الإشريكية القولونية باستخدام سيبروفلوكساسين (٥٠ ميكروجرام / مل) كمعيار. تم استخدام ثلاث طرق بديلة لحساب التركيز التثبيطي الأقصى حتى النصف (IC50) للنشاط المضاد للأكسدة. وكان قيمة IC50 لنبات تيكوما جاوديكاودي (٢١ جم / مل) وحمض الأسكوربيك (١٢ جم / مل) باستخدام تقنية DPPH. بالنسبة للدراسات المضادة للالتهابات ، أظهرت المستخلصات تثبيط ملحوظ تتراوح من ٥٨.٩٧ إلى ٧٢.٣٥ ميكروجرام / مل على التوالي مقارنة بالإندوميتاسين القياسي. تم العثور على ستيرويد ، والصابونين ، والفلافونويد ، والتريتربين ، والفينولات في الفحص الكيميائي النباتي الأولي. في الختام ، يُظهر المستخلص الإيثانولي لتيكوما جاوديكاودي خصائص كبيرة كمضاد للأكسدة ومضاد للالتهابات ومضاد للبكتيريا.