J Integral Sci, 2018, Volume 1, Issue 2, 10-13. ISSN: 2581-5679

www.jisciences.com

Research Article

Journal of Integral Sciences

Phytochemical screening and antibacterial activity of *Bombex ceiba*

Srikanth M [1, *] and Ganga Rao B [2]

[1] MAM College of Pharmacy, Narasaraopet, Andhra Pradesh, India-522601.

[2] AU College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, Andhra Pradesh, India-530003.

* Corresponding author: E-mail:srikanthphd2014@gmail.com, Mobile: +91 9492723149

Received: 3rd July 2018; Revised: 12th July 2018 Accepted: 19th July 2018

Abstract

Bombex ceiba is a traditional medicinal plant used by tribal people in treatment of different diseases. The present carried out for providing the scientific evidence of its traditional medicinal usage on antibacterial capacity and presence of different phytochemical constituents on *B. ceiba* seeds. Qualitative phytochemical screening, quantitative estimation of total phenolics and alkaloids was carried out using different standard test procedures and antibacterial activity was tested using cup plate method and measured its capacity on zone of inhibition measurement. The all extracts of *B. ceiba* revealed the presence of phenols, alkaloids, carbohydrates, steroids, terpenoids and glycosides and gave negative result to saponins. The hydroalcoholic and ethyl acetate extracts revealed the presence of flavonoids and tannins but the hexane extract gave negative results. The Quantified phenolic contents of *B. ceiba* extracts were ranging from 13.85±1.22 to 34.10±2.62 (mg/gm). The quantitative alkaloid content was ranging from 16.24±2.38 to 31.86±1.88 (mg/gm). All the extracts (hexane, ethyl acetate and hydroalcoholic) of selected medicinal plants at different concentrations (50µg, 100µg, 150µg and 200µg/cup) exhibited antibacterial activity along with standard drug (Rifampicin) against tested bacterial strains. Ethyl acetate and hydroalcoholic extract showed equal antibacterial activity on all bacterial strains.

Keywords: *Bombex ceiba*, Seeds, Phenolics, Alkaloids and Antibacterial activity.

1. Introduction

The relationship between humans and plants has been close throughout the development of human culture and they are dependent on plants for survival like food, shelter and in the health maintenance. There were many evidences and reports about the use of natural products including plants usage in the treatment of different diseases in ancient societies. The Rig-Veda, which is the oldest book of library of man, supplies the information about some herbs (De Pasquale, 1984; Kokate *et al.*, 2002). The synthesis of many chemicals and their introduction into therapeutics as drugs certainly revolutionized the treatment of diseases. Today we have a large number of synthetic drugs which are effective in different diseased conditions. However, it is a known fact that these drugs are not fully safe to humans and the disease causing microorganisms getting resistance towards current drugs and they produce a large variety of adverse reactions and have been the cause of a number of diseases (Boursi *et al.*, 2015).

Plant derived natural products hold great promise for discovery and development of new drugs in treatment of different diseases (Mc Chesney *et al.*, 2007). However, a large number of medicinal plants have not been studied in detail for their chemical constituents and pharmacological properties and use in different diseases and prevention of causing microorganisms. In this point of view, we selected the *Bombax ceiba* plant for the present study. *Bombex ceiba* is a traditional medicinal plant used by tribal people in different situations for example used as an abortifacient by the Oraon tribe in West Bengal (Mitra and Mukharjee, 2009), to cure gonorrhoea, impotency, spermatorrhea, sterility, nocturnal emission and leucorrhoea (Kosalge and Fursule, 2009), seeds and roots of *B. ceiba* were used in the treatment of leprosy (Mollik *et al.*, 2009) belongs to the family Malvaceae, widely distributed at tropical and sub-tropical regions (Smith *et al.*, 2004; Parrotta, 2001). There is less work reported on the seed extracts of *B. ceiba.* So, *B. ceiba* seeds were selected to extract with different solvent and to evaluate their phytochemical analysis and Antibacterial capacity.

2. Materials and Methods

2.1 Collection of plant material and preparation of extracts

The plant material seeds were collected at Araku valley, Visakhapatnam district, Andhra Pradesh, India and the plant was authenticated by taxonomist Prof. M. Venkaiah, Department of Botany, Andhra University. The collected seeds was shade dried and milled into powder. The powdered material was used for extraction with different solvents successively (Hexane, Ethyl acetate, and Hydro alcoholic) using maceration process. Then the extracts were used for further study.

2.2 Chemicals and test bacterial species

Muller Hinton agar media was purchased from Sisco Research Laboratories Pvt Ltd., Mumbai. The other chemicals were analytical grade. The microorganisms used for the experiments were procured from MTCC, IMTECH, Chandighar.

Gram +ve organisms:

Bacillus megaterium (B. m), *Staphylococcus epidermidis* (S. e), and *Lactobacillus acedophillus* (L. a).

Gram-ve organisms:

Escherichia coli (E. c), *Salmonella typhi* (S. t) and *Klebsiella pneumonia* (K. p).

2.3 Qualitative and Quantitative Phytochemical Screening

Qualitative phytochemical screening was carried out using different standard phytochemical tests for different compounds (Kokate 1991; Prashant Tiwari *et al.,* 2011) Quantitative estimation of phenols and alkaloids were carried out using Folin-Ciocalteau reagent (Mallikarjuna Rao *et al.,* 2012) and Bromocresol Green solution (Fazal Sharma *et al.,* 2008).

2.4 Culture Media for anti bacterial activity

The Bacterial species were maintained in the nutrient broth medium on placing shaker in separate culture tubes for each species separately. For Anti bacterial activity Muller-Hinton Agar media was used.

2.5 Standard and test solution preparation

The test compounds (dried extracts) at a concentration of 50, 100, 150 and 200µg/mL were dissolved in dimethylsulphoxide and used as stock solution. The reference standard (Rifampicin) as 0.6mg/mL concentration in HPLC grade water and finally added 100µL in each cup of Petri dish during antibacterial activity.

2.6 Evaluation of antibacterial activity

The antibacterial activity was assayed using cup/cylinder plate method. The method was based on capacity of different drugs by zone of inhibition (Size in mm) on microbial growth on Petri dish (*Indian* Pharmacopoeia., 1996; Ganga Rao *et al.*, 2012). The tested microorganisms were spread on different plates using spread plate technique, on those plates 4 wells with 4mm diameter were placed using sterile borers. Accurately measured (100µl) solution of each concentration and reference standards were added to the cups with a micropipette and placed at 2-8°C for effective distribution of testing/standard compounds in wells. Later, they were incubated at 37°C for 24 hours, then Petri dishes were observed for presence or absence of definite zone of inhibition. If any zone of inhibition around the well (cup) indicates presence of antibacterial activity. At the same time, the vehicles (DMSO, HPLC grade water) were alson tested for antibacterial activity.

3. Results and Discussion

Qualitative phytochemical screening of *B. ceiba* extracts revealed the presence of different phytochemical constituents like steroids, terpenoids, flavonoids, alkaloids, glycosides, tannins, carbohydrates, oils and amino acids. The extracts gave negative results for the quinines and saponins. The all extracts of *B. ceiba* revealed the presence of phenols, alkaloids, carbohydrates, steroids, terpenoids and glycosides and gave negative result to saponins. The hydroalcoholic and ethyl acetate extracts revealed the presence of flavonoids and tannins but the hexane extract gave negative results. The hexane and ethyl acetate extracts reveals the presence of minute amount of oils but hydroalcoholic extracts gave negative results. All the extracts gave negative result to amino acids but

the hydroalcoholic extracts give minute result for the presence of amino acids. The results were shown in table 1.

Phenolic contents of *B. ceiba* extracts were ranging from 13.85±1.22 to 34.10±2.62 (mg/gm). The hydroalcoholic extract have more phenolic content i.e. 34.10±2.62 (mg/gm) than other extracts. As phenolic contents, alkaloid content was vary from 16.24±2.38 to 31.86±1.88 (mg/gm). The hydroalcoholic extract has more alkaloid content i.e. 31.86±1.88 (mg/gm) than other extracts. The results were shown in table 2.

All the extracts (hexane, ethyl acetate and hydroalcoholic) of selected medicinal plants at different concentrations (50µg, 100µg, 150µg and 200µg/cup) exhibited antibacterial activity along with standard drug (Rifampicin) against tested bacterial strains (Table 3). The antibacterial potency of different medicinal plants extracts depends on type of extraction and nature of components in them and sensitiveness of tested strains. Significantly higher antibacterial activity was observed with hydroalcoholic extract, whereas least activity was observed in case of hexane extract with intermediate values for ethyl acetate extract. Both gram positive and gram negative bacteria were susceptible to selected plants extracts which supports the earlier reports that plant extracts were most active against bacterial strains. Hexane extract of *Bombax ceiba* seeds showed zone of inhibition on *B. megaterium, K. Pneumonia* and *S.typhi* at 50µg/cup. Ethyl acetate and hydroalcoholic extract showed equal antibacterial activity on all bacterial strains but hydroalcoholic extract showed better activity on *K. Pneumonia* (15mm) and *B. megaterium* (16mm) strains.

The current study outcome, demonstrates that *Bombax ceiba* seeds posses the significant and considerable antibacterial activity on different bacterial strains as currently using drugs and contain biological active compounds (Phenolics, Alkaloids, Steroids, Glycosides, Flavanoids and Terpenoids) which are effective in resisting the growth of the pathogenic bacteria (David *et al.*, 2011; Rajeswari *et al.*, 2014; Newman *et al.*, 2003) and further studies are useful in isolation of drugs from these plants for many diseases.

Table 1. Nature of phytoconstituents presents in different extracts of *Bombax ceiba*.

Phytochemical constituents	*Bombax ceiba*		
	Hexane extract	Ethyl acetate extract	Hydro alcoholic (70%)
Phytosterols	+	+	++
Terpenoids	+	+	+
Glycosides	+	++	++
Saponins	-	-	-
Flavonoids	-	+	+
Tannins	-	+	+
Carbohydrates	+	+	+
Alkaloids	+	+	++
Amino acids	-	-	+
Oils	+	+	+
Phenols	+	+	++

+,++=Present, – = Absent (+=Less Intense; ++= More Intense)

Table 2. Total phenolic and alkaloid contents (mg/gm) of *Bombax ceiba* extracts.

Name of the extract	Total Phenolic content (mg/gm)	Total alkaloid content (mg/gm)
Hexane	13.85±1.22	16.24±2.38
Ethyl acetate	26.28±0.66	22.40±1.36
Hydro alcoholic	34.10±2.62	31.86±1.88

Table 3. Antibacterial activities of *Bombax ceiba* seeds extracts.

Name of the extract	dose (µg/ cup)	Zone of inhibition# (in mm)					
		gram (+)ve			gram (–)ve		
		S.e	*B.m*	*L.a*	*E.c*	*S.t*	*K.p*
Hexane extract	50	-	6	-	-	7	6
	100	-	7	7	7	9	8
	150	7	8	9	9	11	10
	200	8	10	11	11	14	12
Ethyl acetate extract	50	7	6	6	-	6	-
	100	9	8	9	7	8	7
	150	11	10	11	9	10	9
	200	13	12	13	11	13	10
Hydro alcoholic extract	50	-	7	6	7	6	7
	100	6	9	8	9	8	10
	150	8	12	11	11	10	12
	200	10	16	13	13	12	15
Rifampicin DMSO	50	22	20	19	23	24	21
	100µl	-	-	-	-	-	-

-=No activity; #Values Includes the cup diameter (4mm)

4. Conclusion

The present study provide the scientific evidence to the *Bombax ceiba* plants traditional medicinal usage in the treatment of diseases.

Acknowledgements

The authors are acknowledge to the authorities of Andhra University in providing the necessary facilities to successfully complete the research.

Conflicts of interest

Author has none to declare.

References

Boursi B, Mamtani R, Haynes K, Yang YX. The effect of Past antibiotic exposure on diabetes risk. *Eur J Endicrinol*, 2015, 175(6), 639-48.

David O, Kennedy, Emma. and Wightman, L. 2011. Herbal extracts and phytochemicals: Plant secondary metabolites and the enhancement of human brain function. *Adv Nutr,* 2, 32-50.

De Pasquale, A. 1984. Pharmacognosy: the oldest modern science. *J Ethnopharmacol*, 11, 1–16.

Fazel Shamsa, Hamidreza Monsef, Rouhollah Ghamooshi, Mohammadreza Verdian-rizi. 2008. Spectrophotometric determination of total alkaloids in some Iranian medicinal plants. *Thai J Pharm Sci*, 32, 17-20.

Ganga Rao B, Venkateswara Rao Y, T. Mallikarjuna Rao. 2012. Anti-Bacterial Activity of Different extracts of *Melochia corchorifolia* and *Spilanthes acmella* aerial parts. *Journal of Pharmacy Research*, 5 (6), 3022-3024.

Ganga Rao B, Venkateswara Rao Y, T. Mallikarjuna Rao. 2013. Hepatoprotective and antioxidant capacity of *Melochia corchorifolia* Extracts. *Asian Pac J Trop Med*, 6 (7), 412-420.

Indian Pharmacopoeia. The Controller of Publications; Vol-II, New Delhi, 1996.

Kokate CK. 1991. Practical pharmacognosy, Vallabh Prakashan, 2nd Edn, New Delhi, 111-113.

Kosalge SB, Fursule RA. 2009. Investigation of ethnomedicinal claims of some plants used by tribals of Satpuda Hills in India. *J Ethnopharmacol*, 121, 456–461.

Mallikarjuna Rao T, Ganga Rao B, Venkateswara Rao Y. 2012. Antioxidant Activity of *Spilanthes acmella* extracts, *International Journal of Phytopharmacology*, 3(2), 216-220.

Mc Chesney J, Venkataraman S, Henri J. 2007. Plant natural products: Back to the future or into extinction? *Phytochemistry* 68, 2015–2022.

Mitra S and Mukharjee S. Same. 2009. Abortifacient plants used by the tribalpeople of West Bengal. *NPR*, 8 (2),167-171.

Mollik MAH, Hossain MF, Sen D, Hassan AI, Rahman MS. 2009. Traditional Asian medicine & leprosy in Bangladesh. *European JIM*, 1, 181–221.

Newman DJ, Cragg GM, Snader KM. 2003. Natural products as sources of new drugs over the period 1981-2002. *J Nat Prod*, 66, 1022-1037.

Parrotta JA. 2001Healing plants of peninsular India, CABI publishing.

Prashant Tiwari, Bimlesh Kumar, Mandeep Kaur, Gurpreet Kaur, Harleen Kaur. 2011. Phytochemical screening and extraction: A review. *Int Pharm Sci*, 1 (1), 98-106.

Rajeshwari CU, Shobha RI, Andallu, B. 2014. Phytochemicals in diet and human health with special reference to polyphenols. *Ann Phytomed*, 3(2), 4-25.

Smith N, Mori S, Henderson A, Stevenson D, Heald S. 2004. Flowering Plants of the Neotropics. *Princeton University Press.*