



Potential Antimicrobial Activity of Argemone Mexicana Solvent Extracts Against Some Pathogenic Bacteria

* K. S. Gomare ** S. R. Ghuget

* Dept of Biotechnology, COCSIT, Latur - 413512

** Dept of Biotechnology, COCSIT, Latur - 413512

ABSTRACT

The aim of this study was to investigate the antimicrobial activity of Argemone Mexicana seeds and leaves. The antimicrobial activity was evaluated by disc diffusion method. Berberine individually was effective against most of the bacteria. Ethanol and methanol extracts were more potent than aqueous extracts of Argemone Mexicana. Ethanol extract of leaves shows maximum zone of inhibition against *E. coli*, *B. subtilis* 15.3 mm. Ethanol extract of seeds shows maximum zone of inhibition against *S. aureus* & *B. subtilis* 15.5 mm. Methanol extract of leaves and seeds shows maximum zone of inhibition against *P. aeruginosa* 16.3 mm and 17.5 mm respectively. The findings of the present study suggest that Argemone Mexicana have greater importance and more active against gram-positive as well as gram-negative bacteria.

Keywords : Argemone Mexicana, root, seeds, leaves, ethanolic extract, antimicrobial activity.

Introduction:

Argemone Mexicana (Linn), Papaveraceae is commonly known as Mexican poppy or prickly poppy. The plant is pantropic in distribution and it is a weed in waste places. It is everywhere by road-sides and fields in India. The plant contains alkaloids, flavonoids, tannins, sterols and terpenes. In fact, berberine and sanguinarine, two of the main alkaloids isolated from Argemone Mexicana, display significant cytotoxic and antimicrobial properties [12, 17]. The wide range of potential medicinal uses of this plant is one of the reasons for the growing attention it is receiving. However, molecular investigations on this plant are limited.

It was known previously that berberine was isolated from some species of Berberis [4, 16]. The whole plant, roots, leaves, stem, flowers are extensively used in traditional system of medicine for various ailments like leprosy, malaria, jaundice, rheumatism, pain, skin inflammation, diseases, fever, piles, warts, dysentery, tumors and worm infestations [3, 8, 18]. The use of plant extracts and phytochemicals, with known antibacterial properties, may be of immense importance in therapeutic treatments. In the past few years, a number of studies have been conducted in different countries to prove such efficiency [7]. The plant is known to possess antimalarial (8), antioxidant, antibacterial [15] and antifungal [20] activities. Hence in the present study the ethanolic extract of roots and effect of berberine were examined for its antimicrobial activity.

MATERIAL AND METHODS

Plant Material: Argemone Mexicana Seeds and leaves were collected in June 2010 from the waste lands of the village Chakur, Latur district of Maharashtra, India. The identification was done by Botany Department (Sharda Jr. College, Latur) Maharashtra India.

Experimental Methods:

a) Preparation of the extracts of seeds and leaves:

Argemone Mexicana Seeds and leaves were dried and ground into powder. The coarse powder material was extracted in Soxhlet extractor using ethanol, methanol and water as solvent. All the extracts were concentrated to dryness under reduced pressure and controlled temperature (40°C – 50°C).

b) Isolation and Preparation of Technical Berberine Iodide:

The ground wood of the roots of Argemone Mexicana was extracted with 95% ethanol and the extract was concentrated in a vacuum evaporator. With stirring, a 50% solution of NaI was added to the concentrated extract. After 1-2 hr. the crystals of berberine iodide that had deposited as shown in photo no 1 were separated off and both a, b extract was used for further studies.

Test microorganism- Four bacterial strains were used during the study. Gram positive bacteria include *S. aureus* and *B. subtilis* and Gram negative bacteria include *E. coli* and *P. aeruginosa*. All these bacteria were grown in nutrient broth (Himedia, M001:500G) at 37°C and maintained on nutrient agar slants at 40°C.

Disc diffusion method: The surfaces of the media were inoculated with test organisms from a broth culture and discs by dipping into the different extract were placed on the agar. After 24 hrs of incubation at a specific temperature for 37°C the plates were examined and the diameters of the inhibition zones were measured in mm.

Results and Discussion:

As mentioned earlier, the present study the result for checking antimicrobial activity were recorded in terms of zone of inhibition. Antibiogram of some common antibiotics against test microorganism - Antibiogram of the gram positive and gram negative bacteria revealed that all the bacterial strains were resistant to some widely used broad-spectrum antibiotics. However, all the bacteria were sensitive to the new generation antibiotics except *B. subtilis* because of complex growth requirement.

Antimicrobial sensitivity assay of different extract- the antimicrobial screening of the plant extracts of the leaves and seed of *A. Mexicana* on *S. aureus*, *B. subtilis*, *E. coli* and *P. aeruginosa* revealed that the seed extract is more effective than those of leaf extract. The antibacterial activity of methanol extracts of *A. Mexicana* (leaves and seed) showed considerable more efficiency than the hot aqueous and cold aqueous extracts against all the reference bacterial strains. The methanol extract of leaves and seed of the *A. Mexicana* showed the greater antibacterial activity than the corresponding water extracts. The extract of *A. Mexicana* seed under study showed greater antibacterial activity and the diameter of zone of inhibition is

higher. Moreover seed extract were more effective but in vivo study on this medicinal plant is necessary to determine toxicity of active constituents, there side effects. The antimicrobial activity can be enhanced if the active components are purified and adequate dosage determined for proper administration.

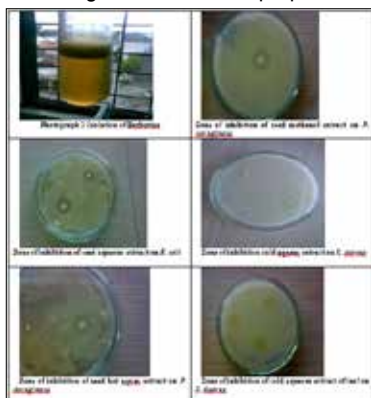
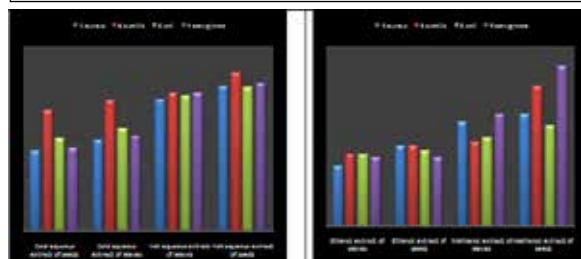


Table 1& 2 Antimicrobial activity of Aqueous, Ethanol and Methanol Extracts of seeds and leaves

| Different extracts of A. Mexicana Leaves & Seeds | Diameter of the inhibitory zones (mm) | | | | Different extracts of A. Mexicana Leaves & Seeds | Diameter of the inhibitory zones (mm) | | | |
|--|---------------------------------------|------------|--------|--------------|--|---------------------------------------|------------|--------|--------------|
| | S.aureus | B.subtilis | E.coli | P.aeruginosa | | S.aureus | B.subtilis | E.coli | P.aeruginosa |
| Cold aqueous extract of seeds | 6.1 | 9.2 | 7 | 6.3 | Ethanol extract of leaves | 15 | 15.3 | 15.3 | 15.2 |
| Cold aqueous extract of leaves | 6.9 | 9.9 | 7.8 | 7.2 | Ethanol extract of seeds | 15.5 | 15.5 | 15.4 | 15.2 |
| Hot aqueous extract of leaves | 10 | 10.5 | 10.3 | 10.5 | Methanol extract of leaves | 16.1 | 15.6 | 15.7 | 16.3 |
| Hot aqueous extract of seeds | 11 | 12 | 10.9 | 11.2 | methanol extract of seeds | 16.3 | 17 | 16 | 17.5 |

Bar diagrams of Aqueous, Ethanol and Methanol Extracts of seeds and leaves



REFERENCES

[1] Almagboul AZ, Bashir AK, Farouk A, Salih AKM 1985. Antimicrobial activity of certain Sudanese plants used in folkloric medicine. Screening for antibacterial activity. *Fitoterapia* 56: 331-337. | [2] Bauer AW, Kirby WM, Sherris JC, Turck M 1966. Antibiotic susceptibility testing by a standardized single disc method. *Am J Clin Pathol* 45: 149-158. | [3] Chopra R.N., Chopra I.C., Varma B.S., Supplement to Glossary of Indian Medicinal Plants with active principles, Publications and Information Directorate, New Delhi, (part I) 1979, 85-86. | [4] Davidyants S. B. and Yu. D. Sadykov, *Izv. Akad.NaukTadzhSSR*, No. 3, 46 (1963). | [5] He, X.G. (2000). On-line identification of phytochemical constituents in botanical extracts by combined high-performance liquid chromatographic-diode array detection mass spectrometric techniques. *J. Chromatogr. A* 880: 203-232. | [6] Holstege, D.M., Seiber, J.N. and Galey, F.D. (1995). Rapid multiresidue screen for alkaloids in plant material and biological samples. *J. Agric. Food Chem.* 43: 691-699. | [7] Ikram M, Inamul H 1984. Screening of medicinal plants for antimicrobial activities. *Fitoterapia* 55: 62-64 | [8] IndranilBhattacharjee., SarojkumarChatterjee., SoumendranathChatterjee., Goutam Chandra., Antibacterial potentiality of monemexicanaL. solvent extracts against some pathogenic bacteria, *MemInstOswaldo Cruz*, 2006, 101: 645-648. | [9] Nadkarni K.M., *Indian MateriaMedica*, PrakashanPvt.Ltd, Bombay, (Vol I) 1976, 133-136. | [10] Nair R, Kalaria T, Sumitra C 2005. Antibacterial activity of Ikram M, Inamul H 1984.Screening of medicinal plants for antimicrobial activities. *Fitoterapia* 55: 62-64. some selected indian medicinal flora. *Turk J Biol* 29: 41-47.8. | [11] NCCLS 1993. Performance standards for antimicrobial disc susceptibility tests. Approved standard NCCLS Publications M2-A5. Villanova, PA, US. | [12] Quinn-Beatie, M.L. (2002). Natural Product Alert (NAPRALERT) database report. The University of Illinois at Chicago. pp.17-20. | [13] Santos PRV, Oliveira ACX, Tomassini TCB 1995. Controlemicrobiológico de produtosfitoterápicos. *Rev Farm Bioquim* 31: 35-38. | [14] Shanab BA, Adwan G, Safiya AD, Jarrar N, Adwan K 2004. Antibacterial activities of some plant extracts utilized in popular medicine in Palaestine. *Turk J Biol* 28: 99-102. | [15] Sreejayan N., Rao M N A., Free Radical Scavenging Activity by Curcuminoids, *Drug Res*, 1996, 46:169-171. | [16] Vasileva V. D. and Shreter, A. I. The Search for New Biologically Active Substances [in Russian], Moscow (1970), p. 17. | [17] Vilinski, J.R.; Dumas, E.R.; Chai, H.B.; Pezzuto, J.M.; Angerhofer, C.K. and Gafner, S. Antibacterial activity and alkaloid content of *Berberis thunbergii*, *Berberis vulgaris* and *Hydrastiscanadensis*. *Pharmaceutical Biology*, December 2003, vol. 41, no. 8, p. 551-557. | [18] Warrier P.K., Nambiar V.P.D., Ramankutty C., *Indian Medicinal Plants*, rient Longman Limited, (Vol I) 1996, 168-172. | [19] WHO 1978. The promotion and development of traditional medicine. Technical report series, 622 pp. | [20] Willcox M.L., Graz B., Falquet J., Sidibe O. Forster M., Diallo D., ArgemonemexicanaL. decoction for the treatment of uncomplicated falciparum malaria, *Transactions of the Royal Society of Tropical Medicine and Hygiene*, |