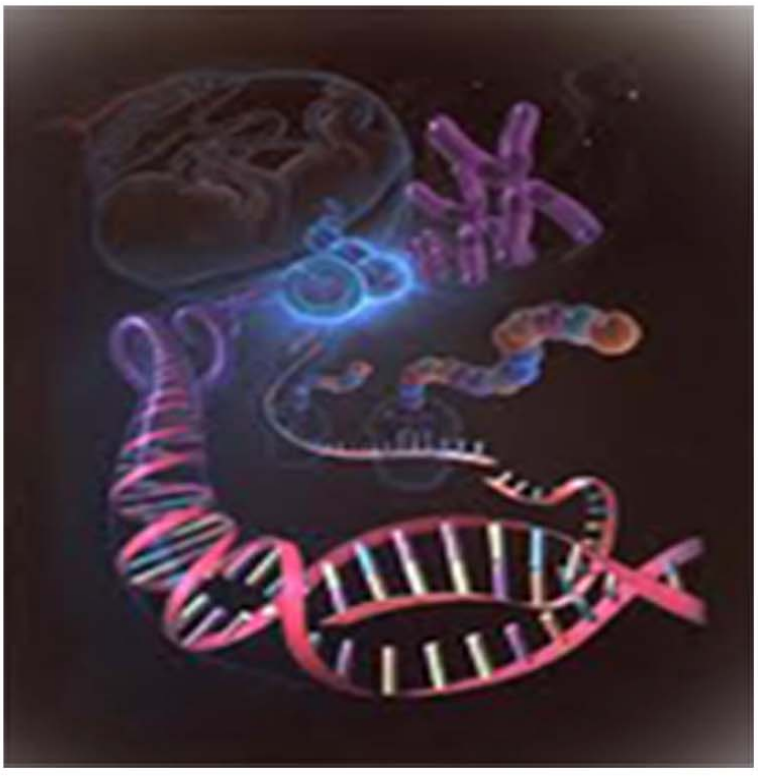
IJLBPR

ISSN 2250 - 3137
Vo1. 2, No. 3, July 2013

International Journal of

Life Sciences Biotechnology and Pharma Research



International Journal of Life Sciences Biotechnology and Pharma Research
Hyderabad, INDIA

www.ijlbpr.com

Email : editorijlbpr@gmail.com or editor@ijlbpr.com

International Journal of Life Sciences Biotechnology and Pharma Research

ISSN 2250-3137 www.ijlbpr.com
Vol. 2, No. 3, July 2013

Research Paper

ANTIMICROBIAL POTENTIAL OF *PARTHENIUM HYSTEROPHORUS* LINN. PLANT EXTRACTS

Ajay Kumar[1], Shailesh Joshi[2]* and Tripti Malik[2]

*Corresponding Author: **Shailesh Joshi,** ✉ shailesh175@gmail.com

Parthenium hysterophorus Linn. (Asteraceae) is an aggressive and exotic weed plant reported to be used as remedy for various diseases. Aqueous and ethanolic extracts obtained from various parts of *P. hysterophorus* Linn. were evaluated for antimicrobial activity against three bacterial strains (*Staphylococcus aureus* MTCC 3160*, Bacillus cereus* MTCC 1272*, Escherichia coli* MTCC 43) and three fungal strains (*Candida albicans* MTCC 3017*, Aspergillus flavus* MTCC 277, *Saccharomyces cerevisiae* MTCC 36). Alcoholic extracts exhibited varying degree of antifungal activity, Root extract was able to inhibit only *Aspergillus flavus* MTCC 277 with zone of inhibition 9.0±0.0 mm, stem extract were able to inhibit *Candida albicans* MTCC 3017 and *Saccharomyces cerevisiae* MTCC 36 with zone of inhibition 7.0±1.0 mm and 15±1.0 mm respectively. Leaf extract was able to inhibit *Bacillus cereus* MTCC 1272, *Candida albicans* MTCC 3017*, Aspergillus flavus* MTCC 277 and *Saccharomyces cerevisiae* MTCC 36, with zone of inhibitions 11±1.0 mm, 13±1.5 mm ,11±1.5 mm and 14±1.5 mm respectively.

Keywords: *Parthenium hysterophorus* Linn., Antifungal, Aqueous and Ethanolic extracts

INTRODUCTION

Natural sources are tremendously rich in diversity of organic molecules. They are always been an attractive source for obtaining therapeutic compounds from ancient time. Moreover, it has become imperative to search for novel antimicrobial agents from natural sources with advent of antibiotic resistance among microorganisms.

Parthenium hysterophorus L. (Asteraceae) is an aggressive and exotic weed that has occupied 5 million hectare of land in the country. Almost all parts of India (Ramaswami, 1997; Ramos *et al*., 2001). It is native to subtropical regions of American continent (Adkins *et al*., 1996), in India its presence was recorded by Rao (1956) from Pune, Maharashtra, however its first record in India was given by Roxburgh (1814) who reported *Parthenium hysterophorus* L. from Hawrah (Paul, 2010). *Parthenium hysterophorus* L. is also known as congress weed, carrot weed, star

[1] Department of Botany, Dolphin (PG) Institute of Biomedical and Natural Sciences, Dehra Dun, Uttarakhand.
[2] Department of Microbiology, Dolphin (PG) Institute of Biomedical and Natural Sciences, DehraDun, Uttarakhand.

weed, white top, chatak chandani, bitter weed, ramphool and gajar grass (Yadav *et al.,* 2010). *Parthenium hysterophorus* L. is an erect herb with alternate, deeply dissected leaves, growing up to 2 m tall with much branched inflorescences. Bearing white flower heads and numerous obovoid, smooth and black achenes (Srivastava and Singh, 2011).

Development of new drugs from natural sources is highly influenced by its ethnobotanical uses. Though *Parthenium hysterophorus* L. is a weed and causes severe allergies to human being, It is reported with many therapeutic applications. Decoction prepared from it's roots has been used by American Indians in traditional medicine to treat amoeboitic dysentery (Uphof, 1959). Ramos *et al*. (2001) reported its applications in treating neurologic disorders, fever, urinary infections, dysentery and malaria and as emmenagogue. Rastogi and Mehrotra (1991) describe *Parthenium hysterophorus* L. as a medicinal plant. This is very much resistant to plant pathogenic microorganisms; this could be attributed to presence of antimicrobial metabolites in plant parts. Most of the studies regarding evaluation of antimicrobial potency used the whole plant; in present investigation an attempt was made to ascertain the effective plant part which imparts antimicrobial effect to the whole plant extracts.

MATERIAL AND METHODS

Microorganisms

Bacterial and fungal strains analyzed were obtained from IMTECH, Chandigarh (*Staphylococcus aureus* MTCC 3160*, Bacillus cereus* MTCC 1272*, Escherichia coli* MTCC 43*, Candida albicans* MTCC 3017*, Saccharomyces cerevisiae* MTCC 36, *Aspergillus flavus* MTCC 277).

Collection of Plant Material

Plants of *Parthenium hysterophorus* L. were collected from different locations around the institute during October 2011 to January 2012 are of varied age and in flowering stage.

Preparation of Plant Material

The selected plants were thoroughly washed and dried under shade at room temperature. The dried plant samples were grounded well and 25 g of dried plant powder was extracted in a soxhlet apparatus using 150 mL of solvent (Distilled water and Ethanol). All the extracts were concentrated using rotary flash evaporator. The extracts thus obtained were weighed and kept at 4 °C. 15 mg of each solvent residue was dissolved in 1 mL of distilled water as a solvent and were used as the test extracts for antibacterial assay (Fazal *et al.* 2011).

Antimicrobial Activity

Antimicrobial activity of the extracts was evaluated by disc diffusion method (Bauer *et al.,* 1966); filter paper discs of 5 mm diameter were impregnated in 20 µL of plant extracts were placed on Muller Hinton Agar plates pre-inoculated with test culture. Plates were incubated at 37 °C and zone of inhibition was noted after 24 h of incubation.

Relative Percentage Inhibition

The Relative Percentage Inhibition (RPI) of the test extracts with respect to positive control (chloremphennicol and nyastatin) was calculated by modifying the formula given by De Britto *et al*. 2012:

$$\text{Relative percentage Inhibition } (RPI) = \frac{\text{Diameter of zone of inhibition of the test extract}}{\text{Diameter of zone of inhibition of the standard drug}} \times 100$$

RESULTS AND DISCUSSION

Extracts from various plant part exhibited varying degree of antimicrobial activity *in vitro*. Aqueous extracts of all the plant parts do not show anti microbial activity, however alcoholic extracts of root, stem and leaf showed antimicrobial activity. This could be ascribed to the alcoholic aqueous environment which promotes easy extraction as reported by Nostro *et al.* (2000).

Extracts from inflorescence do not exhibited any antimicrobial activity *in vitro* (Table 1). The maximum inhibitory activity was recorded with alcoholic extracts; that have shown varying degree of inhibition of *Bacillus cereus* MTCC 1272, *Candida albicans* MTCC 3017*, Aspergillus flavus* MTCC 277 and *Saccharomyces cerevisiae* MTCC 36.

The maximum zone of inhibition (15±1.0; RPI: 113.63%) was recorded against *S. cerevisiae* with alcoholic extract of stem, which also exhibited a least zone of inhibition (7.0±1.6; RPI: 36.64%) against *C. albicans* MTCC 3017.

Extracts obtained from inflorescence do not show any inhibitory activity with microorganisms tested. Moreover *Staphylococcus aureus* MTCC 3160 and *Escherichia coli* MTCC 43 were not inhibited by any of the extract. All the fungal isolates were inhibited by alcoholic extract of leaves however alcoholic extract of roots was able to inhibit growth of filamentous fungus and alcoholic extract was able to inhibit yeast genera tested. Jain (2005), Zaheer *et al*. (2012) also reported inhibitory effect of *Parthenium hysterophorus* L. extracts against *Fusarium solani* (Mart.) Sacc.

Table 1: Diameter of Zone of Inhibition* and Relative Percentage Inhibition (RPI) of the Extract Against Microorganisms**

Extract† ↓	Zone of Inhibitions (in mm) for					
	B. cereus	*E. coli*	*S. aureus*	*A. flavus*	*S. cerevisiae*	*C. albicans*
AlcR	–	–	–	9.0±0.0 [52.02]	–	–
AR	–	–	–	–	–	–
AlcS	–	–	–	–	15.0±1.0 [113.63]	7.0±1.0 [36.64]
AS	–	–	–	–	–	–
AlcL	11±1.0 [58.51]	–	–	11±1.5 [63.58]	14±1.5 [106.06]	13±1.5 [68.06]
AL	–	–	–	–	–	–
AlcI	–	–	–	–	–	–
AI	–	–	–	–	–	–
Chloremphenicol (30 μg)	19.8±1.5	19.9±1.7	18.8±1.5	–	–	–
Nystatin (100u)	–	–	–	17.3±1.4	13.2±1.6	19.1±2.2

Note: *Values are given in mm with SD; ** %RPI values are given in parenthesis; †AlcR:Alcoholic Extract of Root, AR: Aqueous Extract of Root, AlcS: Alcoholic Extract of Stem, AS: Aqueous Extract of Stem, AlcL: Alcoholic Extract of Leaf, AL: Aqueous Extract of Leaf, AlcI: Alcoholic Extract of Inflorescence, AI: Aqueous Extract of Inflorescence.

CONCLUSION

The alcoholic extracts of root, stem and leaf of *Parthenium hysterophorus* L. possesses antimycotic activity against fungi investigated; Alcoholic leaf extract has antibacterial and antimycotic potential as compared to other plant parts. This can be attributed to the presence of different inhibitory molecules in roots and aerial parts (Afsharypuor *et al.*, 1995); moreover it is also possible that extraction process and solvent might have modified the chemical nature or solvent selection may also be few of the causes behind such variation.

ACKNOWLEDGMENT

Authors are thankful to the management of the Dolphin (PG) Institute of Biomedical and Natural Sciences, DehraDun for providing necessary facilities for the investigation.

REFERENCES

1. Adkins S W, Navie S C and McFadyen R E (1996), "Control of Parthenium Weed: A Centre for Tropical Pest Management Team Affort", In R C H Shepherd (Ed.), Proc. 11th Aust. Weeds Conf. Weed Sci. Soc. Victoria, Frankston, pp. 573-578.
2. Afsharypuor S, Mostajeran A and Mokhtary R (1995), "Variation of Scopolamine an Atropine in Different Parts of *Datura metel* during Development", *Planta Med.*, Vol. 61, pp. 383-384.
3. Bauer R W, Kirby M D K, Sherris J C and Turck M (1966), "Antibiotic Susceptibility Testing by Standard Single Disc Diffusion Method", *American Journal of Clinical Pathology*, Vol. 45, pp. 493-496.
4. De Britto A J, Gracelin D H S, Benjamin and Kumar J R (2012), "Antibacterial Potency and Synergistic Effect of A Few South Indian Spices Against Antibiotic Resistant Bacteria", *Indian J. Nat. Pro. and Res.,* Vol. 3, No. 4, pp. 557-562.
5. Fazal Hina, Ahmad Nisar, Ullah Ikram, Inayat Humaira, Khan Lajber and Abbasi Bilal Haider (2011), "Antibacterial Potential In *Parthenium Hysterophorus, Stevia Rebaudiana* and *Ginkgo Biloba", Pak. J. Bot.,* Vol. 43, No. 2, pp.1307-1313.
6. Jain C (2005), "Search of Natural Pesticides of Local Weed Plants", *Asian J. Microbiol. Biotechnol. Environ. Sci.*, Vol. 7, No. 2, pp. 331-332.
7. Nostro A, Germano M P, Angelo V D, Marino A and Cannatelli M A (2000), "Extraction Methods and Bioautography for Evaluation of Medicinal Plant Antimicrobial Activity", *Lett. Appl. Microbiol.,* Vol. 30, pp. 379-384.
8. Paul T K (2010), "The Earliest Record of *Parthenium hysterophorus* L. (Asteraceae) in India", *Current Science,* Vol. 98, No. 10, pp. 1272.
9. Ramaswami P P (1997), "Potential uses of Parthenium", In: *Proc. First Int. Conf. on Parthenium Management,* pp.77-80.
10. Ramos A, Rivero R, Victoria M C, Visozo A, Piloto J and Garcia A (2001), "Assessment of mutagenicity in *Parthenium hysterophorus* L", *Journal of Ethnopharmacology*, Vol. 77, pp. 25-30.
11. Rao R S (1956), *J. Bombay Nat. Hist. Soc.,* Vol. 54, pp. 218-220.

12. Rastogi Ram P and Mehrotra B N (1991), "Compendium of Indian Medicinal Plants" (Vol. II) (1970-79), Pbl. Central Drug Research Institute, Lucknow and Publications and Information Directorate, New Delhi, p. 514.

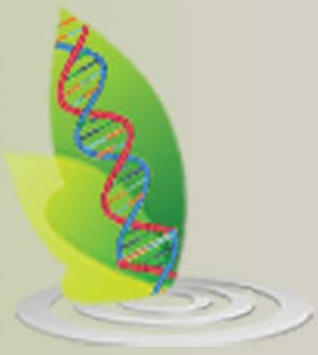
13. Roxburgh W (1814) "*Hortus Bengalensis* or a Catalogue of the Plants Growing in the Honourable East India Company's Botanic Gardden at Calcutta", The Mission Press, Serampore, p. 62.

14. Srivastava Deepika and Singh Padma (2011), "Antifungal Potential of Two Common Weeds Against Plant Pathogenic Fungi- *Alternaria* sp", *Asian j. Exp. Biol. Sci.,* Vol. 2, No. 3, pp. 525-528.

15. Uphof J C (1959), "Dictionary of Economic Plants", p. 267 (Englemann Weinheim).

16. Yadav Neha, Saha Priyanka, Jabeen Sitara, Kumari Suruchi, Kumari Sarita, Verma Sushma Kumari, Raipat Bharti Singh and Sinha M P (2010), "Effect of Methanolic Extract of Parthenium Hysterophorus L. on Haematological Parameters in Wistar Albino Rat", The Bioscan Special Issue, Vol. 2, pp 357-363.

17. Zaheer Zunera, Shafique Shazia, Shafique Sobiya and Mehmood Tahir (2012), "Antifungal Potential of *Parthenium hysterophorus* L. Plant Extracts against *Fusarium solani"* , *Scientific Research and Essays,* Vol. 7, No. 22, pp. 2049-2054.



International Journal of Life Sciences Biotechnology and Pharma Research
Hyderabad, INDIA. Ph: +91-09441351700, 09059645577
E-mail: editorijlbpr@gmail.com or editor@ijlbpr.com
Website: www.ijlbpr.com

ISSN 2250-3137