

**PHARMACOGNOSTICAL, PHYTOCHEMICAL AND  
PHARMACOLOGICAL PROFILE OF *GRANGEA MADERASPATANA*  
(L.) POIR. - AN INCLUSIVE REVIEW**

**Kaushal Kishore Chandrul and Bhuwanendra Singh\***

School of Pharmaceutical Sciences, Shri Venkateshwara University, Gajraula, NH – 24,  
Rajabpur, Distt, Amroha (U. P), India.

Article Received on  
26 Aug 2015,

Revised on 15 Sep 2015,  
Accepted on 05 Oct 2015

**\*Correspondence for  
Author**

**Bhuwanendra Singh**

School of Pharmaceutical  
Sciences, Shri  
Venkateshwara  
University, Gajraula, NH  
– 24, Rajabpur, Distt,  
Amroha (U. P), India.

**ABSTRACT**

Indegenious system of medicines rely on the basis of knowledge and clinical experience of the medical practitioners for accurate & effective use of herbal medicines. *Grangea maderaspatana* (L.) Poir. also known as *Artemisia maderaspatana* or *Perdicium tomentosum* (commonly called as Madras carpet or Mustaru) is a type of weed found near the wetland, it has been used since very long time in treatment of so many diseases, as several researchers has focused on the plant to reveal its importance for the human beings. This weed has studied Pharmacognostically, Phytochemically, Pharmacologically and also have too many patents from the china to prove its IPR value. Leaves are regarded as stomachic, deobstruent and antispasmodic and prescribed in infusion and electuary also consider for irregular menses.

The roots are used as an appetizer; astringent to the bowels, diuretics, anthelmintic, emmenagogue, galactagogue, stimulant; & useful in griping, in troubles of the chest and lungs, headache, paralysis rheumatism in the knee joint, piles, pain in the muscles, diseases of the spleen and the liver, troubles of the ear, the mouth and the nose lessens perspiration An inclusive account of morphology and microscopy and phytochemicals isolated from plant has given in the review.

**KEYWORDS:** *Grangea maderaspatana* (L.) Poir, Mustaru, IPR, Galactagogue, Appetizer, Electuary, Emmenagogue.

## INTRODUCTION

Traditional medicines rely on the basis of knowledge and clinical experience of the practitioners for indigenous systems of medicine. According to our history, many infectious diseases have been treated with the help of herbals. Current status on scientific investigations [database search: PubMed, Sci Finder, SCOPUS, Medicinal and Aromatic Plants Abstracts (MAPA), Indian and Chinese Pharmacopeias] have highlighted the importance and the contribution of many plant families i.e. Asteraceae, Liliaceae, Apocynaceae, Solanaceae, Caesalpinaceae, Rutaceae, Piperaceae, Sapotaceae, Campanulaceae, Erythroxylaceae, Nyssaceae, Acanthaceae, Rubiaceae, Berberidaceae, Graminae, Moraceae, Umbelliferae, Zingiberaceae, Leguminasae, Pinaceae, Cucurbitaceae, Styraceae, Convolvulaceae, polypodiaceae.<sup>[1]</sup>

In this review whole information is given about the plant its macroscopic characters, microscopic structures, its pharmacological activity, phytochemicals isolated since recent years and about the IPR status of *Grangea maderaspatana* (L.) Poir. it is a type of weed so the review also emphasize the importance and application of weed for the humans.

## DESCREPTION *GRANGEA MADERASPATANA* (L.) POIR

### Nomenclature of Mustaru (Madras carpet)<sup>[2]</sup>

#### Botanical name

*Grangea maderaspatana*.

#### Synonyms

*Artemisia maderaspatana*, *Perdicium*.

#### Family

*Tomentosum*.

#### Vernacular names<sup>[2]</sup>

Asteraceae.

English: Madras carpet

Hindi: Mustaru

Manipuri: Leibungou

Tamil: Masipathri

Malayalam: Nilampala

Telugu: Mastaru

Kannada: Davana

Bengali: Namuti

Gujarati: Jhinkimudi

Telugu: Save

Arabic: Afsantin

Hova: Motomaso

Indochina: Caidong

Urdu: Afsantin

Persian: Baran



**Fig 1. Original Photographs of whole plant *Grangea maderaspatana* (L.) Poir.**



**Fig 2. Leaves & Flower of The Plant.**



**Fig 3. Roots of The Plant**



**Fig 4. Photographs of fresh Plant *Grangea maderaspatana* (L.) Poir<sup>[3]</sup>**

#### **Taxonomic Classification<sup>[3,4]</sup>**

Domain: Eukaryota

Kingdom: Plantae

Sub- Kingdom: Viridiplantae

Phylum: Tracheophyta

Sub- Kingdom: Euphyllophytina

Class: Magnoliopsida

Sub- Class: Asteridae

Superorder: Asteranae

Order: Asterales

Family: Asteraceae

Genus: *Grangea*

Species: *Maderaspatana*

**Phytography of *Grangea maderaspatana* (L.) Poir. (Macroscopic Characters)**<sup>[3,5,6]</sup>

Madras Carpet is a herb commonly seen in flat bunches in harvested fields, dry river and pond beds. It is a common weed usually grown in sandy soil and waste places. This hairy, branched herb spreads from the roots and grows up to 70 cm in height. It is an annual herb, stems many; prostrate, spreading from the centre, 10-30 cm long, hairy with soft white hairs.<sup>[3,5,6]</sup>

**Leaves** numerous, alternate, sessile, 2.5-6.3 cm. Long, sinuately pinnatifid with 2-4 pairs of opposite or subopposite lobes smaller towards the base, the terminal lobe the largest, all coarsely serrate-dentate, pubescent on both surfaces, oblong or oblanceolate. Heads globose, 6-8 mm diameter solitary or bipinate, on short leaf opposed peduncles; flowers yellow. Involucral bracts elliptic, obtuse, rigid densely pubescent. Pappus a short tube with fimbriate mouth.<sup>[3,5,6]</sup>

**Fruits**, Achenes glandular, 2.5 cm long including the pappus tube. The odour of leaves resembles that of wormwood; some of the vernacular names of the plant are probably those of *Artemisia spp.*<sup>[5]</sup> **Flowers** The inflorescence is terminal, truncate spherical head, 6-10 mm in diameter, solitary or 2-3 together, yellow and many flowered. The peduncle is 1-4 cm long. The involucral bracts are 2-3 seriate where the outer ones are oblong and acute while the inner ones are elliptical, yellow, involucral bracts elliptic, obtuse, rigid, densely pubescent, Pappus a short tube with fimbriate mouth. Achenes glandular, 2.5 cm long including the pappus-tube.<sup>[3,19,20]</sup>

**Phenology: Flowering and fruiting**

December-April.<sup>[6]</sup> **Distribution** Throughout India, Pakistan and Bangladesh, Africa, Indo-China and Java, Baluchistan.<sup>[5,6,7]</sup> **Ecology and Cultivation** Common weed of rice-fields, wastelands and meadows, forming patches 15-30 cm wide; also on the bank of rivers and *nullahs*; wild.<sup>[6]</sup>

**Folklore and Traditional Uses**

The ethnic communities of Godavari district, (Andhra Pradesh, India) are using leaf of the plant for the cure of hysteria and menstrual complaints. The ethnic communities of Rajasthan, India are also using the leaf of plant for the treatment of hysteria.<sup>[6]</sup>

### Medicinal Uses of Leaf

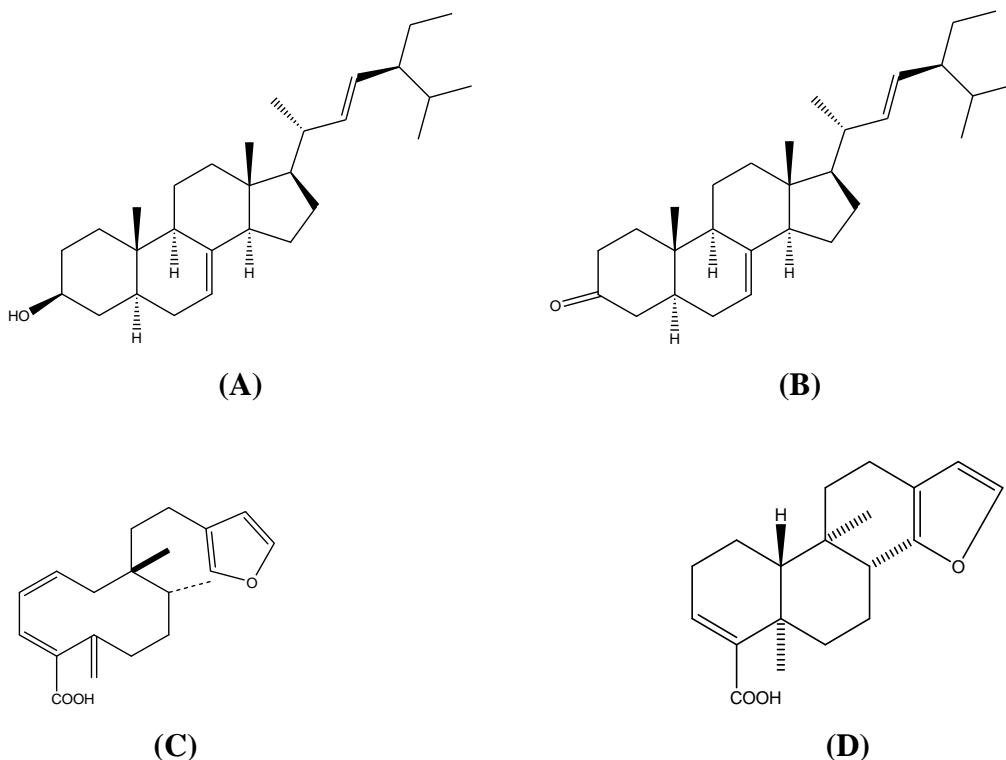
leaves are regarded as stomachic, deobstruent, and antispasmodic, and prescribed in infusion and electuary. They are considered for irregular menses. They are used as antiseptic and anodyne fomentations. The juice of the leaves is employed as an instillation for earache. A mixture of flavonoids extracted from aerial parts possessed oestrogenicity and anti-implantational activities in mouse the leaves are also used as stomachic, sedative, carminative, emmenagogue and antifatulent.<sup>[5,7,8,9]</sup>

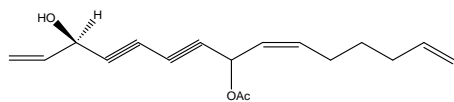
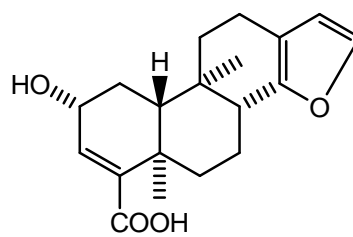
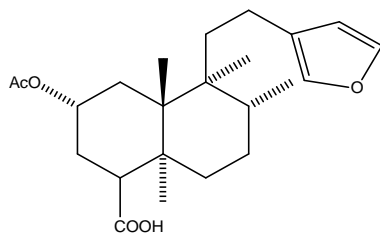
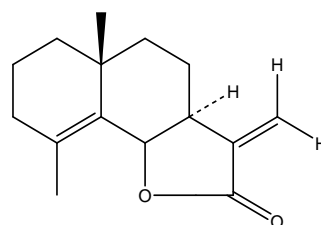
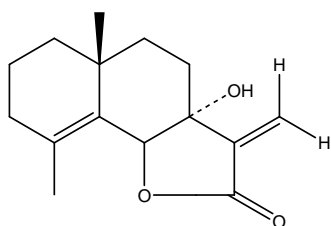
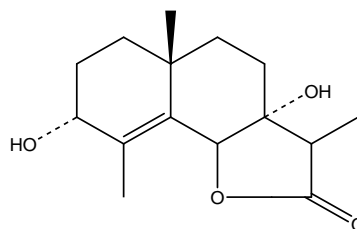
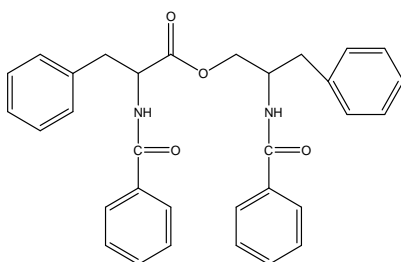
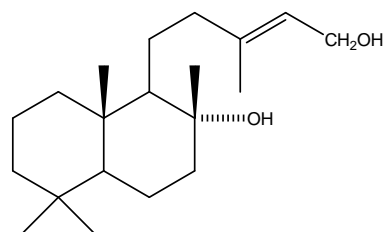
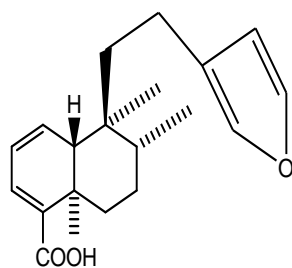
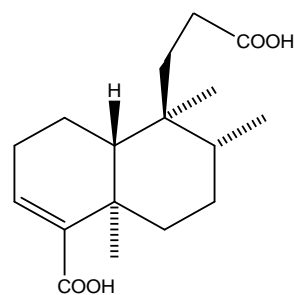
### Roots

the root is an appetizer; astringent to the bowels, diuretics, anthelmintic, emmenagogue, galactagogue, stimulant; useful in griping, in troubles of the chest and lungs, headache, paralysis rheumatism in the knee joint, piles, pain in the muscles, diseases of the spleen and the liver, troubles of the ear, the mouth and the nose lessens perspiration.<sup>[5]</sup>

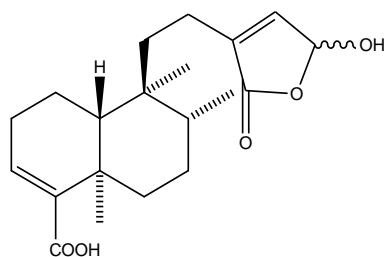
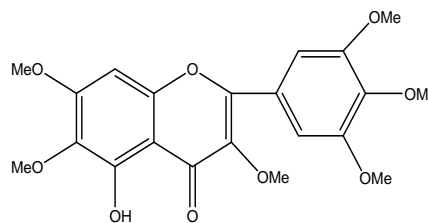
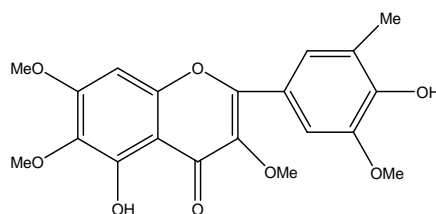
### Phytochemicals isolated & reported from the *Grangea maderaspatana*. (L.) Poir.

[Chemical Structures] Described in the Table no. 1<sup>[10, 11,12,13,14,15,16, 17, 18]</sup>



**(E)****(F)****(G)****(H)****(I)****(J)****(K)****(L)****(M)****(N)**



**(O)****(P)****(Q)**

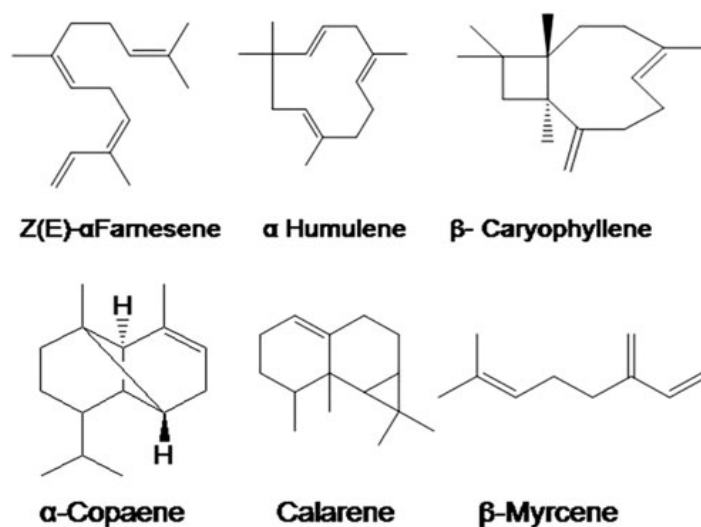
- **A:** Chondrillasterol
- **B:** Chondrillasterone
- **C:** Strictic acid
- **D:** Hardwickiic acid
- **E:** Acetylenic alcohol
- **F:** 2 $\alpha$  hydroxy Hardwickiic acid
- **G:** 2 $\alpha$ Acetoxy-hardwickiic acid
- **H:** Eudesmanolide (-)- frullanolide
- **I:** (-)- 7 $\alpha$  hydroxyl-frullanolide
- **J:** Grangolide
- **K:** Auranamide
- **L:** 8-hydroxy-13E-Labdane
- **M:** 10-epi-nidoresedic acid
- **N:** nor hardwickiic acid
- **O:** 15-hydroxy-16-oxo-15,16H-hardwickiic acid, 15-hydroxycyclo-3,13-dien-15,16-olid-18-oic acid
- **P:** 5-hydroxy-3,3',4',5',6,7-hexamethoxy flavones
- **Q:** Murrayanol



**Table 1. Phytochemicals isolated & reported from *Grangea maderaspatana* (L.) Poir.** [10,11,12,13,14,15,16, 17, 18]

| Sr.No | Compound name  | Chemical class             | Plant part (s)      |
|-------|--|----------------------------|---------------------|
| A     | Chondrillasterol   | Sterol                     | <i>Entire plant</i> |
| B     | Chondrillasterone  | Sterol                     | <i>Entire plant</i> |
| C     | Strictic acid  | Terpenoid                  | <i>Entire plant</i> |
| D     | Hardwickiic acid   | Furanodi-terpenes          | <i>Entire plant</i> |
| E     | Acetylenic alcohol   | Alcohol                    | <i>Entire plant</i> |
| F     | 2 $\alpha$ hydroxy Hardwickiic acid  | Furanodi-terpenes          | <i>Aerial Part</i>  |
| G     | 2 $\alpha$ Acetoxy-hardwickiic acid  | Furanodi-terpenes          | <i>Aerial Part</i>  |
| H     | Eudesmanolide (-)- frullanolide  | Sesqui-terpene lactone     | <i>Entire plant</i> |
| I     | (-)- 7 $\alpha$ hydroxyl-frullanolide  | Sesqui-terpene lactone     | <i>Entire plant</i> |
| J     | Grangolide   | Sesqui-terpene lactone     | <i>Entire plant</i> |
| K     | Auranamide   | Phenyl-alanine             | <i>Aerial Part</i>  |
| L     | 8-hydroxy-13E-Labdane  | Diterpenoid                | <i>Aerial Part</i>  |
| M     | 10-epi-nidoresedic acid  | Clerodane diterpenes       | <i>Aerial Part</i>  |
| N     | nor hardwickiic acid   | Clerodane diterpenes       | <i>Aerial Part</i>  |
| O     | 15-hydroxy-16-oxo-15,16H-hardwickiic acid, 15-hydroxycleroda-3,13-dien-15,16-olid-18-oic acid, | TRANS-Clerodane Diterpenes | <i>Aerial Part</i>  |
| P     | 5-hydroxy-3,3',4',5',6,7-hexamethoxy flavone   | Flavonols                  | <i>Aerial Part</i>  |
| Q     | Murrayanol   | Flavonols                  | <i>Aerial Part</i>  |

**Volatile Essential Oil Composition (Active Principles) of *Grangea Maderaspatana* (L.) Poir**<sup>[27, 31]</sup> From fresh aerial parts: (few examples).



**Some other compounds from oil**<sup>[27, 31]</sup>

- (E)-2-hexanal
- $\alpha$ -Phellandrene

- a-Terpineol
- a-Muurolene
- a-Muurolol
- Muscone
- Rimuene
- Sandaracopimara-8(14), 15, diol
- epi-13-Manoyl-oxide
- Abietatriene
- Nezukol
- 57 trans-Totarol methyl ether
- Monoterpenoid hydrocarbons
- Oxygenated monoterpenes
- Sesquiterpens hydrocarbons
- Oxygenated Sesquiterpens

### **Pharmacological Potentials *Grangea maderaspatana*. (L.) Poir**

#### **Stimulant Action**

*Grangea maderaspatana* leaves are reported to possess emmenagogue, oxytocic, or abortifacient effects were studied on the spontaneous activity of isolated nonpregnant rat uterus.<sup>[21]</sup>

#### **Cytotoxic Activity**

A crude CHCl<sub>3</sub> extract of *Grangea maderaspatana* exhibits strong cytotoxic activity.<sup>[22]</sup> A crude chloroform extract exhibited strong cytotoxic activity (ED<sub>50</sub>=2µg/ml) in the KB cell culture assay.<sup>[3, 22]</sup>

#### **Oestrogenicity and Antiimplantational Activity**

A mixture of flavonoids extracted from the plant *Grangea maderaspatana* exhibited oestrogenicity and antiimplantational activities, in the mouse. In the 3 day uterotrophic bioassay, administration of the drug at a dose of 20 mg/kg body weight per day, intramuscularly to ovariectomized females, resulted in a highly significant (p<0.001) increase in the wet uterine and vaginal weights. However, in comparison with conjugated oestrogen, the extract proved to be mildly oestrogenic. Flavonoids, administered orally at the same dose level effectively interfered with all stages of pregnancy. Maximum interceptory efficacy was

recorded when the drug was administered from days 4-6 post coitum. However, there was a reduction in antinidational activity only if the drug was administered from days 1-3 and 7-9 post coitum.<sup>[3,23]</sup>

### **Analgesic Activity**

The methanol extract of the whole plant of *Grangea maderaspatana* showed a dose-dependent analgesic activity. At doses of 1 and 3 g/kg, the extract significantly ( $P < 0.001$ ) inhibited acetic acid-induced writhing in mice by 50 and 80%, respectively. Methanolic extract of the plant (500 mg and 1 g/kg, p.o.) was also evaluated in tail flick model in our laboratory. The plant extract in both dose significantly increased latency for tail flick indicated analgesic activity.<sup>[3,24,25]</sup>

### **Antioxidant Activity**

The present study was aimed to investigate the antioxidant activities of the methanolic extract of *Grangea maderaspatana* L. Poir (Compositae). The antioxidant activity of the extract was evaluated using five in vitro assays and was compared to standard antioxidant (Ascorbic acid). Further, Total phenolic contents of the extract were determined by using Folin-Ciocalteu method in order to evaluate a relationship between the antioxidant activity and the phytochemical constituents. The total phenolic content was found to be  $121.45 \pm 2.56$   $\mu\text{g}$  Gallic acid equivalent of phenol. The extract and ascorbic acid were found to have different levels of antioxidant activity in the systems tested. Methanolic extract of *Grangea maderaspatana* (GMME) exhibited significant ( $p < 0.05$ ) reducing power ability, 1, 1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity, nitric oxide radical scavenging activity, hydrogen peroxide  $\text{H}_2\text{O}_2$  scavenging activity and inhibition of  $\beta$ -carotene bleaching. In DPPH radical scavenging activity NO scavenging activity,  $\text{H}_2\text{O}_2$  scavenging activity and  $\beta$ -carotene bleaching assay the IC 50 values obtained for GMME were found to be  $46.55 \pm 1.67$   $\mu\text{g}/\text{mL}$ ,  $120.73 \pm 0.694$   $\mu\text{g}/\text{mL}$ ,  $30.54 \pm 1.11$   $\mu\text{g}/\text{mL}$  and  $209.73 \pm 4.63$   $\mu\text{g}/\text{mL}$  respectively and for Ascorbic acid the IC 50 values were found to be  $24.96 \pm 1.95$   $\mu\text{g}/\text{mL}$ ,  $236.37 \pm 1.394$   $\mu\text{g}/\text{mL}$ ,  $57.34 \pm 1.29$   $\mu\text{g}/\text{mL}$  and  $339.16 \pm 5.30$   $\mu\text{g}/\text{mL}$  respectively. The antioxidant property depends upon concentration and increased with increasing amount of the extract. The free radical scavenging and antioxidant activities may be attributed to the presence of phenolic and flavonoid compounds present in the extract. The results obtained in the present study indicate that *Grangea maderaspatana* is a potential source of natural antioxidants.<sup>[3, 26, 27]</sup>

**Diuretic activity**

*Grangea maderaspatana* (L.) Poir is reported for diuretic activity.<sup>[3, 28]</sup>

**Acute toxicity study**

Acute oral toxicity was evaluated by following Organization of Economic Co- operation and Development (OECD) guidelines 420- Fixed Dose Procedure (FDP) [22]. Results indicated that the aqueous and alcoholic extract of *G. maderaspatana* up to a dose of 2000 mg/kg; p.o. did not produced any mortality.<sup>[3, 29, 30]</sup>

**Hepatoprotective activity & Antioxidant and Antimicrobial activity**

Ethanollic extract of *G. maderaspatana* possess significant potential as hepatoprotective agent.<sup>[3,29]</sup> Antimicrobial activity of the oil obtained by steam distillation of extract of aerial parts of *Grangea maderaspatana* (L.) Poir. was tested against one gram positive, four gram negative bacteria and two fungi using agar well diffusion method.<sup>[3, 27]</sup>

**Antiinflammatory and Antiarthritic activity**

Anti-inflammatory activity of methanolic extract of *G. maderaspatana* (1000 mg/kg, p.o.) was evaluated using acute model of carrageenan induced rat paw edema.<sup>[3,25]</sup>

**CONCLUSION**

The traditional and therapeutic application of *Grangea maderaspatana* (L.) Poir with its phytochemical profile need to be explored further based on its different activities. The phytochemical and pharmacological potential outlined throughout this review will help to maximize the desired therapeutic benefits of this well known plant. The plant needs to be further evaluated based on combined approaches of exploitation and exploration, which may help to find effective leads for further research regarding its standardization.

**REFERENCES**

1. Kokate, C. K; Purohit, A. P and Gokhal, S. B., 2006. Pharmacognosy 30<sup>th</sup> ed. Nirali Prakashan, Pune, India.
2. Garg J.M. File: *Grangea maderaspatana* (Madras Carpet) W IMG 9902. jpg From Wikipedia, the free encyclopedia.
3. Galani at el., Innoriginal International Journal of Sciences, 2015; 2(3): May- June 1-2.
4. Species 2000 & ITIS Catalogue of Life: April 2013, taxonomical classification, Available
5. from: [http://eol.org/pages/2895978/hierarchy\\_entries/52957246/names](http://eol.org/pages/2895978/hierarchy_entries/52957246/names).

6. Kirtikar, K. R and Basu, B. D., Indian medicinal plants, 1933; 2: 1336.
7. Bakashi, D. N; Pal, D. C., A Lexicon of Indian medicinal Plants, 2001; 2: 285-286.
8. Pullaiah, T., Encyclopedia of World Medicinal Plants, Regency Pub., West Patel Nagar, New Delhi, India, 2006; 2: 1036.
9. Chopra, R. N; Nayar, S. L; Chopra, I. C., Glossary of Indian medicinal plants, Council of Scientific and Industrial Research, New Delhi, 1956; 1: 127.
10. Anonymous, The Wealth of India: Raw materials. Publication and Information Directorate, CSIR: New Delhi, India, 1992; 2: 580.
11. Iyer, C. S. R and Iyer, P. R., Steroids from *Grangea maderaspatana*. *Phytochemistry* Elsevier, 1978; 17(11): 2036-2037.
12. Iyer, C. S. R; Iyer, P. R; Viswanathan, N., Isolation of strictic acid from *Grangea maderaspatana* Poir: identity of methyl strictate with methyl seconidoresedate. *Indian Journal of Chemistry, Section B: Organic Chemistry Including Medicinal Chemistry*, 1979; 18(6): 529-531.
13. Pandey, U.C; Singhal, A. K; Barua, N. C; Sharma, R. P; Baruah, J. N., Stereochemistry of strictic acid and related furanoditerpenes from *Conyza japonica* and *Grangea maderaspatana*. *Phytochemistry (Elsevier)*, 1984; 23(2): 391-397.
14. Singh, P; Jain, S; Jakupovic, J., Clerodane derivatives from *Grangea maderaspatana* *Phytochemistry*, 1988; 27(5): 1537-1539.
15. Lange G.L and Decicco Carl. P., Constituents of *grangea maderaspatana* A new Eudesmanolide *Journal of natural product*, 1989; 52(1): 130-134.
16. Singh, P; Jain, S., Auranamide - a phenylalanine derivative from *Grangea maderaspatana*. *Journal of the Indian Chemical Society*, 1990; 67(7): 596-597.
17. Rojatkar, S. R; Chiplunkar, Y. G; Nagasampagi, B. A. N., A diterpene from *Cipadessa fruticosa* and *Grangea maderaspatana*. *Phytochemistry*, 1994; 37(4): 1213-14.
18. Singh, P; Krishna, V; Pareek, R. B., Diterpenes derived from clerodane skeleton from some Compositae plants, *Journal of the Indian Chemical Society*, 1998; 75: 10-12, 552-558.
19. Krishna, V and Singh, P. Highly oxygenated flavonols from *Grangea maderaspatana* *Journal of Medicinal and Aromatic Plant Sciences*, 2001; 23(4): 609-611.
20. Kirtikar K, Basu B. *Indian Medicinal Plants*. Vol-2, 2nd Ed. Kolkata: International Book distribution, 2004; 1336-1337.
21. Nandkarni A. *Indian material medica*; Vol.1, 3rd Ed. Bombay: Popular prakashan, 1976; 592.

22. Dhawan, B. N and Saxena, P. N., Evaluation of some indigenous drugs for stimulant effect on the rat uterus. Preliminary report. Indian Journal of Medical Research, 1958; 46: 808-11.
23. Ruangrunsi, N; Kasiwong, S; Likhitwitayawuid, Kittisak; Lange, G. L.; Decicco, C. P., Studies on Thai medicinal plants. Part X. Constituents of *Grangea maderaspatana*. A new eudesmanolide. Journal of Natural Products, 1989; 52(1): 130-134.
24. Jain, S and Sareen, V., Oestrogenic and pregnancy interceptory efficacy of a flavonoid mixture from *Grangea maderaspatana* in the mouse. Phytotherapy Research, 1993; 7: 381-383.
25. Ahmed, M; Islam, M. M; Hussain, C. F; Khan, O. F., A preliminary study on the analgesic activity of *Grangea maderaspatana*. Fitoterapia, 2001; 72(5): 553-554.
26. Raxit P. Rachchh. Evaluation of analgesic, antiinflammatory, and anti-rheumatic activity of *Grangea maderaspatana* Poir. using various animal models. Gujarat Technological University, Gujarat, India, May 2013.
27. Patel, V; Shukal, S; Patel, S., Free radical scavenging activity. Pharmacognosy Magazine, 2009; 5(20): 381-387.
28. Singh D, Mathela CS, Pande V, Panwar A. Antioxidant and antimicrobial activity of *Grangea Maderaspatana* (L.) Poir. Journal of Drug Discovery Therapeutics, 2013; 1(7): 46-52.
29. Ahmed M, Islam MM, Hossain CF. Diuretic activity of *Grangea maderaspatana*. The Dhaka University Journal of Biological Science, 2001; 10(2): 215-18.
30. Omhare N, Barik R, Kondalkar A, Jain S. Hepatoprotective potential of *Grangea maderaspatana* Poir. against CCl<sub>4</sub> and paracetamol induced toxicity in male albino wistar rats. International Journal of Phytotherapy Research, 2012; 2(4): 24-31.
31. Stizel K, Carr G. Statically basis for estimating acute oral toxicity comparison of OECD guidelines 401, 420, 423 and 425. 1999; Appendix O-1: 3-7.
32. Jyotshna, Nidhi Srivastava, Bhuwanendra Singh, Debabrata Chanda and Karuna Shanker Chemical composition and acetylcholinesterase inhibitory activity of *Artemisia maderaspatana* essential oil, Pharmaceutical Biology 2015; 53(11): 1-7. DOI:10.3109/13880209.2014.1001405.