

Know Your Desert Medicinal Plant: *Maytenus Emarginata*

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Abstract: Medicinally important *Maytenus emarginata* is an ever green tree of desert useful against various diseases. It is an ever green tree that tolerates various types of stresses of the desert and is found in drier parts of central, south –western and north western India. *Maytenus* have been used for fever, asthma, rheumatism and gastrointestinal disorders, carcinoma and leukemia, gastrointestinal troubles etc. Medicinal plants are rich source of secondary metabolites, biosynthetically derived from primary metabolites but restricted to specific taxonomic genera of plant kingdom and specific part of plant body. Secondary plant products are of major interest because of their biological activities ranging from antibacterial, antibiotic, insecticidal, hormonal, pharmacological and pharmaceutical.

Keywords: *Maytenus emarginata*, medicinal plant, secondary metabolites, primary metabolites, biological activities.

1. Introduction

Since prehistoric period, India is homeland of large number of ethnic and cultural groups. They have distinct way of life, traditions, dialects and cultural heritage. They are custodian of indigenous knowledge system. They usually collected medicinal plant at a particular growth period and season presumably to get maximum yield of active principles to avoid destruction of large number of plants, allow self-regeneration and conservation. They also use more number of plant species for treatment of single disease, so as to reduce the impact of exploitation.

Varied climatic and topographical conditions prevailing in India has bestowed upon it a rich and diverse flora which is responsible for the richness and uniqueness of medicinal plants. India has its long tradition and history of health care through herbal drugs and still more than 76% of total population residing in rural areas depends for their health care needs on plants. Today the global movement towards a more natural life style has brought about resurgence of interest in herbs.

In recent times, modern medicine which usually uses non plant based drugs or synthesized drugs has shown an interest in natural drugs of plant origin. Efforts have been made in many countries to identify plants having natural drugs which are effective against various modern diseases. *Angelicaacutiloba* and *Astragalusmembranaceus* have been found to have immune stimulating activities. *Seneciovulgaris* and *Boragoofficinalis* pyrrolizidine alkaloids which are effective against veno-occlusive diseases (Reoder, 1995). *Gymnemasylvestre*, *Murrayakoenigii*, *Momordicacharantia*, *Eugeniajambolana*, *Scopariadulcis*, *Trigonellafoenumgraecum* have hypoglycaemic activity and are used in the control of diabetic problems. *Taxassps.*, *Combretumcaffrum*, *Tabernamontanasp.*, *Haemanthusnatalensis*, *Catharanthusroseus*, *Camptothecaacuminata*, *Capsicodendrodinisii*, *Cephalotaxushainanensis*, *Cheilanthescontracta*, *Crocussativus*, *Cunuriaspruceana* are some of a long list of plants having high interest activity and compounds of great potential as sources of useful anticancer, antitumor,

antileukemia and antineoplastic agents. Considering all these beneficial aspects and medicinal values of plants, *M. emarginata* of family Celastraceae, with lots of medicinal values, has been selected for the present study. It is well known plant used in the indigenous system of medicine in India. Almost all parts of these plants are used as medicine.

2. Botanical Classification and Botanical Description

Kingdom: Plantae
Phylum : Magnoliophyta
Class : Magnoliopsida
Order : Celastrales
Family : Celastraceae
Genus : *Maytenus*
Species : *emarginata Willd.*

Synonyms

Celastrus emarginata Willd.
Gymnosporia emarginata Willd.Thw.
Gymnosporia montana Roth. Benth.

Botanical Description

Habitat: It is an ever green tree that tolerates various types of stresses of the desert and is found in drier parts of central, south –western and north western India.

Habit: *Maytenus emarginata* is a small, compact tree, 3-5 meter high young branches purple, often spiny with leaves and flowers on the spines.

Leaves: Thick coriaceous, glabrous, very variable obovate, spatulate, and obtuse, entire or crenulated, apex rounded, decurrent at the base, 3.5-14.5 x 2-9 cm, petioles are 2-12 mm long, nerves 5-6 pairs, alternate on young branchlets, fasciculate on older ones.

Inflorescence: Axillary dichotomous or fasciculate cymes on short branches often forming terminal elongate panicles.

Volume 12 Issue 4, April 2023

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Flowers: Pedicels filiform, bracts small deltoid, fimbriate, bisexual or sometimes unisexual, actinomorphic, white or cream coloured, 5-7 mm in diameter.

Male Flowers: Stamens slightly shorter than petals, stamens absent, disc green, 5 lobed.

Female Flowers: Staminodes shorter than stamen of male flowers, ovary trilobular, green, style as long as ovary.

Calyx: 5, lobes broadly elliptical oblong, ciliate.

Corolla: 5, oblong or ovate oblong, 2-3x1mm white or cream.

Fruit: Capsule, globose, 10-12x8-9 mm, bivalve, reddish purple.

Seed: 1-4 with basal aril or the aril partially to completely covering the individual.

Flowering : Appears in October -January

Fruiting : Appears in January -February

Diagnostic Characters

Plants when young with spines, but spines not developing on older stems well developed brachyblast present leaves coriaceous and losing spines with age well developed brachyblast present leaves coriaceous and usually longer than 40 mm, apex rounded, obtuse to sub acute capsules 3-valved, red seed with a basal aril.

Ecology

Growing at elevations from near sea level and locally abundant on the coast on sand at the edge of mangrove forest or secondary forest, at forest margins, in thickets on branches and hillsides and on sea cliffs, often on limestone. Long, hot summers are needed for production of flowers and fruits.

Propagation

Maytenus emarginata is an out breeding tree therefore it shows great variability. The seed raised plants show enormous variability and if selected plants are to be propagated they has to be vegetatively propagated or cloned through tissue culture methods. The conventional methods of vegetative propagation are not known for this plant species. Therefore for large scale multiplication of selected clones tissue culture method is developed. Sow seed under glass in season of autumn. Remove suckers, which may appear at some distance from the parent plant in spring season. Root semi-ripe cuttings with bottom heat in summer.

Growth Patterns

Maytenus emarginata (Willd.) grow in moderately fertile, moist but well-drained soil in full sun with midday shade. Plants develop new leaves from June to August. Fruit appears in January to February. Flowers appears in October to January. Fruit ripens start from March to April.

Distribution

The species is globally distributed in Paleotropics. Within India, it is common in dry scrub forests throughout, particularly on poor soils in Central and Western peninsular India. The genus *Maytenus* distributed in drier parts of Central, South-Western and North- Western India. It is found throughout in India (Madhya Pradesh, Uttar Pradesh,

Punjab, Maharashtra, Gujarat, Delhi, Bihar, Tamilnadu, and Rajasthan)

In Rajasthan : It's found in Ajmer-Udaipur road (Ajmer), Shahabad (Kota), Gurupratapsingh village(Pali), Vadakhoda (Sirohi), Rajmahal (Tonk), DoogorBeed (Nagaur), FahelpurBeed (Sikar), SikarBeed (Sikar) , Karni Mata (Osian), Deshnoke (Bikaner), ShriBalaji (Nagaur), Chohta (Barmer), ShriMukam-Nokha (Bikaner), Khejarali (Jodhpur), Nursery of Rajasthan University, Jhalana Dungri (Jaipur).

Medicinal and Pharmacological Properties

A number of medicinal properties have been ascribed to various parts of this highly esteemed tree *Maytenus emarginata*. Almost all parts of this plant have been various ailments like in the treatment of gastro intestinal, mouth ulcer, vermifuge, toothache, purify blood. The crude plant extracts of the Celastraceae in traditional medicine and agriculture is astonishing and includes stimulant, restorative, male contraceptive, anti-tumor, anti-leukemic, anti-bacterial, insecticidal and insect repellent activities. Various parts of this plant contain immense medicinal properties.

Root: Used in gastro intestinal troubles, especially dysentery (Kothari and Londhe, 2000).

Stem: Tender shoots of plant help for mouth ulcer. The bark is ground to paste and applied with mustard oil to kill lice in the hair.

Leaf: Pulverized leaves of *M. emarginata* are given in the milk to children as a vermifuge. A decoction of the leafy twigs is used as a mouth wash to relieve toothache. Ash of leaves used to heal up sores and wounds gives cooling effect. The leaves are burnt and mixed with ghee to form an ointment used to heal sores. Agarwal and Nag, 2009). The tender leaves are chewed raw in the treatment of jaundice.

Fruits: Used in medicines to purify blood (Bhandari, 1990). Hot water extract of leaves and root bark showed antiparasitic activity. Ethanolic extract of root bark showed broad spectrum antibacterial, antifungal, antioxidant, anti-inflammatory activity. Alkaloid Mayteine (Nakagawa *et al.*, 2004) produce antitumor effect. The extract of plant showed cytotoxic effect on some cancer.

Pharmacology

For Pharmacological properties, *Maytenus emarginata* revealed that it contains cytotoxic sesquiterpene pyridine alkaloid emarginatine A, B, E, F, G and emarginatinine were isolated from *Maytenus emarginata* showed significant antitumor properties.

Pharmacological Properties

The crude plant extracts of the *M. emarginata* in traditional medicine and agriculture is astonishing, and includes stimulant, restorative, male contraceptive, anti-tumor, anti-leukemic, anti-bacterial, anti-oxidant, cytotoxicity, insecticidal and insect repellent activities.

Ethanol extracts of *Maytenus emarginata* were active against the test pathogens. Leaves ethanol extract was antibacterial to *Klebsiella pneumoniae* and *Proteus vulgaris* proved by Nair *et al.*, Tambekar and Khante *Escherichia coli*, *Staphylococcus aureus*, *Enterobacter aerogenes*, *Salmonella typhi*, *Salmonella typhimurium* and *Shigella flexneri* were mild sensitive. *Proteus*

vulgaris was strongly sensitive to ethanol extract of root of *Maytenus emarginata*.

Maytenus emarginata exhibited significant antimicrobial activity and properties that support folkloric use in the treatment of some diseases as broad spectrum antimicrobial agent.

Cytotoxic sesquiterpene pyridine alkaloid emarginatine A, B, E, F, G and emarginatinine showed significant antitumor properties. Emarginatine A was isolated from the stems and branches of *Maytenus emarginata*, Emarginatine E exhibited cytotoxicity against KB cancer cells, Emarginatine G has been isolated from *Maytenus emarginata* it is also evaluated against tumor cells.

Sesquiterpene pyridine alkaloid, emarginatine B has been isolated, along with maytansine, from *Maytenus emarginata*. Emarginatine B showed potent cytotoxicity against human KB cells.

Macrolide sesquiterpene pyridine alkaloids, emarginatine F and emarginatine G, were isolated from *Maytenus emarginata*, showed that emarginatine F demonstrated strong cytotoxicity against human epidermoid carcinoma of the nasopharynx (KB), ileocecal adenocarcinoma (HCT-8), melanoma (RPMI-7951) and medulloblastoma (TE-671) tumor cells, and against murine leukemia (P-388).

Sesquiterpene pyridine alkaloids from *Maytenus emarginata* Emarginatine C and D and cytotoxic emarginatine E and emarginatinine were isolated from *Maytenus emarginata*. Emarginatine E and emarginatinine showed cytotoxicity against human KB cells.

Leaves of *Maytenus emarginata* contain celacinine β and β -amyrin, β -amyrone, β -sitosterol and its 3'-O-glucoside and kaempferol.

The extracts of the plant show cytotoxic effect on some cancer. The plant is reported to possess anti-pasmodic properties. It is also a source of antitumor agents Maytansinoids Maytansine.

Extract of *Maytenus emarginata* roots, which contain highest amount of phenolic compounds, exhibited the greatest antioxidant activity. The high scavenging property of *Maytenus emarginata* roots may be due to hydroxyl groups existing in the phenolic compounds.

As the process of aging increases, the level of antioxidants in our body decreases, plant products serve a best source for controlling these activities by its own metabolic pathway. Antioxidant activity of the methanol extract of *Maytenus emarginata* was determined by DPPH free radical nitric oxide scavenging assays, superoxide ion scavenging assays, ABTS, and iron chelating methods.

The extract of *Maytenus emarginata* leaves possesses phenols, flavonoids, steroids, glycosides, saponins, tannins, and triterpenoids. The extract showed significant activities in all antioxidant assays compared to the standard antioxidant (ascorbic acid) in a dose-dependent manner, and remarkable activities to scavenge ROS may be attributed by the presence of the above active compounds in the leaves

Maytenus emarginata have anti fertility properties, it have beneficial effect in treatment of wide range of disorder as digestive ailments, nerve afflictions, heart ailments, inflammation, nervous system, rashes.

The ethanolic extract of *Maytenus emarginata* fruit was believed to suppress desire of sex. *Maytenus emarginata* fruit extract treated animals; the antifertility effect was 80%. The study revealed that after 30 days of withdraws of the treatment the percentage of pregnancies was 100%.



(A) *M.emarginata* Tree



(B) *M.emarginata* twig with leaves and spikes

3. Conclusion

This review article revealed ethno medicinal importance of *Maytenus emarginata*. The extensive survey of literature on *Maytenus* plant revealed that it has various important pharmacologically and medicinally phytochemicals. The plant has also been widely studied for its many pharmacological activities such as antimicrobial, antioxidant, anticancer, hepatoprotective and anti-ulcerogenic. *Maytenus emarginata* has been used for many years by the local tribal communities for the treatment of common diseases. Although this plant is the venerable plant of the environment friendly Vishnoi community, yet the number of this plant is decreasing continuously in Rajasthan. Therefore, there is a need to increase awareness about this plant. This review article has focused on several types of medicinal properties of plant, which suggests that further research is needed on this plant.

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Author Profile



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