



A REVIEW ON ENDANGERED MEDICINAL PLANTS OF RAJASTHAN AND THEIR METABOLOMIC PROFILING

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ABSTRACT:

Rajasthan is the largest state of India in terms of geography. Majority part of this state is dry region called as "Great Indian Desert" which is located at western side of Rajasthan. Oldest mountain range splits the state into two geographical zones-desert at one side and forest belt on the other side. Rajasthan has very diverse flora but several of the area's plants are endangered. The medicinal plant has been annihilated from the last two decades. The indiscriminate use of extract of the plant for its medicinal use unscientific, illegitimate, and carelessly has resulted, its disappearance or at risk of extinction. There are so many endangered medicinal plant cultivated in arid and semi-arid regions of Rajasthan named "*Commiphora wightii*, *Calligonum polygonoides*, *Chlorophytum borivilianum*, *Ceropegia odorata*, *Heliotropium calcareum*, *Dicliptera abuensis*, *Strobilanthes halbergii*, *Withania coagulans* etc. Even after the emergence of modern medicine, in urban and rural part of Rajasthan and India plants have been used for medicinal purpose from ancient time. Plant medicine, also known as phyto-therapy. Due to inadequate drugs supply, side effect of synthetic drugs and expensive treatment, traditional medicine continue to be widely practiced at local levels and humans are taking benefits of its as well. Various parts of plant like stem, roots, leaves, flower, seed, and bark are used to combat the disease because plants have antioxidant activity due to various type of secondary metabolites like flavonoids, alkaloids and steroids which are used to inhibit the free radical ions.

KEYWORDS:

ANTIOXIDANT, ENDANGERED, ILLEGITIMATE, INADEQUATE DRUG, TRADITIONAL MEDICINES, FREE RADICAL IONS
ETC.

INTRODUCTION

Herbal medicines are boon for mankind because it's safe, cost effective and less side effects thus gaining and scaling the faith. The villagers and tribal are still exploring the plants for ethanomedicinal purposes. Various phytochemicals isolated from plants showed pharmacological efficacy used directly as drugs or provide base for synthesis of new drugs. This review summarizes phytochemical, ethanomedicinal, pharmacological value and methods of conservation of eight endangered medicinal plants. Introduction of such plant are given below mentioned.

1. COMMIPHORA WIGHTII



FIGURE 1

Commiphora wightii is a flowering plant belongs to family Burseraceae. It is a small, bushy tree with thorny branches and produces a yellowish gum resin (guggulu). Small ducts located throughout its bark. It produces a fragrant resin called gugal, guggul or gugul, that is used

in incense and vedic medicine (or ayurveda). Guggal consists of oleo-gum resin obtained as an exudate from the tapping of stem and branches of *Commiphora wightii*. The plant is commonly known as guggal, gugar, mukul, myrrh and Indian bdellium tree and is found in arid areas of India, Bangladesh, and Pakistan. In India, it is found in Rajasthan (Jaipur, Jodhpur), Gujarat (Kutch), Assam, Madhya Pradesh (morena), and Karnataka.

2. CALLIGONUM POLYGONOIDES



FIGURE 2

Calligonum polygonoides (phog plant) is a member of family Polygonaceae. It is a small shrub found in Thar desert areas, usually 4 feet to 6 feet high but occasionally may reach even 10 feet in height with a girth of 1 to 2 ft [7]. The phog plant have extensive root system and leafless grows on sand dunes and acts as an effective sandbinder. It has a reputation in folklore medicine as a stimulant and astringent. It grows on sand dunes of

Barmer, Bikaner, Churu, Jaisalmer, Jhunjhunu, Nagaur, Sikar and Shri Ganganagar. They are eaten in Western Rajasthan, fruit usually eaten raw, buds and flowers eaten as vegetable. (Jaipur, Jodhpur, Bikaner, Kishengarh, Jaisalmer), smooth stems and branches, abortive flowers and small succulent fruit eaten. Flowers made into bread or cooked with ghee or coconut oil.

3. *CHLOROPHYTUM BORIVILIANUM*



FIGURE 3

Chlorophytum borivilianum is a herb with lanceolate leaves belong to Asparagaceae Family, The Hindi name is safed musli (also commonly known as musli or indian Spider Plant 'white gold' or 'divya aushad'. It is reported in Mount Abu, Mahi and Aravalli hills (Rajasthan) of India. It is characterised by its large, waxy, glossy leaves, which are 5 to 30 cm long. The flowers are small, white and have five petals. It is blooming in the summer months. The leaves of this plant are very low maintenance, which makes it an excellent choice for gardeners need less water. It's beautiful and unique houseplant that comes in a variety of colours, including red, pink, orange, yellow and white.

4. *CEROPEGIA ODORATA*



FIGURE 4

Ceropogia odorata, belongs to the Asclepiadaceae family. It is an endangered plant. It is known for its unusual characteristics, such as milky, clear-coloured leaves and flowers or leaves set with small holes. The *Ceropogia odorata* can grow in sun to partial shade. It prefers hot weather and can grow in U.S. *Ceropogia*, whose flowers have a strong fragrance, hence the species name *odorata*. The flowers bloom only for some days and exhale a very strong jasmine scent. In Rajasthan it is found in Mount Abu. In Gujarat this species is called Jeemikanda.

5. *DICLIPTERA ABUENSIS*



FIGURE 5

Dicliptera abuensis is an endangered plant located in the hilly areas of Mount Abu belong to the Acanthaceae family, mostly shrubs or herbs. the Kathiarbar-Gir Dry Deciduous Forests and the Dhobi Ghats. The Kathiarbar-Gir Dry Deciduous Forests are also the home of the world's only population of the Asiatic lion.

6. *HELIOTROPIUM CALCAREUM*



FIGURE 6

A silvery slender desert annual, Flowers white, long Inflorescences belong to Boraginaceae family. Style 0.6–1.5 mm long, with slightly 2-fid or notched sterile tip protruding 0.02–0.14 mm above the stigmas. Nutlets whitish, beige, or reddish, ovate in outline, (1.1–)1.5–2.4 x 1.2–2 mm.

7. *STROBILANTHES HALBERGII*



FIGURE 7

Strobilanthes halbergii is another plant located on Mount Abu. It is also a member of the Acanthaceae family. *Strobilanthes* these are known for their striking purple flowers and striped purple leaves. The characteristics of this plant are a purple stem, there are coarse feathers, while on the surface of the leaves have a fine hair. It is an aromatic herb found in South India, has been extensively studied for its anti-inflammatory property. The oil prepared from the plant is reported to be effective in various inflammatory conditions.

8. WITHANIA COAGULANS



FIGURE 8

Withania coagulans belong to family Solanaceae, commonly known as Indian cheese maker and Paneer Phool in hindi. Paneer dodi is widely used in Ayurvedic system of medicine for over 3,000 years in India (Indian Pharmacopoeia, 1985). The fruits have been used for milk coagulation. The fruits are sweet and are reported to be diuretic and alterative.

MATERIAL AND METHODS

Published data in this review were all collected from databases like PubMed, MEDLINE is the National Library of Medicine's (NLM) premier bibliographic database, Journal like Elsevier, Springer, BMC, Scopus, Google Scholar, and Web of Science.

PHYTOCHEMICAL STUDY

Plant Name	Plant part used	Phytochemical Constituents
<i>Commiphora wightii</i>	Bark, Stem	Oleo-gum resin, oil, monoterpenoids, sesquiterpenoids, diterpenoids, and triterpenoids, steroids, flavonoids, guggultetrols, lignans, sugars and amino acids[12]
<i>Calligonum polygonoides</i>	Leaves, Stem, Flower, Buds, Seeds	phenolic, flavonoids, tannin ,essential oil
<i>Chlorophytum borivilianum</i>	Roots, Leaves	25 alkaloids, vitamins, proteins, carbohydrates, saponins, steroids, calcium, potassium, phenol, magnesium, resins, mucilage, fibers
<i>Ceropegia odorata</i>	Leaves, Flower, Stem,	Phenylpropanoid, flavonoid, tannin gallic acid Cerpegin, a pyridine alkaloid, cathechol, vanillin and salicylic acid[17]
<i>Dicliptera abuensis</i>	Root, Stem , Leaf	lutein, shikimic acid and guaiacylglycerol[11]
<i>Heliotropium calcareum</i>	Flower	Pyrrolizidine alkaloids, flavonoids, and terpenoids.
<i>Strobilanthes halbergii</i>	Root, Leaves	lupeol, stigmaterol, betulin, stigmaterol glycosides
<i>Withania coagulans</i>	Fruits	Flavonoids, tannins, and β -sterols

CONSERVATION METHOD

Many of the medicinal plant species are facing threats of extinction due to over and improper exploitation, habitat loss, degradation of land, urbanization etc. On the other hand, the increasing global demand for the medicinal plant's necessities an accelerated cultivation and conservation of them. Large scale indiscriminate collection, inadequate attempts have been made either to allow its replenishment or promote cultivation enlisted this species as 'endangered' by government of India in 2000.

PROPAGATION OF ENDANGERED MEDICINAL PLANTS

The propagation of *Commiphora* occurs by cuttings or from seed and *Dicliptera abuensis* propagated also from cutting, plant all of them in a single pot. *Heliotropium calcareum* is a flowering plant, can grow from seed. All plants grows vigorously in a bright location and in a well-drained substrate. The main cause of failure in the cultivation of this sampling is the excessive amount of water. *Ceropegia* need a permeable and well-drained soil. Waterlogging is not good for plant, lead to root rot.

In Vitro cultured can be done in *Calligonum polygonoides*. It produces root suckers and is easily propagated by cutting

and layering. Micropropagation is popular method of conservation and large-scale propagation of *Withania coagulans* and in *Strobilanthes halbergii*. A micro propagation protocol using different explants, agro technology and use of synthetic seed has also been reported in *Chlorophytum borivilianum*[15].

SIGNIFICANCE AND USES

COMMIPHORA WIGHTII

Guggulu possesses hypolipidemic, anti-inflammatory, anti-arthritic, antifertility, Anti-atherosclerotic, astringent, anti-septic, anti-inflammatory, analgesic, wound healing, anti-obesity, anti-spasmodic activity. In Indian traditional system of medicine, guggulu has been used for thousands of years in the treatment of arthritis, inflammation, stimulates libido, nervous diseases, bronchial congestion, cardiac and circulatory problems, weak digestion, wounds, abscess, foetid ear, fractures, gout, skin rashes, irregular menstruation, diarrhea, headache, mild nausea, liver toxicity, rheumatism, obesity, and disorders of lipids metabolism. Guggul in combination with inula racemosa showed improvement in ECG and reduces chest pain[13] Important metabolites present in the bark of *C.wightii* such as guggulsterone these can be explored further for the development of phytopharmaceuticals.

CALLIGONUM POLYGONOIDES

Leaves and stems are chewed to wash teeth and to treat gummosis. Root's paste for the treatment of prickly heat and scabies. Decoction is used for the treatment of sore gums, typhoid. Flowers buds are effective in sun stroke. Flowers pastes are also used for the treatment of asthma, eczema, cough and cold. It is reported that juice of the plant is applied in eyes to remove poisonous effect of *Calotropis procera*. *C. polygonoides* acts as an antidote against snake bite. The leaves are anti-inflammatory and antiulcer[8]. It is used in the treatment of gastric problems. *C. polygonoides* possess significant antioxidant, antifungal and cytotoxic bioactive compounds[3,6]. *Calligonum polygonoides* essential oil obtained by hydrodistillation from its fruit and stem was analysed by GC-MS and reported for first time[9]. Asmaal Owis and others published Analysis of phenolics in *Calligonum polygonoides in vitro* cultured roots [2].

CHLOROPHYTUM BORIVILIANUM

It is cultivated and eaten as a leaf vegetable in some parts of India, and its roots are used as a health tonic under the name *safed musli*. In traditional Indian medicine it is used as *rasayan* or adaptogen, class of vitality and longevity. This herb belongs to the *vajikaran rasayana* group in Ayurveda. In some instances this plant is called Herbal Viagra. It has some reported usage postpartum in part due to preventing depression and acting as a galactagogue (milk production enhancer).

CEROPEGIA ODORATA

The leaves are chewed to cure stomach pains, the juice from the tubers is used as eye medicine. Furthermore the

tubers are eaten as vegetable. Cerpegin, a pyridine alkaloid was isolated from its tubers and stem[10].It exhibited antipyretic, hepato-protective, anti-ulcer, analgesic, hypotensive and tranquilizing activities[5]

DICLIPTERA ABUENSIS

The plant is used in traditional Chinese medicine. The leaves have been used in the form of water extract decoctions for the treatment of ailments including cough, dysentery, diarrhoea, and bronchitis. Ethanol and aqueous extracts of the leaves are sometimes used for the treatment of malaria[1]

HELIOTROPIUM CALCAREUM

The utilization of *Heliotropium calcareum* has been evident since ancient times for treating various disease states like inflammation associated with gout and rheumatism, poisonous bites, and other skin disorders.

STROBILANTHES HALBERGII

Maintain kidney health, destroying gallstones, increase blood volume, inhibits cancer growth Overcome diarrhoea and maintain the health of the liver, lowers cholesterol, some leaves of this plant can hinder the itching, diabetes.

WITHANIA COAGULANS

The berries contain a rennet-like protease that can be used to clot milk for cheese production. [4,16].It is helpful in control diabetes and it is anticancerous, antidiabetic, and antihyperlipemic effects[14],it has been encapsulated in chitosan nanoparticles which targeted gastrointestinal delivery of nutraceuticals, providing protection from gastrointestinal degradation of the active substances (Ernest et al., 2018). *Withania Coagulans* help with correcting high blood sugar. It helps with maintaining antioxidant status in our body and the chances of renal failure is reduced in diabetes patients.

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