



Pelagia Research Library

Asian Journal of Plant Science and Research, 2022, 12(8)



Anthropogenic and Biological Pressure on Critically Endangered Species *Commiphora Wightii* (Arnott) Bhandari in its Natural Habitat, India

JR Rot^{1*}, K Sasikumar¹, MK Sujnan¹, SK Jha² and PL Katara³

¹Department of Forest, Silviculture and Forest Utilization circle, Rajpipla, India

²Department of Forest, Navsari Agricultural University, Navsari, India

³Department of Biological Science, Sage University, Indore, India

*Corresponding author: JR Rot, Department of Forest, Silviculture and Forest Utilization circle, Rajpipla, India,
E-mail: jimmyforestry13@gmail.com

Received date: August 02, 2022, Manuscript No. AJPSKY-22-14451; Editor Assigned date: August 04, 2022, PreQC No. AJPSKY-22-14451(PQ); Reviewed date: August 15, 2022, QC No. AJPSKY-22-14451; Revised date: August 24, 2022, Manuscript No. AJPSKY-22-14451(R); Published date: August 31, 2022, DOI: 10.36648/2249-7412.12.8.308

Citation: Rot JR, Sasikumar K, Sujnan MK, Jha SK, Katara PL (2022) Anthropogenic and Biological Pressure on Critically Endangered Species *Commiphora Wightii* (Arnott) Bhandari in its Natural Habitat, India. Asian J Plant Sci Res Vol.12 No.8:308.

ABSTRACT

Despite the loss of large number of forest species in the country, but our gluttonous demand for the resources still continue in insatiable way. a well-known medicinal plant for its healing properties. It has been used since our vedic era and now it is over exploited due to voracious demand in global market; hence it become in a queue of extinction. Processed *Commiphora wightii* oleo-resin products are exported from India to global market, including re-export to Pakistan, for anti-inflammatory use and an anti-obesity treatment considered to lower cholesterol and lipid levels. In this paper we try to review an anthropogenic and biological threat factors with reference to its status, distribution and demand for its medicinal properties. *Commiphora wightii* has over exploited for its medicinal properties, while the species distributed in small geographical area of India and adjoining sub continents with arid climatic condition and facing varied anthropogenic and biological pressure. It is categorized as critically endangered by IUCN after detailed field assessment. To protect the species from future extinction it needs to regulate extraction and demand for its medicinal properties under legislative laws. Also conserve by scientific research and adopt different conservation strategies like In-situ and Ex-situ programmes.

Keywords: *Commiphora wightii*; Anthropogenic; Biological; Threats; Demand; Habitat; Conservation

Introduction

Biological diversity is the relative abundance of species while living organisms and ecological complexes which important for stability of ecosystem. According to, a diverse ecosystem is more resistant to environmental disturbances and is likely to contain species that would thrive through natural or imposed perturbations in the ecosystem and compensate for the loss of other members [1,2]. A taxon well thought-out to be threatened and endemic; when its area of distribution is significantly restricted to smaller than the average taxa of the similar rank in expanses [3]. *Commiphora wightii* has facing a high jeopardy due to their lower population, restricted geographic distribution and anthropogenic disturbance [4]. The wild occurrence of this species only restricted to Rajasthan and Gujarat of Indian states and the adjoining region of Pakistan. The foremost reason behind the over exploitation is oleo-gum resin tapped from stem of the species, that mainly leading by demand for traditional medicine all over the world. Ruthless exploitation of this species has led to decline the population in wild which consequently categorized as critically endangered by International Union for Conservation of Natural resources (IUCN) in 2015.

Morphological description

Commiphora wightii known as “Guggul” which belongs to Burseraceae family. It is shrubby, branched and very slow growing plant with average height of 2-3 m. It forms silvery and paper like grimy or grayish-brown bark shed-

ding off in small pieces. It is much-branched, knotty scented spines, spirally and crooked ascending branches ending in sharp spines [5]. Leaves are small, sessile, rhomboid-(ob)ovate, 1-3 leaflets, highly aromatic, leathery, shining green on top and grayish below with irregularly toothed edges. Lateral leaflets present only less than half size of the terminal one [6]. Flowers are smaller, bisexual, sessile, brownish red, occurring singly or in groups of 2-3, 8-10 lobed disc and an oblong-ovoid ovary; stamen 8-10. Fruit an ovoid green berry like drupe, reddish, 6-8 mm in diameter and seed generally contain an under developed embryo [7].

Habitat and distribution range

Commiphora wightii prefers a distinct environmental gradient bounded through the topography and salinity. It grows well in arid and semi-arid climates and is tolerant to deprived soil. It prefers sandy, loamy, clayey and gravelly soil types and grows well in open canopy cover. The highest density (41.2 per ha) of the species has been recorded from loamy soil having pebbles as substratum, shallow soil depth and low salinity [8]. The habitat of the species get low rainfall, which varies between 327-434 mm and the temperature ranges from 4.6°C in winter to 45°C in summer. The species has been recorded from undulating terrain, flat and hilly areas and dry river beds (IUCN, 2015).

In Indian-subcontinent, *Commiphora spp.* occurs in India and Baluchistan [9,10]. In India, it occurs in the arid rocky tracts of Rajasthan, Gujarat, Madhya Pradesh, Karnataka and Kalat division of Andhra Pradesh, as well as Sindh and Baluchistan states of Pakistan [11-14].

Medicinal uses

Guggulu has a historic account of use in ayurveda. The Atharvaveda is the earliest reference covered its medicinal and therapeutic properties in SushrutaSamhita [15]. Comprehensive description concerning its actions, uses and indications and the varieties of guggul have been described in numerous ayurvedic treatises including CharakaSamhita (1000 B.C.), SushrutaSamhita (600 B.C.) and Vagbhata (7th century A.D.).

Although new compounds continue to be found in *C. wightii* oleo-resins, the main commercial interest is in Guggulsterones [16]. These contain active ingredients used to treat arthritis, cancer, obesity, osteoarthritis, rheumatoid arthritis, gout, facial paralysis, sciatica, constipation, haemorrhoids, liver disorders, inflammation, cyst, cervical lymphadenitis, coronary thrombosis, anaemia, diabetes, urinary calculus, increased frequency and turbidity of urine and skin diseases and reduce cholesterol and obesity [17-19]. The main active ingredients are Z Guggulsterone and Eguggulsterone [18].

Threats

Biological threats: The global extent and rapid increase in invasive species is homogenizing the world's flora and fauna and is recognized as a primary cause of global biodiversity loss [20]. *Prosopis juliflora* known as vicious species and also share same habitat as *Commiphora wightii* preferred. Hence the invasion of this ferocious species, synergistically affect the regeneration of *Commiphora wightii* along with *Lantana camara* invasion in aravallis of Udaipur district and other habitat [21]. Over-exploitation, a constrained occurrence, occupancy restraint to small area, stern fragmentation of populations, very low regeneration and pressure of alien species leads *C. wightii* to high extinction risk.

Anthropogenic threats: Grazing and browsing by cattle seems to lead restraint the natural regeneration of this species. Due to grazing and browsing seedling and sampling are hardly survive under disturbed habitat [8]. Consequently it continuing exposed to anthropogenic pressure which ultimately seize new recruitment of the species. Vicious harvest to obtain the gum is the major threat facing this species. *C. wightii* oleo-resin is important in international trade, but is being extracted using un sustainable methods. The application of ethephon on tapping cuts to increase Guggul gum certainly increased gum production, consequently plant has get infected and die within few year after access tapping cuts [11]. From mature plants average yield of gum is around 250-500 gm during single extraction season [13]. The forest department has collected around 43 tons of Guggul gum in 1963 to 1970 from the Kachchh [8]. Due to high level of collection led large population of mature plants to death. Subsequently decline in population and also in collection of forest department during that period. The collection number attributes the destruction of large population.

Conservation measures

The major threat to the species is overexploitation for medicinal properties rather than demographic and genetic con-

straint [22]. In current scenario, its needs to makes conservation strategies and good knowledge about distribution of genetic diversity for this rare and endangered species [23-25].

Conservation management for this species should aim large as well as small population to easly adapt changing environment in their habitat [26]. On other hand the Indian government has banned the export of the species while biotic pressure has been regulated and developed sustainable extraction techniques adopted to reduce mortality rate [8]. To minimize the pressure on wild population, it developed multiplication through micro and macro propagation techniques by ex-situ conservation.

Conclusion

In essence, a long history of over exploitation of this species has executed to global demand for its oleo gum. Its critically endangered status by IUCN entailed after rigorous field assessment based on available information regarding distribution range, ecological aspects and global demand for its medicinal properties. After reviewing different information related to the species; we came to know that, still there is large gap to understand the conservation management and sustainable utilization of the species. It needs more research work on the species and standardize criteria for export of plant material [27]. CITES has no legislative policy to protect at international level due to lack of information about the species. Following are few recommendations to conservation implements by [8]. (I) It needs ex-situ and in-situ conservation through various propagation techniques. (ii) Government has to establish protection reserve in its natural habitat. (iii) To reduce its mortality rate we need to make legislative law to regulate the extraction methods and medicinal products. (iv) Local communities play vital role in its conservation and management, so it foremost need to make aware of people about the status of the species. Although invasive species confined to threat for native flora and spread rapidly in ubiquitous way, thus regular monitoring of habitat should done.

References

1. McNaughton SJ (1977) Diversity and stability of ecological communities: A comment on the role of empiricism in ecology. *Am Nat* 111: 515–525.
2. Stapanian MA, Cassell DL, Cline SP (1997) Regional patterns of local diversity of trees: Associations with anthropogenic disturbance. *For Ecol Manage* 93: 33–44.
3. Costa M (1997).Biogeography. *Botanica* edited by Izco J, Barreno E, Bruguez M, Costa M, Devesa J, Fernandez F (McGraw Hill Interamericana, Madrid, Spain) 683-687.
4. Kulloli R, Kumar S (2013) *Commiphora wightii* (Arnott) Bhandari: A threatened plant of conservation concern. *Journal of Medicinal Plants Research* 7: 2043-2052.
5. Kumar S, Shankar V (1982) Medicinal plants of the Indian deserts: *Commiphora wightii* (Arnott) Bhandari. *Arid Environ* 5: 1-11.
6. Tiwari DN, Kumar K, Tripathi A (2001) Guggal-Utthan-Center for sustainable Development and Poverty alleviation, 18-A Auckland Road. Allahabad P. 117.
7. Varrier VPS (1994). *Indian Medicinal Plants*. <http://www.vedamsbooks.com>
8. Dixit A, Rao S (2000) Observation on distribution and habitat characteristics of Guggul (*Commiphora wightii*) in the arid region of Kachchh, Gujarat, India. *Tropical Ecology* 41: 81-88.
9. Hooker JD (1872). *The Flora of British India*. Part-I London: Reeve, P.740.
10. Choudhary II (1959) Scope of the plant introduction in agriculture and forestry of West Pakistan. *Agriculture* 9: 208-211.
11. Soni, V., 2010. Conservation of *Commiphora wightii* an endangered medicinal shrub, through propagation planting and education awareness program in the Aravali Hills of Rajasthan, India. *Conservation Evidence* 7: 27-31.
12. Khan AH (1958). The essential oil bearing plants of Pakistan part –1. *Pak J For* 8: 262-283.
13. Atal C, Gupta O, Afaq S (1975) *Commiphora mukul*: Source of guggal in Indian systems of medicine. *Economic Botany* 29: 209-218.

14. Gupta P, Shivanna K, Mohan Ram H (1996) Apomixis and polyembryony in the Guggul plant, *Commiphora wightii*. *Annals of Botany* 78: 67-72.
15. Joshi A (1980). *Ayurvedic Patrikaritaka has (History of Ayurvedic Publications)*. Mimeo. Mohan Ayurvedic Pharmacy Jodhpur, India p 260.
16. Meselhy M (2003) Inhibition of LPS-induced NO production by the oleogum resin of *Commiphora wightii* and its constituents. *Phytochemistry* 62: 213-218.
17. Antonio J, Colker CM, Torina GC, Shi Q, Brink W, et al. (1999) Effects of a standardized guggulsterone phosphate supplement on body composition in overweight adults: A pilot study. *Current Therapeutic Research* 60: 220-227.
18. Gonzalez-Castejon M, Rodriguez-Casado A (2011) Dietary phytochemicals and their potential effects on obesity: A Review. *Pharmacological Research* 64: 438-455.
19. Sharma B, Salunke R, Srivastava S, Majumder C, Roy P (2009) Effects of guggulsterone isolated from *Commiphora mukul* in high fat diet induced diabetic rats. *Food Chem Toxicol* 47: 2631-2639.
20. Mooney HA, Hobbs RJ (2000) *Invasive species in a changing world*. Island Press, Washington, D.C.
21. Reddy CS, Meena SL, Hari Krishna P, Charan PD, Sharma KC (2012) Conservation threat assessment of *Commiphora wightii* (Arn. Bhandarian economically important species. *Taiwania* 57: 288-293.
22. Haque I, Bandopadhyay R, Mukhopadhyay K (2010) Population genetic structure of the endangered and endemic medicinal plant *Commiphora wightii*. *Mol Biol Rep* 37: 847-854.
23. Hamrick JL, Godt MJW (1989) Allozyme diversity in plant species. *Sinauer Associates Inc, Sunderland, Massachusetts*.
24. Holsinger KE, Gottlieb LD (1991) *Conservation of rare and endangered plants: Principles and prospects*. Oxford University Press, New York, Oxford pp. 195-208.
25. Qiu YX, Li JH, Liu HL, Chen YY, Fu CX (2006) Population structure and genetic diversity of *Dyosma versipellis* (Berberidaceae) a rare endemic from China. *Biochem Syst Ecol* 34: 745-752.
26. Luijten SH, Dierick A, Gerard J, Oostermeijer B, Raijmann LEL, et al. (2000) Population size, genetic variation and reproductive success in a rapidly declining, self incompatible perennial (*Arnica montana*) in The Netherlands. *Conserv Biol* 14: 1776-1787.
27. Ved D, Saha D, Ravikumar K, Haridasan K (2015) *Commiphora wightii*. *The IUCN Red List of Threatened Species* 2015.