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Threat Status of *Rheum emodi* - A Study in Selected Cis-Himalayan Regions of Kashmir Valley Jammu & Kashmir India

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Abstract

Rheum emodi being one of the most sought after species in the pharmaceutical industry, providing good dividends to the States from where it is procured, is rapidly declining in nature. The present study entitled as "Threat status of *Rheum emodi* Wall - A study in selected Cis-Himalayan regions of Jammu & Kashmir" was conducted at Sonamarg (Upper Sindh Forest Range) and Chatergul (Manasbal Forest Range) with the aim to assess the status of *Rheum emodi* and factors affecting its sustainability. A comprehensive protocol was framed. From this study it was concluded that this highly beneficial herb, is under immense pressure to survive in natural habitat. Illegal/Unsustainable extraction from the Forests is a major cause for dwindling species of *Rheum emodi*. Lack of understanding of sustainable harvesting/extraction has lead to disturbance of habitat, loss of diversity, reduced abundance and local declining of *Rheum emodi*.

Keywords: Threatened herbs; Rhubarb; Medicinal herbs of J&K; Traditional medicine

Introduction

Jammu & Kashmir state is rich storehouse of medicinal, aromatic and other economic plants due to the wide variation of temperature (-20°C to 45°C) and altitudes (300 to 8,600 meter above the sea level) found throughout the state. The Himalayas known for its loftiest and longest mountain ranges in the world is a reputed treasure of Medicinal Plants. The valley of Kashmir is very rich in high value and high altitude aromatic and medicinal plants. More than 50% of plant species described in British pharmacopoeia are reported to grow in Kashmir Valley. Near 570 plant species are reported to be of medicinal importance. The Sonamarg Area and the Sindh Forest Division (Area of Study) in Kashmir is home to different high altitude Medicinal Plants like Piccrorhiza kurroa, Rheum emodi, Innula racemosa, Sausseria costus, Sausseria sacra, Artemesia (spp), Pyerethrum Spp, Aconitum heterophyllum etc. The medicinal extracts and essential oils derived from these plants form the backbone of pharmaceutical, perfumery and cosmetic industry [1-5].

Rheum emodi [6-10]

BotanicalName(s): Rheumemodi

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Caryophyllales

Family: Polygonaceae

PartsUsed: Rhizome.

Vernacular name(s): Rhubarb, amla-vetasa, aml parni, revandchini, archu, Chinese Rhubarb, Turkey, rhubarb, Da huang, Bangla Revanchini, Himalayan rhubarb, Indian rhubarb, Ladakirevandachini, Nattu ireval-chinni, Reval-chini, Rhabarber, Rheuchini, Rhubarb de Perse, Tursak, Variyattu. **Habitat:** Grown throughout the valleys in Himalayan region at altitude of 3200-5200 m. *Rheum emodi Wall*. Ex Meissn. is a perennial stout herb, distributed in the temperate and subtropical regions of Himalaya from Kashmir to Sikkim, between an elevation of 2800 and 3800 m. In Himalayas it is generally found between 2800 and 3600 m in an alpine zone on rocky soil, between boulders and near streams.

Medicinal uses: Rhubarb is stomachic, bitter, tonic, cathartic. Useful for simple diarrhea, but not in constipation or any affection in which a continuous aperient action is necessary; Best used for the ailments of children and aged persons. Purgative, antibacterial, antitumor, antifungal, diuretic, haemostatic, cholagogue, antihypertensive, lowers serum cholesterol, anti-inflammatory. It moves the blood and is good for blood stagnation associated with acute stabbing pain and bruises, for which it can be taken both internally as well as externally in a liniment [8-10].Reduces the impact of Type II Diabeties Mellitus. Studies have shown it exhibits Anti-cancer properties in Human pancreatic cancer

Chemical constituents [11-14]: Hydroxanthracene derivatives such as chrysophanic acid (=chrysophanol), emodin, aloe-emodin, rhein and physcion, with their O-glycosides such as glucorhein, chrysophanein, glucoemodin; sennosides A-E, reidin C and others. The astringent principle consists of gallic acid together with small amounts of tannin. The drug also contains cinnamic and rheinolic acids, volatile oil and starch. Two major glycosidic active principles, sennoside A

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and B, are present along with free anthraquinones. At low doses, the tannin exerts astringent effect and relieves diarrhea; at higher doses anthraquinones stimulate laxative effect and relieve constipation.

Objectives

To study the status of *Rheum emodi* availability in the designated areas of upper reaches of Sonamarg (Upper Sindh Forest Range) and Chatergul (Manasbal Forest Range), to compare the current availability of the species with the availability before a decade or more, to evaluate the causes of current threat status of *Rheum emodi* species in Natural habitat of J&K.

Methodology

The present study entitled as "Threat status of *Rheum emodi* Wall -A study in selected Cis-Himalayan regions of Jammu & Kashmir" was conducted at Sonamarg (Upper Sindh Forest Range) and Chatergul (Manasbal Forest Range). A comprehensive protocol was framed. The study extended from May 2013 to June 2014. Blue print of the study was conceptualized as materials and methods which can be described as under Study design: Pharmacognosial Study.

Area of Study: Two areas from the natural habitat of *Rheum emodi* were selected Viz a viz upper reaches of Sonamarg (10 Sq Kms) falling under upper Sindh Forest Range and upper reaches of Chatergul (10 sq Kms) falling under Manasbal Forest range.

Data Collection

Data was procured through:

- 1. Visits of PI: PI visited the area of study to determine the availability status of the herb. A target of 200 plants of *Rheum emodi* in 10 Sq km area in each area of study was fixed based on previous studies. (Annexure "A").
- 2. Interview and interactions with Locals/Nomads: PI took interview of people living in and around the area of the study (in the age group of 40-75 Years) through questionnaire in order to get their inputs regarding the presence of the herb in the area of study, its present status, uses and factors affecting its survival and availability. (Annexure "B")
- **3.** Feedback from officials of Forest Department & Research Institutes: Information like present status of *Rheum emodi*, its market demand and factors affecting its survival was sought

from experts in the field like forest department (Annexure "C"), Scientists/Research scholars of SKUAST-K, IIIM J&K, J&K SFRI, J&K SMPB working in Medicinal Plants sector through questionnaire (Annexure "D").

Observations

Visits of PI to the area of study (Table 1)

Target 200 Plants of *Rheum emodi* in 10 Sq km area (Natural habitat) each of two areas of study

Interview and interactions with locals/nomads. (Table 2)

Sample size: 64 people (32 at each place)

Data procured from research institutes

Feedback from Scientists/Research scholars of SKUAST-K, IIIM J&K, J&K SFRI, J&K SMPB working in Medicinal Plants sector through questionnaire (Table 3).

Data procured from forest department

Feedback from Officers/officials of Forest Department through questionnaire (Table 4).

Discussion

The plant over the past several decades has been extensively exploited through extraction of crude drug and also through impact of various anthrogenic pressures like grazing, uncontrolled deforestation, selective extraction, rapid urbanization and industrialization. Now the situation is such that a single plant of *Rheum emodi* is seen after hours of trekking in higher regions of Himalaya [12]. International Union for Conservation of Nature (IUCN) committee for threatened plant species indicates that one in ten species of vascular plants on the earth is endangered or threatened due to commercial exploitation and international trade. This may lead to gene erosion in next 20-30 years. *Rheum emodi* is among the top of that list. Therefore, it has been identified top priority species for conservation and cultivation [15,16].

This observational study was meant to assess the threat status of *Rheum emodi* through the methodology mentioned above, although based on the questionnaire other observations like the traditional knowledge about the usage of herbs in the area of study by locals/ nomads were also inferred. *Rheum emodi* being one of the most sought after species in the pharmaceutical industry, providing good dividends

% age of area under Forest Department	70	14/20
%age of area under wildlife Department	30	6/20
% age of area having natural habitat for Rheum emodi	100	20/20
% age of plants found by PI in Sonamarg Area	6	13/200
% age of plants found by PI in Chatergul Area	7	15/200
% age of target achieved	7	28/400

Table 1: Visits of PI to the area of study. Target 200 Plants of Rheum emodi in 10 Sq km area (Natural habitat) each of two areas of study.

% age of people who know <i>Rheum emod</i> i is found in the area of study	100	64/64
%age of people using Rheum emodi as traditional Medicine	79	51/64
% age of who think availability of Rheum emodi species have dwindled since last decade.	100	64/64
% age of who think Illegal extraction from forests is the cause of dwindling availability of the species.	76	49/64
% age of who think lack of conservation and cultivation of <i>Rheum emodi</i> is the cause for declining availability of the species.	17	11/64
% age of who think Environmental factors are responsible for declining availability of the species	6	4/64

Data procured from Research Institutes.

Table 2: Interview and interactions with Locals/Nomads. Sample size: 64 people (32 at each place).

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Sample size: 7 scholars		
% age of Scholars giving Rheum emodi as status of High demand species	100	7/7
%age of scholars who think that the species of Rheum emodi is dwindling in J&K.	100	7/7
% age of scholars who think Illegal extraction from forests is the cause of dwindling availability of the species.	100	7/7
% age of Scholars who think lack of conservation and cultivation of Rheum emodi is the cause for declining availability of the species.	71	5/7
% age of Scholars who think Environmental factors are responsible for declining availability of the species	28	2/7
% age of Scholars who think Current status of threatened species be changed to Endangered species for Rheum emodi.	100	7/7

Table 3: Feedback from Scientists/Research scholars of SKUAST-K, IIIM J&K, J&K SFRI, J&K SMPB working in Medicinal Plants sector through questionnaire.

Sample size 9 officers		
% age of officers/officials who think Rheum emodi is a High demand species	88	8/9
%age of officers/officials who think that the species of Rheum emodi is dwindling in J&K.	100	9/9
% age of officers/officials who think Illegal extraction from forests is the cause of dwindling availability of the species.		2/9
% age of officers/officials who think lack of conservation and cultivation of <i>Rheum emodi</i> is the cause for declining availability of the species.	55	5/9
% age of officers/officials who think Environmental factors are responsible for declining availability of the species		1/9
% age of officers/officials who think Current status of Threatened species be changed to Endangered species for Rheum emodi.		9/9

Data procured from Forest Department.

Table 4: Feedback from officers/officials of forest department through questionnaire.

to the States from where it is procured, is rapidly declining in nature. The threat perception of the species changes every single day. This highly beneficial herb, is under immense pressure to survive in natural habitat. The species is categorized as threatened. Three major causes found by the PI during the study for its decline were:

Illegal extraction, the major cause found by the PI during the study, for which almost 75% people, 100% Research Scholars, and even 22% Forest department officials (owing to their official constraints) voted to be one of the major causes for its dwindling species. The illegal extraction of high commercial and high demand species goes unabated in J&K. The Forest Department and the Law enforcement agencies have done a lot to stop the illegal extractions, but owing to the difficult terrains and lack of manpower, it is not possible to keep a check on all the areas. J&K State Medicinal Plants Board and Forest department invoked a blanket ban for extraction of some species, but find it difficult to stop the illegal extraction of these species. This has lead to an alarming statistics of the availability of the species in nature.

Lack of Conservation of the species was the 2nd important cause found for its decline. There is need of *in situ* conservation methods to be developed so that the species is safe within its natural habitat. J&K State Medicinal Plants Board had started a project of Vanaspati Van which was executed by the forest Department, in which 1465 Hectares of Forest land was taken under *in situ* and *ex situ* conservation programmes, which is acknowledged by one and all for its role in conserving rare and endangered species of Medicinal Plants in the Sindh Forest Division of Ganderbal District in Kashmir. The conservation areas under the project have succeeded in conserving the species in its natural habitat. Unfortunately the project was closed prematurely in 2009. The need to demarcate the areas under conservation with added security of the areas is the preeminent method which will effectively save the species from extinction.

Lack of cultivation is another cause which the PI inferred from the observations. To save a species from extinction that too a high demand species for the industry, breeding zones developed outside their natural habitat is highly important. For that research based agro-techniques have to be developed and quality planting material produced at a rapid pace. Few nurseries have been established during last four Years in Kashmir, with negligible results of providing Quality Planting Material (QPM) to the Farmers. Farmers/Growers need to be encouraged to take up the species as a commercial crop entwining research institutes, processing/marketing facilities and industries so that the ensuing high economic benefits are achieved. The component of cultivation of this species will ensure enough feeding to industries, thereby releasing the pressure from the wild and natural habitats.

Environmental factors were found to be another cause for the decline of species. The causes varied between, Global warming, dwindling forest areas, more human interference, Soil erosions etc. Increased population has taken its toll on the environment, whether it is wildlife or botanical life. The species which once flourished in their natural habitats have become vulnerable due to more and more human interference. Felling of trees to create more agricultural lands, to the environmental pollution set up by using modern agricultural methods, vehicular transmissions etc have all contributed in making the species vulnerable and fit for extinction.

Lack of awareness among the masses about the importance of the species, its conservation, cultivation and commercial utilization was also found to be one of the causes. The awareness programmes need to focus on the the local population in and around the natural habitats of the species.

The species of *Rheum emodi* is suffering from one or combination of more than one of the above factors. The threat status has rapidly increased from the last decade. The species which was put under "Threatened" category is emerging to be an "Endangered" one. Before 15 years people used to find more than 250 plants in the area of study, and now the status is that 15-18 Plants are found in the study area. If the conditions remain the same the species may be vanished after a decade.

- From the study conducted by PI, and data analysed, following observations have been inferred:
- The threat status of *Rheum emodi* has increased manifold from last 15 years.
- Illegal/Unsustainable extraction from the Forests is a major cause for dwindling species of *Rheum emodi*. Lack of understanding of sustainable harvesting/extraction has lead to disturbance of habitat, loss of diversity, reduced abundance and local declining of *Rheum emodi*.

- Negligible Commercial Cultivation of species through Farmers/ Growers/NGOs/Public sector that in turn has put tremendous pressure on the natural reserves of *Rheum emodi*.
- Few Conservation areas for a *Rheum emodi* in its natural habitat.
- Lack of awareness among general, masses about the importance of sustaining this important species.

Conclusion

Medicinal Plants are natural resources, formulating a backbone for AYUSH industry and treatment, which is achieving enormous popularity among the masses, more in developed countries for its curative and preventive efficacies more so for life style disorders. The need of the hour is to promote, and propagate this natural wealth, with innovations for their sustainability in their natural diversities, as well as development of Agro techniques to swell their populations in unfamiliar habitats. Rheum emodi is not the only species suffering, the study may hold true for other important Cis-Himalayan species of Medicinal Plants of Jammu & Kashmir. Research Institutes, Forest Department, Medicinal Plants Board etc, all have obligations to save these species for future generations to come. To fill the huge appetite of the herbal industry commercialization and privatization of important components like Marketing, & processing should be a priority. Likewise, Research Institutes like Agricultural Universities, IIIM (CSIR) J&K, Universities, should prioritize to develop good agrotechniques and QPM for Rheum emodi and other endangered species, so that the farmers/growers may find it feasible to cultivate these species and add these species to their cash crops. Moreover, State Govt should initiate steps at administrative level for encouraging entrepreneurship in Medicinal Plants Sector, and ensuring policy framework regulating the trade, cultivation, and value addition in the sector. The sector has the potential to lead the employment/revenue generation for the State after power generation.

Recommendations

Short term

- 1. Threat Status of *Rheum emodi* be changed from current "THREATENED" to "ENDANGERED" Species.
- The species should be included in the list of prioritized species of National Medicinal Plants Board under the category of "75%" subsidy from the current "50%" for mass cultivation.

Long term

1. New areas for conservation of *Rheum emodi* be identified and projects to be implemented on public, private partnerships.

- 2. Measures to be taken for sustainable extraction/harvesting of the species from the Forests.
- 3. Strict laws are needed to curb the illegal extraction of the species.

Mass awareness programmes should be taken by J&K State Medicinal Plants Board in collaboration with all line departments.est ecosystems.

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