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Biodiversity Conservation in Rajasthan: Role of a Botanist.

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ABSTRACT

The future survival of humanity depends on the conservation and protection of natural wealth, and the destruction of a species or a genetic line, results in the loss of a unique resource. Biodiversity is being lost at an alarming rate. In Rajasthan, many commercially and medicinally important species such as *Commiphorawightii*, *Tecomellaundulata*, and several others are facing severe threats of extinction. A Botanist would help in combating important biodiversity conservation problems of Rajasthan such as desertification, invasion of *alien species* and loss of the traditional knowledge system etc. A Botanist would play decisive role in conservation, bio-prospecting and sustainable utilization of plant diversity because they know physiological and ecological requirements of the plants, their distribution status, importance and, the species that need immediate measures and methods of conservation. Botanist can easily generate base line data essential for the conservation.

Keywords: Desertification; *Alien species*; Bio-prospecting .

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INTRODUCTION

Biodiversity is essential for maintaining the ecological functions, including pollination and cross-fertilization of crops and other vegetation, protection against soil erosion, maintenance and replenishment of soil fertility, stabilizing of the water cycle and stability of food producing and other ecosystems. Conservation of biological diversity is essential for the conservation of the important ecological diversity, to preserve the continuity of food chains.

Rajasthan is the largest state of the India. Very large portion of the Great Indian Desert is located inside Rajasthan, Aravallis one of the oldest mountain ranges in the world, are also in Rajasthan. It has two wetlands one is Keoladeo National Park, a World Heritage Site and the other is Sambhar Lake. Two tiger reserves, the Sariska Tiger Reserve and Ranthambore National Park are also located in Rajasthan.

Rajasthan has very diverse flora and fauna. It is home to about 3000 known species of flora and fauna and, a large number of undocumented insects, butterflies and micro-organisms. Some of which are endemic to the region. A majority of the native plants and animals in the state are known for their economic importance and are being used by local communities, but several of these are facing severe threats of extinction.

In Rajasthan, it is estimated that 100 species of plants (including 61 of desert region) are threatened in view of their conservation status. There are 23 species of plants that are endemic to the state and, all the 19 endemic species are threatened, so are all the 35 wild relatives of cultivated plants. Although extinction is a natural process, but according to the International Union of Conservation of Nature (IUCN), it is estimated that the current species extinction rate is between 1000 and 10,000 times higher than it would naturally be. So, biodiversity conservation is the need of the hour. Plants being the 'producers' occupy the first trophic level in any ecosystem, and hence have a very important role in biodiversity conservation. Since, botanists concerns with plants, therefore, they have crucial role to play in Biodiversity conservation.

The era of rapid progress in biological sciences and technology, has widened the term 'botanist' considerably. The term 'botanist' in a broader perspective includes molecular biologists,[1] geneticists,[2] biochemists, a forester,[3] etc. because they could play a vital role in biodiversity conservation. Integration of the understanding from various disciplines of biology will hasten the process of conservation considerably and effectively.

Traditional Biodiversity Conservation Practices in Rajasthan:

The concept of Biodiversity conservation is not new to people of Rajasthan.[4] Conservation and sustainable use of Biological resources based on local knowledge system, and practices are inherent in Rajasthani ethos. Examples of such practices are Orans and traditional Agroforestry.

Orans/sacred woodlands, groves :

Orans are the traditional sacred conservation practices. Most commonly, these practices prevail in the Rajasthan and Arawali groves. These practices are supporting important biodiversity.[5] The orans like systems have acted as emergency reserve especially for animals during drought.[6] *Orans* and *gauchart* together occupy 62,158 ha area only in Jodhpur district.[7] Along with Bishnoi and Garasia communities, society at large in the Rajasthan has been responsible for maintaining *orans*. Some of the well-known *orans* include those at *Ramdevara*, *Biratrakia* near Barmer[6], Bhadriyaoran in Jaisalmer, Shital Das and Gopal Das ki Devbani in Alwar.

Agroforestry:

In traditional agroforestry practices, species such as *Prosopis cineraria*, *Tecomella undulata* and *Salvadora oleoides* etc. have been used. They serve as an important life support system during drought. The agroforestry provide fodder, fuel, timber, fruits, seeds, pods, and gum, etc. Unfortunately, the agroforestry practices have been reduced by the intensive agriculture.[7] The traditional knowledge system has not been able to sustain in the larger context of the modern development concept. However, the traditional systems have huge potential to offer.

Concerns of Biodiversity Conservation in Rajasthan:

Biodiversity, in Rajasthan, has been considerably threatened by the invasive alien species such as *Prosopis juliflora*, *Lantana camara* and *Parthenium histophorum* ('congress grass'). These plant species were introduced here either accidentally or by different agencies for harvesting their qualities for betterment of the local communities. But, these have been causing loss of biodiversity in the State.[8] The eradication of these species is very difficult task. One example of such species is *Prosopis juliflora*, the plant which was introduced in early twentieth century from Chile due to its hardy nature. Now this has profusely spread in all agro climatic region of the state and has displaced grasses, local shrubs, trees and, rendered agricultural area unfit for cultivation.

In Rajasthan, Desertification also is a big concern. Due to high pressure from deforestation and various climatic factors desert is increasing.[9] In desert of Rajasthan reactivation of sand dunes is of a common occurrence. Bare sand dunes and other land forms are most vulnerable to wind erosion. Wind erosion cause Reactivation of sand dunes. Reactivation of sand drift exposes roots that cause uprooting of trees and other plants, and threatens their life. This process endangers the eco systems and the livelihoods of the local communities which depend on these eco systems. Reactivated sand dunes and agricultural patches causes habitat fragmentation and isolation of species Habitat fragmentation and isolation are important factors affecting the occupancy of many species in Rajasthan.[10] These would affect the ecologically "specialist" species, i.e. the species which would require a

“specific niche” for survival. Thus the habitat conservation of ecologically sensitive species of desert and dry land forest eco systems require a special attention.

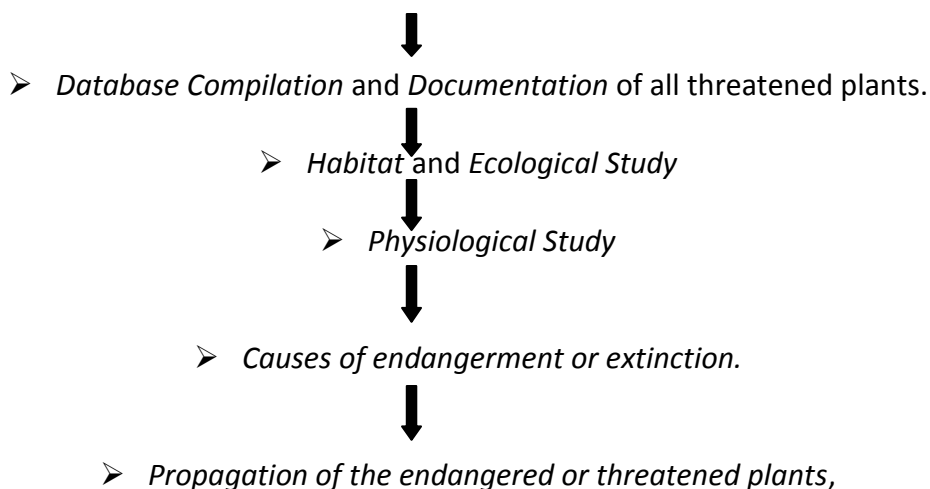
The Role of Botanist:

A botanist can design specific programmes for fixation of sand dunes and sequential restoration of vegetation in reactivated dunes. Excellent results have been obtained by plantations of indigenous species such as *Calligonum*, *polygonoides* and *Cenchrusciliaris* combination, which provide best yield of fodder and fuel wood, with *Cassia angustifolia* to control sand drift.[11] *Acacia tortilishas* also been used for fixation of dunes.

The success of such programme depends upon the formation of a network of local botanists with expertise on both the species themselves and threats to their habitats. A formulation of regional plant conservation and assessment strategies can be done by botanists and, recommendations should be made to both governmental and non-governmental organizations to mitigate the loss of plant diversity. The effective conservation programmes could be made involving institutions with long-term commitment to a particular region and well adapted to the constraints of the local, cultural and political environment. One example of such institutions in Rajasthan is CAZRI (central arid zone research institute, Jodhpur).

The project of biodiversity conservation, however, has to be implemented considering not only protection of any plant life in its natural status, but its further multiplication and subsequent plantation followed by utilizations. For a particular programme on threatened plants, the tasks of a botanist can be as follows:

- *Identification and Characterization* of the endangered or threatened plant, and the study of its taxonomy.
- ❖ *Molecular markers and molecular diagnostic tools can be used to give valuable support for the rapid and accurate identification of plant species through DNA bar-coding [9].*



Under controlled environment, followed by *in situ* conservation i.e. conservation in its natural environment.

- *Self-sustainable population creation in the natural habitat.*
 - *Emphasizing the exploration and utilities of endangered plants.*
- ✓ **Public Awareness**

For the conservation of any plant first of all identification and characterization, documentation and compilation of data base should be done. Then a botanist has to study the ecology and the physiology of the plant. A Thorough investigation should be made on the causes of a particular plant becoming endangered. Another important task for a botanist would be to select type of conservation method for a particular species. A majority of the plants, conserved so far have shown the ability to grow both *in situ* and *ex situ* surroundings. Some rare plants may not survive in *in situ* environment, but will grow well in *ex situ* location, and vice versa. Several options under *ex situ* conservation are available, such as botanical gardens,[12] seed banks,[13] orchards, tissue culture or cryopreservation,[14] and depending upon the plant system and habitat, a botanist has to select a cost effective and appropriate method. *Ex situ* conservation procedures have a vital role in the protection of rare plants and they offer to supply plant propugules to return to the wild habitat as part of any future recovery accomplishments whereas *in situ conservation* is essential for habitat management and to direct manipulation of the populations. During *in situ* conservation the job of a botanist, sometime becomes difficult, because certain plant members belong to the intricate ecosystems which are mutually dependent for survival; plants with high dormancy that cannot be broken by conventional techniques, or plants having specialized breeding systems. Planting of rescued plant material in natural habitat depend on plant system, it could be done either by sowing of seeds or through vegetative propugules. *Ex situ* conservation methods complements *in situ* conservation. So, a combination of both will be beneficial. A combination of *ex situ* and *in situ* conservation methods of a critically endangered plant (*Ceropegia fantastica*) has been demonstrated.[15] *Ceropegia* sp. is endangered in Rajasthan. A well-judged combination of *ex situ* and *in situ* conservation has to be taken by a botanist and he should try to create a self – sustaining population of the plant in their natural habitat. For saving endangered plants in the new scenario a Botanist has to focus on their further utility for various benefits to civilization. Simultaneously, he should make people aware of their importance which would generate a community based approach for biodiversity conservation.

Several rare plants have been successfully rescued and established, the micropropagation technology has helped save numerous rare plants such as *Huerniahystrix*,[16] *Daphnecneorum*,[17] *Frereaindica*,[18] *Coronopusnavastii*,[19] *Ceropegia attenuata*Hook.[20] Community based approaches are found effective for conservation of threatened/endangered plants such as *Commiphorawightii*. [21]



Some Endangered Plant Species of Rajasthan

CONCLUSION

The future survival of humanity depends on the conservation and protection of natural wealth, and destruction of a species or a genetic line results in the loss of a unique resource. This type of genetic and environmental damage is irreversible. The changes in the structure and the multiplicity of genetic resources have lessened the society's options to respond to new problems, and its opportunities to fight existing problems in better ways. There are the dangers of new plant diseases or pests, climatic change due to the greenhouse effect and other setbacks. To overcome these problems, Biodiversity conservation is the necessity.

The conservation and protection of natural heritage of Rajasthan is a tough job because in most of its parts, climatic conditions are very drastic. Biodiversity is being lost at an alarming rate. In Rajasthan, desert is increasing. The habitat of many ecologically sensitive species has been destroyed. Several commercially and medicinally important species such as *Commiphora wightii*, *Tecomella undulata*, and others are facing severe threats of extinction.

A Botanist would play decisive role in conservation, bio-prospecting and sustainable utilization of plant diversity because they know physiological and ecological requirements of the plants, their distribution status, importance and, the species that need immediate measures and methods of conservation. Botanist can easily generate base line data essential for conservation. There is a need to have specific programmes involving botanist, who would identify the sites of intervention by recognizing the ecologically sensitive habitats and species. A sequential restoration of vegetation in stabilized and reactivated dunes can be done to stop the process of desertification. Preference should be given to indigenous or local native species.



With the help of botanist the use of traditional knowledge in promoting agro –forestry, identification of the important conservation habitat would serve a valuable contribution. For making an effective strategy of enhancing biodiversity, collaborated efforts and cooperation among government, policy makers, funding agencies, society and botanist is essential.

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