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The conservation of medicinal plants in the over-exploited nallamalais hills, Central Eastern Ghats, Andhra Pradesh

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Abstract
Forests, considered to be precious assets and the lungs of the earth are at the risk of being destroyed and exploited by human intruders. Thus ecosystem services of biodiversity, maintained through formation and protection of soil, conservation and purification of water and the maintenance of hydrological cycles are disrupted by human mismanagement of biological resources. It is the need of the hour to conserve biodiversity from the threats of anthropogenic activity. The Nallamalais region is being exploited in an unregulated manner for its natural wealth and the rich and diverse heritage of traditional indigenous plant wealth which needs to be conserved. In this bleak scenario, conservation and sustainable development of forests are the only solutions to save not only the germplasm of trees and shrubs but also tiny herbs with medicinal properties.

Keywords: Biodiversity, forests, nallamalais, exploitation, conservation

Introduction
Billions of years ago the Earth was a fiery ball. Slowly it cooled to a harsh, inhospitable and forbidding terrain. The plants with their green touch converted the Earth into a living planet replete with forests which are precious assets and the saviours of this planet as they are home to much of the world's biodiversity, store vast amounts of carbon, and have a significant role in reducing the vulnerability of rural poor people who depend on forests for their livelihood. The forests also witnessed the birth of humans. Like a mother they nurtured humans and like a father they taught them the ways of life. Sadly today, the scenario has completely altered. The forests are highly assailable and human beings have already started exploiting this invaluable resource. The forests play a very unique role that cannot be duplicated by any known manmade system. Forests are the earth's lungs and they are the habitats to most land life. So long as this earth is full of nature (wild plants and animals), the human race is going to flourish (Charaka Samhita). The International Union for the conservation of Nature and Natural Resources (IUCN) is the world's main authority on the conservation status of species (Mrosovsky, 1997) [15]. The IUCN Red List is set upon precise criteria to evaluate the extinction risk of taxa and also help the international community to try to reduce species extinction. IUCN Red List is widely considered to be the most objective and authoritative system for classifying species in terms of the risk of extinction. The 1997 IUCN Red List of Threatened Plants listed 12.5% of the world's vascular plants in one of the threatened categories (Walter and Gillett 1998) [23]. In the current red list (IUCN, 2007) there are now 41,415 species and 16,306 of them are threatened with extinction. The Botanical survey of India following IUCN guidelines published 3 volumes of Red data book covering over 621 threatened plants which are under various degrees of threat (Nayar & Sastry, 1987, 1990) [16] and later revised the list with over 2000 species (Rao *et al*., 2003) [18]. The Global Biodiversity Strategy (Anon., 1992) [5] and the National Biodiversity Strategy and Action Plan of India (Anon., 2000) [6] and Andhra Pradesh (Rao, 2001) [19] highlighted the strengthening of research on ethical, cultural and religious issues related to biodiversity. Saheb & Rao (2019) [21] reported 501 vascular plants and in Nallamalais a total of 78 diseases were known to be cured, treated and prevented with the usage of these medicinal plant resources. Salwasser (1990) [20] enumerated the major factors affecting biological diversity that include pollution, fragmentation of habitats, over exploitation of resources.
Biodiversity is greatly affected whenever the habitats of existing organisms are disturbed, displaced, destroyed or reduced (Ayodae *et al*., 2009, Agarwal *et al*., 2011) [7, 3]. Natural habitats are often destroyed through human activity for the purpose of harvesting natural resources for industrial production and urbanization.

Clearing forest areas for agriculture damage and modify the forest ecosystem and the construction of hydroelectric project on the rivers (Agarwal *et al*., 2014) [2] change the reverine habitat to reservoir habitat.

Study area

Nallamalais, one of the Centres of Plant Diversity (CPD) (WWF & IUCN, 1995), represent a group of moderately steep hills in the Central Eastern Ghats between latitudes $15^0$20' – 16 – 30'N and longitudes $78^0$30' – 80^0 10'E in Andhra Pradesh State. They are extended to an area of 7640 Sq. Km. running North-South over a length about 130Km with some precipitous cliffs. The hills cluster near Gundla Brahmeswaram is the nucleus of the Nallamalais appearing as plateau. The central Nallamalais varies in altitude from 300 to 800m. The prominent peaks are Durgappa Konda (907m), Katalakonda (863m), gundlakonda (850m), Naramamula Konda (810m) and Amadala konda (770m). The hills are reputed harbouring many of the significant Hindu shrines like Srisailam in the north and Ahobilam and Mahanandi in the south. Rivers of major importance in Nallamalais are Krishna and Gundlakamma. There are two wildlife sanctuaries namely, Nagarjuna Sagar-Srisailam and Gundl Brahmeswaram in forest mainly for tiger conservation. The Nallamalais Hills, Andhra Pradesh are endowed with an extensively rich variety of biological species, geological formations and different ethnic tribes live there. The rich and diverse heritage of traditional indigenous plant wealth of Nallamalais was record through the basic study and the need to conserve this highly threatened fragile ecosystem was perceived. With increasing interest in herbal medicines worldwide, conservation of the medicinal plant wealth of Nallamalais. The Nallamalais region is being exploited in an unregulated manner for its natural wealth. Conservation efforts including documentation of the available medicinal plant diversity and other floristic wealth is the need of the hour. Tribal communities, who live in and around forests in Nallamalaais, utilize wide varieties of medicinal plants that grow on this hillock. A large number of ethnic aboriginal tribes use medicinal plants for the treatment of various ailments that affect them. Despite the ecological and economic value of the Nallamalais forests, the eco-region witnessed unprecedented biotic interference in the recent decades leading to alarming loss of plant resources, especially plants of potential medicinal value. An uncertain future is predicted about the Nallamalais Hills because of overexploitation and habitat loss.

Methodology

The field survey was conducted during 2015-2019 and several visits were made to different places of the Nallamalais at fortnightly and monthly intervals. In the field survey it is noted that the local people were procuring forest produce in the more unscientific manner. It is also observe that tribal people damage the value plants in the process of collecting the forest produce. The important medicinal plants of Nallamalais Hills facing extinction have been documented. The following plants are needed for their unique medicinal properties and we must ensure that these plants along with others will continue to exist in the Nallamalais hills. All the plants recorded from the study area were evaluated for their threatened status state level following the recent IUCN version 3.1 (Jadhav *et al*., 2001) [11] were given different threat status.

Discussion

However the general public were ignorant of biodiversity concerns. The United Nations conference on the environment and Development (UNCED) held at Rio de Janerio (Brazil) in 1992 instilled the spirit of biodiversity conservation in the common man, strongly stressing the importance of biodiversity and defining it as the variability of living organisms from all sources including inter alia, terrestrial, marine and other aquatic ecosystems, the ecological complexes of which they are part and this includes diversity within species and between the species of any ecosystem. It is well accepted that the single legally accepted definition of biodiversity adopted by the UN convention on Biological Diversity the tribal populations are an integral part of the biodiversity of the forests since ages.

Ever since life appeared on earth, there has been several mass extinction in which many of the earth's species were wiped out because of climate change, volcanic activity or reasons we have not yet discovered. The plants and animals which currently live on earth have continued to evolve over the 65 million years since the last mass extinction. But many scientists consider the huge reduction in biodiversity since the emergence of humans is now on the scale of another mass extinction. Included in this list are a large number of wild medicinal plants from our country and in dire need of concerted conservation efforts and national level campaigns. This is the need of the hour to avoid the threat of extinction of the plants that save us.

India has one of world's richest medicinal plant resources. The wealth is not only in terms of the number of unique species (6160) documented thus for their medicinal use but also in terms of the tremendous depth of traditional knowledge about such uses for human and livestock health. The forests of India have been the source of traditional medicines for millennia. Of the 17,000 species of higher plants described in India, 7500 are known for their medicinal uses. The Charakasamhita, a document on herbal therapy written about 300 BC, reports on the production of 340 herbal drugs and their indigenous uses. Stake holders of forest habitat should emphasize on conservation rather than preservation as conservation emphasizes the protection of plant resources for sustainable utilization mainly by the tribal inhabitants of forests.

Loss of biodiversity occurs when either the habitat essential for the survival of a species is destroyed, or a particular species is destroyed. The former is more common as habitat destruction is a fallout of development. The latter reason is encountered when particular species are exploited for Economical gain. It is a well-known fact, that worldwide thousands of plant species are facing extinction with the current trend of over exploitation and destruction. In recent years, a growing awareness and concerns are generated among target populations about the impact of temperature rise, industrialization, desertification and shift in the growing seasons of plants, loss of pollinators, seed dispersers which lead to loss of biodiversity. These steps have to be followed if the degradation of Nallamalais hills has to be reversed and its resources to be conserved.

Over-exploitation

For many decades forests were looked upon as revenue generators and were hacked down mercilessly. The guardians of forests at various levels turned a blind eye to the malpractices once they received their pound of flesh. Forest

based industries were established without any regard to sustainability of forests. Careless and wrong methods of collecting forest produce played havoc with the forests. Humans have subsisted on wild plants and animals since the earliest primordial times. Most contemporary aboriginal societies remain primarily extractive in their daily quest for food, medicine, fibre and other biotic sources of raw materials to produce a wide range of utilization and ornamental artifacts. Example of exploited plant products includes fruits, nuts, oilseeds, latex, resins, gum, and medicinal plants. Over exploitation occurs when the harvest rate of any given population exceeds the natural replacement rate.

Table 1: List of Over-Exploited plants in Nallamalais

S. No.	Plant Name	IUCN Status	Family	Habit	Importance
1.	*Actiniopteris radiata* (Koinig ex Sw.) Link.	Rare	Actiniopteridaceae	Herb	Blood pressure(wp)
2.	*Andrographis nallamalayana* J.L. Ellis	Rare, Endemic, vulnerable	Acanthaceae	Herb	Leucorrhoea, fevers(Leaves, root)
3.	*Aristolochia indica* L.	Critically Endangered	Aristolochiaceae	Climber	Emmenogogue, asthma, leucoderma (Root)
4.	*Boswellia ovalifoliolata* N.P. Balakr. & Henry	Endangered	Burseraceae	Tree	Ulcers, emmenagogue (gum)
5.	*Cheilocostus speciosus* (J. Koenig) C.D. Specht.	Near Threatened	Costaceae	Herb	Jaundice, diabetes, asthma(Rhizome)
6.	*Decalepis hamiltonii* Wight & Arn.	Endangered	Sugandipala	Climber	Blood purifier, increase eye vision(Root)
7.	*Dioscorea hispida* Dennst.	Endangered	Dioscoreaceae	Climber	Aphrodisiac, diabetes(Tuber)
8.	*Gloriosa superba* L.	Vulnerable	Liliaceae	Climber	Rejuvenator, induces labour pain performs normal delivery, abortifacient (Rhizome)
9.	*Gymnema sylvestre* (Retz.) R.Br. ex Sm.	Vulnerable	Asclepiadaceae	Climber	Jaundice, anti-diabetic (leaves)
10.	*Hemidesmus indicus* (L.) R.Br. ex.	Not Evaluated	Asclepiadaceae	Climber	Jaundice, snakebite(Root)
11.	*Sterculia urens* Roxb.	Vulnerable	Sterculiaceae	Tree	Anti diabetic (Gum)
12.	*Terminalia chebula* Retz.	Not Evaluated	Combretaceae	Tree	Jaundice, asthma, cardiac disorders(Fruit)
13.	*Toddalia asiatica* Lam.	Not Evaluated	Rutaceae	Straggler	Asthma, fever, Snakebite (Root)
14.	*Vernonia anthelmintica* (L.) Willd.	Endangered	Asteraceae	Herb	Asthma, cough, fever(Seed)
15.	*Vitex negundo var. Purpurascens* Sivar. & Moldenke	Not Evaluated	Verbenaceae	Small tree	Asthma, cough, nervous debility(root)

Why conserve biodiversity

Biodiversity is the life support system of our planet. We depend on it for the air we breathe, the food we eat and the water we drink. Medicines originating from wild species have saved millions of lives and alleviated tremendous suffering. It has been observed that native species richness is linked to the health of ecosystem and also the quality of life of humans. The connection between biodiversity and our sustainable future need to be explored further to understand the consequences of not conserving biodiversity. We literally need to conserve biodiversity as our lives depend on it very much.

Conclusion

Man is one of the natural creators and should not be alien to the other natural life forms. We have no moral right to destroy nature and other beings that dwell on earth. We should treat all animals and plants with compassion. Every individual can make a small and yet significant effort in the race to save our planet by conserving biodiversity. In the last two decades or more, these plants have been over exploited from the Nallamalais for commercial purposes. No attempts have been made to replace the plants which were uprooted for various purposes. The effects of deforestation affect the entire world in a very adverse manner. The current situation represents 'destroy locally and bear the brunt globally'. In this bleak scenario, conservation and sustainable development of forests is the only solution. This is high time we took necessary action to stop the exploitation of other plants and also there should be concerted efforts to bring in situ conservation methodologies so that the biodiversity of the area is restored. Government bodies, non-government organizations and other participants should come forward to remedy the situation by proactively.

Suggestions

1. Study of taxonomy, ecology.
2. To understand the reasons for a particular plant becoming over exploited.
3. Propagation of the plant under controlled environment followed by in- situ and ex- situ conservation.
4. Ecological habitats of the state need an immediate survey and analysis.
5. Efforts should be made to conserve disappearing medicinal and herbal plants in the Nallamalais.
6. Local communities should be educated on conservation and sustainable utilization of bio resources and provide incentive mechanisms to local communities to protect and preserve traditional knowledge, innovations and practices.
7. Modern techniques of ex-situ conservation like "tissue culture" and biotechnology should be promoted for the preservation of threatened species.
8. Planting of exotic species should be avoided.
9. Biodiversity conservation serves as an insurance policy for the future.

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