



INSTITUTIONAL GARDENS IN CONSERVATION OF R.E.T SPECIES- EXPERIENCE FROM AHALIA

Smitha R. Nair*, Sreejith E.G., Sabik S. and Anju G.

Ahalia Ayurveda Medical College, Palakkad, Pin:678557, Kerala

*Email: drsmitharnair@gmail.com

ABSTRACT

Impending threats leading to the extinction of the global plant biodiversity are both natural and man-made. Approximately, one-fourth of all plant species in the world are at the risk of getting extinct. The International Union for Conservation of Nature (IUCN) and World Wide Fund for Nature (WWF) estimated that up to 60,000 higher plant species would become extinct or nearly extinct by 2050, if the current trends in utilization continue. With increasing international trade in herbal medicinal products, adulteration and substitution along with controversial sources haunting the Ayurveda drug industry, protection and conservation of authentic medicinal flora especially the Rare, Endangered and Threatened (R.E.T) species is the need of the hour. The COVID-19(Corona Virus-19) pandemic has further highlighted the importance of the relationship between man and nature. The current paper is a humble attempt to analyze the role of ex-situ conservations like institutional gardens in the conservation of R.E.T species. In addition to their aesthetic landscapes and topiary, Institutional gardens can truly serve as live repositories for harbouring rare and endangered species. R.E.T garden in the campus of Ahalia, Palakkad showcases many such endemic plants. The garden has collaborations with national-level organizations and has a pivotal role in related outreach programs. From our experience, we observed that R.E.T plant conservation via institutional gardens is an option looking at the good growth and performance of such species in Ahalia garden. The Ministry of Environment, Forest and Climate Change (MoEFCC) has a programme to provide assistance to establish such gardens, which certainly can go a long way in combating the acute scarcity of medicinal plants while promoting sustainable use and conservation.

KEYWORDS

IUCN, WWF, biodiversity

INTRODUCTION

It is estimated that up to four billion people (representing 80% of the world's population) living in the developing countries rely on herbal medicinal products as a primary source of healthcare and traditional medical practice which involves the use of herbs viewed as an integral part of the culture in those communities (Bodeker and Ong 2005; Bandaranayake 2006). The science of Ayurveda dealing with several such medicinal plants also has dual objectives - both preventive and curative (Sharma 1998). The cultural acceptability and minimal side effects makes the alternative medicine very felicitous to human psyche and soma. Around 70 % of the 8000 species (Aathira 2021)of medicinal plants in the country are spread across the tropical forests. However, available information shows that 1,800 species are used in the Classical Indian systems of medicine, of which Ayurveda uses 1200 (Lakshman 2016). The emerging sector of herbal industry holds a great potential for the economic development of our country. Usage of herbs as a source of food, medicine, fragrance, flavour, dyes and other items in Indian systems of medicine is on an increasing trend. It is estimated that, 95 % of

the medicinal plants used in Indian herbal industry today are collected from the wild. The World Health Organization has listed over 21000 plant species used around the world for medicinal purpose (Lakshman 2016). However due to increased demand more supply is resorted and consequently there is a perceptible depletion of resources posing a great challenge in keeping a healthy balance. Adulteration, substitution and controversies regarding botanical identity along with acute scarcity of quality medicinal plants in high demand are all posing serious threats to the Ayurveda drug industry. In this paper we tried to study the conservation process of R.E.T species and the role and scope of institutional mechanism in ex-situ conservation.

MATERIALS AND METHODS

The study setting was Ahalia campus, Palakkad which is located in Southern Western Ghats, the most species rich eco-region in peninsular India. With a tropical wet and dry climate, the temperatures remain moderate throughout the year with the exception of March and April. A very high amount of precipitation, mainly due to the South-West Monsoon is received in

Palakkad. However, compared to other parts of the state, the study area is comparatively dry and semi-arid conditions prevail.

IUCN Red list and Growth Data

The IUCN Red List: The IUCN Red List is a rich compendium of information on threats, ecological requirements, and habitats of species; and on conservation actions that can be implemented to reduce or prevent extinctions. It is based on an objective system for assessing the risk of extinction of a species based on past, present and projected threats. The IUCN Red List of Threatened Species is the world's most comprehensive information source on the global conservation status of plant species. There are 8 IUCN Red List categories based on criteria linked to population trend, size and structure, and geographic range. Species listed as Critically Endangered, Endangered or Vulnerable are collectively described as threatened. Red List data are being used to report on and measure progress towards the Aichi Biodiversity Targets, adopted by governments at the Conference of the Parties to the Convention on Biological Diversity (CBD), 2010-in particular (Dobson 2005), Target 12: By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

The Growth Data: The plant development from a single cell to the mature plant consists of pattern formation, morphogenesis, growth and differentiation. The capacity for growth and development originates from the embryonic tissue regions called meristems concerned with the formation of stem cells. Growth refers to the irreversible changes in the size of the

cell, organ or whole plant. The plant growth can be visualized in terms of increase in length or plant height, stem diameter, increase in fresh weight or dry weight, increase in leaf area, leaf weight etc (Pandey et al 2017). This Growth Data is considered as a vital indicator of the overall health of the plants which also indicate site suitability largely based on ecosystem specificity.

Methods

In Ahalia, the sample seedlings were procured from authentic sources ensuring taxonomic authenticity in Pharmacognostic identification, and reputed institutions like Jawaharlal Nehru Tropical Botanic Garden and Research Institute (JNTBGRI) Palode, KFRI (Kerala Forest Research Institute, MSSRF (MS Swaminathan Research Foundation) and NMPB accredited nurseries like "Rayirath Gardens" in Thrissur. The specimens were also checked with medicinal plant and floristic databases or online redlist categories, IUCN Threatened plants etc. for confirming the authenticity. The plants were acclimatized to the growing conditions, planted in pots and kept in Nursery/Green houses, with adequate manuring to ensure maximum survival of the species. The growth data was recorded by a Measuring Tape/ruler/measuring meter stick as practiced in silvicultural studies. The growth recordings were taken annually and the latest data was compared with the previous records to analyse the growth rate. Once optimal growth was observed, they were relocated to the designated gardens (*ex-situ*) in the campus like R. E. T, Spiritual, Kerala Thanima and Dasamoola. The growth was recorded periodically (yearly) (Fig. 1) and the status was regularly monitored.

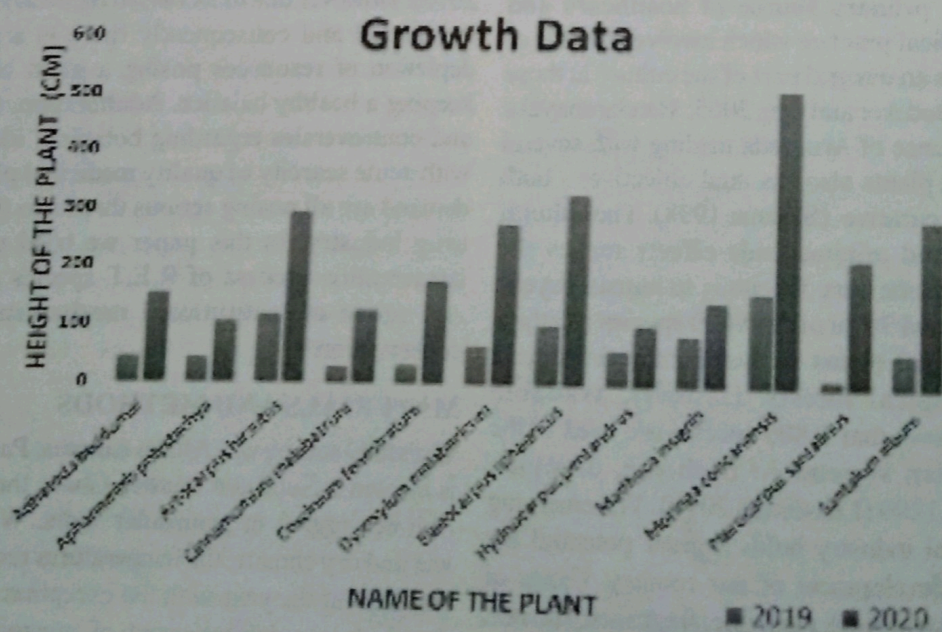


Fig. 1. Growth data of selected R. E. T species in Ahalia campus

Ahalia is also successfully carrying out other forms of *ex-situ* conservation models such as Plantations and Medicinal Plant Landscaping. We have *ex-situ* plantations of *Pterocarpus santalinus*, *Embllica officinalis*, *Ficus racemosa*, *Terminalia chebula*, *Azadirachta indica*, *Aegle marmelos* etc. Several medicinal plants like *Lawsonia inermis*, *Adhatoda zeylanica* and *Hibiscus rosa sinensis* are also being used in hedges and landscaping, adding an aesthetic element to the campus while ensuring steady supply of raw materials. Working hand-in-hand with National and State level organizations of biodiversity conservation, Ahalia is involved in conducting outreach programs promoting both cultivation and conservation, like setting up institutional gardens in nearby schools, colleges etc.

RESULTS AND DISCUSSION

Being an exhaustible resource, and finding immense applications in many oral and codified systems of medicine in India, the survival of medicinal plants is under various surmounting threats. Many of them are being threatened due to over harvesting in the wild and rapidly increasing demand for herbal products. Threatened species are any species which are vulnerable to extinction in the near future unless remedial measures are adopted to arrest the declining trend. International Union for Conservation of Nature treats threatened species not as a single category but as a group of three categories: vulnerable, endangered,

and critically endangered, depending on the degree to which they are threatened. Rapid loss and fragmentation of natural habitats is an added danger leading to extinction. Species like *Coscinium fenestratum*, *Janakia arayalpathra*, *Dactylorhiza hatagirea*, *Saussurea costus* are critically endangered in the wild. It is expected that around 1000 species of medicinal plants are facing threat to their existence in the wild and some of them have already become extinct. Medicinal plants are potential renewable natural resources. Therefore, the conservation and sustainable utilization of medicinal plants especially the Rare, Endangered and Threatened (R.E.T) species must necessarily involve a long-term programme. A holistic and systematic approach envisaging interaction between social, economic and ecological systems will be a more desirable one. The most widely accepted scientific technologies of biodiversity conservation should be resorted to for ensuring the survival of our medicinal heritage (Source : <http://envis.frhlt.org/> accessed on 22-02-2021). A list of R. E. T plants finding refuge in Ahalia campus is given in table-1.

In Ahalia, planting of herbs were done after checking the seedlings for their authenticity based on reliable resources and data. *Pharmacognostic identification* is the preliminary step towards raising and conservation of quality medicinal plant materials. Being in the era of global pandemic, both online and offline sources were made use of. The plant specimens were also selected considering the geographical,

Table 1.List of R.E.T species in Ahalia with their conservation status

Sl. No	Botanical Name of the Plant species	Family	IUCN Status (Ravikumar et al 2000)
1.	<i>Adhatoda beddomei</i>	<i>Acanthaceae</i>	CR
2.	<i>Elaeocarpus sphaericus</i>	<i>Elaeocarpaceae</i>	EN
3.	<i>Artocarpus hirsutus</i>	<i>Moraceae</i>	VU
4.	<i>Pterocarpus santalinus</i>	<i>Fabaceae</i>	EN
5.	<i>Madhuca insignis</i>	<i>Sapotaceae</i>	EX
6.	<i>Santalum album</i>	<i>Santalaceae</i>	VU
7.	<i>Moringa concanensis</i>	<i>Moringaceae</i>	VU
8.	<i>Coscinium fenestratum</i>	<i>Menispermaceae</i>	CR
9.	<i>Cinnamomum malabatum</i>	<i>Lauraceae</i>	VU
10.	<i>Saraca asoca</i>	<i>Caesalpiaceae</i>	EN
11.	<i>Dysoxylum malabaricum</i>	<i>Meliaceae</i>	EN
12.	<i>Baccaurea courtallensis</i>	<i>Euphorbiaceae</i>	VU
13.	<i>Rauwolfia serpentina</i>	<i>Apocynaceae</i>	EN
14.	<i>Persea macrantha</i>	<i>Lauraceae</i>	VU
15.	<i>Aphanamixis polystachya</i>	<i>Meliaceae</i>	VU
16.	<i>Cinnamomum sulphuratum</i>	<i>Lauraceae</i>	VU
17.	<i>Trichopus zeylanicus</i>	<i>Dioscoreaceae</i>	EN
18.	<i>Acorus calamus</i>	<i>Araceae</i>	EN
19.	<i>Aegle marmelos</i>	<i>Rutaceae</i>	VU
20.	<i>Hydnocarpus pentandrus</i>	<i>Flacourtiaceae</i>	VU
21.	<i>Baliospermum montanum</i>	<i>Euphorbiaceae</i>	VU

CR-Critically Endangered, EN-Endangered, EX-Extinct, VU-Vulnerable

edaphic and climatic compatibility to ensure optimal survival of the species in the area. Growth Data thus can be used as an index to identify the plants that suits the particular environmental condition (Site specific suitability). It can be used as a tool to explain differences between species growing under the same environmental conditions and differences within a species growing in different environments. Also the biodiversity indices reveal that plant growth is directly proportional to the carbon sequestration capacity of the forest (Kumar 2008). After growth rate was found satisfactory, the destined plants were relocated to the ex-situ conservation areas like Spiritual Garden, R. E.T Garden, Kerala Thanima etc. The growth data collected from the garden indicates that there is great scope for *ex situ* conservation of such threatened species as evidenced from their performance.

Through the outreach programs in nearby schools and colleges, Ahalia aims to create Conservation awareness among the younger generation because the future lies in their hands. By saving the biodiversity and the ecosystems that provide the natural resources we need to live, we also ensure the survival of the species which depend on them. The COVID-19 pandemic has further highlighted the relationship between man and Nature and we are literally bound to face the consequences of ecological imbalance and loss of biodiversity.

CONCLUSION AND RECOMMENDATIONS

Conservation strategies are bound to assure the survival of maximum number of species. A comparatively good number of species in gardens can thereby act as source of authentic material apart from reducing supply – demand pressure. We can manage viable population which can also act as seed stand and quality germplasm.

Conservation via institutional herbal gardens is one of the most convenient and effective mode of ex-situ conservation. Institutional gardens can very well support conservation research and outreach programs. Priority should be given to medicinal plants especially the R.E.T species as per recommendations of IUCN. Agro-technology information should be pooled in for such species. Several and many of them can be integrated into landscaping and gardening. The preferred model of conservation fitting to different space, time and conservation needs should be developed.

ACKNOWLEDGEMENTS

Our heart-felt acknowledgements to Dr. V. S. Gopal, Chairman, Ahalia foundation, Palakkad and Dr. R. V. K. Varma, Director, Ahalia Heritage village for the support and encouragement rendered. Also thanking Dr. Asundi Vijayalakshmi, Principal (in-charge), Ahalia Ayurveda Medical College for providing the necessary amenities for the work. We are virtually at loss of words to convey our gratitude to our guide and mentor, Dr. Haridasan K, Consultant, Bio Resources, Dept. of Agriculture, Resources and Environment (DARE), Ahalia, who have guided and inspired us all through the work. A note of special thanks to Sri. Anosh, Assistant Manager, Chairman's Office and Sri. Shaibu, Manager, DARE.

REFERENCES

- Aathira P (2021): <https://india.mongabay.com/2020/02/forests-that-heal-medicinal-plants-as-an-ecosystem-service/>
- Bandaranayake W M (2006): Quality control, screening, toxicity, and regulation of herbal drugs. *Modern Phytomedicine*, 1, 25-57.
- Bodeker G and Ong C K (2005): *WHO global atlas of traditional, complementary and alternative medicine* (Vol. 1). World Health Organization.
- Dobson A (2005): Monitoring global rates of biodiversity change: challenges that arise in meeting the Convention on Biological Diversity (CBD) 2010 goals. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 360(1454), 229-241.
- Kumar P (2008): Carbon sequestration strategy of Nubra Valley with special reference to agroforestry. *DRDO Technology Spectrum*, pp. 187-192
- Kumar G P, Kumar R, Chaurasia O P and Singh S B (2011): Current status and potential prospects of medicinal plant sector in trans-Himalayan Ladakh. *Journal of Medicinal Plants Research*, 5(14), 2929-2940.
- Lakshman C D (2016): Bio-diversity and conservation of medicinal and aromatic plants. *Adv Plants Agric Res*, 5(4), 561-566.
- Pandey R, Paul V, Das M, Meena M and Meena R C (2017): Plant growth analysis. *Manual of ICAR Sponsored Training Programme for Technical Staff of ICAR Institutes on "Physiological Techniques to Analyze the Impact of Climate Change on Crop Plants"*, 103p.
- Ravikumar K, Ved D K, Vijaya Sankar R and Udayan P S (2000): 100 Red listed medicinal plants of conservation concern in Southern India.
- Sharma P V (1998): *Charaka Samhita*, 4th Edition, Chaukhambha Orientalia, Varanasi, Chikitsasthanam, Chapter 1, , Shloka 4