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Ecosystem services of Indian Bael tree a "Sthalavriksha" of Tamil Nadu, India

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Abstract

Trees are living monuments of nature, offering numerous ecological, socio-cultural, and religious services to the local communities. "Sthalavriksha," the sacred tree that is indigenous and prominent to every Dravidian Hindu temple. This research article provides a synopsis of Ecosystem services, termed as "Benefits that humanity receives from nature." Specifically, Indian Bael (Aegle marmelos) an important "Sthalavriksha" of temples in Kongunadu (three western districts) of Tamil Nadu State, India. Literature review and local narratives from people reveal that it is imperative to conserve this sacred tree species to provide essentials to sustain life on this blue planet like clean air, water, soil fertility, and biodiversity for well-being.

Keywords: *Sthalavriksha, Sacred, Ecosystem Services, ecological, socio-cultural, religious*

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Introduction

Ancient Tamil Sangam literature reveals that "**trees were the abodes of deities**" (Natrinai, 83-2 and 303:3; Agananuru 270:12; Agananuru, 7; Sirupanatruppadai, 17; Kalithogai, 83:14; Manimekalai, 3:144; Purananuru, 191:1 and 198:1; Natrinai, 343-4; Tirumurugatruppadai, 256 and Kurunthogai, 87:1) and inform that Dravidian society for generations is aware of numerous nature conservation practices. One such method is the limit of abuse of a resource for a given period or season: regulated misuse, specific stages of life, history, and behavior. Partial misappropriation of particular resources protects certain important tree species such as **Indian Bael** *(Aegle marmelos),* thus the entire ecosystem. These plants continued to be considered sacred and essential in the south Indian state of Tamil Nadu. Dating back from the post-Sangam period, throughout the middle ages, and right to the present times as information sourced from farmers/cultivators/temple priests during the fieldwork reveals. This article brings to limelight the ecosystem Services benefits that this dominant "*Sthalavriksha*" tree species revered as sacred among locals as they offer for the well-being of humanity, which demands awareness to plan, plant, and protect them individually and as a community in the present technological era. During the early 2000s, the Millennium Ecosystem Assessment (MEA) and The Economics of Ecosystems and Biodiversity (TEEB) clustered ecosystem services into four major categories: ***Provisioning services*** are the products obtained, freshwater, food, wood, fiber, genetic material, and medicines from the ecosystem. ***Regulating services***, defined as the benefits of regulating processes such as climate regulation, natural disaster regulation and mitigation, water conservation and purification, waste management, pollination, or pest control—***Habitat services*** highlight providing habitat for migratory bird species and maintaining gene pool viability. ***Cultural services*** include non-material benefits such as spiritual enrichment, intellectual advancement, physical and mental recreation, and aesthetic and related values from the ecosystem. (James, 2017). The highlights are Binomial Name: *Aegle marmelos (L.) Correa,* Common Name: Wood Apple (English), Vilvam (Tamil), Bael (Hindi), Kingdom: Plantae, Angiosperm, Order: Sapindales, Family: Rutaceae, Genus: Aegle, Species: A.marmelos, Morphological features: medium-size tree, deciduous, fluted base-bark, slender, drooping branches and instead of a shabby crown, leaves - trifoliate, each leaflet 5-14,2-6 cm long, ovate with tapering or the pointed tip and rounded base. Flowers 1.5to 2cm, pale green or yellowish with four or five petals; the fruit 5-12mm diameter is pale yellow when ripe as seen in Figure: 1, Distribution all over the Indian Subcontinent.

Figure 1 : *Aegle marmelos L.,* Correa
Source: Author

Materıals And Methods

The qualitative inquiry field study on *"Sthalavriksha"* and their associative temples conducted in three western districts (Kongunadu) of Tamil Nadu, India. Various temples were frequented for research and discussion during 2018-19 to document the ecosystem services—the field observation and data recorded in the dairy. Taxonomic identification made using the floras Gamble and Fischer (1935) and Mathew (1983). The associated *"Sthalavrikshas"* studied by observation and inquiry with the local communities. The four ecosystem services offered by the dominant *"Sthalavriksha"* Indian Bael collected from literature and local people. Warrier (1994) and Warrier (1995). The temples and their importance were studied and recorded from priests, manuscripts, and Hindu charitable endowment board Greeshma Nair et al. (2014). The age of *"Sthalavrikshas"* was determined using the method described in early works Mitchell et al. (1994). Nandavanam or temple gardens have been surveyed and studied (Mohantry, 1997).

Results

"Sthalavriksha" worship in temples is a famous religious practice in Tamil Nadu State, India. This work attempt to survey the *"Sthalavrikshas"* of 87 temples in the Kongunadu region, including the western districts of Salem, Namakkal, and Karur, along with their importance. Of the surveyed eighty-seven temples, eighty-two dedicated to Lord Shiva temples, three were to Lord Vishnu temples, two were to Goddess Sakthi temples, and multiple deities. The present study includes thirty-five temples in Salem district, forty temples in Namakkal district, and twelve temples in Karur district. *Aegle marmelos (L.) Correa* found as *"Sthalavrikshas"* in forty-six temples constitutes fifty-three percentage. Account of ecosystem services of *"Sthalavrikshas"* was listed in Table 1. To determine the age of "*Sthalavriksha"* method adopted (Mitchell et al.,1994). *Aegle marmelos (L.) Correa* recorded in the range between 14 to 250 years of age.

Table: 1 Tree Species – I **Binomial Name: *Aegle marmelos (L.) Correa***

Ecosystem Service and categories		Ecological role/function	Description of benefit
Provisioning services	Food	Feed frugivorous birds, insects, and small mammals.	The well-being of frugivorous birds and animals to keep up the ecosystem
	Leaves	Leaves are anti-fungal and anti-bacterial effects.	Positive health benefits
	Wood/Timber	Spiny timber /branches used in house construction as effective barrier making, fencing	Eco-friendly products
	Bio-Chemicals /Oil	Rich in alkaloids, cardiac glycosides, terpenoids, tannins, and steroids	Environment-friendly applications
	Medicine	The oil used as a base in ayurvedic treatment	The base for natural health care products for communities
	Economic	Fruits pulp used as a local cool drink called "sherbet."	Cottage industrial produce for individual/family/community
Regulating services	Bio-control	"Fragrant "species, flowers neutralize volatile gases	Effective in bacterial control and deodorizing petrified organic matter
	Climate	Chemical pollutants "Sink" as it absorbs poisonous gases from the atmosphere and emitting oxygen.	The well-being of individual/family/community revered as "Climate Purifier."
	Health	Products produce no ill-effects, Excellent Energy booster to humans	The well-being of individual/family/community
	Water	Reduction of surface run-off co-efficient	Increases recharge of water percolation and soil moisture
	Erosion	Increase soil fertility and prevent erosion	Soil quality enhancement and conservation
	Multiple supporting and regulating	Used for Fruit-based agri-horticulture system area of arid soil	System based initiative for individual/community
		Rehabilitation of degraded Ecosystem and fallow land	Soil fertility and enrichment of microorganism
Habitat services	Migratory Birds	Habitat and breeding ground	The well-being of birds and animals

	Gene-pool	Serves as a refugee to many beneficial organisms	Increases chance of biological fitness and survival
Cultural services	Spiritual enrichment	Auspicious	"Form" symbolize deity "Shiva," leaves for religious worship
	Intellectual development	Sacrifice	Trifoliate shape signifies three components or namely Sattva, Rajas, and Tamas.
	Recreation	Sacred enclosure /space for community	Commons for religious worship
	Aesthetic value	Veneration	Landmark / Foci

Dıscussıon

"Sthalavrikshas" worship is a way of in-situ conservation of plants. They are selected based on specific ecological, economic, and mythological considerations (Hangarge, 2016) and Sasikala (2011), which has enabled various local tree conservation within the temple precinct. In this study, *Aegle marmelos (L.) Correa* at Kasi Vishwanathan temple, Nerur, were identified in fossilized forms. The *"Sthalavriksha"* is also well noted for its ecosystem services. All these became evidence for the people's knowledge of the importance of plants in purifying the temple's atmosphere, which resulted in the mental and physical well-being of the devotees. This study thus first report on the age of the *Aegle marmelos (L.) Correa* as *"Sthalavrikshas"* in temples. And an account of its predominance as *"Sthalavriksha"* could be an example of the people's role in in-situ plant species conservation. The part of people in the preservation of plants is a traditional practice since the historical period in Tamil Nadu.

Conclusıons

It's to conclude that the *"Sthalavriksha"* worship is an age-old practice, myths, and beliefs. This practice is significant as in-situ preservation and conservation of sacred tree species that offer Provisioning, Regulating Habitat, and Cultural Ecosystem Services as narrated. Reveals the tree species significance for maintaining local/regional bio-diversity to humanity for life sustenance and perpetual well-being, complete health of the regional landscape, and retaining local community socio-cultural integrity as "Natural Heritage." Hence, this paper shall inspire awareness within individuals and local communities to plan, and protect it as green living monuments of nature to keep the blue planet and its living things overall well-being.

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