

Regular Article

## Gymnosperms of Nilgiris District, Tamil Nadu

\*Jeevith S.<sup>1</sup>, Ramachandran V.S.<sup>1</sup> and V. Ramsundar <sup>2</sup>

<sup>1</sup>Taxonomy and Floristic Lab, Department of Botany, School of Life Sciences, Bharathiar University, Coimbatore - 641 046, Tamil Nadu, India,

<sup>2</sup>Government Botanical Garden, Udthagamandalam, Nilgiris - 643 001, Tamil Nadu, India

\* Corresponding author Email : jeevithbotany@gmail.com

**Gymnosperms are seed bearing vascular plants; an intermediate of Pteridophytes and Angiosperms occupying an important place in the plant kingdom. In the present study 43 species belonging to 20 genera comes under 10 families. The wild and exotic species are catalogue in Government botanical garden at Udthagamandalam for conservation strategies.**

**Key words:** Gymnosperms, naked seed, Nilgiris.

A Gymnosperm is a seed plant that produces naked seeds that are not enclosed by a protective fruit. They have needle or scale like leaves and deep growing root system. Conifers are the largest group of gymnosperms on earth. The Gymnosperms are group co-ordinate with the Angiosperms within Phanerogams or Spermatophytes. The *Pteridospermales* or *Cycadofilicales*, fern like seed bearing plants of Cordaitales dominated to the earth in Carboniferous and Permian periods.

Ginkgoaceae, Araucariaceae and Taxodiaceae are purely exotic (Beisnner and Hooker 1862-63, Biswas 1933, Arnold 1948). In Jurassic period members of *Caytoniales*, *Bennittitales*, *Pentoxylales*, *Cycadales*, *Gingkoales*, *Coniferales* and *Taxales*, constitutes the dominant flora on surface of the earth (Uniyal and Aswathi, 2000). The fossil have revealed many facts concerning the status of many groups which are not expressed by living plants, are paramount importance for classification and new discoveries about fossils. Living gymnosperms are one of the great antiquities, conifers dominate tend to form most of the forests have been gradually displayed by the evolved gymnosperms

and they still successful in many parts of the world and occupy large of earth's surface (Dar and Dar, 2006). The importances of gymnosperms include mainly evergreen trees and shrubs, which are extremely captivating because of their graceful habit and attractive shapes (Poonam Tripathi, Lalit M. Tewari, Ashish Tewari, Sanjay Kumar, Pangtey, Y. P. S. and Geeta Tewari, 2009). The Indian subcontinent one of the 34 mega diversity countries of the world, with its rich biodiversity. The country is divided into 10 bio-geographic regions. Trans-Himalayan, Himalayan, Indian Desert, Semi-Arid, Western Ghats, Deccan peninsular, Gangetic plains, North-East India, Islands and Coasts, this diversity creates rich biodiversity in the country. Currently available data placed India in the tenth position in the world and fourth in Asia in plant diversity (Seeni and Sabu, 1998; BSI, 2007). Biodiversity hot spots are a method to identity those regions of the world where attention is needed to address biodiversity loss and to guide investments in conservation. The Montane Himalayan forests are the most biological diverse habitat covered with gymnosperms. The

Indian Himalayan region occupies a special place in the mountain ecosystems of the world (Sarvesh Suyal, C.M. Sharma, Sumeet Gairola, S.K. Ghildiyal, C.S. Rana and D.S. Butola, 2010). Most of them perished in due course of time and now represented by the orders Cycadales, Ginkgoales, Taxales, Coniferales, Gnetales. Although the family Ginkgoaceae, Araucariaceae and Taxodiaceae are purely exotic but is successfully cultivates as well as naturalized in India (Raizada Saahni, 1958). The characteristic of gymnosperms lack vegetation means of reproduction by means of cuttings, layering and they are slow growers. The seeds dispersal is not viability to grow in varied habitats, only by wind. The bisexuality reduces, self-fertilization and pollen is spread through wind pollination, seeds and ovules are unprotected and absence of vessel in xylem and companion cells in the phloem (Johri, 1997).

#### Materials and Methods

**Study area:** Nilgiris is the Queen of Hills. It is situated in the Western Ghats of India, one of the eight hottest hot spots of the world is known for its rich biodiversity, at an elevation of 350 to 2657 meters above MSL. Its latitudinal and longitudinal dimensions being 11°10' and 11°43' N and 76°14' and 77°00' E. The mean average temperature is between 13.8°C and 16.8° C. The annual average rainfall is 122.8 cm. The higher regions of the Nilgiris have a tropical warm temperature, the low temperature being mainly due to the high altitude. The present investigation was taken up to assess the diversity of gymnosperms plants in Nilgiris district (Fig.1). An extensive field survey was made to enumerate the diversity of gymnosperms from Nilgiris district, Tamilnadu during a period from August 2012 to April to collect the twig of the plant with cone, bark, resins as materials for the species. Plant materials collected from the different sites were identified with the local floras, taxonomic revisions and monographs by using identification keys. These specimens were

poisoned, processed and labeled by standard herbarium method given by (Santapau, 1955; Fosberg and Sachet, 1965, Jain and Rao, 1977). Field observations such as habitat, associated species distribution pattern and ecology factor were also noted. Photographs of selected plants were taken and incorporated in the text as plates in the appropriate places. The voucher specimens were deposited in the Herbarium of Department of Botany (BUH), Bharathiar University, Coimbatore, Tamil Nadu.

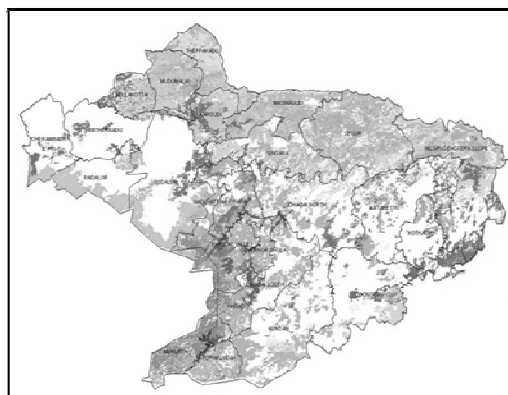


Fig.1 Map showing study area, Nilgiris district

#### Results and Discussion

Intensive explorations were carried out to enumerate wild and exotic species of gymnosperms. A total of 43 species representing 20 genera and 10 families were collected (Table.1). The habit of gymnosperms were made for the life forms and found 32 are trees, 10 shrubs and 1 climber (Fig.2). Which includes the dominant families like Cupressaceae (17 species), Araucariaceae (8 species), Pinaceae (6 species), Podocarpaceae and Taxodiaceae with (3 species) each, Cycadaceae (2 species). Ginkgoaceae, Taxaceae, Zamiaceae and Gnetales with all 1 species each. *Gnetum ula* is the only in climber in the gymnosperms collected. The plant species such as *Cedrus deodara*, *Cupressus gluaca*, *Cupressus torulosa*, *Juniperus recurva*, *Pinus longifolia* are indigenous to India and 37 plant species are introduced from other countries. The IUCN Red List includes more than 1,052 species of gymnosperms and 1,020 are evaluated species. Among the

various species collect 39% are categorized as threatened species (IUCN). The species such as *Araucaria rulei*, *Cupressus goveniana*, *Fitzroya cupressoideas*, *Cycas circinalis*, *Ginkgo biloba*, *Pinus palustris*, *Zamia furfuracea* are endangered. *Widdringtonia whytei* is critically endangered. *Biota orientalis*, *Cryptomeria japonica*, *Chamaecyparis lawsoniana*, *Cupressus obtosa*, *Thuja japonica*, *Thuja orientalis* are nearly threatened. *Araucaria heterophylla*, *Cupressus macrocarpa* are vulnerable (IUCN, 2014).

### ECONOMIC VALUE

Conservation is very well represented in ornamental collections throughout the gardens and apart from their ornamental value and commercial values. *Araucaria* and *Podocarpus* are important conifers of the Southern Hemisphere. *Cupressus macrocarpa* and *Pinus patula* are frequently planted in afforestation in south division of Nilgiris. Most plywood's are gymnospermous. *Podocarpus* and *Juniperus* are used to make fibers, paper pulp and occasionally are used for creating artificial silk and other textiles. Conifers foliage leaves and cones are burnt as incense; barks are used to manufacturing fuel for power generation or domestic uses, charcoal production, extraction of chemicals and waxes. Cedar oil is extracted from barks and foliages of Himalayan pine *Cedrus deodara*.

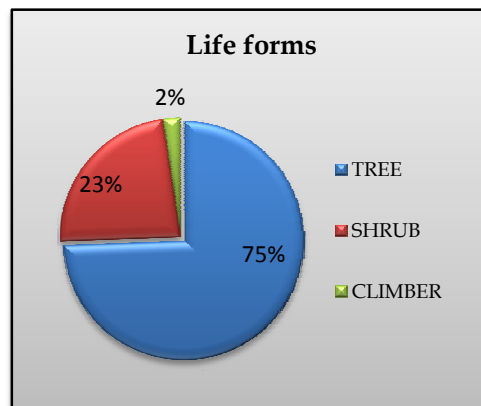


Fig.2. Number of Gymnosperms enumerated based on its habit

### Conservation Need for Gymnosperms

The reform of forest regulatory regimes accompanied by the strengthening of framework for their effective implementation for the propagation of gymnosperms. The study will construct an analytical frame work to assess legal frameworks for forest management and their implementation from the perspective of forest conservation and it is important to ensure that an evaluation process is embedded into strategic planning for the conservation of gymnosperms. Botanic gardens and reserve forests are main centers for conservation of Gymnosperms plants from their extinction.

Table.1 Floristic of wild and exotic gymnosperms from Nilgiris district

S. No	Botanical name	Family	Common name	Habit	Origin	ST
1	<i>Agathis robusta</i> C. Moore	Araucariaceae	Queensland Kauri pine	T	Queensland	LC
2	<i>Araucaria bidwillii</i> Hook.	Araucariaceae	Monkey puzzle	T	Australia	LC
3	<i>Araucaria columnaris</i> R. Br	Araucariaceae	New Caledonian	T	Australia	LC
4	<i>Araucaria cooki</i> R.Br.	Araucariaceae	Cook's araucaria	T	Australia	LC
5	<i>Araucaria cunninghamii</i> Sweet.	Araucariaceae	Moreton Baypine	T	Australia	LC
6	<i>Araucaria excelsa</i> Lamb	Araucariaceae	Norfolk Islandpine	T	Norfolk Island	LC
7	<i>Araucaria heterophylla</i> Salisb.	Araucariaceae	Norfolk Island	T	Australia	V
8	<i>Araucaria rulei</i> F. Mueller	Araucariaceae	Rule araucaria	T	China	E
9	<i>Biota orientalis</i> Endl.	Cupressaceae	Chinese arborvitae	S	China & Japan	NT

10	<i>Callitris rhomboidea</i> R.Br.	Cupressaceae	Frenela	T	North Holland	LC
11	<i>Cedrus deodara</i> Roxb.	Pinaceae	Himalayan cedar	T	Western Himalaya	LC
12	<i>Cryptomeria japonica</i> Linn.	Taxodiaceae	Japan cedar	T	Japan	NT
13	<i>Cupressus lusitanica</i> Endl	Cupressaceae	Mexican cypress	T	Mexico	LC
14	<i>Cupressus funebris</i> Endl.	Cupressaceae	Weeping cypress	T	North-East China	-
15	<i>Cupressus gluaca</i> Lam.	Cupressaceae	Cedar of Goa	T	East India	LC
16	<i>Cupressus goveniana</i> Gord.	Cupressaceae	Gowen cypress	T	California	E
17	<i>Chamaecyparis lawsoniana</i> Murr	Cupressaceae	White cedar	S	California	NT
18	<i>Cupressus macrocarpa</i> Hartw.	Cupressaceae	Monaterey cypress	T	California	V
19	<i>Cupressus obtosa</i> C.Koch	Cupressaceae	Fernspray cypress	T	Japan	NT
20	<i>Cupressus semipervirens</i> L.	Cupressaceae	Italian cypress	T	Europe	LC
21	<i>Cupressus torulosa</i> D.Don	Cupressaceae	Bhutan cypress	T	Himalayas	LC
22	<i>Fitzroya cupressoides</i> (Molina) I.M.Johnst.	Cupressaceae	Patagonian cypress	S	Patagonia	E
23	<i>Cycas circinalis</i> L.	Cycadaceae	Sago palm	S	Indo- Malaysia	E
24	<i>Cycas revoluta</i> Thunb.	Cycadaceae	Fern Palm	S	South Japan	LC
25	<i>Ginkgo biloba</i> L.	Ginkgoaceae	Maiden hair Tree	T	North China	E
26	<i>Gnetum ula</i> Brongn.	Gnetaceae	Gnemon	C	East Coast India	LC
27	<i>Juniperus recurva</i> Buch.	Cupressaceae	Himalayan weeping Juniper	T	Himalayas	LC
28	<i>Juniperus virginiana</i> L.	Cupressaceae	Eastern Red cedar or Pencil tree	T	North America	LC
29	<i>Pinus canariensis</i> Sm.	Pinaceae	Canary pine	T	Canary Island	LC
30	<i>Pinus caribaea</i> Morelet	Pinaceae	Caribbean Pine	T	Cuba	LC
31	<i>Pinus palustris</i> Mill	Pinaceae	Long leaves pine	T	India	E
32	<i>Pinus patula</i> Schltldl.	Pinaceae	Jelecote pine	T	Mexico	LC
33	<i>Pinus sabiniana</i> Douglas.	Pinaceae	Digger pine	T	California	LC
34	<i>Podocarpus elongatus</i> Aiton	Podocarpaceae	Cape of Good Hope.	S	Africa	LC
35	<i>Podocarpus macrophyllus</i> Don.	Podocarpaceae	Big leaf Podocarp	S	China & Japan	LC
36	<i>Podocarpus sylvestris</i> J.Buchholz	Podocarpaceae	Yew-leaved Podocarpus	S	Andy's	LC
37	<i>Taxodium distichum</i> (L.) Rich.	Taxodiaceae	Mexican Cypress	T	Mexico	LC
38	<i>Taxodium mucronatum</i> Tenore	Taxodiaceae	Marshy Cypress	T	Mexico	LC
39	<i>Taxus buccata</i> L.	Taxaceae	Thuner Yew	S	Western Europe	LC
40	<i>Thuja japonica</i> Maxim.	Cupressaceae	Arborvitae	T	Japan	NT
41	<i>Thuja orientalis</i> L.	Cupressaceae	Oriental arborvitae	T	Western China	NT
42	<i>Widdringtonia whytei</i> Rendle.	Cupressaceae	African cypress	T	Africa	CE
43	<i>Zamia furfuracea</i> L.	Zamiaceae	Cardboard Palm	S	Eastern Mexico	E

**Notes:** ST: Status, C: Climber, S: Shrub, T: Tree, LC: Least Concern, E: Endangered, CE: Critical Endangered, NT: Nearly Threatened, V: Vulnerable.



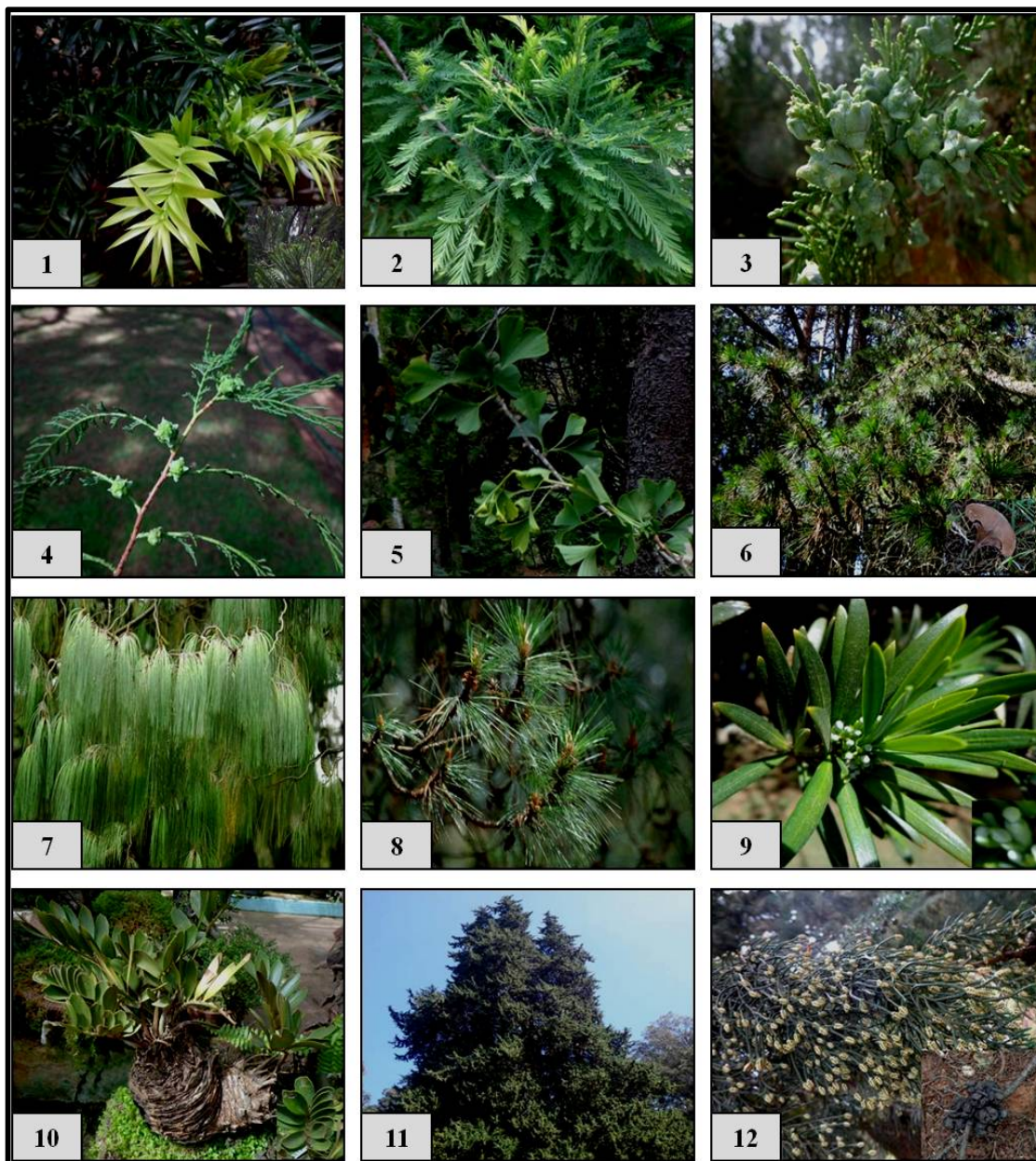


Plate:1; *Araucaria bidwilli* Hook. 2. *Taxodium distichum* (L.) Rich. 3. *Thuja orientalis* Endl. 4. *Cupressus funebris* Endl. 5. *Ginkgo biloba* L. 6. *Cedrus deodara* Roxb. 7. *Pinus patula* Schldt. 8. *Pinus palustris* Roxb. 9. *Podocarpus sylvestris* H.B.K. 10. *Zamia furfuracea* L. 11. *Cupressus macrocarpa* Hartw. 12. Male and female cone - *Cupressus macrocarpa* Hartw.

A living fossil *Ginkgo biloba* “maiden-hair tree” the sole survivor of the ancient species among gymnosperms. The plants such as *Araucaria bidwilli*, *Araucaria cooki*, *Zamia*, *Taxodium* species are also conserved in Botanical garden at Udhagamandalam. The adoption of measurable targets could considerably enhance the means available

by which evaluation can be achieved in future.

### Conclusion

The present study observed that many gymnosperms plants are introduced from other countries. The effect must be taken to conserve these plants for biodiversity.

These plants play pivotal role in natural habitat formulation. There is a dire need to protect this natural wealth with the involvement of community. This study revealed that the knowledgeable on the plant diversity and quite conscious on the importance of protection of their biological resource.

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