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Biodiversity of Andhra Pradesh

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Introduction

Andhra Pradesh is one of the 29 States of the Indian Union. When India became independent, the Telugu speaking population was distributed in about 20 districts, 9 of them in the Nizam's Dominion and 11 in the Presidency of Madras. In 1953, first Andhra State was carved out of the erstwhile Presidency of Madras so as to include predominantly Telugu speaking areas. On November 1st, 1956, according to the recommendations of the States reorganisation Commission, Andhra Pradesh was formed, by the addition of nine districts, which were formely in the Nizam's Dominion. On 2nd June 2014 Government of India has decided to divide the State of Andhra Pradesh into two states, Telangana and Residuary Andhra Pradesh.

The thirteen districts of the State of Andhra Pradeshare generally grouped into two geographically distinct regions called (1) Circars or Coastal Andhra with nine districts, i.e., Srikakulam, Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Krishna, Guntur, Prakasam and Nellore and (2) Rayalaseema with four districts, i.e., Kurnool, Kadapa (formerly called Cuddapah), Anantapur and Chittoor.

Andhra Pradesh Situated in the middle portion of the Eastern half of the Indian Peninsula the State Andhra Pradesh lies between the latitudes 12°37' N and 19°54' N and longitude 76°46' E and 84°46' E (Map 1).Geographically, the whole State can be divided into the Coastal plains, the Eastern Ghats and the Western peneplains. The State Andhra Pradesh has the monsoon type of tropical climate.In coastal Andhra and Chittoor district tropical rainy type of climate prevails, except the western parts of Guntur and the adjoining parts of Nellore. Hot Steppe type of climate is noticed in the excepted areas and in the rest of the State.

Maximum temperature in the summer season varies between 37°C and 44°C and minimum temperature in the winter season ranges between 14°C and 19°C. The average rain fall ranges from 120 cm in the north and as we go south-west ward the rainfall comes down to about 50 cms in Anantapur district.Andhra Pradesh contains a wide variety of Geological formations ranging from among the oldest Dharwar schists to the recent alluvium. These rocks possess rich minerals and they are well distributed throughout the State. The State has a wide variety of soils and they form into six broad categories. They are red, black, alluvial, laterite, coastal sandy soils and skeletal soils. Andhra Pradesh is popularly and rather appropriately called a "river State", nearly 75% of its territory is covered by the basins of three big rivers, viz. Godavary, Krishna and Pennar and their tributaries viz., Tungabhadra, Hundri, Musi,

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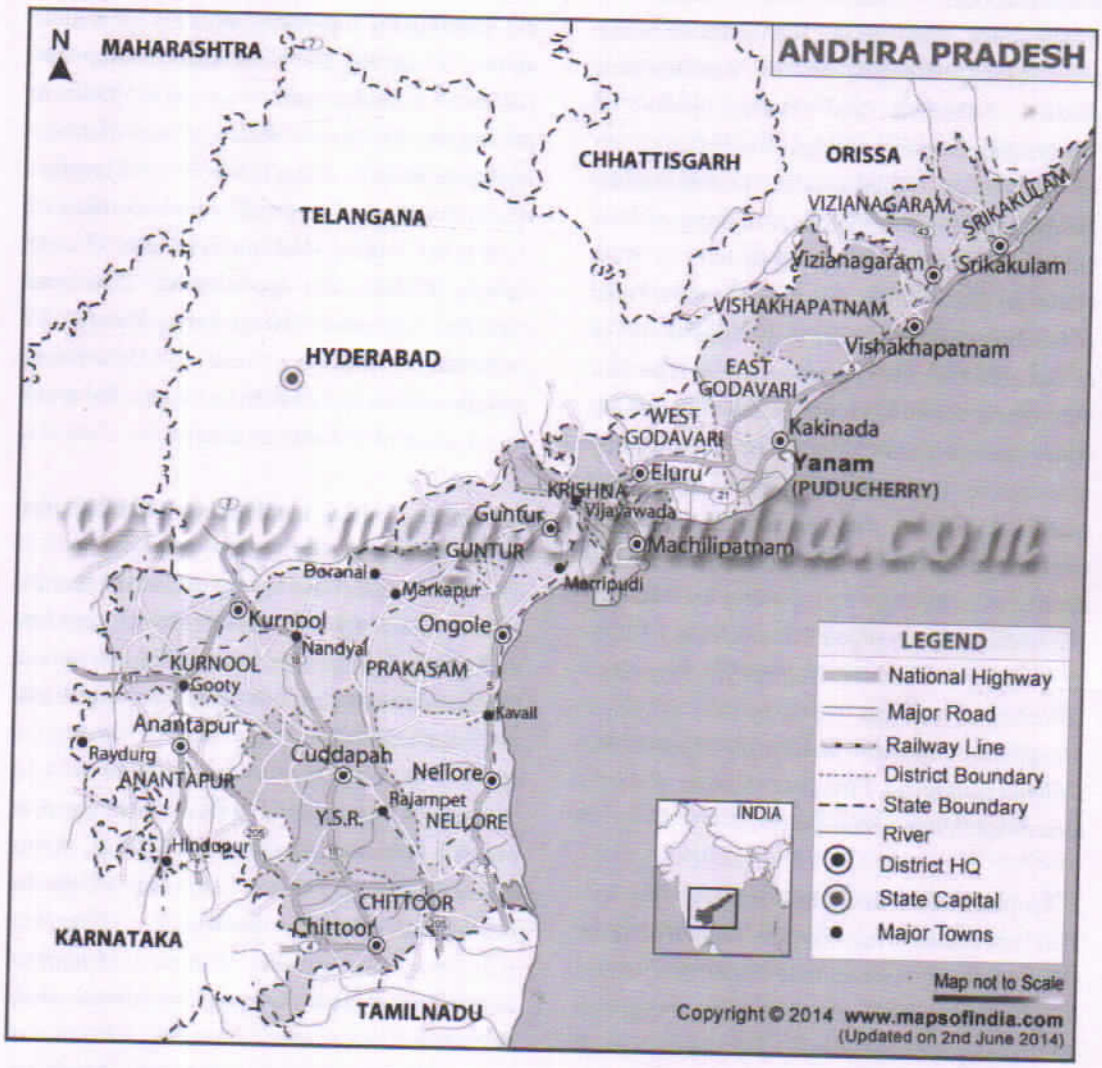
Wyra, Chandravanka, Errakalva, Tammileru, Budameru, Naguleru, Dindi, Papaghni, Chitravathi, Cheyyeru and Kunderu.



Ecosystem Diverstiy

Ecosystem here is discussed under Inland vegetation, Coastal vegetation and Aquatic vegetation

Inland Vegetation

The type of forests met within Andhra Pradesh, as per the classification of Champion and Seth (1968) are:

1. Tropical semi-evergreen forests:

(Moist deciduous forests mixed with evergreen elements):

This type occurs in a localised manner in small pockets in valleys near the banks of perennial streams and hills at about 800 m where the climatic conditions are favourable with plenty of humus and moisture in the soil. In Sonkaram blocks of Madugula Range, Gudem,

Sileru, Sapparla, Chintapalli, Lankapakala, Sambarikonda, Dharakonda, Galikonda, Minumuluru, Padovalasa, Thanjavanam, some areas near Anantagiri etc. in Visakapatnam district, Sitampeta and Borra blocks of Vizianagaram district, Tekkali and Pathapatnam of Srikakulam, Nulakamaddi, Dummakonda, Peddakond hills and Maredumilli areas of East Godavari district and Papikonda hills of West Godavari district show this type of forest. Trees of heights ranging from 21 to 30 m, girth of 1-2 m and above are very common. These represent the highest floristic evolution. A number of top storey species are deciduous. The second storey is evergreen. Bamboos are generally absent and whenever present, they constitute the middle storey to the exclusion of the other species. The main trees which form the top storey are *Michelia champaka, Pterocarpus marsupium, Litsea* spp., *Syzygium cumini, Nothopegia heyneana, Schleichera oleosa, Diospyros sylvatica, Mangifera indica, Artocarpus lakoocha, Dillenia pentagyna, Firmiana colorata, Bridelia tomentosa, Xylia xylocarpa* etc.

2. Tropical Moist deciduous forests

This type occurs in region with a rainfall of 1,016 mm and above at an altitude of 610 mts. These forests can be subdivided into three categories for the sake of convenience (a) Northern tropical moist deciduous forests (sal forests), (b) South Indian tropical moist deciduous forests and (c) Southern tropical moist deciduous riverian forests.

(a) Northern tropical moist deciduous forests

This type of forest is found in Srikakulam district. In the sal forests *Shorea robusta* predominates and is associated with *Syzygium cumini, Xylia xylocarpa, Haldina cordifolia, Terminalia tomentosa, Pterocarpus marsupium, Anogeissus latifolia, Albizia procera, Madhuca longifolia* etc. forming the top storey, whereas the middle storey is formed by trees like *Cleistanthus collinus, Buchanania lanzan, Dillenia pentagyna, Diospyros melanoxylon, Mallotus philippinensis, Careya arborea, Syzygium operculatum* etc. The shrubby layer consists of *Ardisia solanacea, Alstonia venenata, Grewia hirsuta, Colebrookia oppositifolia, Cipadessa baccifera, Clerodendrum viscosum, Woodfordia fruiticosa, Helicteres isora, Holarrhena antidysenterica* and *Ziziphus oenoplia.* Sal is not found south of Srikakulam district.

(b) South Indian tropical moist deciduous forests

These forests are found in parts of Gudem, Rampa Agency, parts of West Godavari district, between Rollapenta and Bairluty, Gundlabrahmeswaram (Nallamalais) in Kurnool district and Talakona in Chittoor district.

Tectona grandis (this is present only in a few places), *Terminalia tomentosa, T. alata, Xylia xylocarpa, Anogeissus latifolia, Dillenia pentagyna, Haldina cordifolia, Mitragyna parviflora, Schleichera trijuga, Mangifera indica, Dalbergia latifolia, Albizia odoratissima, A. amara, Protium serratum, Diospyros montana, Lannea coromandelica, Madhuca indica, Buchanania lanzan* etc. form top storey.

(c) Southern tropical moist deciduous riverian forests

Along the courses of rivers and streams in the plains, where alluvial soil is deposited, there are many plants predominantly exclusive to these areas. This riparian vegetation is maintained by the interaction of constant erosion and

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redeposition of the soil going on the banks of rivers. It generally forms a very narrow belt along the banks; sometimes it may extend to the higher elevations. The riparian trees may be evergreen or deciduous depending upon the region. This type of forest is present along the banks of river Godavary and other hill streams in a narrow belt. The most common trees in these forests are *Terminalia arjuna, Mitragyna parviflora, Tamarindus indica, Bombax ceiba, Barringtonia acutangula, Butea monosperma, Strychnos nux-vomica, Pongamia pinnata, Syzygium cumini, Oroxylum indicum, Trema orientalis, Memecylon umbellatum* etc.

3. Dry deciduous forests

In this type of forests, the trees begin to shed their leaves by about December and between February and May the forest looks very open and at times eye-soring, but no area is completely leafless at any one time of the year. Flowering and fruiting are generally far advanced before the first flush of new leaves appears with the conventional showers in April-May. These forests are widely spread in almost all the districts of the State, where the soil conditions are poor. The forest composition does not show zonations.

Anogeissus latifolia is perhaps the commonest tree in these forests. *Tectona grandis, Boswelia serrata, Cochlospermum religiosum, Diospyros melanoxylon, Gardenia latifolia, Givotia rottleriformis, Gyrocarpus americanus, Lannea coromandelica, Shorea roxburghii, Kavalama urens* (Syn.: *Sterulia urens*), *Strychnos potatorum, Ziziphus xylopyrus, Terminalia* spp., *Chloroxylon swietenia, Pterocarpus marsupium, Albizia odoratissima, Haldina cordifolia, Cassia fistula, Diospyros melaxoxylon* etc. are some of the typical trees. The orange blossoms of *Firmiana colorata* are less common. *Balanites aegyptiaca, Gmelina asiatica* and *Naringi crenulata* are armed trees present, at the edges of the forest. In Deccan plateau *Tectona grandis-Terminalia alata* are the dominant species, while in Southern Andhra Pradesh, *Anogeissus latifolia* and *Lannea coromandelica* is dominant. Eastern Ghats of northern Andhra Pradesh shows predominance of *Xylia xylocarpa* with *Terminalia alata.* Red sanders (*Pterocarpus santalinus*) is gregarious species in Seshachalam hills of Kadapa and Chittoor districts. Some species like *Boswellia ovaliofoliolata, Shorea tumbaggaia, Terminali pallida* are found only in Southern Andhra Pradesh region.

Holarrhena antidysenterica, Wrightia tinctoria, Alangium salvifolium, Bauhinia racemosa, Tarenna asiatcia, Flacourtia indica, Helicteres isora, Nyctanthus arbor-tristis, Woodfordia fruticosa, Grewia hirsuta etc. are some of the common shrubs found in this type of forests.

4. Northern mixed dry deciduous forests

These generally occur at about and above 400 m in shallow soils of well drained hill sides. The canopy is closed though uneven and not dense. Most of the species are deciduous. The under-growth is usually dense since enough light penetrates through the upper canopy. Epiphytes and ferns are very rare. This type of forests are confined to some hill slopes and plateau of Kadapa district, northern portions of the hills of Chittoor district and southern portions of the Kurnool district adjoining the Kadapa district.

Common among the canopy trees are *Albizia amara, A. odoratissima, Anogeissus latifolia, Hardwickia binata, Terminalia chebula, T. tomentosa, T. paniculata, Shorea tumbaggaia,*

Syzygium alternifolium, Kavalama urens (=Sterculia urens), Bauhinia racemosa, Butea monosperma, Cassia fistula, Dalbergia spp., *Emblica officinalis, Lannea coromandelica, Mangifera indica, Pterocarpus marsupium* etc.

The middle storey comprises small trees such as *Chloroxylon swietenia, Dalbergia paniculata, Vitex altissima, Dolichandrone atrovirens, Gardenia gummifera, G. latifolia, Strychnos potatorum* etc.

The common shrubs are *Acacia* spp. *Dodonea viscosa, Ixora arborea, Securinega virosa, Helicteres isora, Chomelia asiatica, Combretum albidum, Hiptage benghalensis, Ventilago madraspatana* etc. The bamboo, *Dendrocalamus strictus* is often found.

5. Dry savannah forests

These forests, formed as a result of intense biotic interference, are scattered throughout the Eastern Ghats. The stunted trees are *Emblica officinalis, Phoenix humilis, Pterocarpus marsupium, Terminalia chebula* are associated with grasses like *Aristida setacea, Arundinella bengalensis, Bothrichloa pertusa, Brachiaria ramosa, Themeda triandra, Cymbopogon flexuosus, Chrysopogon aciculatus, Panicum* spp., *Setaria* spp., etc.

6. Dry evergreen forests

This type of forest occur in Coastal and plains areas with a rainfall of 635 mm and below at an altitude of less than 244 mts. and on impoverished soils with practically no organic matter and where the top soil is practically non-existent. This type of forest occur in Poolbagh, Velagada of Vizianagaram district, Madugula range of Visakhapatnam, Tekkali and Pathapatnam of Srikakulam, in South Kadapa, Sriharikota island near Nellore and Mamandur valley in Chittoor division.

The common species are *Manilkara hexandra, Albizia amara, Acacia leuceophloea, Syzygium cumini, Sapindus emarginatus, Strychnos nux-vomica, Erythroxylon monogynum, Drypetes sepiaria, Gardenia spicata, Wrightia tinctoria, Atalantia monophylla, Cordia dichotoma, Manilkara hexandra, Flacourtia indica, Ochna obtusata, Gyrocarpus americanus, Drypetes sepiaria, Catunaregam spinosa* etc.

7. Tropical scrub forests

Scrub forests are widely distributed on the arid and semiarid zones of earth, where the rainfall is scanty. The vegetation presents a very open appearance so that the trees and shrubs are widely spaced. The bulk of the vegetation consists of co-dominant, spinous shrubs and trees capable of great drought resistance. In this type there are two categories, viz. (a) the permanent vegetation occurring throughout the year and (b) the temporary vegetation consisting of the annuals growing mainly during short rainy season. Corresponding to this, the area represent two distinct seasonal variations. (1) The permanent xerophytic vegetation consists of trees and shrubs, which flower in the summer and winter seasons, when the soil is devoid of the ground cover (2) in the rainy season, the vegetation will be at its best and the soil which is otherwise barren between the trees and shrubs, is covered by a vivid-green carpet of a temporary vegetation. This flowers and fruits in a short time and disappears soon after the surface layer of the soil dries up as winter sets in. These are mainly present in almost all the drier parts of Andhra Pradesh like the districts of Anantapur, Kurnool, Kadapa, Guntur and peripheries of forests in other districts. The

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main species are *Acacia chundra, Albizia amara, Balanites aegyptiaca, Anisochilus carnosus, Canthium parviflorum, Erythroxylon monogynum, Flacourtia indica, Premna tomentosa, Ziziphus* sps., *Dodonaea viscosa, Euphorbia antiquorum, Dichrostachys cinerea, Capparis brevispina, Maytenus emarginata, Carissa spinarum, Grewia tenax* etc.

COASTAL VEGETATION

T.A. Rao and Sastry (1973) have studied the coastal vegetation and flora of Andhra Pradesh. The coastal area of the Andhra Pradesh is stretched about 968 kms from Pulicat lake of Nellore district in the south to Icchapuram of Srikakulam district in the north. The vegetation of coastal Andhra Pradesh is divisible into two types 1. Strand vegetation and 2. Estuarine types.

1. Strand vegetation: The strand vegetation is characterised with open, mat forming poineer species followed by scattered herbs, shrubs and trees dispersed along the relief beyond the high tide limit or the backshore region. This can be further classified into two substrata types viz., sand strand, rock strand.

(a) Sand strand: The sand strand vegetation along the sandy beaches exhibits zonations distinguishable into open pioneer, closed herbaceous, middle mixed or bushy and inner wood-land zones. (i) *Open Pioneer zone* : This zone is the first in the supra tidal region immediately preceding the drift line. In this area, the vegetation is rather sparse with a few plants like *Cyperus arenarius, Gisekia pharnaceoides, Glinus oppositifolius, Ipomoea pes-caprae, Launaea sarmentosa, Polycarpaea corymbosa, Rothia indica, Sesuvium portulacastrum, Spinifex littoreus, Tribulus terrestris, Trachys muricata* and *Zoysia matrella.* (ii) *Closed herbaceous zone* : Here the vegetation attains a little more density with some mat-forming herbaceous plants. In this zone *Alternanthera pungens, Boerhavia diffusa, Borreria articularis, Chloris barbata, Croton bonplandianum, Euphorbia* sps., *Gisekia pharnaceoides, Glinus oppositifolius, Mollugo nudicaulis, Ipomoea pes-caprae, Goniogyna hirta, Trachys muricata, Tribulus terrestris, Portulaca tuberosa, P. oleracea, P. quadrifida, Perotis indica, Phyla nodiflora, Fimbristylis polytrichoides, Solanum virginianum (S.surattense)* and *Spinifex littoreus* are commonly found. (iii) *Middle mixed or bushy zone* : Here both herbaceous plants and some sub-shrubby or bushy plants mixed are together giving rise to the appearance of a mixed vegetation. The commonly noticeable herbaceous plants are *Euphorbia rosea, Synostemon bacciforme, Geniosporum tenuiflorum, Phyllanthus rotundifolius, Borreria articularis, Zornia gibbosa, Coldenia procumbens, Allmania nodiflora, Boerhavia diffusa, Asystasia gangetica,* and sub-shrubby/bushy plants like *Crotalaria linifolia, C. verrucosa, Tephrosia hirta, T. purpurea, Opuntia dillenii, Calotropis procera, Solanum surattense, S. trilobatum, Carissa spinarum, Jatropha gossypifolia, Dodonaea viscosa* and *Clerodendrum inerme* etc. are encountered. (iv) *Inner woodland zone*: This zone chiefly dominated by tree species like *Borassus flabellifer, Prosopis cineraria, Cocos nucifera, Morinda citrifolia, Thespesia populnea, Pongamia pinnata, Calophyllum inophyllum* and *Syzygium ruscifolium.* Of these *Borassus flabellifer* and *Prosopis cineraria* are self-sowing forming extensive pure strands at some places. Climbers like *Gloriosa superba, Tiliacora acuminata* and *Hemidesmus indicus*

also grow. At places, dense groves of the screwpine, *Pandanus odoratissimus* with branching stems bearing dense long leaved crowns supported by stilt roots and with extremely sweet scented inflorescences and large sized multiple fruits form as eye- catching aspect. This zone gradually merges into the wastelands/cultivated fields in the interland region in the coastal belt.

(b) Rock strand : This particular type of habitat is much limited to small strips at Waltair and Poodimadaka, in the whole of Andhra Pradesh coast, where the inland hillocks and their rocky promontories project in the sea. The vegetation and flora are mostly a mixture of coastal and inland plants, occurring in the following zones. (i) *Exposed rocky low lying reefs* : This zone, subjected to regular sea water inundation is seen exposed only during low tide and supports a rich growth of marine algae belonging to species of *Padina, Sargassum, Enteromorpha, Caulerpa* and *Ulva.* (ii) *Rocky relief* : Mostly with exposed laterite and rocky boulders with thin mantle of sand in crevices or weathered surfaces. *Blepharis repens, Euphorbia thymifolia, Portulaca tuberosa, Goniogyna hirta, Vernonia cinerea, Hybanthus enneaspermus, Scilla hyacinthina, Tridax procumbens, Indoneesiella echioides* etc. are found in this zone. (iii) *Inland gravelly/rocky habitat* : The dominant shrubby plants in this zone are *Carissa spinarum, Toddalia asiatica, Ziziphus oenoplia, Maytenus emarginata, Dichrostachys cinerea, Stachytarpheta urticaefolia, Barleria prionitis* and *Euphorbia tirucalli* etc. The common herbaceous plants are *Hybanthus enneaspermus, Pavonia zeylanica, Acanthospermum hispidum, Echinops echinatus, Caralluma attenuata, Indonesiella longipedunculata, Acalypha indica. Tylophora asthmatica* and *Cissus quadrangularis* are common climbers found in this area.

2 Estuarine Vegetation The mangrove vegetation which develops along muddy tidal banks, is primarily restricted to the Godavary and Krishna estuarine systems in Andhra Pradesh. Unlike in the Sundarbans and in the Mahanandi deltas where the estuarine region as well as species composition forms a bigger complex exhibiting certain plant groupings into soil vegetational units having a preference to certain habitats or niches of their own, the mangroves in Andhra Pradesh region are comparatively few and consequently the vegetational units or zonations are also fewer. In the Coringa and Gaderu tidal estuaries of the Godavary estuarine system on the newly formed silt deposits in the intertidal region, the grass, *Porteresia coarctata* grows as a pioneer together with a few seedlings of *Avicennia* and *Sonneratia.* Further interior *Avicennia alba* and *Sonneratia apetala* dominate forming a *Avicennia- Sonneratia* crop. They attain ca 6 m height with a straight, slender bole and beautiful foliage of cottony-white and green respectively. Along the sheltered banks of the side creeks near the estuarine mouth, well grown trees of *Rhizophora apiculata, R. mucronata* and *Bruguiera gymnorrhiza* are commonly noticable. Further away from the estuarine mouth the vegetation is composed of mixed mangrove species like *Avicennia alba, A. marina, A. officinalis, Aegiceras corniculatum, Bruguiera gymnorrhiza* and *Ceriops decandra.* Behind this zone, under the influence of more fresh water influx, *Excoecaria agallocha, Hibiscus tiliaceus, Lumnitzera racemosa, Sonneratia apetala, Xylocarpus granatum* and *Avicennia officinalis* grow well giving a mosaic appearance. These trees are overgrown by prickly

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climbers like *Caesalpinia crista, Dalbergia spinosa* and *Derris trifoliata* forming dense impenetrable thickets. *Ipomoea macrantha* and *Sarcolobus carinatus* are the two commonly notable members. *Clerodendrum inerme, Acanthus ilicifolius, Myriostachya wightiana* and *Cyperus rotundus* mostly grow along the water margins. The upland dry 'bank' area that lie behind and away from tidal influx, support a sparse growth of halophytic species. Another very interesting aspect of the existing natural vegetation along the Andhra coast is noticeable in Sriharikota island, and in certain sandy tracts of Irakkam island, in the Pulicat lake. Not very far from the coast line in Sriharikota, in some undisturbed areas, the vegetation is composed of tree species of *Strychnos nux-vomica, Terminalia arjuna, Hydnocarpus* spp., *Sapindus emarginatus, Albizia amara,* and *Tamarindus indicus* and shrubby zone is ehiefly dominated by *Memecylon umbellatum* and *Dodonaea viscosa.* The common climbers in these areas are *Abrus precatorius, Ichnocarpus frutescens,* and *Hemidesmus indicus.* The margins of ponds are fringed with luxuriantly growing dense thickets of *Calamus* spp. The above floristic composition suggests the existence of a moist deciduous type of vegetation in the island in the past. Extensive plantations of *Eucalyptus* and *Casuarina* and Cashew-nut exist now. The *Casuarina* plantations in this island are the best examples in quality perhaps for the entire east coast. The vast mudflats/saline flats that occur particularly at places in the vicinity of Kakinada, Machilipatnam and Tada (Pulicat lake) support sparse vegetation, composed of halophytic species like *Suaeda maritima, S. nodiflora, Salicornia brachiata, Sesuvium portulacastrum, Heliotropium curassavicum, Enicostema axillare, Aeluropus lagopoides* and *Cressa cretica.* Besides these *Drosera burmannii* and *Eriocaulon xeranthemum* also occur in certain restricted wet areas bordering cultivated fields here. *Psilostachys sericea* is to be seen only at Krishnapatnam for the entire coast as earlier reported by Gamble. The mud flats along the Creeks harbour low bushes of *Avicennia marina, Dalbergia spinosa, Derris trifoliata* and *Acanthus ilicifolius* to give rise to a secondary type of mangrove vegetation.

Aquatic Vegetation

The State of Andhra Pradesh is quite rich in streams, ponds, ditches and rivers, which harbour a large number of hydrophytic plants (including aquatic and marshy-wetland plants). Most of the ditches and temporary ponds are filled up with water during monsoon, in the second half of which a number of plants of the hydrophytic vegetation appear. These hydrophytes can be classified as 1. Floating hydrophytes 2. Submerged hydrophytes 3. Emergent hydrophytes 4. Wetland hydrophytes.

1. Floating hydrophytes: There are three types of plants in this division basing on the relationship between the plant and the substratum. They are (a) Free floating on the surface of water : In this subtype the plants have no contact with the soil. They float freely on the surface of water and are in contact with air and water. *Eichhornia crassipes, Lemna perpusilla, Pistia stratiotes, Spirodela polyrhiza* and *Trapa natans* var. *bispinosa* are common examples for this type. (b) Attached hydrophytes with floating shoots : These plants are attached to the muddy floor by their roots, but their shoots come out and float on the surface of water. The principal examples of this category are *Hygrorhiza aristata, Ipomoea aquatica, Ludwigia adscendens* and *Neptunia*

oleracea. (c) Attached hydrophytes with floating leaves : In this category the plants are attached to the sub-stratum and their stems (mostly rhizome) remain under water in contact with soil and water while the leaves float on the surface of the water. *Aponogeton natans, Limnophyton obtusifolium, Monochoria vaginalis, Nelumbo nucifera, Nymphaea pubescens, N. nouchali, N. rubra, Nymphoides cristatum, N. indicum, Ottelia alismoides, Potamogeton nodosus* and *Tenagoncharis latifolia* are common examples.

2. Submerged hydrophytes These plants always remain under water surface and can be grouped into two categories viz., suspended submerged hydrophytes and attached submerged hydrophytes. (a) Suspended submerged hydrophytes : These plants remian submerged in water but have no contact with the soil. Their flowers may or may not come above the water level e.g., *Ceratophyllum demersum, Utricularia aurea* and *U. exoleta.* (b) Attached submerged hydrophytes : These plants remain in contact with soil and water. Their vegetative portion remains completely submerged in water, while the flowers may come out of water surface. *Aponogeton crispus, Cryptocoryne retrospiralis, Hydrilla verticillata, Najas graminea, Lagarosiphon alternifolia, Polypleurum stylosum, Potamogeton crispus, P. pectinatus* and *Vallisneria natans* are found in this type.

3. Emergent hydrophytes Plants which are attached to soil covered with water but most of their vegetative parts come out of water surface, e.g., *Aeschynomene aspera, A. indica, Ammannia baccifera, Bacopa monnieri, Cyperus distans, C. pangorei, Echinochloa colona, Fimbristylis* spp., *Hygrophila auriculata, Ischaemum rugosum, Limnophila indica, Polygonum barbatum, Phragmites karka* and *Typha angustata.*

4. Wetland hydrophytes or marshy plants The plants included in this category are rooted to the soil saturated with water, which may also survive in dried conditions too in the later part of their life cycle. A large number of species are found in this habitat. Some typical ones are *Phyla nodiflora, Alternanthera sessilis, Polygonum plebeium, Commelina* spp., *Glinus lotoides, Caesulia axillaris, Eclipta prostrata, Melochia corchorifolia, Sphaeranthus indicus, Ipomoea carnea, Cynodon dactylon, Murdannia nodiflora, Justicia betonica* etc.

Species diversity

Florsitic studies have gained momentum in the last three decades. Pullaiah (1997) Pullaiah and Chennaiah (1997), Pullaiah and Moulalai (197), Pullaiah and Surya Prakash Babu (1998) and Pullaiah and Karuppusamy (2008) brought out flora of Andhra Pradesh in Five volumes. Pullaiah and Muralidhara Rao (2002), Pullaiah and Sri Rama Murthy (2001), Pullaiah *et al.* (2007) and Pullaiah *et al.* (2010) brought out first four volumes of Flora of Eastern Ghats while the remaining volumes are under progress. Several district floras have been brought out during the last three decades. These include Flora of Anantapur district (Pullaiah and Yesoda, 1989), Flora of Kurnool (Venkata Raju and Pullaiah, 1994), Flora of Nellore district (Suryanarayana and Srinivasa Rao, 2001), Flora of Guntur district (Pullaiah *et al.*, 2000), Flora of Krishna district (Lakshminarayana *et al.*, 1997), Flora of West Godavari district (Rolla S. Rao *et al.*, 1986), Flora of East Godavari district (Rolla S. Rao *et al.*, 1999), Flora of Visakhapatnam district (Subb Rao and Kumari (2003-08), Flora of

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Vizianagaram district (Venkaiah, 2004) and Flora of Srikakulam district (Rolla S. Rao and Hara Sreeramul, 1986). As a part of Doctoral dissertation work Rangachari (1991) worked on Flora of Chittoor district while A.M.Rao (1989) worked on Flora of Cuddapah (presently called Kadapa) district. Flora of Sri Venkateswara National Park was studied by Benjamin and Murthy (2013). Bhirava Murthy and Krishnamohan (199) published a paper on Flora of Prakasam district.

Several new species have been described from Andhra Pradesh during the last decade which include *Tripogon tirumalae* (Chorge *et al.*, 2013), *Ceropegia pullaiahii* (Kullayi Swamy *et al.*, 2012), *Rhynchosis ravii* (Prasad and Narayana Swamy, 2014), *Brachystelma pullaiahii* (Rao et al., 2014), *Glochidion tirupathiense* (Rasingam *et al.*, 2014), *Brachystelma penchalakonense* (Rasingam *et al.*, 2013) and *Leucas mathewana* (Sunojkumar et al., 2009).

Angiosperm Diversity

Angiosperms constitute the dominat part of the vegetation. The present study revealed that there are 2837 taxa in Andhra Pradesh belonging to 2726 species, 1098 genera and 176 families. Of these total 2726 species, 2078 species belong to Dicotyledones nd 670 species belong to Monocotyledones. The dominant families are Poaceae 329 species, Fabaceae (Leguminosae) 326 species (231+53+42), Euphorbiaceae (141), Cyperaceae (131). Acanthaceae (110), Orchidaceae (96), Asteraceae (95), Rubiaceaae (93), Lamiaceae (79), Convolvulaceae (64), Asclepiadaceae (62) and Malvaceae (53).

Largest genera are *Crotalaria* (45 species), *Cyperus* (44 species), *Euphorbia* (36), *Ficus* (27), *Fimbristylis* (24), *Indigofera* (22), *Eragrostis* (21), *Senna* (20), *Phyllanthuss* (19), *Grewia* (18) and *Acacia* (17).

Gymnosperms

Four species of Gymnosperms have been reported from Andhra Pradesh. These include *Cycas beddomei* Dyer, *Cycas sphaerica* and *Cycas circinalis* L. of Cycadaceae and *Gnetum ula* Brongn. of Gnetaceae,. Of these *Cycas beddomei* is listed in Threatened category.

Pteridophytes

Pullaiah *et al.* (2003) reported 89 species of Pteridophytes belonging to 51 genera spread over 32 families. The largest genera are *Selaginella* (7 species), *Asplenium* (6 species) and *Pteris* (5 species). Thre species of tree ferns – *Cyathea spinulosa, C. gigantea* and *C. nilgiriensis* – are found in the north coastal districts near streams in hilly terrain.

Bryophytes

Sandhya Rani *et al.* (2014) reported the occurrence of 94 species of Bryophytes belonging to 3 classes (Hepaticae, Antheocerotae and Musci) spread over 67 genera and 36 families. Of these Musci is the largest class and comprises of 59 speces belonging to 40 genera and 19 families. Hepaticae is represented by 32 species under 24 genera and 15 families. Class Anthocerotae is poorly represented by 3 species, 3 genera and 2 families. Pottiaceae is the largest family with 9 species under 5 genera while the remaining families have 5 or less than 5 species. 14 families are monotypic (single genus with single species). *Fissidens* and *Bryum* are the largest genera with 6 species each followed by *Riccia* with 5 species.

Lichens

Mohabe *et al.* (2014, 2015), Reddy *et al.* (2011) have repored 75 species of Lichens from Chittoor district. Devi *et al.* (2013) enumerated 46 species of lichens from YSR Kadapa district. So far 125 species of Lichens have been reported from the Andhra Pradesh State (Mohabe *et al.*, 2015).

Genetic Diversity

73 species of wild replates of major cultivated crops belonging to crop groups cereals, millets, small millets, pulses, oil seeds, vegetables, leafly vegetables, tuber crops, fruit crops and spices have been reported from Andhra Pradesh (Pandravada et al., 2008). Some of these wild relatives of cerelas and millets are *Oryza myeriana* subsp. *granulata, Oryza officinalis* subsp. *malampuzhaensis, Oryza rufipogon, Porteresia coarctata, Hygroshiza aristata, Sorghum halepense, S.nitidum, Pennisetum hohenackeri, P. pedicellatum, P. polystachyon, P. setosum, Eleusine indica, Seteria intermedia, S. palmifolia, S. paniculifera, S. pumila, S. verticillata, Panicum fischeri, P. maximum, P. notatum, P. paludosum, P. repens, P.trypheron, P. walense.* Wild relatives of pulses include *Cajanus cajanifolia, Cajanus albicans, Cajanus scarabaeoides, C. volubilis, Rhynchosis bracteata, Dolichos trilobus, Glycine pentaphylla, G. wightii* and *Vigna dalzelliana.* Wild relatives of oil seed crops include *Sesamum alatum, S. laciniatum* and *S. prostratum.* The wild relatives of vegetables include *Solanum anuivi, S. erianthum, S. giganetum, S. melongena* var. *incanum, S. melongena* var. *insanum, S. nigrum, S. pubescens, S. seaforthianum, S. surattense, S. torvum, S. trilobatum, Trichosanthes cordata, T. cucumeriana, T. lobata, T. tricuspidata, Abelmoschus manihot, A. moschatus, Luffa acutangula* var. *amara, L. cylindrica, L. tuberosa, Cucumis callosus* and *Momordica dioica.* Wild relatives of spices occurring in Andhra Pradesh are *Capsicum frutescens, Piper attenuatum, P. hymenophyllum, P. longum, P. nigrum, Curcuma aromatica, C. decipiens, C. neilgherrensis, Vanilla wightiana, Zingiber capitatum Z. purpureum, Z. roseum, Z. wightianum, Pimpinella bracteata, P. heyneana, P. tirupatiensis* and *P. wallichiana* (Pandravada *et al.*, 2008).

Conservation strategies

The term Protected Areas is commonly used to describe areas of Ecological and Biological importance like Biosphere Reserves, Wildlife Sanctuaries, National Parks, Zoos, Game reserves etc. An area qualifies to be declared as Protected Area when it bears some floral or faunal species of great significance, which needs to be conserved or has an ecological system, which is fragile and needs to be protected. Most countries all over the world have taken elaborate measures to identify areas of Ecological and Biological significance and declare them as protected. It is in such area that most of the rich Biological Diversity of the world exists. Andhr Pradesh, being situated in the tropical region harbours a rich Bio-Diversity. Biosphere Reserves, Wild Life Sanctuaries and Parks are dedicated to the preservation of wild life and to represent ecological units in Andhra Pradesh.

There are twelve Protcted Areas in the State of Andhra Pradesh. These are given below.

Seshachalam Biosphere reserve, designated recently in 2011, is located in Seshachalam hill ranges of Eastern Ghats in Southern Andhra Pradesh. The Seshachalam hill ranges lie between 13^0 38" and 13^0 55" N latitudes and 79^0 07" and 79^0 24" E longitudes and spread over two districts, viz., Chittoor and Kadapa. The total geographical area of Seshachalam Biosphere

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Reserve is 4,755.997km^2. Biogeographically the reserve comes under Malayan Realm, Tropical Dry deciduous forests biome. The reserve is a home for nearly 1756 species of flowering plants belonging to 879 genera and 17 families. Endangered plants of the reserve mainly include *Homalium zeylanicum, Butea monosperma* and *Rhynchosis heynei. Rauvolfia serpentina* and *Litsea glutinosa* are the critically endangered species in the Biosphere reserve area. *Hildegardia populifolia, Sterculia urens, Aegle marmelos, Rubia cordifolia, Gymnema sylvestre, Oroxylum indicum, Euphorbia fusiformis, Phyllanthus indofischerii, Stemona tuberose* and *Gloriosa superba* are considered vulnerable plants. Under Near Threatened plants category species like *Shorea robusta, Celastrus paniculatus, Pueraria tuberosa, Holostemma adakodien* and *Costus speciosus* have been reported in the reserve. The forests of the reserve harbor certain highly endangered wildlife species like Slender Loris, Indian Giant Squirrel, Mouse deer, Golden Gecko etc.

2. **Papikonda National Park** is located in East Godavari and West Godavari districts of Andhra Pradesh and Khammam district of Telangana, with an area of 1,012.86 km2. Wildlife includes mammals like tiger, leopard, sambar and spotted deer, bison, wild water buffaloe. But it appears that wild water buffalo extinct in this region now a days. People of this region used to see wild water buffalo 25 years ago.

3. **Nagarjunsagar-Srisailam Tiger Reserve** is the largest Tiger reserve in India. The reserve spreads over five districts - Kurnool District, Prakasam District and Guntur District in Andhra Pradesh and Nalgonda District and Mahbubnagar district in Telangana. The total area of the tiger reserve is 3,568 km2. The main mammals in the reserve are: Bengal tiger, Indian leopard, sloth Bear, dhol, Indian Pangolin, chital, sambar deer, Chevrotain, blackbuck, chinkara and chowsingha. There are also mugger crocodile, Indian python, king cobra and Indian peafowl.

4. **Kolleru Lake** is one of the largest freshwater lakes in India. Kolleru is located between Krishna and Godavari delta. Kolleru spans into two districts - Krishna and West Godavari. The lake serves as a natural flood-balancing reservoir for these two rivers. The lake is fed directly by water from the seasonal Budameru and Tammileru streams, and is connected to the Krishna and Godavari systems by over 68 in-flowing drains and channels. Many birds migrate here in winter, such as Siberian crane, ibis, and painted storks. The lake was an important habitat for an estimated 20 million resident and migratory birds, including the grey or spot-billed pelican (Pelecanus philippensis). The lake was declared as a wildlife sanctuary in November 1999 under India's Wildlife Protection Act of 1972, and designated a wetland of international importance in November 2002 under the international Ramsar Convention. The wildlife sanctuary covers an area of 308 km2.

5. **Nelapattu Bird Sanctuary** is a bird sanctuary in Nellore district. It has an area of 458.92 hectares. It is an important breeding site for spot-billed pelicans (Pelecanus philippensis). Nelapattu has two major plant communities, Barringtonia swamp forests and southern dry evergreen scrub. Dominant tree and scrub species include Manilkara hexandra, Maba

buxifolia Memicylon edule, Buchanania angustifolia, Zizyphus xylopyrus and others. The Barringtonia swamp forests are found in the 83-hectare Nelapattu tank. The predominant tree species is Barringtonia acutangula. This tree also grows in uplands but the tree species found at Nelapattu can grow in flooded conditions lasting for 5 to 7 months at a stretch. The saplings can survive total submergence during the long duration of flooding.

187 bird species can be found at Nelapattu Bird Sanctuary, 50 of which are migratory. In addition to the spot-billed pelican, it is an important breeding site for white ibis, openbill stork, night heron, and little cormorant. Other migratory water birds that visit the sanctuary include pintail, common teal, dabchick, shoveler, coot, spot-bill duck, grey heron, darter, black-winged stilt, and garganey gadwall.

6. **Pulicat Lake Bird** Sanctuary is a famous 481 km² Protected area in Nellore and Chittoor districts of Andhra Pradesh and in Thiruvallur District of Tamil Nadu state. The sanctuary is most noted for the many greater flamingos seen here.

7. **Coringa Wildlife Sanctuary**, a wildlife sanctuary and estuary situated in Andhra Pradesh, is the second largest surviving stretch of mangrove forests in India with 24 mangrove tree species, and more than 120 bird species. It is home for the critically endangered white-backed vulture, and long billed vulture. The sanctuary is a part of the Godavari estuary and has extensive mangrove and dry deciduous tropical forest.

About half of the area is the backwater, which include a sand pit of 18 km stretch. The rivers Coringa and Gaderu and their deltic branches intersect the region, along with other water channels. This forms about 335.7 square km of marsh vegetation. The Sanctuary in the estuary of river Godavari has rich mangrove vegetation. At present there are thirty five species of plants belonging to twenty four families. The plant species that are commonly found are: Avicennia officinalis, Avicennia marina, Avicennia alba, Excoecaria agallocha, Rhizophora mucronata, Ceriops decandra, Bruguiera gymnorrhiza, Lumnitzera recemosa, Sonneratia apetala, Rhizophora conjugata, Aegiceras corniculatum, Thespesia populneoides and Hibiscus tiliaceus.

The sanctuary possesses a wide variety of birds, because of the feed available in the backwater of the mangrove forest. Particularly, during the low tide some of the areas are exposed (elevated mud flats having small fishes, shrimps, molluscs) attracting avifauna for its feed. Some critically endangered spieces like white-backed vulture, and long billed vulture are present in the sanctuary. The painted stork, Oriental white ibis, ferruginous pochard found in the sanctuary are near threatened spices, and spot-billed pelican is a vulnerable species. Significant populations of waders and mangrove birds are also present. All together, more than 120 species of birds have been reported and among them some of the commonly found birds in the sanctuary are: little egret, cattle egret, pied kingfisher, small blue kingfisher, black-capped kingfisher, pond heron, reef heron, grey heron, night heron, little stint, sandpiper, redshank, red-wattled lapwing, crow pheasant, flamingos, sea gulls, purple heron, brahmini kite, openbill stork, and little cormorant. Apart from the avian fauna the sanctuary has a fair population of golden jackal, sea turtle, fishing cat, estuarine crocodile, and a healthy breeding population of smooth-coated otter. The sanctuary has an 18-km long

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sand spit where olive ridley sea turtles nest from January to March every year.

8. Rollapadu Wildlife Sanctuary is a wildlife sanctuary in the Kurnool district. Known primarily as a habitat of the Great Indian Bustard, the species has suffered a drastic fall in its numbers in the sanctuary in recent years. Covering an area of 6.14 km2, it was established in 1988 to protect the Great Indian Bustard and the Lesser Florican and remains the only habitat in Andhra Pradesh for the Bustard which is a critically endangered species. Rollapadu is primarily a grassland ecosystem with mixed forests and thorny bushes. Cotton, tobacco and sunflower are cultivated in the agricultural lands that border the sanctuary

9. Krishna Wildlife Sanctuary is a wildlife sanctuary and estuary located in the coastal plain of Krishna delta. It is one of the rarest eco-regions of the world owing to the fact that it harbors vast tracts of pristine mangrove forests. It is believed among conservationists as one of the last remaining tracts of thick primary mangrove forests of South India, which is rapidly disappearing due to absence of protective measures. The sanctuary is a part of the mangrove wetland in Andhra Pradesh. The Krishna mangroves are spread across Krishna and Guntur districts of Andhra Pradesh. The estuary of Krishna River passes through the sanctuary, and the mangroves line the estuary. The area has the potential to become world's first reserve for a few of the IUCN identified endangered species including the fishing cat (Prionailurus viverrinus) or better known locally as bavuru pilli. Some of the tree species found in the sanctuary are: Casuarina equisetifolia, Pongamia gladra, Calotropis gigantea, Cassia auriculata, Thespesia populnea, Ipomoea pescaprae, Spinifex littoreus, Pongamia pinnata, Prosopis juliflora, banyan, peepul, margosa, tumma, mango, palmyra.

10. The Kambalakonda Wildlife Sanctuary is a forest located near Visakhapatnam. It is a dry evergreen forest mixed with scrub and meadows and covers an area of 70.70 km2. The indicator species is the Indian Leopard. The sanctuary has a dry evergreen forest mixed with scrub and meadows. The terrain is hilly with steep slopes. The fauna present in the sanctuary is Russell's Viper (Daboia russelii), Indian Cobra (Najanaja), Chameleon, Asian Paradise-flycatcher (Terpsiphone paradisi), Treepie, quails, partridges, Indian Leopard (Panthera pardus fusca), Indian Muntjac (Muntiacus muntjak), Indian Pangolin (Manis crassicaudata), Chital (Axis axis), and Indian Jackal (Canis aureus indicus).

11. Kaundinya Wildlife Sanctuary is a wildlife sanctuary and an elephant reserve situated in Chittoor district. The sanctuary is covered by southern tropical dry deciduous and thorn forests. Some of the important flora consists of Albizia amara, Acacia, Lagerstroemia, Ficus, bamboo and Santalum album. The sanctuary is primarily an elephant reserve and is home to about 78 Indian elephants. The vulnearble yellow-throated bulbul is present in the sanctuary. Some of the animals found in the sanctuary are: sloth bear, panther, cheetal, chowsingha, sambar, porcupine, wildboar, jungle cat, jackal, jungle fowl, starred tortoise and slender loris.

12. Sri Lankamalles wara Wildlife Sanctuary is a wildlife sanctuary in Kadapa district. It is the only habitat in the world which provides home for the Jerdon's courser, a highly endangered

species. In addition to that it is also a home to nearly 176 families of vegetation and living organisms. Jerdon's courser was first discovered in 1848 by the Surgeon-Naturalist Thomas C. Jerdon and was thought to be extinct until it's rediscovery in 1986. The bird now inhabits the sparse scrub regions and forests of the Sri Lanka Malleshwara Sanctuary where the topography and weather conditions are compatible for its existence. The Sanctuary provides home to nearly 1400 plant species and nearly 176 families of vegetation and living organisms. It has dry deciduous mixed thorn forests with deep gorges and steep slopes. Red Sanders, an endemic species can be found here. It's fauna includes the panther, sloth bear, cheetal, sambar, chowsingha, chinkara, nilgai, wild boar, fox and the jerdon's courser.

Plants Endemic to Peninsular India found in the State of Andhra Pradesh (Source: Ahmedulla and Nayar, 1987).

1. Abutilon neelgherrense Munro ex Wight
2. Actinodaphne madraspatana Bedd ex Hook. f.
3. Adenostemma lavenia (L.) Kuntze
4. Aglaia elaeagnoidea (A. Juss.) Benth. var. beddomei (Gamble) K.K.N.Nair
5. Alphonsea maderaspatana Beddome
6. Alysicarpus bupleurifolius (L.) DC. var. hybridus DC.
7. Alysicarpus scariosus (Rottl. ex Spreng.) Graham ex Thwaites var. pilifer (Prain) Pramanik & Thoth.
8. Andrographis beddomei C.B.Clarke
9. Andrographis nallamalayana J.L. Ellis
10. Andrograaphis serpyllifoila (Rottl. ex Vahl) Wight
11. Argyreia arakuensisN.P. Balakr.
12. Argyreia cuneata (Willd.) Ker.Gawl.
13. Argyreia daltonii C.B.Clarke
14. Argyreia kleiniana (Roem. & Schult.) Raizada
15. Argyreia pilosa Arn.
16. Arundinella setosa Trin. var. lanifera Fischer
17. Aspidopterys indica (Roxb.) Hochr.
18. Barleria montana Nees
19. Barleria morrisiana Bor ex Fischer
20. Begonia malabarica Lam.
21. Boswellia ovalifoliolata N.P.Balakr. & Henry
22. Boucerosia indica (Wight & Arn.) Plowes [Syn.: Caralluma indica (Wight & Arn.) N.E.Br.]
23. Brachystelma ciliatum Arekal &T.M. Ramakrishna
24. Brachystelma glabrum Hook.f.
25. Brachystelma nallamalayanum Prasad & Ravi Prasad Rao
26. Brachystelma penchalakonense Rasingamet al.,
27. Brachystelma pullaiahii Raoet al.
28. Brachystelma volubile Hook.f.
29. Bridelia retusa (L.) A.Juss.
30. Bupleurum adhricum M.P.Nayar & R.N. Banerjee
31. Cajanus cajanifolius(Haines) Maesen (Syn.: Atylosia cajanifolia Haines)
32. Caralluma adscendens (Roxb.) R.Br. var. adscendens
33. Caralluma adscendens (Roxb.) R.Br. var. attenuata (Wight) Gravely & Mayuranathan
34. Caralluma adscendens (Roxb.) R.Br. var. fimbriata (Wall.) Gravely & Mayuranathan
35. Caralluma lasiantha N.E.Br.
36. Carissa inermis Vahl
37. Ceropegia candelabrum L. var. candelabrum
38. Ceropegia spiralis Wight
39. Chrysopogon velutinus (Hook. f.) Bor
40. Crotalaria epunctata Dalzell
41. Crotalaria longipes Wight & Arn.,
42. Crotalaria paniculata Willd. var.

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nagarjunakondensis Thoth.
43. Crotalaria pulchra Andrews
44. Crotalaria rigida B. Heyne ex Roth
45. Crotalaria speciosa Heyne ex Roth
46. Crotalaria willdenowiana DC. subsp. willdenowiana
47. Croton scabiosus Bedd.
48. Cycas beddomei Dyer
49. Cyperus clarkei Cooke
50. Decalepis hamiltonii Wight & Arn.
51. Decaschistia cuddapahensis Pal & Nayar
52. Decaschistia rufa Craib.
53. Deccania pubescens (Roth) Tirveng. var. candolleana (Wight & Arn.) Tirveng.
54. Dendrobium ovatum (Willd.) Kranz
55. Desmodiastrum racemosum (Benth.) A.Pramanik & Thoth., var. racemosum. (Syn.: Alysicarpus racemosus Benth.)
56. Dicliptera beddomei C.B.Clarke
57. Dicliptera cuneata Nees
58. Dimorphocalyx kurnoolensis Venkataraju & Pullaiah
59. Diospyros neilgerrensis (Wight) Kosterm.
60. Dolichandrone atrovirens (Heyne ex Roth) Sprague
61. Dyschoriste vagans (Wight) Kuntze
62. Ehretia indica (Dennst. ex Kostel.) M.R. & S.M.Almeida
63. Eriocaulon dianne Fyson var. richardiana Fyson
64. Eriolaena lushingtonii Dunn
65. Euphorbia linearifolia Roth var. nallamalayana J.L.Ellis
66. Euphorbia senguptaeN.P.Balakr. & Subr.
67. Ficus dalhousiae Miq.
68. Griffithella hookeriana Warming,
69. Habenaria panigrahiana Misra
70. Habenaria roxburhgii Nicolson
71. Hemigraphis latebrosa (heyne ex Roth) Nees
72. Indigofera mysorensis Rottl. ex DC.
73. Indigofera trifoliata L. subsp. trifoliata (Syn.:Indigofera barberi Gamble)
74. Indotristicha ramosissima (Wight) van Royen
75. Iseilema venkateswarlui Satyavathi
76. Isonandra villosa Wight
77. Justicia trinervia Vahl
78. Justicia vahlii Roth var. rupicola Pullaiah & al.
79. Kalanchoe cherukondensis Subbarao & Kumari
80. Kingiodendron pinnatum (Roxb. ex DC.) Harms
81. Knoxia wightiana Wall. ex Wight & Arn.
82. Lasianthus verticillatus (Lour.) Merr. (Syn.: L. truncates Bedd.)
83. Lasiococca comberi Haine
84. Lepidagathis mitis Dalzell
85. Leucas diffusa Benth.
86. Leucas mathewiana Sunojk.
87. Leucas mukerjiana Subba Rao & Kumari
88. Leucas nepetifoliaWall. ex Benth.
89. Maerua apetala (Roth) Jacobs
90. Mallotus resinosus (Blanco) Merr.
91. Memecylon lushingtonii Gamble
92. Memecylon madgolense Gamble
93. Memecylon molestum (C.B.Clarke) Cogn.
94. Meyenia hawtayneana (Wall.) Nees
95. Miliusa montana Gardner ex Hook. f. & Thoms.
96. Mucuna pruriens (L.) DC. var.hirsuta (Wight & Arn.) Wilmot-Dear (Syn.: Mucuna hirsuta Wight & Arn.)
97. Neolitsea foliosa (Nees) Gamble var. caesia (Meisner) Gamble
98. Ochna gamblei King ex Brandis
99. Ophiorrhiza chandrasekharanii Subba Rao & Kumari
100. Osbeckia stellata Buch.-Ham. ex Ker.-

Gawl., var. hispidissima (Wight) Hansen
101. Pachystylidium hirsutum (Blume) Pax & Hoffm. (Syn. Tragia gagei Haines)
102. Pamburus missionis (Wight) Swingle
103. Pavetta madrassica Bremek.
104. Peperomia dindigulensis Miq.
105. Phyllanthus indofisheri Bennet
106. Phyllanthus narayanswamii Gamble
107. Pimpinella tirupatiensis N.P.Balakr. & Subr.
108. Piper hymenophyllum Miq.
109. Polyalthia cerasoides (Roxb.) Bedd.
110. Polycarpaea aurea Wight & Arn.
111. Psilotrichum sericeum (König ex Roxb.) Dalzell (Syn.: Psilostachys sericea Hook.f.)
112. Premna lucidula Miq. (Syn.: P. hamiltonii J.L Ellis)
113. Pterocarpus santalinus L.f.
114. Radermachera xylocarpa (Roxb.) K.Schum.
115. Rhynchosia beddomei Baker
116. Rhynchosia heynei Wight & Arn.
117. Rhynchosia ravii Prasad & Narayanaswamy
118. Rostellulari crinita (Nees) Nees
119. Scolopia crenata (Wight & Arn.) Clos
120. Senna montana (Heyne ex Roth) V. Singh
121. Sesbania procumbens (Roxb.) Wight & Arn.,
122. Shorea roxburghii G.Don
123. Shorea tumbaggaia Roxb.
124. Sophora interrupta Bedd.
125. Stenosiphonium cordifolium (Vahl) Alston
126. Stenosiphonium setosum T. Anderson
127. Strobilanthes consanguineus (Nees) T.Anderson var. hypoleuca (Nees) C.B.Clarke
128. Strobilanthes jeyporensis Bedd. [Syn.: Phlebophyllum jeyporensis (Bedd.) Bremek.]
129. Strobilanthes pulneyensis C.B.Clarke [Syn.: Nilgirianthus circarensis (Gamble) Bremek.]
130. Taxillus heyneanus (Schult.) Danser
131. Tephrosia calophylla Bedd.
132. Tephrosia strigosa (Dalzell) Santapau & Maheshw.
133. Terminalia pallida Brandis
134. Terminalia paniculata Roth
135. Toxocarpus longistigma (Roxb.) Wight & Arn. ex Steud. (Syn. Toxocarpus roxburghii Wight & Arn.)
136. Tragia involucrata L. var. angustifolia Hook.f.
137. Tribulus subramanyamii P. Singh
138. Tricholepis radicans (Roxb.) DC.
139. Wendlandia gamblei Cowan

Table 1. Threat Status of Assessed (Red listed) Medicinal Plant Species in Andhra Pradesh

Sl.	Species	IUCN Status	Criteria based on presence in the region	Estd. Proportion of global presence in the region
1	*Acorus calamus*	Endangered	B2 a, b(iii)	<1 %
2	*Aegle marmelos*	Vulnerable	A2 c,d	2 - 5%
3	*Amorphophallus sylvaticus*	Vulnerable	A2 c	5 - 10%
4	*Angiopteris evecta*	Endangered	B1a,b (iii,v) & B2 a,b (iii,v)	1 - 2 %
5	*Anodendron paniculatum*	Endangered	B2 a,b (iii, v)	0.5 - 1%
6	*Boswellia ovalifoliolata*	Endangered (Globally)	B1 & B2 a,b(iii, v)	100%

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Sl.	Species	IUCN Status	Criteria based on presence in the region	Estd. Proportion of global presence in the region
7	*Celastrus paniculatus*	Near Threatened		2 - 3%
8	*Chlorophytum arundinaceum*	Least Concerned		< 1%
9	*Plectranthus barbatus*	Endangered	B2 a,b (iii)	< 1%
10	*Costus speciosus*	Near Threatened	A2 c,d	2 - 5%
11	*Cycas beddomei*	Critically Endangered (Globally)	B1 a,b (ii,iii,iv,v)	100%
12	*Decalepis hamiltonii*	Endangered (Globally)	A2 c,d	40 - 50%
13	*Embelia ribes*	Critically Endangered	B1&2 a,b(iii), D	<1%
14	*Entada pursaetha*	Endangered	B2 a,b (ii, iii)	< 1%
15	*Euphorbia fusiformis*	Vulnerable	A2 c,d	2 - 5%
16	*Gloriosa superba*	Vulnerable	A2 d	0.5 - 1%
17	*Gymnema sylvestre*	Vulnerable	A2 c,d	2 - 5%
18	*Hildegardia populifolia*	Vulnerable (Globally)	A2 c,d	80 - 90%
19	*Holostemma ada-kodien*	Near Threatened		2 - 3%
20	*Lasia spinosa*	Endangered	B1&B2 a,b(iii, iv,v)	<1%
21	*Litsea glutinosa*	Critically Endangered	A2 c,d	0.5 - 1%
22	*Merremia turpethum*	Least Concerned		2 - 5%
23	*Mesua ferrea*	Not Evaluated		<1%
24	*Nervilia aragoana*	Endangered	A2 c / B2 a, b (ii, iii, iv)	<1%
25	*Oroxylum indicum*	Vulnerable	A2 c,d	3 - 5%
26	*Paederia foetida*	Near Threatened		<1%
27	*Phyllanthus indofischeri*	Vulnerable (Globally)	A2 c	25 - 30%
28	*Pimpinella tirupatiensis*	Endangered (Globally)	B1&2 a,b (ii,iii)	100%
29	*Piper nigrum*	Endangered	B2 a,b(ii)	<1%
30	*Plumbago indica*	Endangered	B2 a,b (iii)	<1%
31	*Pterocarpus santalinus*	Endangered (Globally)	A4 c,d	> 90%
32	*Pueraria tuberosa*	Near Threatened		5-10%
33	*Rauvolfia serpentina*	Critically Endangered	A2 c,d	2 - 5%
34	*Rhaphidophora decursiva*	Endangered	B1 & B2 a,b(iii)	<1%

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Sl.	Species	IUCN Status	Criteria based on presence in the region	Estd. Proportion of global presence in the region
35	*Rubia cordifolia*	Vulnerable	A2 c	< 2%
36	*Santalum album*	Endangered	A2 c,d	2 - 5%
37	*Saraca asoca*	Endangered	B2 a,b(iii)	<2%
38	*Shorea robusta*	Near Threatened		< 2%
39	*Shorea tumbaggaia*	Endangered	B1 & B2 a,b(ii)	95%
40	*Stemona tuberosa*	Vulnerable	A2 c	<1%
41	*Kavalama urens (Syn.:Sterculia urens)*	Vulnerable	A2 c,d	3 - 5%
42	*Strychnos colubrina*	Endangered	B1 & B2 a,b(ii, iii)	2 - 5%
43	*Syzygium alternifolium*	Endangered (Globally)	A2 c	95%
44	*Tacca leontopetaloides*	Near Threatened		<1%
45	*Terminalia pallida*	Endangered (Globally)	A2 c & B2 a,b(ii, iii, iv)	90%
46	*Trichosanthes cucumerina*	Near Threatened		2 - 3%
47	*Urginea nagarjunae*	Endangered (Globally)	B1a,b(ii, iii) B2 a,b(ii, iii) / C1	40 - 50%
48	*Zanthoxylum rhetsa*	Endangered	B1 & B2 a,b(ii, iii) / C1	< 1%
49	*Zingiber roseum*	Endangered	B2 a,b(ii, iii)	10 - 20%

(Source K.N.Reddy and C.S.Reddy, 2008)

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d n	Estd. Proportion of global presence in the region
	< 2%
	2 - 5%
	<2%
	< 2%
)	95%
	<1%
	3 - 5%
ii)	2 - 5%
	95%
	<1%
i,	90%
	2 - 3%
2	40 - 50%
	< 1%
	10 - 20%

and C.S.Reddy, 2008)

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