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ASSESSMENT OF ECOLOGICAL STATUS OF ECONOMICALLY IMPORTANT PLANTS IN UDHAYAGIRI HILLS, NAGARCOIL

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ABSTRACT

The present ecological investigation was carried out in the understorey of tropical moist deciduous forest of Udhayagiri fort hills, Kanyakumari, Tamil Nadu. A total number of 171 species were documented in the understory of the study area and among them 163 species were recognized as economically important. The secured value of ecological attribute, importance value index (IVI) indicates that the species like *Tephrosia purpurea, Clerodendron infortunatum Acalypa indica*, *Aerva lanata*, *Asystasia gangetica*, *Belpharis maderaptensis*, *Cleome viscosa, Dodonia viscose, Glycosmis pentaphylla, Leucas aspera*, *Limnophila indica, Martynia annua, Oldenlandia* umbellate, *Pavetta indica*, *Phyllanthus amarus* and *Rhynchosia minima* are well established in the study area. On the other hand, 55 plant species are considered to be ecologically weaker in the community. Hence priorities must be given to these species for natural regeneration and hence their conservation as well.

Keywords: Ecological status, Udhayagiri hills**,** Importance value index**.**

1. INTRODUCTION

Western Ghats is among the ecologically richest of India, next to the Himalaya in the diversity of its biological species (Gadgil, 1984). It encompasses many types of ecosystems such as tropical wet evergreen forests, dry deciduous forests, moist deciduous forests, thorny scrub jungles and the fragile montane shoals with associated grasslands (Champion and Seth, 1968). Among the different types of vegetations in the Western Ghats, The present study area, Udhayagiri Hills is dominated by the tropical moist deciduous forests. A large number of herbs, shrubs and climbers is commonly occupying in the under storey of the study area. Udhayagiri Hills under semi - arid climatic condition in many parts hold more number of economically and medicinally important plants due to the presence of diverse secondary metabolites. However, works on phytosociological analysis in the understory of this region have been limited. Hence, the present ecological investigation was carried out to enlist economically important plants and to assess their ecological position through phytosociological analysis in the understory of the study area.

2. MATERIALS AND METHODS

2.1. Study area

The present study area, Udhayagiri fort hills is situated in the Kanyakumari district of Tamil Nadu and lies at a distance of 14 km from the town of Nagercoil. The Udhayagiri covers a huge area of 22.50 hectares which is surrounded by isolated hills. The elevation of the study area is 97m above msl. The geographical location of Udhayagiri fort hills lies between 8° -14' 38.4 N attitude and 77°- 19' 55.2 E longitude.

2.2. Experimental methods

Phytosociological analysis was carried out during the rainy month of September, 2013 in the understory of the study forest, Udhayagiri hills. At the time of sampling, 50 random quadrats each with the size of $1m^2$ were laid to encount the species and their individuals. The quantitative characters such as frequency, density, abundance, relative frequency, relative density, relative dominance and importance value index were calculated according to the following formulae proposed by Cottam and Curtis (1956):

$$\text{Frequency (\%)} = \frac{\text{Number of quadrats in which the species present}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Density} = \frac{\text{Total number of individuals of the species in all quadrats}}{\text{Total number of quadrats studied}}$$

$$\text{Abundance} = \frac{\text{Total number of individuals of the species in all quadrats}}{\text{Number of quadrats of occurrence of the species}}$$

Since most of the stems are cylindrical, the basal area was calculated by using the formula:

$$\text{Basal area} = \pi r^2$$

Where, π = 3.14 and 'r' is the radius of the stem at the point of emergence.

Relative frequency, relative density, and relative dominance were calculated from the following formulae:

$$\text{Relative frequency (\%)} = \frac{\text{Number of occurence of the species}}{\text{Number of occurence of all species}} \text{ X } 100$$

$$\text{Relative density (\%)} = \frac{\text{Number of individuals of the species}}{\text{Number of individuals of all species}} \text{ X } 100$$

$$\text{Relative dominance (\%)} = \frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \text{ X } 100$$

Importance value Index (IVI) is the sum of quantities of relative frequency, relative density and relative dominance expressed per 300.

3. RESULTS AND DISCUSSION

A total number of 171 species were documented in the understory of the study area and among them 163 were recognized as economically important (Table 1). This may be explained that the study area has favourable microclimate for better growth and development of more number of species and also potential habitat for the plants of economic importance. Puri *et at* (1989) stated that the continuous availability of moisture in the soils of shoals in Western Ghats enables the appearance of more number species. Despite the presence of suitable microclimate, the constituent species in the understory of shoals in Western Ghats showed wide variation in distribution level, population size and basal area between them (Padmavathy, 2005).

In the present study, the ecological position for highly and poorly established plants alone is highlighted in terms of expressing their frequency, density, basal area and importance value index (Table 2). The dicot species such as *Acalypa indica*, *Asystasia gangetica*, *Cleome viscose, Leucas aspera*, *Phyllanthus amarus* and *Sida cardata* showed maximum frequency value of 100% in the community and certain other herbaceous species viz., *Aerva lanata*, *Belpharis maderaptensis*, *Mollugo pentaphylla*, *Oldenlandia umbellate*, *Stylosantus hamate* and *Tephrosia purpurea* also showed higher distribution (around 85% frequency value) during rainy month of September. The higher seed output and greater reproductive potential exist in these species may be the possible reasons for this fact (Usher, 1991).

Many species in the understory of the study area like *Amaranthus spinnosus, Amaranthus virigidis*, *Barleria buxifolia*, *Biophytum sensitivum, Croton zeylanicus*, *Crotalaria pallida*, *Curculigo orchioides*, *Plumbago zeylanica* and *Rauvolfia serpentina* have exhibited poor distribution. The external factors like topography, soil conditions and the biotic disturbance and some intrinsic factors like dispersal mechanism, longevity of seeds, duration of dormancy and germination efficiency are some of the environmental variables generally determine the degree of distribution of any plant species (Belsky, 1988).

The plant species such as *Tephrosia purpurea, Acalypa indica*, *Aerva lanata*, *Asystasia gangetica*, *Belpharis maderaptensis*, *Cleome viscosa, Clerodendron infortunatum, Leucas aspera*, *Phyllanthus amarus*, *Sida cardata*, *Mollugo pentaphylla* and *Oldenlandia umbellata* were present in the study area with higher densities. This may be due to the presence of continuous wetness, a favourable factor for the better growth of these species in the soil of moist deciduous forest (Saxena, 1991). On the other hand, many species like *Rauvolfia serpentina, Cardiospermum halicacabum* and *Borreria articularis, Andrographis paniculata*, *Boerhavia diffusa, Blainviella acmella*, *Cleome rutidesperma*, *Cleome rutidesperma, Croton zeylanicus*, *Desmodium illinoensis*, *Rungia repens*, *Sida cordifolia, Barleria cuspidata*, *Aerva lanata*, *Amaranthus virgatus*, *Clitoria ternate*, *Corchorus aestuans* and *Croton bonplandiam*, *Belpharis maderaptensis, Gymnema sylvestre, Heydyotis peterita*, *Ocimum americanum, Ludwigia octovalvis* etc., have always present with low densities in the study area. The poor reproductive potential with less seed output and weaker competitive ability may lead the species with low density in the communities (Chandrasakaran and Swamy, 1995).

The basal cover of certain plant species such as *Tephrosia purpurea, Clerodendron infortunatum*, *Acalypa indica* and *Pavetta indica* was greater in the understory of studied forest. Among them, due to shrubby habit two species namely *Clerodendron infortunatum* and *Pavetta indica* were occupied higher basal cover in comparison to other constituent species. This feature may lead to the occupation of higher basal cover in the communities. The lower basal cover attained by many species such as *Aerva javanica, Alternanthera sessilis*, *Asparagus racemosus*, *Centella asiatica*, *Clitoria ternate*, *Desmodium adscendens*, *D. triflorum*, *Evolvulus alsinoides*, E. *nummularis*, *Indigofera hirsuta, I. glandulosa, Justicia gluca,* and *Oldenlandia corymbosa* might be due to their poor ecological characters like lower density and less basal area per individual.

Table 1. The constituent species in the study area, Udhayagiri hills with their ecological status and economic importance.

S. No.	Species	Ecological status	Parts used	Medicinal/Other economic importance	Mode of administration
1	*Abrus pulchellus*	Common	Leaves	Cure fever, cough, cold	Juice
2	*Abulition indicum* (L.). Sw	Common	Root	Piles	Extract
3	*Acalypha indica* L.	Common	Leaves	Headache, wounds, itching	Juice, paste
4	*Acanthospermum hispidum* DC.	Common	Root	Jaundice	Decoction
5	*Achyranthus aspera* Linn.	Common	spike	Poisonous insect bites.	Paste
6	*Aerva javanica*	Common	Whole plant	Swelling	Decoction
7	*Aerva lanata* (L.) Juss.ex.Shut.	Common	Root	Piles	Paste
8	*Alternanthera pungens* Kunth.	Common	Whole plant	Gonorrhea	Decoction
9	*Alternanthera tenella*	Common	Inflorescences	Earache	Ash
10	*Amaranthus spinosus* L.	Common	Whole plant	Thorns	Paste
11	*Amaranthus viridis* Linn.	Common	Leaves, root	Scorpion sting, diuretic, laxative, retention of urine, treat gonorrhea	Decoction, paste
12	*Andrographis echioides* (Burm.f.) Nees	Common	Leaf	Head ache	Paste
13	*Andrographis paniculata* (Burn.F) Wall.ex.Nees.	Common	Root, leaves	Fever, liver complaints and jaundice	Decoction, paste
14	*Asparagus racemosus* Willd.(L.)	Common	Root tubers	Kidney stone, week end immunity	Powder, paste
15	*Asystasia gangetica*. (L.) T. Anderson in Thwaittes.	Common	Whole plant	Rheumatism	Juice
16	*Barleria buxifolia* (L.)	Common	Leaves	Viral fever, urinary affection, stomach disorders	Juice
17	*Barleria cuspidate*	Common	Leaves, flower	Viral fever	Decoction
18	*Barleria lupulina*	Rare, endemic	Leaves	Urinary tract infection	Juice
19	*Belpharis maderaptensis* (L.) B. Heyne. Ex. Roth. Nov.	Common	Leaves	Bone fracture	Paste
20	*Biophytum sensitivum*	Common	Leaves, roots	Bite poisoning, wound	Paste
21	*Blainviella acmella*	Common	Leaves	Alcohol deaddiction	Juice
22	*Boerhavia diffusa* L.	Common	Root	Asthma, sugar in urine	Decoction, juice
23	*Borreria latifolia*	Common	Leaves, stem	Body pain	Crushed
24	*Bryophyllum pinnatum* (lam) oken. Alleg	Common	Leaves	Dysentery cuts and wounds, head ache.	Juice, paste
25	*Cardiospermum halicacabum* L.	Common	Leaves	Cough piles, arthritis, joint pains, skin diseases	Decoction
27	*Celosia argentea* L.	Common	Whole plant	Urinary stones	Decoction

28	*Centella asiatica* (Linn) Urban.	Common	Whole plant	Typhoid	Juice
29	*Cheilocostus specious*	Endangered	Root	Head ache, diarrhea, stop vomiting	Powder
30	*Chromolaena oderata* (L.) King & Robi	Common	Whole plant	Wounds and rashes	Paste
31	*Cleome aspera*	Endemic	-	-	-
32	*Cleome gynandra* L.	Common	Leaf	Wounds, fever	Paste, decoction
33	*Cleome monophylla*	Endemic	Leaves, root	Vomit	Powder
34	*Cleome rutidesperma*	Common	Whole plant	To relief general sickness and uneasiness of the body	Infusion
35	*Cleome viscosa* L.	Common	Leaves	Earache, wound	Juice, paste
36	*Clerodendram infortunatum* auct. Non L.	Common	Leaves	Tumors, hair growth, wounds and fungal infection.	Paste
37	*Clitoria ternata* L.	Common	Whole plant	Snake bite, cause abortion	Extract
38	*Commelina benghalensis* Linn.	Common	Whole plant	Leprosy, jaundice	Paste, juice
39	*Corchorus aestuans* L.Syst. Nat	Common	Leaves	Head ache	Poultice
40	*Corchorus olitorius* L.	Vulnerable	Seed	Stomach ache	Powder
41	*Crotalaria mysorensis* Roth.	Common	Leaf, fruit	Stomach ache and stomach ulcer	Paste
42	*Crotalaria pallid*	Common	Seed, leaf, whole plant	Skin diseases, ring worm, itches, stomach pain	Paste, decoction
43	*Crotalaria verrucosa* L.	Common	Leaves	Skin allergies	Extract
44	*Croton bonplandiam* Bail.	Rare, endemic	Latex	Bleeding and venereal sores, headache	Juice
45	*Croton hirtus*	Common	-	-	-
46	*Croton zeylanicus*	Common	Bark	Stomachache	Juice
47	*Cuphea hyrsopifolia*	Common	Leaves	Cold	Infusion
48	*Curculigo orchioides* Gaertn.	Common	Root	Ulcer, treat asthma, piles, jaundice, diarrhea, and gonorrhea	Juice
49	*Cyanotis axilaris*	Common	Whole plant	Rheumatism, joint pain	Decoction
50	*Cyanotis tuberose*	Common	Tubers	Relief cough	Eaten
51	*Cynodon doctylon* (L.) Pers Panicum Dactylon Linn.	Common	Whole plant	Diuretic	Extract
52	*Cyperus rotundus* L.	Common	Tuber	Stomach ache	Paste
53	*Cyrtococcum patens*	Common	-	-	-
54	*Datura metal* L.	Common	Leaves	Asthma, chronic ulcer	Juice
55	*Desmodium adscendens*	Common	Leaves	Wounds, venereal sores	Powder
56	*Desmodium illinoensis*	Common	Leaves	Itches	Boiled
57	*Desmodium triflorum* (Linn.) Dc.	Common	Leaves, root	Diarrhea, cough, asthma	Paste, juice
58	*Dodonaea viscosa* (L.) Jacq	Common	Leaves	Tooth ache	Juice

59	*Ecbolium viride* acut. Non (Frossk) Alston.	Common	Leaves, root	Jaundice, rheumatism	Decoction
60	*Echinochloa colona* (L.) Link.	Common	-	-	-
61	*Eclipta prostrate* L.	Common	Leaves	Jaundice	Decoction
62	*Emilia sonchifolia*	Common	Root	Diarrhea	Juice
63	*Euphorbia hirta* Linn.	Common	Leaves	Blood in urine, pita aggravation	Paste
64	*Euphorbia serpens* Kunth	Common	-	-	-
65	*Euphorbia thymifolia*	Common	Whole plant	Gastric problem	Extract
66	*Evolvulus alsinoides* L.	Common	Whole plant	Leucoderma, hair growth	Paste
67	*Evolvulus nummularis* (L.) L.	Common	Whole plant	Edema of legs	Tied
68	*Glycosmis pentaphylla* (Retz.) DC	Endangered	Leaf	Jaundice	Powder
69	*Gomphrena serrata*	Common	Flowers	Baby gripe cough, diabetes and cooling	Boiled
70	*Gymnema sylvestre* (Retz.) R. Br.ex.schutt.	Common	Root, leaf	Poison bites, diabetes	Powder
71	*Hedyotis diffusa*	Common	Whole plant	Cold	Juice
72	*Hedyotis pterita*	Common	Root	Ulcer	Juice
73	*Heliotropium indicum* L.	Vulnerable	Leaves	Snake bite, scorpion bite	Juice
74	*Hemidesmus indicus* (L) R. Br. In Aiton	Common	Root	Leucoderma, abdominal tumors, eruptions of tongue of children	Paste, decoction, powder
75	*Hibiscus micranthus* L.F.	Common	Root	Head ache	Paste
76	*Hibiscus surattensis* L.	Common	Leaves, stem	Venereal sores, arthritis	Infusion
77	*Hibiscus* vitifolius	Common	Whole plant	Breast to cure mastitis (maruti ubale)	Paste
78	*Hybanthus enneaspermus* L.	Common	Root	Body pain	Paste
79	*Hygrophila auriculata*	Common	Root	Edema patients	Powdered
80	*Hyptis suaveolens* (L.) Poit. Ann.	Common	Root, leaf	Malaria fever, bleeding from nose cuts and wounds	Decoction. Powder, juice
81	*Imperata cylindrica* L.	Rare, endemic	Root	Fever	Infusion
82	*Indigofera asplanthoides* Vahl ex DC.	Common	Whole plant	Skin diseases	Ash
83	*Indigofera glandulosa* Wendl	Common	Fruit	Stomach ache	Powder
84	*Indigofera hirsute* L.	Common	Whole plant	Asthma, whooping cough	Juice
85	*Indigofera uniflora* Buch. Ham.ex Roxb.	Common	Leaf	Skin diseases	Paste
86	*Ipomoea carnea* Jaqc	Common	Leaves	Hardened pimples	Crushed
87	*Ipomoea obscura* (L.) Ker Gawler	Common	Leaf	Snake bite	Juice
88	*Justicia adhatoda*	Common	Root	Asthma and fever	Extract

89	*Justicia gluca* Rott	Common	Leaves	Back ache	Juice
90	*Justicia simplex* D. Don.	Common	Leaves	Strengthening of bones	Extract
91	*Justicia tranquebariensis* L.f.	Common	Leaves	Jaundice. Skin aliments	Juice, paste
92	*Kyllinga odorata*	Common	Root, leaf	Diarrhea	Poultice
93	*Lagascea mollis* Cav	Common	Whole plant	Chest and throat to cure cold	Paste
94	*Lantana camera* Linn.	Common	Leaves	Measles and chicken pox, malarial fever, ring	Decoction, paste
95	*Leucas aspera* (Wild). Link, Enum.	Common	Leaf, flower	Itch scabies, blockage of nose, head ache	Paste
96	*Leucas grandis*	Common	Flower	Alleviate fever	Paste
97	*Linderina crustacea*	Common	Leaves	Ring worm	Paste
98	*Lindernia ciliate*	Common	Leaves, whole plant	Ring worm, clear stomach	Paste, juice
99	*Ludwigia octovalvis* (Jacq.) Raven.	Common	Whole plant	Fungal infection of toes	Paste
100	*Ludwigia peruviana*	Common	Leaves	Urine problem of children	Decoction
101	*Malvastrum coromandelianum* (L.) Garcke	Common	Leaves	Wounds and dysentery	Decoction
102	*Martynia annua*	Common	Root, leaves	Snake bite, epilepsy, tuberculosis	Decoction, juice
103	*Melhania hamiltoiana*	Common	Leaves	Dysentery, wounds	Decoction
104	*Melochia corchorifolia* L.	Common	Leaves	Stomach disorders	Decoction
105	*Merremia tridentate* (L.) Hallier	Common	Leaf, root	Growth of the hair, diabetes	Paste, decoction
106	*Microstachys chamaelea*	Common	Whole plant	Head ache	Paste
107	*Mimosa pudica* L.	Common	Root	Whylous urine, veterinary	Decoction, paste
108	*Mollugo pentaphylla* L.	Common	Leaf	Cooling purpose, urinary troubles	Boil, juice
109	*Naregamia alata* Wight & Arn	Common	Whole plant, root	Itch and contagious skin diseases and dysentery	Extract, decoction
110	*Ocimum americanum* L.	Rare, endemic	Leaf	Cuts and wounds	Juice
111	*Ocimum basilicum* L.	Common	Leaf	Acne vulgarism, pimples, earache, nasal congestion	Juice
112	*Ocimum gratissimum* L.	Endemic	Leaves	Cough, fever, nasal catarrh	Infusion
113	*Ocimum tenuiflorum*	Common	Whole plant, leaf	Leucoderma, common fever, cold and cough	Paste, decoction, juice
114	*Oldenlandia corymbosa* L.	Common	Whole plant	Liver trouble, urinary disorder in children, jaundice, fever and bilious infection.	Juice
115	*Oldenlandia umbellate* L.	Common	Leaf, root	Asthma, bronchitis	Extract, paste
116	*Orthosiphon thymiflorus* (Roth) Sleesen, Reinwandtia	Common	Leaves	Skin eruption	Juice
117	*Osbeckia aspera*	Common	-	-	-
118	*Pavetta indica* L.	Common	Root, leaves	Urinary diseases, ulcerated nose	Decoction

119	*Pedalium murex* L.	Common	Leaves	Gonorrhea	Juice
120	*Pergularia daemia* Forssk.	Common	Leaf	Head ache and asthma	Paste
121	*Peristrophe paniculate* (Forsk). Burm.	Common	Fruit	Eye problem	Juice
122	*Persicaria hydropiper* L.	Common	Leaves	Cold and cough	Infusion
123	*Phryma laptostachya*	Common	Root	Skin diseases	Paste, infusion
124	*Phyla nodiflora* (L.)Greene.	Endemic	Leaves	Leucorrhoea, dandruff	Powder, paste
125	*Phyllanthus amarus* Schumach & Thonn.	Common	Whole plant, root	Skin diseases, body heat, fever, jaundice	Paste
126	*Phyllanthus debilis* Klein ex willed.	Common	Leaves	Sickle cell anemia	Juice
127	*Phyllanthus maderrasptensis* L.	Common	Fruits	Teeth diseases	Powder
128	*Phyllanthus myrtifolius*	Common	Root	Jaundice	Paste
129	*Phyllanthus virgatus* G.Forest.FI.	Common	Leaves	Eye diseases	Juice
130	*Physalis minima* L.	Common	Leaf	Stomach to cure boils	Juice
131	*Plumbago zeylanica* Linn.	Common	Roots	Fever, skin diseases, diuretic, rheumatism and dyspepsia.	Powder
132	*Polycarpaea corymbosa* (L.) Lam.	Common	Leaf	Jaundice	Paste
133	*polygala chinensis*	Common	Leaves	Stopping mother feeding	Paste
134	*Portulaca quadrifida*	Common	Leaves	Swellings erysipelas, burns, scalds	Paste
135	*Psuedarthria viscida* (L) Wight & Arn.	Common	Root	Asthma, fever, diarrhea, worms, piles	Juice
136	*Rauvolfia serpentine* (Linn.)Benth.ex Kurz	Endangered	Root, rhizome, leaves	Dysentery	Decoction, powdered
137	*Rhinacanthus nasutus* (L.) Kurz. J.Asiat	Endemic	Leaf, root	Snake and skin diseases.	paste
138	*Rhynchosia minima* (L.) DC.	Common	Whole plant	Delivery for body care	Juice
139	*Rulliea prostrate*	Common	Whole plant	Diabetes	Infusion
140	*Rulliea tuberosa* L.	Common	Leaves	Asthma, sinking of ribs	Juice
141	*Rungia repens* (L.) Nees.	Endemic	Whole plant	Bronchitis, fever	Decoction
142	*Scoparia dulcis* Linn.	Common	Seed, leaf	Kidney stone, common fever, throat sore	Powder and decoction
26	*Senna absus*	Endemic	Leaves, seeds	Cough, ringworm, skin diseases	Juice and paste
143	*Senna occidentalis*	Common	Seed, leaf, root	Skin disease, head bone fractures	Paste
144	*Senna uniflora*	Common	Leaves	Wounds, cure eczema	Poultice
145	*Sida acuta* Burm F.FI.	Common	Leaves	Wounds	Paste
146	*Sida cordata* (Burm.f.) Borss.Waalk.	Common	Roots	Nervous, urinary diseases	Infusion

147	*Sida cordifolia* L.	Common	Root	Refrigerant	Paste
148	*Solanum melongena*	Common	Seeds, leaves	Cold, cough, phlegm accumulation, gum infection, tooth ache.	Powder
149	*Solanum torvum* Swartz	Common	Fruit	Anemia, chest congestion cough, cold.	Paste
150	*Solanum virginianum*	Common	Fruits, whole plant	Cough, asthma, tooth ache, chest pain	Decoction, juice
151	*Spermacoce articularis*	Common	Whole plant	Head ache	Decoction
152	*Spermacoce hispida*	Common	Root	Urinary infection, headache, internal heat	Decoction
153	*Spermacoce ocymoides* Burm.F	Common	Leaves	Diarrhea and dysentery	Infusion
154	*Spermacoce pusilla*	Common	Roots	Urinary infection, headache, internal heat	Decoction
155	*Stashytropheta jamaicensis* (L.) Vahl.Enum.	Common	Whole plant	Stomach pains	Decoction
156	*Stylosanthus fruticosa*	Common	Whole plant	Febrifuge	Infusion
157	*Stylosantus hamata*	Common	Whole plant	Diarrhea and cold	Juice
158	*Synederella nodiflora* (L). Gaertn.Fruct.Sem.	Common	Leaves	Itch scabies	Juice
159	*Tephrosia purpurea* (L.) Pers.	Common	Root, flower	Dyspepsia, eye inflammation	Decoction, juice
160	*Trianthema portulacastrum* Linn	Common	Leaf	Urinary troubles	Juice
161	*Tribulus terrestris* Linn	Common	Fruit, whole plants	Urinary problem, kidney stones, stomach ache	Powder, extract
162	*Trichodesmum indicum* (L.) R.Br	Common	Leaf, root	Scabies, swelling of joints	Paste, powder
163	*Tridax procumbens* L.	Common	Leaves	Head ache, cuts, wounds	Juice, paste
164	*Triumfetta rhomboidea* Jacq. Enum. Sy st.	Common	Roots	Bone fracture	Paste
165	*Urena lobata* Linn.	Common	Root	Body edema	Paste
166	*Urena sinuate*	Common	Root	Urinary disease	Decoction
167	*Vernonia cineriea* (L.) Less.Linnaea.	Common	Whole plant	Wounds	Paste
168	*Vigna triblobata* (L.)Verde.	Rare	Root	Till the person vomits in snake bite	Powder
169	*Waltheria indicum* L.	Vulnerable	Roots, leaves	Washing wounds	Decoction
170	*Xanthium stumarium*	Common	Leaves	Infection fingers	Paste
171	*Zorina diphylla* (L.) Pers.	Common	Whole plant	Breast to cure mastitis (maruti ubale)	Paste

*Ahmedullah, M. and Nayar, M.P. (1987); Nayar, M.P. and Sastry, A. R. K. (1987- 1990); Maheshwari, J.K. (2000);

* Anonymous (1940-1976); Singh S. K. (2004); Viswanathan, M.B. (2004).

Table 2. Number of individuals in 50 quadrats (1 x 1m each) and quantitative characters such as frequency, density, abundance, basal area, relative frequency, relative density, relative dominance and IVI of constituent species in the study forest during the rainy month of September 2013.

S. No	Species	2013 SEP	Frequency %	Density (indi./m2)	Abundance	Basel area (sq.mm/50quad.)	Relative frequency (%)	Relative density (%)	Relative dominance (%)	IVI
1	*Abrus pulchellus*	42(29)	58	0.84	1.45	2.41	0.86	0.96	0.16	1.98
2	*Abulition indicum*	32(25)	50	0.64	1.28	8.61	0.74	0.73	0.57	2.04
3	*Acalypa indica*	61(50)	100	1.22	1.22	42.84	1.49	1.39	2.81	5.69
4	*Acanthospermum hispidum*	29(15)	30	0.58	1.93	3.74	0.45	0.66	0.25	1.35
5	*Achyranthus aspera*	40(29)	58	0.8	1.38	4.08	0.86	0.91	0.27	2.04
6	*Aerva javanica*	19(10)	20	0.38	1.90	0.27	0.30	0.43	0.02	0.75
7	*Aerva lanata*	70(49)	98	1.4	1.43	4.01	1.46	1.60	0.26	3.32
8	*Alternanthera pungens*	20(15)	30	0.4	1.33	2.58	0.45	0.46	0.17	1.07
9	*Alternanthera tenella*	17(15)	30	0.34	1.13	0.68	0.45	0.39	0.04	0.88
10	*Amaranthus spinnosus*	15(10)	20	0.3	1.50	4.04	0.30	0.34	0.26	0.90
11	*Amaranthus virigidis*	16(12)	24	0.32	1.33	3.08	0.36	0.36	0.20	0.92
12	*Andrographis echoides*	20(15)	30	0.4	1.33	3.85	0.45	0.46	0.25	1.16
13	*Andrographis paniculata*	12(9)	18	0.24	1.33	6.19	0.27	0.27	0.41	0.95
14	*Asparagus racemosus*	14(10)	20	0.28	1.40	0.09	0.30	0.32	0.01	0.62
15	*Asystasia gangetica*	62(50)	100	1.24	1.24	2.47	1.49	1.41	0.16	3.06
16	*Barleria cuspidata*	19(13)	22	0.32	1.45	14.68	0.33	0.36	0.96	1.66
17	*Barleria buxifolia*	16(11)	26	0.38	1.46	14.64	0.39	0.43	0.96	1.78
18	*Barleria lupulina*	26(19)	38	0.52	1.37	18.26	0.57	0.59	1.20	2.36
19	*Belpharis maderaptensis*	69(49)	98	1.38	1.41	5.38	1.46	1.57	0.35	3.39
20	*Biophytum sensitivum*	9(7)	14	0.18	1.29	2.06	0.21	0.21	0.14	0.55
21	*Blainviella acmella*	15(11)	22	0.3	1.36	7.74	0.33	0.34	0.51	1.18
22	*Boerhavia diffusa*	18(13)	26	0.36	1.38	1.83	0.39	0.41	0.12	0.92
23	*Borreria latifolia*	20(17)	34	0.4	1.18	8.15	0.51	0.46	0.54	1.50

24	*Bryophyllum pinnatum*	20(16)	32	0.4	1.25	16.85	0.48	0.46	1.11	2.04
25	*Cardiospermum halicabum*	15(10)	20	0.3	1.50	3.44	0.30	0.34	0.23	0.87
26	*Cassia absus*	27(25)	50	0.54	1.08	2.11	0.74	0.62	0.14	1.50
27	*Celosia argentea*	18(15)	30	0.36	1.20	5.62	0.45	0.41	0.37	1.23
28	*Centella asiatica*	15(13)	26	0.3	1.15	0.10	0.39	0.34	0.01	0.74
29	*Cheilocostus speciosus*	16(13)	26	0.32	1.23	14.68	0.39	0.36	0.96	1.72
30	*Chromolaena oderata*	14(12)	24	0.28	1.17	8.05	0.36	0.32	0.53	1.20
31	*Cleome aspera*	20(11)	22	0.4	1.82	4.59	0.33	0.46	0.30	1.08
32	*Cleome gynandra*	25(15)	30	0.5	1.67	14.37	0.45	0.57	0.94	1.96
33	*Cleome monophylla*	19(12)	24	0.38	1.58	5.93	0.36	0.43	0.39	1.18
34	*Cleome rutidesperma*	18(13)	26	0.36	1.38	6.45	0.39	0.41	0.42	1.22
35	*Cleome viscose*	65(50)	100	1.3	1.30	37.36	1.49	1.48	2.45	5.42
36	*Clerodendran infortunatum*	72(48)	96	1.44	1.50	60.65	1.43	1.64	3.98	7.05
37	*Clitoria ternate*	13(11)	22	0.26	1.18	0.19	0.33	0.30	0.01	0.64
38	*Commelina benghalensis*	15(10)	20	0.3	1.50	1.93	0.30	0.34	0.13	0.77
39	*Corchorus aestuans*	15(13)	26	0.3	1.15	1.93	0.39	0.34	0.13	0.86
40	*Corchorus olitorius*	25(23)	46	0.5	1.09	10.19	0.68	0.57	0.67	1.92
41	*Crotalaria mysorensis*	12(11)	22	0.24	1.09	10.11	0.33	0.27	0.66	1.26
42	*Crotalaria pallida*	16(12)	24	0.32	1.33	17.22	0.36	0.36	1.13	1.85
43	*Crotalaria verrucosa*	25(19)	38	0.5	1.32	14.37	0.57	0.57	0.94	2.08
44	*Croton bonplandianum*	12(9)	18	0.24	1.33	5.52	0.27	0.27	0.36	0.90
45	*Croton hirtus*	13(9)	18	0.26	1.44	7.47	0.27	0.30	0.49	1.05
46	*Croton zeylanicus*	9(7)	14	0.18	1.29	4.64	0.21	0.21	0.30	0.72
47	*Cuphea hyrsopifolia*	19(15)	30	0.38	1.27	2.45	0.45	0.43	0.16	1.04
48	*Curculigo orchioides*	10(8)	16	0.2	1.25	7.71	0.24	0.23	0.51	0.97
49	*Cyanotis axillaries*	13(9)	18	0.26	1.44	1.32	0.27	0.30	0.09	0.65
50	*Cyanotis tuberose*	18(14)	28	0.36	1.29	1.40	0.42	0.41	0.09	0.92
51	*Cynodon doctylon*	34(19)	38	0.68	1.79	1.95	0.57	0.78	0.13	1.47
52	*Cyperus rotundus*	35(26)	52	0.7	1.35	2.73	0.77	0.80	0.18	1.75
53	*Cyrtococcum patens*	28(25)	50	0.56	1.12	6.42	0.74	0.64	0.42	1.80
54	*Datura metal*	19(12)	24	0.38	1.58	18.91	0.36	0.43	1.24	2.03

55	*Desmodium adscendens*	19(17)	34	0.38	1.12	0.27	0.51	0.43	0.02	0.96
56	*Desmodium illinoensis*	15(12)	24	0.3	1.25	4.04	0.36	0.34	0.26	0.96
57	*Desmodium triflorum*	17(12)	24	0.34	1.42	0.24	0.36	0.39	0.02	0.76
58	*Dodonia viscose*	30(26)	52	0.6	1.15	25.27	0.77	0.68	1.66	3.12
59	*Echinochloa colona*	25(22)	44	0.5	1.14	12.90	0.65	0.57	0.85	2.07
60	*Eclipta prostrate*	17(14)	28	0.34	1.21	9.77	0.42	0.39	0.64	1.45
61	*Ecobolium viride*	18(15)	30	0.36	1.20	6.45	0.45	0.41	0.42	1.28
62	*Emila sonchifolia*	25(20)	40	0.5	1.25	5.73	0.60	0.57	0.38	1.54
63	*Euphorbia hirta*	16(13)	26	0.32	1.23	6.52	0.39	0.36	0.43	1.18
64	*Euphorbia serpens*	26(23)	46	0.52	1.13	2.03	0.68	0.59	0.13	1.41
65	*Euphorbia thymifolia*	29(17)	34	0.58	1.71	7.80	0.51	0.66	0.51	1.68
66	*Evolvulus alsinoides*	15(12)	24	0.3	1.25	0.38	0.36	0.34	0.03	0.72
67	*Evolvulus nummularis*	13(10)	20	0.26	1.30	0.33	0.30	0.30	0.02	0.62
68	*Glycosmis pentaphylla*	30(25)	50	0.6	1.20	29.86	0.74	0.68	1.96	3.39
69	*Gomphrena serata*	26(23)	46	0.52	1.13	2.03	0.68	0.59	0.13	1.41
70	*Gymnema sylvestre*	16(9)	18	0.32	1.78	11.24	0.27	0.36	0.74	1.37
71	*Hedyotis diffusa*	19(15)	30	0.38	1.27	8.74	0.45	0.43	0.57	1.45
72	*Hedyotis pterita*	14(10)	20	0.28	1.40	5.71	0.30	0.32	0.37	0.99
73	*Helitrophihum indicum*	29(23)	46	0.58	1.26	24.43	0.68	0.66	1.60	2.95
74	*Hemidesmus indicus*	19(14)	28	0.38	1.36	3.66	0.42	0.43	0.24	1.09
75	*Hibiscus micranthus*	13(9)	18	0.26	1.44	5.98	0.27	0.30	0.39	0.96
76	*Hibiscus surrattensis*	16(12)	24	0.32	1.33	9.20	0.36	0.36	0.60	1.33
77	*Hibiscus vitifolius*	15(12)	24	0.3	1.25	4.04	0.36	0.34	0.26	0.96
78	*Hybanthus ennaespermum*	13(10)	20	0.26	1.30	1.68	0.30	0.30	0.11	0.70
79	*Hygrophila auriculata*	28(25)	50	0.56	1.12	6.42	0.74	0.64	0.42	1.80
80	*Hyptis suvaledens*	25(17)	34	0.5	1.47	14.37	0.51	0.57	0.94	2.02
81	*Imperata cylindrical*	29(18)	36	0.58	1.61	24.43	0.54	0.66	1.60	2.80
82	*Indigofera asplanthoides*	32(27)	54	0.64	1.19	1.83	0.80	0.73	0.12	1.65
83	*Indigofera glandulosa*	20(9)	18	0.4	2.22	1.15	0.27	0.46	0.08	0.80

84	*Indigofera hirsute*	29(25)	50	0.58	1.16	0.74	0.74	0.66	0.05	1.45
85	*Indigofera uniflora*	29(17)	34	0.58	1.71	0.42	0.51	0.66	0.03	1.19
86	*Ipomea carnea*	13(8)	16	0.26	1.63	1.32	0.24	0.30	0.09	0.62
87	*Ipomea obscura*	22(16)	32	0.44	1.38	1.72	0.48	0.50	0.11	1.09
88	*Justicia adothoda*	12(8)	16	0.24	1.50	12.92	0.24	0.27	0.85	1.36
89	*Justicia gluca*	32(26)	52	0.64	1.23	6.17	0.77	0.73	0.40	1.91
90	*Justicia simplex*	18(13)	26	0.36	1.38	1.03	0.39	0.41	0.07	0.87
91	*Justicia tranquebariensis*	26(20)	40	0.52	1.30	1.49	0.60	0.59	0.10	1.29
92	*Kyllinga odorata*	29(19)	38	0.58	1.53	0.74	0.57	0.66	0.05	1.28
93	*Lagascea mollis*	26(20)	40	0.52	1.30	2.65	0.60	0.59	0.17	1.36
94	*Lanata camera*	20(15)	30	0.4	1.33	19.90	0.45	0.46	1.31	2.21
95	*Leucas aspera*	55(50)	100	1.1	1.10	14.80	1.49	1.25	0.97	3.71
96	*Leucasgrandis*	19(14)	28	0.38	1.36	7.75	0.42	0.43	0.51	1.36
97	*Linderina ciliate*	19(15)	30	0.38	1.27	3.66	0.45	0.43	0.24	1.12
98	*Linderina crustacea*	26(20)	40	0.52	1.30	3.35	0.60	0.59	0.22	1.41
99	*Ludwigia octovalis*	14(12)	24	0.28	1.17	1.81	0.36	0.32	0.12	0.79
100	*Ludwigia peruviana*	16(10)	20	0.32	1.60	2.06	0.30	0.36	0.14	0.80
101	*Malvastrum coromandelianum*	17(12)	24	0.34	1.42	6.09	0.36	0.39	0.40	1.14
102	*Martynia annua*	39(30)	60	0.78	1.30	38.81	0.89	0.89	2.55	4.33
103	*Melhania hamiltoniana*	29(25)	50	0.58	1.16	0.42	0.74	0.66	0.03	1.43
104	*Melochia corehorifolia*	45(36)	72	0.9	1.25	12.11	1.07	1.03	0.79	2.89
105	*Merremia tridentate*	30(26)	52	0.6	1.15	1.72	0.77	0.68	0.11	1.57
106	*Microstachys chamaelea*	17(12)	24	0.34	1.42	1.33	0.36	0.39	0.09	0.83
107	*Mimosa pudica*	27(19)	38	0.54	1.42	6.19	0.57	0.62	0.41	1.59
108	*Mollugo pentaphylla*	50(38)	76	1	1.32	3.90	1.13	1.14	0.26	2.53
109	*Naregama alata*	20(16)	32	0.4	1.25	6.24	0.48	0.46	0.41	1.34
110	*Ocimum americanum*	19(14)	28	0.38	1.36	13.34	0.42	0.43	0.88	1.73
111	*Ocimum basilicum*	20(15)	30	0.4	1.33	19.90	0.45	0.46	1.31	2.21
112	*Ocimum gratissimum*	22(14)	28	0.44	1.57	15.45	0.42	0.50	1.01	1.93
113	*Ocimum tenuiflorum*	25(20)	40	0.5	1.25	6.73	0.60	0.57	0.44	1.61
114	*Oldenlandia corymbosa*	23(21)	42	0.46	1.10	0.33	0.63	0.52	0.02	1.17

115	*Oldenlandia umbellate*	65(46)	92	1.3	1.41	6.62	1.37	1.48	0.43	3.29
116	*Orthosiphon thymiflorus*	23(19)	38	0.46	1.21	19.37	0.57	0.52	1.27	2.36
117	*Osbeckia aspera*	39(35)	70	0.78	1.11	10.50	1.04	0.89	0.69	2.62
118	*Pavetta indica*	46(28)	56	0.92	1.64	42.19	0.83	1.05	2.77	4.65
119	*Pedalium muxex*	45(35)	70	0.9	1.29	18.34	1.04	1.03	1.20	3.27
120	*Pergularia daemia*	30(26)	52	0.6	1.15	6.88	0.77	0.68	0.45	1.91
121	*Peristrophe paniculata*	32(29)	58	0.64	1.10	1.83	0.86	0.73	0.12	1.71
122	*Persicaria hydropiper*	29(23)	46	0.58	1.26	5.59	0.68	0.66	0.37	1.71
123	*Phryma laptostachya*	23(19)	38	0.46	1.21	1.79	0.57	0.52	0.12	1.21
124	*Phyla nodiflora*	15(12)	24	0.3	1.25	1.17	0.36	0.34	0.08	0.78
125	*Phyllanthus amarus*	60(50)	100	1.2	1.20	7.74	1.49	1.37	0.51	3.36
126	*Phyllanthus debilis*	25(23)	46	0.5	1.09	3.22	0.68	0.57	0.21	1.47
127	*Phyllanthus maderraptensis*	23(20)	40	0.46	1.15	2.34	0.60	0.52	0.15	1.27
128	*Phyllanthus myrtifolius*	39(31)	62	0.78	1.26	3.97	0.92	0.89	0.26	2.07
129	*Phyllanthus virgatus*	28(21)	42	0.56	1.33	1.11	0.63	0.64	0.07	1.34
130	*Physalis minima*	30(25)	50	0.6	1.20	3.06	0.74	0.68	0.20	1.63
131	*Plumbago zeylanica*	19(15)	30	0.38	1.27	2.45	0.45	0.43	0.16	1.04
132	*Polycarpaea corrymbosa*	32(29)	58	0.64	1.10	7.34	0.86	0.73	0.48	2.07
133	*Polygala chinensis*	20(16)	32	0.4	1.25	1.15	0.48	0.46	0.08	1.01
134	*Portulaca quadrifida*	29(26)	52	0.58	1.12	24.43	0.77	0.66	1.60	3.04
135	*Psuedathria viscid*	35(27)	54	0.7	1.30	3.57	0.80	0.80	0.23	1.84
136	*Rauvolfia serpentine*	9(7)	14	0.18	1.29	2.06	0.21	0.21	0.14	0.55
137	*Rhinacanthus nasutus*	20(15)	30	0.4	1.33	16.85	0.45	0.46	1.11	2.01
138	*Rhynchosia minima*	35(30)	60	0.7	1.17	24.58	0.89	0.80	1.61	3.30
139	*Rulliea prostrate*	35(29)	58	0.7	1.21	16.11	0.86	0.80	1.06	2.72
140	*Rulliea tuberose*	19(17)	34	0.38	1.12	10.92	0.51	0.43	0.72	1.66
141	*Rungia repens*	15(11)	22	0.3	1.36	2.89	0.33	0.34	0.19	0.86
142	*Scoparia dulcis*	29(20)	40	0.58	1.45	20.36	0.60	0.66	1.34	2.59
143	*Senna uniflora*	12(10)	32	0.4	1.25	10.32	0.48	0.46	0.68	1.61
144	*Senna oxidentalis*	20(16)	20	0.24	1.20	4.30	0.30	0.27	0.28	0.85

145	*Sida acuta*	15(10)	20	0.3	1.50	1.93	0.30	0.34	0.13	0.77
146	*Sida cardata*	59(50)	100	1.18	1.18	2.35	1.49	1.35	0.15	2.99
147	*Sida cordifolia*	15(12)	24	0.3	1.25	12.64	0.36	0.34	0.83	1.53
148	*Solanum melongena*	16(10)	20	0.32	1.60	5.73	0.30	0.36	0.38	1.04
149	*Solanum torvum*	20(13)	26	0.4	1.54	11.50	0.39	0.46	0.75	1.60
150	*Solanum virginianum*	25(19)	38	0.5	1.32	11.50	0.57	0.57	0.76	1.89
151	*Spermacoce articularis*	17(13)	26	0.34	1.31	1.73	0.39	0.39	0.11	0.89
152	*Spermacoce hispida*	22(19)	50	0.64	1.28	3.26	0.74	0.73	0.21	1.69
153	*Spermacoce ocymoides*	15(10)	38	0.44	1.16	2.84	0.57	0.50	0.19	1.25
154	*Spermacoce pusilla*	32(25)	20	0.3	1.50	1.93	0.30	0.34	0.13	0.77
155	*Stashytropheta jamensia*	29(19)	38	0.58	1.53	26.60	0.57	0.66	1.75	2.97
156	*Stylosanthus fruticona*	19(15)	30	0.38	1.27	2.45	0.45	0.43	0.16	1.04
157	*Stylosantus hamate*	46(39)	78	0.92	1.18	4.69	1.16	1.05	0.31	2.52
158	*Syndrella nodiflora*	19(13)	26	0.38	1.46	5.11	0.39	0.43	0.34	1.16
159	*Tephrosia purpurea*	77(48)	96	1.54	1.60	82.89	1.43	1.76	5.44	8.62
160	*Trianthema portulacastrum*	29(22)	44	0.58	1.32	16.67	0.65	0.66	1.09	2.41
161	*Tribulus terrestrus*	29(19)	38	0.58	1.53	7.80	0.57	0.66	0.51	1.74
162	*Trichodesmium indicum*	35(29)	58	0.7	1.21	18.06	0.86	0.80	1.19	2.85
163	*Tridax procumbens*	30(27)	54	0.6	1.11	23.12	0.80	0.68	1.52	3.01
164	*Triumfetta rhomboids*	29(21)	42	0.58	1.38	14.96	0.63	0.66	0.98	2.27
165	*Urena lobata*	29(23)	46	0.58	1.26	7.80	0.68	0.66	0.51	1.86
166	*Urena sinuate*	27(22)	44	0.54	1.23	11.01	0.65	0.62	0.72	1.99
167	*Vernonia cineria*	35(27)	54	0.7	1.30	8.03	0.80	0.80	0.53	2.13
168	*Vigna trilobata*	30(26)	52	0.6	1.15	9.36	0.77	0.68	0.61	2.07
169	*Waltheria indica*	25(18)	36	0.5	1.39	10.19	0.54	0.57	0.67	1.77
170	*Xanthium stumarium*	26(21)	42	0.52	1.24	21.90	0.63	0.59	1.44	2.66
171	*Zorina diphylla*	20(15)	30	0.4	1.33	4.59	0.45	0.46	0.30	1.20
	Total		**6720**	**87.68**	**227.34**	**1523.65**	**100.00**	**100.00**	**100.00**	**300.00**

The higher IVI contributed by many species like *Tephrosia purpurea, Clerodendron infortunatum Acalypa indica*, *Aerva lanata*, *Asystasia gangetica*, *Belpharis maderaptensis*, *Cleome viscosa, Dodonia viscose, Glycosmis pentaphylla, Leucas aspera*, *Limnophila indica, Martynia annua, Oldenlandia* umbellate, *Pavetta indica*, *Phyllanthus amarus* and *Rhynchosia minima* in the present study area indicates their stronger perpetuation and higher functional role in the ecosystem.

Many species like *Alteranthera pungens*, *Amaranthus spinosus*, *Desmodium illinoensis, Evolvulus nummularis, Hybanthus enneaspermus*, *Justicia simplex*, *Ocimum basilicum*, *Plumbago zeylanica*, *Phyla nodiflora*, *Rauvolfia serpentine*, *Rungia repens*, *Solanum melongena, Acanthospermum hispidum, Aerva javanica, Amaranthus viridis*, *A. spinosus, Andrographis paniculata*, *Asparagus racemosus*, *Barleria buxifolia, B.lupulina, B. mysorensis, Biophytum sensitivum, Blainvilla trinervia, Borreria articularis, Boerhavia diffusa*, *Senna occidentalis, Cardiospermum halicabum, Centella asiatica*, *Chromolaena oderata, Cleome aspera, C. tetrandra, C. rutidesperma, Clitoria ternate*, *Commelina benghalensis*, *Corchorus aestuans, Croton hirtus, C. bonplandiam*, *C. sparsiflorus*, *Curculigo orchioides*, *Cyanotis axillaris*, *Cyanotis tuberosa, Desmodium adscendens*, *Desmodium triflorum*, *Evolvulus alsinoides*, *Ecobolium viride, Euphorbia hirta, Heydyotis peterita, Hibiscus vitifolius*, *H. micranthus*, *Indigofera glandulosa, Ipomea carnea, Justicia gluca, Ludwigia octovalvis, L. Peruviana, Phyllanthus virgatus, Sebastiana chamaelea, Sida acuta, Spermacoce articularis* and *S. hispida* were weaker in ecological attributes and secured poor IVI in the communities of studied forest. In addition to less fitness, the killing of young individuals by frost in winter may be ascribed as reason for this fact (Agarwal *et al.,* 1961). Hence it is suggested that priority must be given to these species for conservation by employing proper macro micro propagation techniques.

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