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Diversity of invasive plant species in Boluvampatti forest Range, Southern Western Ghats, India

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ABSTRACT The present study deals with the implication of invasive plant species on the diversity of Boluvampatti forest range in Southern Western Ghats of Tamil Nadu, India. A total number of 90 invasive alien species under 74 genera belonging to 37 families have been recorded based on field exploration and literature consultations. Among these, 53 species are being used by local inhabitants who reside in this forest range for medicinal purposes. Thirteen species have been introduced intentionally, while the remaining species established unintentionally through trade. The present study shows that a better planning is needed for early detection to control and reporting of infestations of spread of naturalized species to be scrutinized.

KEY WORDS Ecosystem; field survey; invasive plants; natural habitat; diversity.

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INTRODUCTION

Understanding the diversity of nature in various forms is a fundamental goal of ecological research (Lubchenco et al., 1991). Apart from the immense economic, ethical and aesthetical benefits, it is essential for the ecosystem function and stability (Ehrlich & Wilson, 1991; Holdgate, 1996; Tilman, 2000). It has also attracted world attention because of the growing awareness of its importance on the one hand and the anticipated massive depletion on the other (Singh, 2002). Biodiversity hotspots around the world contain high degree of endemism and are undergoing exceptional loss of habitats (Myers et al., 2000). Moreover, plant diversity around the world is facing various threats and is reducing very rapidly (Dogra et al., 2009).

The invasive species are widely distributed among all categories of living organisms as well as all kinds of ecosystems throughout the world. The invasion of alien plant species in the new regimes became a second highest threat to plant diversity after the habitat loss (Hobbs & Humphries, 1995). The spread of species beyond their natural habitats has always played a key role in the dynamics of biodiversity, but the present rate of species exchange is unprecedented and has become one of the most intensively studied fields in ecology. Invasive species may displace or otherwise adversely affect native plant species. These species often produce prolific seeds that may disperse widely and remain viable in the soil for long periods of time (Drake et al., 2003).

IUCN (International Union for Conservation of Nature and Natural Resources) defines Invasive Species as an alien species which becomes established in natural or semi-natural ecosystems or habitat, an agent of change and threatens native

biological diversity. A taxon can be considered successfully naturalized after overcoming geographical, environmental and reproduction barriers, while an invasive species requires, in addition, to overcome dispersal barrier within the new region (Richardson et al., 2000). They are noxious and cause negative impact in environment, ecosystems, habitats, native biodiversity, economics and even human health (Khanna, 2009).

Introduction of these species may occur accidentally or through their being imported for a limited purpose and subsequently escaping or deliberately on a large scale (Levine, 1989). Many of these species have allelopathic potential and possess high tolerance to different abiotic conditions (Huang et al., 2009). Many people introduce non-native species into new habitats for economic reasons (McNeely, 2001) and most cases of invasive species can be linked to the intended or unintended consequences of economic activities (Perrings et al., 2002). The differences between native and exotic plant species in their requirements and modes of resource acquisition and consumption may cause a change in soil structure, its profile, decomposition, nutrient content of soil, moisture availability (Walck et al., 1999; Vila & Weiner, 2004).

The biotic invaders tend to establish a new range in which they proliferate, spread and persist to the detriment of the environment (Mack et al., 2000). Invasive species has faster rates of growth and biomass production compared to native species, higher competitive ability, high reproductive efficiency including production of a large number of seeds, efficient dispersal, vegetative reproduction, rapid establishment and other traits that help them adapt to new habitats (Simberloff et al., 2005; Sharma et al., 2005). Despite the recent recognition of the impacts caused by invasive plants worldwide (Mooney & Hobbs, 2000), there are still many regions in the world where basic information on naturalized plant taxa and plant invasions is only anecdotal or completely lacking like Asia and neighbouring regions (Corlett, 1988; Enmoto, 1999; Meyer, 2000).

In India, comprehensive studies on invasive species and plant invasions are still missing except a few studies (Reddy, 2008; Khanna, 2009; Singh et al., 2010; Chandra Sekar, 2012; Chandra Sekar et al., 2012). A large number of exotics are naturalized, affecting the distribution of native flora and a few among them have conspicuously altered vegetation patterns of the country. There is an apparent need for a regional and national authentic database on invasive alien species for monitoring their spread and impact in various regions and for devising appropriate management strategies. In view of these facts, the present study was conducted to examin the implication of invasive plant species on the diversity of Boluvampatti forest range in Southern Western Ghats of Tamil Nadu.

MATERIAL AND METHODS

Study area

The study area (Boluvampatti forest) is situated about 30 km west of Coimbatore city and is a continuation of the Western Ghats lying North of Palghat Gap and to the South-east of the Nilgiris (Fig. 1). The area comes under the Boluvampatti range of Coimbatore forest division which includes the villages of Irrutupallam, Sadivayal, Semmedu and Siruvani. It lies between 10° 56′ and 10° 58′ N latitude and 76° 42′ and 76° 44′ E longitude. The elevation of this area is between 625 and 650 m asl (Subramanian, 1959). The rock formation is of Archaean age and consists of principally gneiss and its metamorphic variations. The gneiss foliated and is composed of quartz, feldspar and biotite (black mica) with an occasional admixture of garnet. The soil is reddish with irregular galleries filled with yellow clay running through and it has the property of hardening on to the air (Subramanian, 1966).

The climate is cool and pleasant for the major part of the year except during the months of March to May when it is hot and dry. The difference in elevation between the plains and the hilly areas makes appreciable variations in climatic conditions. The temperature ranges from 21ºC to 38ºC and the mean annual humidity is 51%. The vegetation of this area includes scrub jungle, moist deciduous and sub-tropical evergreen forests. These forests are subjected to extreme biotic influences and extensive areas near Sadivayal and Siruvani settling tank are planted with *Eucalyptus*, teak, bombax, etc. The natural regeneration of trees in these forests is very poor. Perhaps this may be due to excessive grazing and other biotic influences. There is a profound invasion of many non-native species on biodiversity of this area.

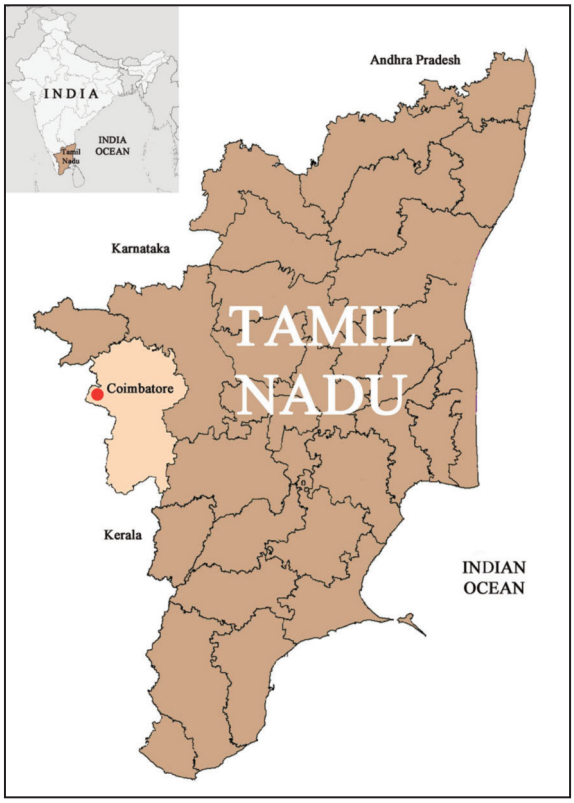

Figure 1. Location of Boluvampatti forests in Coimbatore district of Tamil Nadu, India.

Floristic study

The present study was conducted during 2010–2012 to compile a comprehensive list of invasive alien plant species. Intensive field studies were conducted in a planned manner repeatedly in different seasons in order to document maximum representation of invasive plant species. During the repeated field visits, the observations on field characters such as habit, habitat, spread, important species traits associated with invasiveness were made. Almost the entire forest area was surveyed in order to know the impact of invasiveness on native vegetation in the study area.

During the course of study, the invasive plant species were collected in their natural habitats and filed numbers were assigned to each species. All the collected plant species were identified with the help of regional floras (Gamble & Fischer, 1915–1936; Matthew, 1983; Nair & Henry, 1983; Henry et al.,1987; Chandrabose & Nair, 1988). Plant species collected were dried and herbarium specimens were prepared by using standard methods as suggested by Jain & Rao (1976). The voucher specimens were deposited in the Herbarium of Department of Botany, Bharathiar University, Coimbatore, Tamil Nadu for future reference.

The nativity of the invasive plants has been recorded from the published literature (Chatterji, 1947; Maheswari, 1960; Srivastava, 1964; Matthew, 1969; Maheswari & Paul, 1975; Nayar, 1977; Hajra & Das, 1982; Sharma, 1984; Saxena, 1991; Pandey & Parmer, 1994; Reddy & Raju, 2002; Negi & Hajra, 2007). The modes of introduction of these species were documented from the published literature and categorized according to their economic uses as food, fodder, medicinal and ornamental. Plants were also categorized by life form i.e., herb, shrub, climber and tree. Literature and local people were consulted for use value or anthropogenic use, if any.

RESULTS AND DISCUSSION

The present study was undertaken to identify the diversity of invasive plant species in Boluvampatti forest range, the Southern Western Ghats of Tamil Nadu. A total number of 90 alien plants from 37 families belonging to 74 genera were documented from the study region. They are listed alphabetically in tabular form, followed by author's abbreviation, name of the family, nativity, life form, habitat, uses and voucher specimen number (Table 1). Among these the dicotyledons are represented by 32 families, 67 genera and 83 species; monocotyledons by 5 families, 7 genera and 7 species. All the species listed in this study were also reported as weeds in other countries or as invasive alien plants in most of the regions, and are included in the Global Compendium Weeds (Randall, 2002).

Out of 90 species, only 13 namely *Ageratum conyzoides*, *Amaranthus spinosus*, *Asclepias curassavica*, *Cassia alata*, *Catharanthus roseus*, *Celosia argentea*, *Chenopodium ambrosioides*, *Ipomoea eriocarpa*, *Lantana camara*, *Mirabilis jalapa*, *Passiflora foetida*, *Portulaca oleracea* and *Solanum nigrum* seem to have been introduced deliberately and the rest of them unintentionally through trade exchange including grain import. Further, it has been observed that few species like *Parthenium hysterophorus*, *Lantana camara*,

Eupatorium odoratum, *Prosopis juliflora* and *Ageratum conyzoides* are highly invasive and have invaded on the fringes of forests as well as inside the reserved forests.

On the basis of the nativity of the species, a total of 17 different geographical regions were recorded in the present study. In that, about 72% are contributed by five major geographical regions viz., Tropical America (59%), Tropical Africa (15%), Australia (3%), Europe (4%) and South America (13%) (Fig. 2). It is interesting to note that, most of the invasive species in the study region owe their origin to tropical regions i.e., America (72%), Africa (14%) and Europe (3%). The remaining 28% species were collectively contributed by nine regions.

Habit wise analysis showed that herbs with 70 species (78%) predominate, followed by shrubs (10 species, 11%), climbers (5 species, 6%) and trees (5 species, 5%). Annual plants comprise about 52% of the invasive species and the remaining are perennials. In terms of number of species, Asteraceae were found to be the most dominant family with 15 species among the reported invasive species followed by Amaranthaceae (6 sp.), Convolvulaceae (5 sp.), Caesalpiniaceae and Solanaceae (4 sp. each), Asclepiadaceae, Poaceae, Euphorbiaceae, Malvaceae and Lamiaceae (3 sp. each). The genera with the highest number of invasive species in the study area are *Cassia* and *Ipomoea* (4 sp. each), *Cleome*, *Corchorus* (3 sp. each), *Alternanthera*, *Blumea*, *Calotropis*, *Euphorbia*, *Solanum* and *Tribulus* (2 sp. each).

Invasive alien plant species are used for a variety of functional and aesthetic purposes. Many people who seek to introduce a non-native species into a new habitat do so for an economic reason (McNeely, 2001) and most cases of invasiveness can thus be linked to the intended or unintended consequences of economic activities (Perrings et al., 2002). Commercial use of invasive alien plant species can contribute in uplifting the economic status of poor rural communities (Semenya et al., 2012). For example, *Lantana camara* is being used for basket-making and some other purposes. A search in literature and consultation with local people indicated that several of the invasive species are also used for different purposes for example, the stem of *Malvastrum coromandelianum*, *Sesbania bispinosa* and *Sida acuta* for fibre and

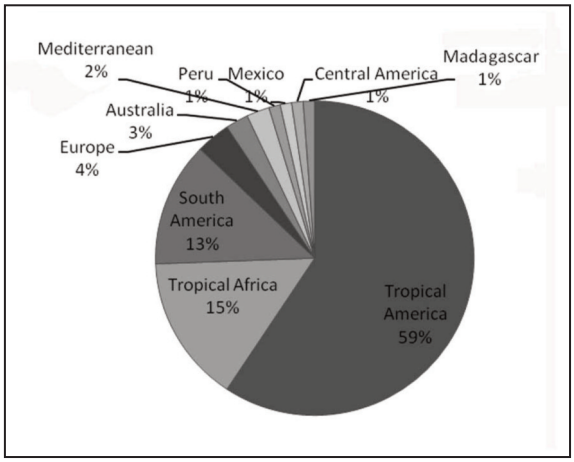

Figure 2. Contribution of different geographical areas to invasive species in the study.

Borassus flabellifer for making hand-held fans (Sekar et al., 2012).

Thirteen invasive species are under consideration for medicinal purposes (Table 2). Several of these are used for adulteration: for example, mustard oil is adulterated with extract from seeds of *Argemone mexicana*. Moreover, some of the species i.e. *Parthenium hysterophorus*, *Lantana camara* and *Prosopis juliflora* have high allelopathic potential and are harmful to natural plant population. These invasive alien species are ready colonizers in disturbed areas and cause considerable ecological damages to natural areas.

CONCLUSION

The results of the present study have shown that most of the exotic plant species currently spreading were intentionally introduced. They have not only disturbed the environment and ecosystem but have also threatened the indigenous flora, as a number of plants are getting rare. There is every possibility that if the invasion of alien species will continue to operate unchecked, the endemic species may get extinct and the germplasm of economic plants may become rare or even be exterminated. Therefore, it is very important to make an effective database for the management of invasive species, and improve the knowledge about their diversity, life form, habitat and uses for further studies.

Name of the species	***Family***	***No.***	***Nativity***	***Life form***	***Habit***	***Uses***
Acacia dealbata Link.	Mimosaceae	1127	Australia	Tree	Perennial	Fuel wood
Acanthospermum hispidum DC.	Asteraceae	1134	Brazil	Herb	Annual	Medicinal
Ageratum conyzoides L.	Asteraceae	1135	Tropical America	Herb	Annual	Medicinal
Alternanthera pungens Humb.	Amaranthaceae	1174	Tropical America	Herb	Perennial	Medicinal
Alternanthera sessilis (L.) DC.	Amaranthaceae	1175	Tropical America	Herb	Perennial	Medicinal, Fodder
Amaranthus spinosus L.	Amaranthaceae	1176	Tropical America	Herb	Annual	Medicinal, Fodder
Argemone mexicana L.	Papaveraceae	1101	South America	Herb	Annual	Medicinal
Asclepias curassavica L.	Asclepiadaceae	1150	Tropical America	Herb	Perennial	Medicinal
Bidens pilosa L.	Asteraceae	1136	Tropical America	Herb	Annual	Medicinal, Fodder
Blumea eriantha DC.	Asteraceae	1137	Tropical America	Herb	Perennial	Fodder
Blumea lacera (Burm. f.) DC.	Asteraceae	1138	Tropical America	Herb	Annual	Medicinal
Borassus flabellifer L.	Arecaceae	1185	Tropical Africa	Tree	Perennial	Fruit edible
Calotropis gigantea (L.) R. Br.	Asclepiadaceae	1151	Tropical Africa	Shrub	Perennial	Medicinal
Calotropis procera (Ait.) R. Br.	Asclepiadaceae	1152	Tropical Africa	Shrub	Perennial	Medicinal
Cassia alata L.	Caesalpiniaceae	1123	South America	Shrub	Perennial	Medicinal
Cassia obtusifolia L.	Caesalpiniaceae	1124	Tropical America	Herb	Perennial	Medicinal
Cassia occidentalis L.	Caesalpiniaceae	1125	South America	Herb	Perennial	Medicinal
Cassia tora L.	Caesalpiniaceae	1126	South America	Herb	Annual	Medicinal
Catharanthus roseus L.	Apocynaceae	1149	Tropical America	Herb	Perennial	Medicinal
Chenopodium ambrosioides L.	Chenopodiaceae	1180	Tropical America	Herb	Annual	Fodder
Chloris barbata (L.) Sw.	Poaceae	1188	Tropical America	Herb	Perennial	Fodder
Chromolaena odorata L.	Asteraceae	1139	Tropical America	Shrub	Perennial	Medicinal
Cleome viscosa L.	Cleomaceae	1104	Tropical America	Herb	Perennial	Medicinal
Cleome gynandra L.	Cleomaceae	1102	Tropical America	Herb	Annual	Medicinal
Cleome monophylla L.	Cleomaceae	1103	Tropical Africa	Herb	Annual	Fodder
Corchorus aestuans L.	Tiliaceae	1110	Tropical America	Herb	Annual	Medicinal
Corchorus tridens L.	Tiliaceae	1111	Tropical Africa	Herb	Annual	Fibre, Fodder
Corchorus trilocularis L.	Tiliaceae	1112	Tropical Africa	Herb	Annual	Fibre
Crotalaria retusa L.	Fabaceae	1119	Tropical America	Herb	Annual	Fodder, Ornamental
Croton bonplandianum Baill.	Euphorbiaceae	1181	South America	Herb	Perennial	Fodder

Table 1. List of invasive plant species in Boluvampatti forests, Coimbatore district of Tamil Nadu, India.

Name of the species	*Family*	*S. No.*	*Nativity*	*Life form*	*Habit*	*Uses*
Cuscuta reflexa Roxb.	Cusutaceae	1158	Mediterranean	Climber	Annual	Medicinal
Croton bonplandianum Baill.	Euphorbiaceae	1181	South America	Herb	Perennial	Fodder
Cuscuta reflexa Roxb.	Cusutaceae	1158	Mediterranean	Climber	Annual	Medicinal
Cyperus difformis L.	Cyperaceae	1187	Tropical America	Herb	Annual	Fodder
Datura metel L.	Solanaceae	1159	Tropical America	Shrub	Perennial	Medicinal
Digera muricata (L.) Mart.	Amaranthaceae	1178	South West Asia	Herb	Annual	Medicinal
Echinochloa colona (L.) Link.	Poaceae	1189	South America	Herb	Annual	Fodder
Echinops echinatus Roxb.	Asteraceae	1140	Afghanistan	Herb	Annual	Medicinal
Eclipta prostrata (L.) Mant.	Asteraceae	1141	Tropical America	Herb	Annual	Medicinal, Ornamental
Emilia sonchifolia (L.) DC.	Asteraceae	1142	Tropical America	Herb	Annual	Medicinal
Euphorbia cyathophora Murray	Euphorbiaceae	1182	Tropical America	Herb	Annual	Ornamental
Euphorbia hirta L.	Euphorbiaceae	1183	Tropical America	Herb	Annual	Medicinal
Evolvulus nummularis L.	Convolvulaceae	1153	Tropical America	Herb	Perennial	Fodder
Gomphrena serrata L.	Amaranthaceae	1179	Tropical America	Herb	Annual	Fodder
Hyptis suaveolens (L.) Poit.	Lamiaceae	1170	Tropical America	Herb	Annual	Medicinal
Indigofera trita L.	Fabaceae	1120	Tropical Africa	Shrub	Perennial	Fodder
Ipomoea eriocarpa R. Br.	Convolvulaceae	1154	Tropical Africa	Herb	Annual	Medicinal
Ipomoea obscura (L.) Ker.-Gawal.	Convolvulaceae	1155	Tropical Africa	Climber	Perennial	Medicinal
Ipomoea pes-tigridis L.	Convolvulaceae	1156	Tropical Africa	Climber	Annual	Medicinal
Ipomoea staphylina Roem. et Schult.	Convolvulaceae	1157	Tropical Africa	Climber	Annual	Fodder
Lantana camara L.	Verbenaceae	1168	Tropical America	Herb	Perennial	Medicinal, Ornamental
Leonotis nepetiifolia (L.) R.Br.	Lamiaceae	1171	Tropical Africa	Herb	Annual	Medicinal
Malvastrum coromandelianum (L.) Garcke	Malvaceae	1106	Tropical America	Herb	Annual	Medicinal, Fibre
Martynia annua L.	Pedaliaceae	1164	Tropical America	Herb	Perennial	Medicinal
Melia azedarach L.	Meliaceae	1117	India	Tree	Perennial	Medicinal
Mikania micrantha Kunth.	Asteraceae	1143	Tropical America	Climber	Annual	Medicinal
Mimosa pudica L.	Mimosaceae	1128	Brazil	Herb	Perennial	Medicinal
Mirabilis jalapa L.	Nyctaginaceae	1173	Peru	Herb	Annual	Ornamental
Ocimum americanum L.	Lamiaceae	1172	Tropical America	Herb	Annual	Ornamental
Opuntia stricta Haw.	Cactaceae	1132	Tropical America	Shrub	Perennial	Fruits edible

Table 1. List of invasive plant species in Boluvampatti forests, Coimbatore district of Tamil Nadu, India.

Name of the species	***Family***	***S. No.***	***Nativity***	***Life form***	***Habit***	***Uses***
Oxalis corniculata L.	Oxalidaceae	1116	Europe	Herb	Perennial	Vegetable
Parthenium hysterophorus L.	Asteraceae	1144	North America	Herb	Annual	Fodder
Passiflora foetida L.	Passifloraceae	1131	South America	Climber	Perennial	Medicinal
Pedalium murex L.	Pedaliaceae	1165	Tropical America	Herb	Perennial	Medicinal
Peristrophe paniculata (Forssk.) Brummit	Acanthaceae	1166	Tropical America	Herb	Annual	Medicinal
Physalis minima L.	Solanaceae	1160	Tropical America	Herb	Annual	Medicinal
Pilea microphylla (L.) Liebm.	Urticaceae	1184	South America	Herb	Annual	Vegetable, Ornamental
Portulaca oleracea L.	Portulacaceae	1105	South America	Herb	Annual	Medicinal, Vegetable
Prosopis juliflora (Sw.) DC.	Mimosaceae	1129	Mexico	Tree	Perennial	Fuel wood
Ruellia tuberosa L.	Acanthaceae	1167	Tropical America	Herb	Annual	Ornamental
Scoparia dulcis L.	Scrophulariaceae	1163	Tropical America	Herb	Perennial	Medicinal
Sesbania bispinosa (Jacq.) Wight.	Fabaceae	1121	Tropical America	Shrub	Annual	Fibre, Vegetable
Sida acuta Burm. f.	Malvaceae	1107	Tropical America	Herb	Annual	Medicinal, Fibre
Solanum nigrum L.	Solanaceae	1161	Tropical America	Herb	Annual	Medicinal, Edible
Solanum torvum Sw.	Solanaceae	1162	Tropical America	Shrub	Perennial	Medicinal
Sonchus asper (L.) Hill	Asteraceae	1145	Mediterranean	Herb	Annual	Medicinal
Sorghum halepense (L.) Pers.	Solanaceae	1190	Tropical America	Herb	Perennial	Fodder
Spermacoce hispida L.	Rubiaceae	1133	Tropical America	Herb	Perennial	Medicinal
Spilanthes acmella (L.) Murr.	Asteraceae	1146	South America	Herb	Annual	Fodder
Stachytarpheta jamaicensis	Verbenaceae	1169	Tropical America	Herb	Annual	Medicinal
Stylosanthes hamata L.	Febaceae	1122	Tropical America	Herb	Perennial	Fodder
Synedrella nodiflora (L.) Gaertn.	Asteraceae	1147	West Indies	Herb	Annual	Ornamental
Tribulus lanuginosus L.	Zygophyllaceae	1114	Tropical America	Herb	Annual	Medicinal
Tribulus terrestris L.	Zygophyllaceae	1115	Tropical America	Herb	Perennial	Medicinal
Tridax procumbens L.	Asteraceae	1148	Central America	Herb	Perennial	Medicinal
Triumfetta rhomboidea Jacq.	Tiliaceae	1113	Tropical America	Herb	Annual	Medicinal
Turnera ulimifola L.	Turneraseae	1130	Tropical America	Herb	Annual	Ornamental
Typha angustata Bory et Chaup.	Typhaceae	1186	Tropical America	Herb	Perennial	Ornamental
Urena lobata L.	Malvaceae	1108	Tropical Africa	Shrub	Perennial	Fibre
Waltheria americana L.	Sterculiaceae	1109	Tropical America	Herb	Perennial	Medicinal
Ziziphus mauritiana Lam.	Rhamnaceae	1118	Australia	Tree	Perennial	Fruits edible

Table 1. List of invasive plant species in Boluvampatti forests, Coimbatore district of Tamil Nadu, India.

S. No.	*Name of the plant*	*Part(s) used*	*Medicinal uses*
1.	*Ageratum conyzoides* L.	Leaves	Leaf-juice used in healing the wounds, sores and skin diseases.
2.	*Alternanthera sessilis* (L.) R. Br.	Whole plant	Plants used in snake-bite.
3.	*Amaranthus spinosus* L.	Whole plant	Plants used in snake-bites, bowel and kidney complaints.
4.	*Argemone mexicana* L.	Whole plant	Roots used in scorpion sting.
5.	*Asclepias curassavica* L.	Leaves and roots	Roots used in curing piles. Leaf juice used for hemorrhages.
6.	*Bidens pilosa* L.	Flower	Dried flowers buds used in toothache.
7.	*Calotropis gigantea* (L.) R. Br.	Latex	Latex used as disinfectant to wounds.
8.	*Cassia tora* L.	Leaves and seeds	Leaves and seeds used as skin diseases.
9.	*Catharanthus roseus* (L.) G. Don.	Root	The roots are great commercial value in medicine.
10.	*Celosia argentea* L.	Seeds	Seeds used in blood disease and mouth sores.
11.	*Cleome gynandra* L.	Whole plant	Plants used in scorpion-sting and snake-bite.
12.	*Digera muricata* (L.) Mart.	Flowers and seeds	Flowers and seeds used in urinary troubles.
13.	*Eclipta prostrata* L.	Root	Roots used as antiseptic to ulcers and wounds in cattle.
14.	*Emilia sonchifolia* (L.) DC.	Leaves	Leaf-juice used in curing wounds and sore ears.
15.	*Euphorbia hirta* L.	Whole plant	Plants used in bowel complaints for children.
16.	*Ipomoea eriocarpa* R. Br.	Whole plant	Plants used in the treatment of rheumatism and headache
17.	*Ipomoea obscura* (L.) Ker-Gawl.	Leaves	Leaves used in the treatment of ulcers.
18.	*Ipomoea pes-tigridis* L.	Leaves	Leaves used as an antidote to dog-bite; also used in boils.
19.	*Martynia annuva* L.	Leaves	Leaves used in epilepsy.
20.	*Melia azedarach* L.	Leaves and seeds	Leaves used as anthelmintic; seeds used in rheumatism.
21.	*Mimosa pudica* L.	Root	Roots used in asthma, dysentery, etc.
22.	*Ocimum americanum* L.	Whole plant	Plants used in fever.
23.	*Oxalis corniculata* L.	Leaves	Leaves used in fever.
24.	*Passiflora foetida* L.	Leaves	Leaves used in headache.
25.	*Pedalium murex* L.	Leaves and fruits	Leaves used in gonorrhoea; fruits used in spermatorrhoea.
26.	*Physalis minima* L.	Leaves	Leaf juice used in earache.
27.	*Scoparia dulcis* L.	Whole plant	Plants used in toothache.
28.	*Solanum nigrum* L.	Leaves	Leaf-juice used in chronic enlargement of the liver and dysentery.
29.	*Spilanthes acmella* (L.) DC.	Leaves	Leaves used to treat toothache and skin diseases.
30.	*Stachytarpheta jamaicensis* (L.) Vahl.	Whole plant	Plants used in fever, rheumatism and dysentery.

Table 2. List of medicinally useful invasive species in the study.

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