

Catalogue of invasive alien flora of India

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Abstract

The present study deals with comprehensive list of invasive alien species in the flora of India with background information on family, habit and nativity. Total 173 invasive alien species belonging to 117 genera under 44 families were documented. It was prepared based on history, species origin, species behavior and field observations. Literature and websites were consulted extensively for relevant publications. Almost 80% of the species were introduced from neotropics. Tropical America (74%) and Tropical Africa (11%) contribute maximum proportion to the invasive alien flora of India. Habit wise analysis shows herbaceous species share 151 species, followed by shrubs (14), climbers (5) and trees (3). A better planning is needed for early detection and reporting of infestations of spread of new and naturalized weeds to monitor and control. [Life Science Journal. 2008; 5(2): 84 – 89] (ISSN: 1097 – 8135).

Keywords: invasion; alien; nativity; list; India

1 Introduction

Convention for Biological Diversity (1992) visualize “biological invasion of alien species as the second worst threat after habitat destruction”. Biological invasions may be considered as a form of biological pollution and significant component on human-caused global environmental change and one of the major causes of species extinction. The opportunity of accidental introductions will may become more with rapidly increasing global commerce (Mooney and Drake, 1987; Drake *et al*, 1989).

Despite the recent recognition of the impacts caused by invasive plants worldwide (Mooney and 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, e.g. Asia and neighboring regions (Corlett, 1988; Enmoto, 1999; Meyer, 2000). Establishment of a database of naturalized species is the first step in the development of invasion biology, and will also serve as a stepping-stone for further detailed studies on the biology and impact of individual species (Wu *et al*, 2004).

Naturalization has been recognized as the first phase of biological invasions. A naturalized species is defined as an introduced (non-native, exotic, alien) species, that can consistently reproduce and sustain populations over many generations without (or despite) direct intervention by humans (Richardson *et al*, 2000; Pyšek *et al*, 2002). After successful local establishment, some naturalized species disperse and produce viable offspring in areas distant from the sites of introduction. Such naturalized species are called invasive (Richardson *et al*, 2000). Many invasive plant species cause economic and/or environmental damage, and referred to as alien pests or weeds (Richardson *et al*, 2000).

2 Materials and Methods

India has a characteristic geographic location at the junction of the three major biogeographic realms, namely the Indo-Malayan, the Eurasian and the Afro-tropical (6° 45' to 37° 6' latitude and 68° 7' to 97° 25' E longitude) with a land frontier of about 15,200 km and a coastline of 7,516 km. It is the seventh largest country in the world and the second largest in Asia. It is considered to be one of the twelve centers of origin and diversity of several plant species in the world. India is an important center of

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agri-biodiversity having contributed 167 species to the world agriculture and homeland for 320 species of wild relatives of crops. India accounts for 8 % of the global biodiversity existing in only 2.4% land area of the world. The number of angiospermous species of India are 17000 (Hajra & Mudgal, 1997).

The flora of India shows close affinity with the flora of Indo-Malayan and Indo-Chinese region. At present 5400 (32%) species are endemic to India. 35% of Indian flora has south-east Asian and Malayan, 8% temperate, 1% steppe, 2% African, and 5% Mediterranean-Iranian elements (Nayar, 1977). Still there is information gap on exact number of naturalized alien/exotic species in India. The number of such species may be around 2000.

In India, comprehensive studies on invasive species and plant invasions are still missing. In view of this, the present study attempted to focus on the invasive alien species in the flora of India. This first list of invasive exotic species in India will serve as a base for future research on biological invasions in this country.

The present study was conducted during 2003 – 2007, to compile a comprehensive list of invasive alien plant species. The challenge is recognizing which introduced species incur ecological and economic costs and which simply becomes part of India's tropical/subtropical/temperate landscape and cause no real harm. It is very difficult to choose exotic species, from all over the country, that really are invasive or worse than any others.

After an extensive review of literature on global invasive species (Mooney and Drake, 1987; Heywood, 1989; Cox, 1999; Cox, 2004; Cracraft and Francesca, 1999; D'Antonio and Vitousek, 1992; Drake *et al*, 1989; Randall *et al*, 1997; Huxel, 1999; Jenkins, 1999; Lonsdale, 1999; Mooney, 1999; Elton, 2000; Mooney and Hobbs, 2000; Almeilla and Freitas, 2001; Cowie, 2001; McNeely *et al*, 2001) and of India and their spread based on history, species origin, species behavior and field observations, a list of 173 species of invasive aliens was prepared. The websites were also examined extensively for background information.

The nativity of the species is provided based on Matthew, 1969; Maheswari and Paul, 1975; Nayar, 1977; Sharma, 1984; Hajra and Das, 1982; Saxena, 1991; Pandey and Parmar, 1994; Reddy *et al*, 2000; Reddy & Raju, 2002; Reddy & Reddy, 2004; Murthy *et al*, 2007; Negi and Hajra, 2007.

3 Results

The study brought to light catalogue of invasive alien

species in India. Total 173 species in 117 genera and under 44 families were documented as invasive alien plant species, representing 1% of the Indian flora. The 173 invasive alien species were shown along with family name, habit and nativity in Table 1.

Tropical America (with 128 species) region contribute the greatest to the number (74%) followed by tropical Africa (11%). The other regions, which contribute minority, are Afghanistan, Australia, Brazil, East Indies, Europe, Madagascar, Mascarene Islands, Mediterranean, Mexico, Peru, Temperate South America, Trop. West Asia, West Indies and Western Europe.

Habit wise analysis shows that herbs with 151 species (87.3%) predominate followed by shrubs (14), climbers (5) and trees (3). Of the 44 families, Asteraceae is the most dominant family with 33 species followed by Papilionaceae (15), Convolvulaceae (10), Caesalpiniaceae (9), Solanaceae (9), Amaranthaceae (8), Poaceae (8), Euphorbiaceae (7), Mimosaceae (6) and Tiliaceae (5). The top ten families contribute 110 species with proportion of 63.6%. The 17 families represent one species each, i.e. Apocynaceae, Araceae, Arecaceae, Balsaminaceae, Cactaceae, Liliaceae, Melastomataceae, Nyctaginaceae, Oxalidaceae, Papaveraceae, Passifloraceae, Piperaceae, Polygonaceae, Rubiaceae, Salviniaceae, Typhaceae and Urticaceae.

4 Discussion

While a number of lists of invasive plant species are in worldwide circulation, criteria used in these listings often are not documented clearly. Surveys have shown that more than half of exotic plant species currently spreading naturally were intentionally introduced, and that most of the exotic species that endanger India's native ecosystems were first introduced for horticultural purposes. Thus reducing the intentional use of high-risk exotic plants could reduce the spread and impact of invasive plants in the country.

All these species reported here, were reported as weeds in other countries or invasive alien plants in most of the regions. Almost 80% of the invasive alien plant species were introduced from Neotropics.

The invasive alien species are ready colonizers in disturbed areas and cause considerable ecological damage to India's natural areas, speed the disappearance of threatened and endemic species, reduce the carrying capacity of pastures, increase the maintenance costs of croplands, and interfere with our enjoyment of the outdoors. Of these, some species may have invaded only a

Table 1. List of invasive alien plant species in India

Sl. no.	Species	Family	Habit	Nativity	Sl. no.	Species	Family	Habit	Nativity
1	<i>Acacia farnesiana</i> (L.) Willd.	Mimosaceae	Tree	Trop. South America	31	<i>Cassia occidentalis</i> L.	Caesalpinaceae	Herb	Trop. South America
2	<i>Acacia mearnsii</i> De Wild.	Mimosaceae	Tree	South east Australia	32	<i>Cassia pumila</i> Lam.	Caesalpinaceae	Herb	Trop. America
3	<i>Acanthospermum hispidum</i> DC.	Asteraceae	Herb	Brazil	33	<i>Cassia rotundifolia</i> Pers.	Caesalpinaceae	Herb	Trop. South America
4	<i>Aerva javanica</i> (Burm.f.) Juss. ex Schult.	Amaranthaceae	Herb	Trop. America	34	<i>Cassia tora</i> L.	Caesalpinaceae	Herb	Trop. South America
5	<i>Aeschynomene americana</i> L.	Papilionaceae	Herb	Trop. America	35	<i>Cassia uniflora</i> Mill.	Caesalpinaceae	Herb	Trop. South America
6	<i>Ageratina adenophora</i> (Spreng.) King & Robinson	Asteraceae	Herb	Trop. America	36	<i>Catharanthus pusillus</i> (Murray) Don	Apocynaceae	Herb	Trop. America
7	<i>Ageratum conyzoides</i> L.	Asteraceae	Herb	Trop. America	37	<i>Celosia argentea</i> L.	Amaranthaceae	Herb	Trop. Africa
8	<i>Ageratum houstonianum</i> Mill.	Asteraceae	Herb	Trop. America	38	<i>Chamaesyce hirta</i> (L.) Millsp.	Euphorbiaceae	Herb	Trop. America
9	<i>Alternanthera paronychioides</i> A. St. Hil	Amaranthaceae	Herb	Trop. America	39	<i>Chamaesyce indica</i> (Lam.) Croizat	Euphorbiaceae	Herb	Trop. South America
10	<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Amaranthaceae	Herb	Trop. America	40	<i>Chloris barbata</i> Sw.	Poaceae	Herb	Trop. America
11	<i>Alternanthera pungens</i> Kunth	Amaranthaceae	Herb	Trop. America	41	<i>Chromolaena odorata</i> (L.) King & Robinson	Asteraceae	Herb	Trop. America
12	<i>Alternanthera tenella</i> Colla	Amaranthaceae	Herb	Trop. America	42	<i>Chrozophora rottleri</i> (Geis.) Spreng.	Euphorbiaceae	Herb	Trop. Africa
13	<i>Antigonon leptopus</i> Hook. & Arn.	Polygonaceae	Climber	Trop. America	43	<i>Cleome gynandra</i> L.	Cleomaceae	Herb	Trop. America
14	<i>Argemone mexicana</i> L.	Papaveraceae	Herb	Trop. Central & South America	44	<i>Cleome monophylla</i> L.	Cleomaceae	Herb	Trop. Africa
15	<i>Asclepias curassavica</i> L.	Asclepiadaceae	Herb	Trop. America	45	<i>Cleome rutidosperma</i> DC.	Cleomaceae	Herb	Trop. America
16	<i>Asphodelus tenuifolius</i> Cav.	Liliaceae	Herb	Trop. America	46	<i>Cleome viscosa</i> L.	Cleomaceae	Herb	Trop. America
17	<i>Bidens pilosa</i> L.	Asteraceae	Herb	Trop. America	47	<i>Clidemia hirta</i> (L.) D. Don	Melastomataceae	Herb	Trop. America
18	<i>Blainvillea acmella</i> (L.) Philipson	Asteraceae	Herb	Trop. America	48	<i>Conyza bipinnatifida</i> Wall.	Asteraceae	Herb	Trop. America
19	<i>Blumea eriantha</i> DC.	Asteraceae	Herb	Trop. America	49	<i>Corchorus aestuans</i> L.	Tiliaceae	Herb	Trop. America
20	<i>Blumea lacera</i> (Burm. f.) DC.	Asteraceae	Herb	Trop. America	50	<i>Corchorus fascicularis</i> Lam.	Tiliaceae	Herb	Trop. America
21	<i>Blumea obliqua</i> (L.) Druce	Asteraceae	Herb	Trop. America	51	<i>Corchorus tridens</i> L.	Tiliaceae	Herb	Trop. Africa
22	<i>Borassus flabellifer</i> L.	Arecaceae	Tree	Trop. Africa	52	<i>Corchorus trilocularis</i> L.	Tiliaceae	Herb	Trop. Africa
23	<i>Calotropis gigantea</i> (L.) R.Br.	Asclepiadaceae	Shrub	Trop. Africa	53	<i>Crassocephalum crepidioides</i> (Benth.) Moore	Asteraceae	Herb	Trop. America
24	<i>Calotropis procera</i> (Ait.) R. Br.	Asclepiadaceae	Shrub	Trop. Africa	54	<i>Crotalaria pallida</i> Dryand	Papilionaceae	Herb	Trop. America
25	<i>Cardamine hirsuta</i> L.	Brassicaceae	Herb	Trop. America	55	<i>Crotalaria retusa</i> L.	Papilionaceae	Herb	Trop. America
26	<i>Cardamine trichocarpa</i> Hochst. ex A. Rich.	Brassicaceae	Herb	Trop. America	56	<i>Croton bonplandianum</i> Boil.	Euphorbiaceae	Herb	Temperate South America
27	<i>Cassia absus</i> L.	Caesalpinaceae	Herb	Trop. America	57	<i>Cryptostegia grandiflora</i> R.Br.	Asclepiadaceae	Herb	Madagascar
28	<i>Cassia alata</i> L.	Caesalpinaceae	Shrub	West Indies	58	<i>Cuscuta chinensis</i> Lam.	Cuscutaceae	Herb	Mediterranean
29	<i>Cassia hirsuta</i> L.	Caesalpinaceae	Herb	Trop. America	59	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Herb	Mediterranean
30	<i>Cassia obtusifolia</i> L.	Caesalpinaceae	Herb	Trop. America	60	<i>Cyperus difformis</i> L.	Cyperaceae	Herb	Trop. America
					61	<i>Cyperus iria</i> L.	Cyperaceae	Herb	Trop. America
					62	<i>Cytisus scoparius</i> (L.) Link	Papilionaceae	Herb	Europe
					63	<i>Datura innoxia</i> Mill.	Solanaceae	Shrub	Trop. America
					64	<i>Datura metel</i> L.	Solanaceae	Shrub	Trop. America

Continued

Sl. no.	Species	Family	Habit	Nativity	Sl. no.	Species	Family	Habit	Nativity
65	<i>Dicoma tomentosa</i> Cass.	Asteraceae	Herb	Trop. Africa	96	<i>Ipomoea hederifolia</i> L.	Convolvulaceae	Herb	Trop. America
66	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	Herb	SW Asia	97	<i>Ipomoea obscura</i> (L.) Ker.-Gawl.	Convolvulaceae	Herb	Trop. Africa
67	<i>Dinebra retroflexa</i> (Vahl) Panz.	Poaceae	Herb	Trop. America	98	<i>Ipomoea pes-tigridis</i> L.	Convolvulaceae	Herb	Trop. East Africa
68	<i>Echinochloa colona</i> (L.) Link	Poaceae	Herb	Trop. South America	99	<i>Ipomoea quamoclit</i> L.	Convolvulaceae	Herb	Trop. America
69	<i>Echinochloa crusgalli</i> (L.) Beauv.	Poaceae	Herb	Trop. South America	100	<i>Ipomoea staphylina</i> Roem. & Schult.	Convolvulaceae	Herb	Trop. Africa
70	<i>Echinops echinatus</i> Roxb.	Asteraceae	Herb	Afghanistan	101	<i>Lagascea mollis</i> Cav.	Asteraceae	Herb	Trop. Central America
71	<i>Eclipta prostrata</i> (L.) Mant.	Asteraceae	Herb	Trop. America	102	<i>Lantana camara</i> L.	Verbenaceae	Herb	Trop. America
72	<i>Eichhornia crassipes</i> (C. Martius) Solms- Loub.	Pontederiaceae	Herb	Trop. America	103	<i>Leonotis nepetifolia</i> (L.) R.Br.	Lamiaceae	Herb	Trop. Africa
73	<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae	Herb	Trop. America	104	<i>Leucaena</i> <i>leucocephala</i> (Lam.) de Wit	Mimosaceae	Herb	Trop. America
74	<i>Euphorbia</i> <i>cyathophora</i> Murray	Euphorbiaceae	Herb	Trop. America	105	<i>Ludwigia adscendens</i> (L.) Hara	Onagraceae	Herb	Trop. America
75	<i>Euphorbia</i> <i>heterophylla</i> L.	Convolvulaceae	Herb	Trop. America	106	<i>Ludwigia octovalvis</i> (Jacq.) Raven	Onagraceae	Herb	Trop. Africa
76	<i>Evolvulus</i> <i>nummularius</i> (L.) L.	Convolvulaceae	Herb	Trop. America	107	<i>Ludwigia perennis</i> L.	Onagraceae	Herb	Trop. Africa
77	<i>Flaveria trinervia</i> (Spreng.) C. Mohr.	Asteraceae	Herb	Trop. Central America	108	<i>Macroptilium</i> <i>atropurpureum</i> (DC.) Urban	Papilionaceae	Climber	Trop. America
78	<i>Fuirena ciliaris</i> (L.) Roxb.	Cyperaceae	Herb	Trop. America	109	<i>Macroptilium</i> <i>lathyroides</i> (L.) Urban	Papilionaceae	Climber	Trop. Central America
79	<i>Galinosoga parviflora</i> Cav.	Asteraceae	Herb	Trop. America	110	<i>Malachra capitata</i> (L.) L.	Malvaceae	Herb	Trop. America
80	<i>Glossocardia</i> <i>bosvallea</i> (L.f.) DC.	Asteraceae	Herb	East Indies	111	<i>Malvastrum</i> <i>coromandelianum</i> (L.) Garcke	Malvaceae	Herb	Trop. America
81	<i>Gnaphalium</i> <i>coarctatum</i> Willd.	Asteraceae	Herb	Trop. America	112	<i>Martynia annua</i> (Houstoun in Martyn) L.	Pedaliaceae	Herb	Trop. America
82	<i>Gnaphalium</i> <i>pensylvanicum</i> Willd.	Asteraceae	Herb	Trop. America	113	<i>Mecardonia</i> <i>procumbens</i> (Mill.) Small	Scrophulariaceae	Herb	Trop. North America
83	<i>Gnaphalium</i> <i>polycaulon</i> Pers.	Asteraceae	Herb	Trop. America	114	<i>Melilotus alba</i> Desv.	Papilionaceae	Herb	Europe
84	<i>Gomphrena serrata</i> L.	Amaranthaceae	Herb	Trop. America	115	<i>Melochia</i> <i>corchorifolia</i> L.	Sterculiaceae	Herb	Trop. America
85	<i>Grangea</i> <i>maderaspatana</i> (L.) Poir.	Asteraceae	Herb	Trop. South America	116	<i>Merremia aegyptia</i> (L.) Urban.	Convolvulaceae	Herb	Trop. America
86	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Herb	Trop. America	117	<i>Mikania micrantha</i> Kunth	Asteraceae	Climber	Trop. America
87	<i>Impatiens balsamina</i> L.	Balsaminaceae	Herb	Trop. America	118	<i>Mimosa pigra</i> L.	Mimosaceae	Shrub	Trop. North America
88	<i>Imperata cylindrica</i> (L.) Raensch.	Poaceae	Herb	Trop. America	119	<i>Mimosa pudica</i> L.	Mimosaceae	Herb	Brazil
89	<i>Indigofera</i> <i>astragalina</i> DC.	Papilionaceae	Herb	Trop. America	120	<i>Mirabilis jalapa</i> L.	Nyctaginaceae	Herb	Peru
90	<i>Indigofera glandulosa</i> Roxb. ex Willd.	Papilionaceae	Herb	Trop. America	121	<i>Monochoria vaginalis</i> (Burm.f.) C. Presl.	Pontederiaceae	Herb	Trop. America
91	<i>Indigofera linifolia</i> (L.f.) Retz.	Papilionaceae	Herb	Trop. South America	122	<i>Nicotiana</i> <i>plumbaginifolia</i> Viv.	Solanaceae	Herb	Trop. America
92	<i>Indigofera linnaei</i> Ali	Papilionaceae	Herb	Trop. Africa	123	<i>Ocimum americanum</i> L.	Lamiaceae	Herb	Trop. America
93	<i>Indigofera trita</i> L.f.	Papilionaceae	Shrub	Trop. Africa	124	<i>Opuntia stricta</i> (Haw.) Haw.	Cactaceae	Herb	Trop. America
94	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Shrub	Trop. America	125	<i>Oxalis corniculata</i> L.	Oxalidaceae	Herb	Europe
95	<i>Ipomoea eriocarpa</i> R.Br.	Convolvulaceae	Herb	Trop. Africa					

Continued

Sl. no.	Species	Family	Habit	Nativity	Sl. no.	Species	Family	Habit	Nativity
126	<i>Parthenium hysterophorus</i> L.	Asteraceae	Herb	Trop. North America	150	<i>Solanum torvum</i> Sw.	Solanaceae	Shrub	West Indies
127	<i>Passiflora foetida</i> L.	Passifloraceae	Herb	Trop. South America	151	<i>Solanum viarum</i> Dunal	Solanaceae	Herb	Trop. America
128	<i>Pedaliium murex</i> L.	Pedaliaceae	Herb	Trop. America	152	<i>Sonchus asper</i> Hill	Asteraceae	Herb	Mediterranean
129	<i>Pennisetum purpureum</i> Schum.	Poaceae	Herb	Trop. America	153	<i>Sonchus oleraceus</i> L.	Asteraceae	Herb	Mediterranean
130	<i>Peperomia pellucida</i> (L.) Kunth	Piperaceae	Herb	Trop. South America	154	<i>Spermacoce hispida</i> L.	Rubiaceae	Herb	Trop. America
131	<i>Peristrophe paniculata</i> (Forssk.) Brummitt	Acanthaceae	Herb	Trop. America	155	<i>Spilanthes radicans</i> Jacq.	Asteraceae	Herb	Trop. South America
132	<i>Phyllanthus tenellus</i> Roxb.	Euphorbiaceae	Herb	Mascarene Islands	156	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	Verbenaceae	Herb	Trop. America
133	<i>Physalis angulata</i> L.	Solanaceae	Herb	Trop. America	157	<i>Stachytarpheta urticaefolia</i> (Salisb.) Sims	Verbenaceae	Herb	Trop. America
134	<i>Physalis pruinosa</i> L.	Solanaceae	Herb	Trop. America	158	<i>Stylosanthes hamata</i> (L.) Taub.	Papilionaceae	Herb	Trop. America
135	<i>Pilea microphylla</i> (L.) Liebm.	Urticaceae	Herb	Trop. South America	159	<i>Synadenium grantii</i> Hook. f.	Euphorbiaceae	Shrub	Trop. America
136	<i>Pistia stratiotes</i> L.	Araceae	Herb	Trop. America	160	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	Herb	West Indies
137	<i>Portulaca oleracea</i> L.	Portulacaceae	Herb	Trop. South America	161	<i>Torenia fournieri</i> Linden ex E. Fournier	Scrophulariaceae	Herb	Australia
138	<i>Portulaca quadrifida</i> L.	Portulacaceae	Herb	Trop. America	162	<i>Tribulus lanuginosus</i> L.	Zygophyllaceae	Herb	Trop. America
139	<i>Prosopis juliflora</i> (Sw.) DC.	Mimosaceae	Shrub	Mexico	163	<i>Tribulus terrestris</i> L.	Zygophyllaceae	Herb	Trop. America
140	<i>Rhynchelytrum repens</i> (Willd.) C.E. Hubb.	Poaceae	Herb	Trop. America	164	<i>Tridax procumbens</i> L.	Asteraceae	Herb	Trop. Central America
141	<i>Rorippa dubia</i> (Pers.) Hara	Brassicaceae	Herb	Trop. America	165	<i>Triumfetta rhomboidea</i> Jacq.	Tiliaceae	Herb	Trop. America
142	<i>Ruellia tuberosa</i> L.	Acanthaceae	Herb	Trop. America	166	<i>Turnera subulata</i> J.E. Smith	Turneraceae	Herb	Trop. America
143	<i>Saccharum spontaneum</i> L.	Poaceae	Herb	Trop. West Asia	167	<i>Turnera ulmifolia</i> L.	Turneraceae	Herb	Trop. America
144	<i>Salvinia molesta</i> D. S. Mitch.	Salviniaceae	Herb	Brazil	168	<i>Typha angustata</i> Bory. & Choub.	Typhaceae	Herb	Trop. America
145	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Herb	Trop. America	169	<i>Ulex europaeus</i> L.	Papilionaceae	Shrub	Western Europe
146	<i>Sesbania bispinosa</i> (Jacq.) Wight	Papilionaceae	Shrub	Trop. America	170	<i>Urena lobata</i> L.	Malvaceae	Shrub	Trop. Africa
147	<i>Sida acuta</i> Burm.f.	Malvaceae	Herb	Trop. America	171	<i>Waltheria indica</i> L.	Sterculiaceae	Herb	Trop. America
148	<i>Solanum americanum</i> Mill.	Solanaceae	Herb	Trop. America	172	<i>Xanthium strumarium</i> L.	Asteraceae	Herb	Trop. America
149	<i>Solanum seaforthianum</i> Andrews	Solanaceae	Climber	Brazil	173	<i>Youngia japonica</i> (L.) DC.	Asteraceae	Herb	Trop. South America

restricted region, but have a huge probability of expanding, and causing great damage. Other species may already be globally widespread and causing cumulative but less visible damage.

Among the 173 species, majority are generalists found in all kinds of systems like forests, crop lands, waste lands, plantations, gardens and road sides. The 33 species are invaders of wetlands, i.e. *Aerva javanica*, *Aeschynomene americana*, *Alternanthera paronychioides*, *Alternanthera philoxeroides*, *Asclepias curassavica*, *Cassia alata*, *Corchorus trilocularis*, *Cyperus difformis*, *Cyperus iria*, *Echinochloa colona*, *Echinochloa crusgalli*,

Eclipta prostrata, *Eichhornia crassipes*, *Fuirena ciliaris*, *Gnaphalium coarctatum*, *Gnaphalium pensylvanicum*, *Gnaphalium polycaulon*, *Grangea maderaspatana*, *Ipomoea carnea*, *Ludwigia adscendens*, *Ludwigia octovalvis*, *Ludwigia perennis*, *Mecardonia procumbens*, *Monochoria vaginalis*, *Pistia stratiotes*, *Portulaca quadrifida*, *Rorippa dubia*, *Saccharum spontaneum*, *Salvinia molesta*, *Sesbania bispinosa*, *Sonchus asper*, *Sonchus oleraceus* and *Typha angustata*.

The predominance of Asteraceae species in invasive category shows the high impact of neotropical flora on Indian region.

5 Conclusion

According to the available information, there are about 173 alien species of invasive nature are found in India. Monitoring of invasion can be done through qualitative approach like species inventory (seasonally) and quantitative approach using phytosociological methods and mapping using ground-based methods (via map overlays or GPS), remotely-sensed images (aerial photos, high resolution multi-spectral digital data).

A better planning is needed for early detection and reporting of infestations of spread of new and naturalized weeds by creation of plant detection network in each State by establishing communication links between taxonomists, ecologists and land managers to monitor and control.

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