

Alien Flora of Ballari District, Karnataka, India

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ABSTRACT

The present study deals with comprehensive list of invasive alien species in the flora of Ballari district with background information on family, habit and nativity. Total 215 invasive alien species belonging to 168 genera under 68 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 54% are native to Tropical America contribute maximum proportion to the invasive alien flora of Ballari district. Habit wise analysis shows herbaceous species share 119(56%) species, followed by shrubs 35 (16%), climbers 20(9%) and trees 42(19%). Among 68 families, Asteraceae is the most dominant family with 27 species (25%) followed by Ceasalpinaceae with 14 species(13%). There is an imperative need to listing regional data on exotic species in order to study the impact on local vegetation and survey the worldwide pattern of species invasion.

Keywords: Alien species, biodiversity, plant invasion, biogeography, taxonomy, Ballari district

1. INTRODUCTION

Invasion of alien plant species in recent times has been recognized as the second worst threat after habitat destruction [C. B. D, 2005]. Recently, research on biological invasions has recognized the importance of social perceptions of alien invasive species for their management (Kueffer 2017, Shackleton et al. 2019a). In plant ecology, the term invasion is generally used for situations where the distribution and abundance of plants changes as a result of human activities. For other situations such as after the retreat of glaciations, the terms migration, spread, range expansion or range extension are used (Pyšek et al., 2004). The International Union for Conservation of Nature and Natural Resources (IUCN) defines "alien invasive species" as an alien species which becomes established in natural or seminatural ecosystems or habitat as agent of change and threatens native biological diversity.

Three crucial decisions should be made when defining the status of a plant species in a given region: (1) whether the taxon is native or alien to that region (origin status); (2) what is its position in the invasion process, i.e., when was it introduced (residence status); and (3) what is the degree of its naturalization and possible invasion (invasion status) (Petr Pyšek (2004). The impact of Invasive species on biodiversity and functioning of ecosystems has been well documented (Mack et al., 2000; Hobbs, 2000; Polley et al., 1994) and is now recognized as a primary cause for global biodiversity loss (Czech and Krausman, 1997; Wilcove and Chen, 1998) and species extinction (di Castri, 1989).

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Parthenium hysterophorus has been accounted for to be a wellbeing risk, especially to cultivate workers. Incessant contact with this plant causes hypersensitivity, dermatitis, skin inflammation, asthma, and gangrene (Bahar, N. 2000), and furthermore consistent sniffing, hack, and fever (Dasgupta, A.K. 2010). Another obtrusive species, Lantana camara builds the rate of dozing infection in both wild and tamed creatures, also in as people (Mack, R.N.,(2000), (Sidanand V. Kamar et.al. (2011).

2. MATERIAL AND METHODS

Study Area

Ballari district is situated on the eastern side of the Karnataka state and classified as Northern Maidan region with monotonous, treeless, and expansive plateau landscape. spread across 7 taluks, namely Ballari, Siruguppa, Hospet, Kudligi, Sandur, Hadagali and Hagaribommanahalli . This district is bounded by Raichur district on the north, Koppal district on the west, Chitradurga and Davanagere districts on the south, and Anantapur and Kurnool districts of Andhra Pradesh on the east. The Sandur hills run North West of the district dividing the district in to two distinct parts. The Tungabhadra River forms the eastern and northern boundary of the district.

Geographical area of the district (Fig. 1.) is about 8,461 sq km lying between the latitudinal parallels of 15° 30' and 15°50' North and longitudes of 75° 40' and 77° 11' East. The average elevation of the district is 493.71m amsl. The highest elevation in the ridge is the famous Kumaraswamy

hills which is 1084m amsl. Ramanmalai (993.1m amsl) and jambunatha hill (908 m amsl) are the major ridges in the district. The other ridges in the district are Ramagod (1058 m amsl) and Donimalai (1027m amsl). Temperature ranges from 48o C (Max) and 11oC (Min), Average humidity 88(Max) & 40 (Min), Average annual rainfall 606 mm.

The other important rivers are Hagari and Chikkahagari district is also known as the ‘Steel city of South India’. The soils of the district are derived from Granites, Gneisses and Schistose rocks. The Sandy loam soil mixed with black and grey soil occurs along the stream beds. Farm Land and Rich minerals characterize Ballari district and also making headlines with mining industry. The present study is an attempt to know the documentation of exotic plants in Ballari district of Karnataka. Periodic field surveys were carried out during June 2019 to August 2020. Standard methods were followed for the collection of plant materials and the specimens were identified, by referring standard flora [Gamble 1994, Hooker 1978, Saldanha, C.J. (1984, 1996), Sharma, B.D. et.al.,(1984), Singh, N.P. (1988)]. As part of this study we have focused on building a comprehensive list of alien species with their habit, origin and uses.

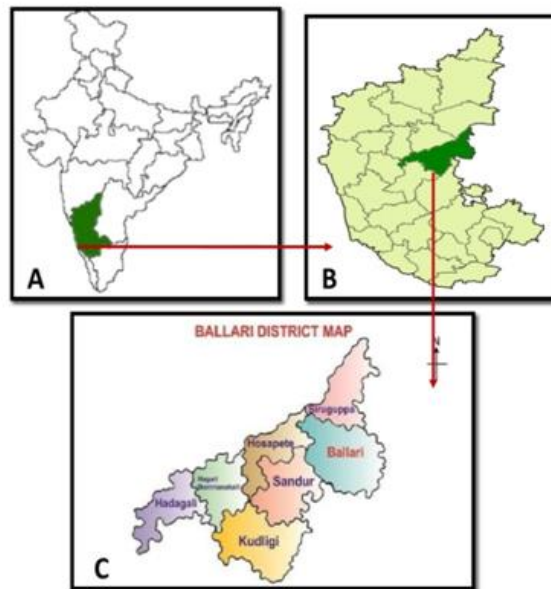


FIG. 1, LOCATION MAP OF THE STUDY AREA A. INDIA, B. KARNATAKA STATE, C. BALLARI DISTRICT

3. RESULTS

The study brought to light catalogue of invasive alien species in Ballari district. Total 215 species in 168 genera and under 68 families were documented as invasive alien plant species. The 215 invasive alien species were shown along with family name, habit, nativity and uses in Table 1.

TABLE 1 Alien plant species of Ballari District, their habit, origin, longevity and uses

	ACANTHACEAE	HA	OR	LO	US
1	Peristrophe paniculata (Forssk) Burmmit.	H	AF	A	FO
2	Ruellia prostrata L.	H	AF,AS	A	M
	AGAVACEAE				
3	Agave americana L.	S	AM	P	RM
	AMARANTHACEAE				
4	Alternanthera pungens Kunth in H. B. & K. Nov.	H	AM	P	M
5	Alternanthera sessilis (L.) R. Br. ex DC.	H	AM	P	M
6	Amaranthus viridis L.	H	AM	A	V
7	Celosia argentea L.	H	AM	A	M
8	Gomphrena celosioides Mart.	H	AM	P	NK
9	Gomphrena globosa L.	H	AM	P	M
	ANACARDIACEAE				
10	Anacardium occidentale L.	T	AM	P	EF, M
	ANNONACEAE				
11	Annona reticulata L.	T	AM	p	EF, M
12	Annona muricata L.	T	AM	P	EF, V
13	Annona squamosa L.	T	AM	P	EF
14	Artabotrys hexapetalus (L. f.) Bhandari	T	AS	P	CH, M
15	Polyalthia longifolia (Sonnerat) Thw.	T	AS	P	O, WO
	APIACEAE				
16	Coriandrum sativum L.	H	AM	A	M
17	Cuminum cyminum L.	H	EM	A	M
18	Daucus carota L.	H	EM	A	V, M
19	Foeniculum vulgare Gaertn.	H	EM	A	V, M
	APOCYNACEAE				
20	Alstonia scholaris (L.) R. Br.	T	M	P	CH, WO
21	Catharanthus pusillus (Murr.) G. Don	H	AM	A	M
22	Catharanthus roseus (L.) G. Don	H	MA	P	M
23	Nerium oleander L.	S	EM, AS	P	O
24	Plumeria alba L.	T	AM	P	M
25	Plumeria rubra var. acuminata (Ait.) R.S.Rao & Balam	T	AM	P	M, WO
26	Thevetia peruviana (Pers.) K. Schum.	T	AM	P	O
	ARACEAE				
27	Pistia stratiotes L.	H	AM	P	M, FO
	ARECACEAE				
28	Borassus fiabellifer L.	T	AF	P	HF

29	<i>Cocos nucifera</i> L.	T	AM	P	EF
30	<i>Livistona chinensis</i> R. Br.	T	EA	P	TH
	ASCLEPIADACEAE				
31	<i>Allamanda cathartica</i> L.	C	AM	P	O
32	<i>Asclepias curassavica</i> L.	H	AM	P	O
33	<i>Calotropis gigantea</i> (L.) R. Br.	S	AF	P	M
34	<i>Calotropis procera</i> (Ait.) R. Br.	S	AF	P	M
35	<i>Cryptostegia grandiflora</i> R. Br.	C	MA	P	M
	ASTERACEAE				
36	<i>Acanthospermum hispidum</i> DC.	H	AM	A	M
37	<i>Ageratum conyzoides</i> L.	H	AM	A	M
38	<i>Bidens biternata</i> (Lour.) Merr. & Sherif ex Sherff	H	AM	A	M
39	<i>Blainvillea acmella</i> L.	H	AM	A	CH
40	<i>Blumea lacera</i> L.	H	AM	A	M
41	<i>Carthamus tinctorius</i> L.	H	AF	A	CH
42	<i>Cosmos bipinnatus</i> Cav.	H	AM	A	CH
43	<i>Cosmos sulphureus</i> Cav.	H	AM	A	O, M
44	<i>Crassocephalum crepidioides</i> (Benth.) S. Moore	H	AF	A	CH
45	<i>Dahlia pinnata</i> Cav.	H	AF	A	CH
46	<i>Dicoma tomentosa</i> Casso	H	AF, MA	A	M
47	<i>Eclipta alba</i> var. <i>prostrata</i> (L.) Miq.	H	AM	A	M
48	<i>Emilia sonchifolia</i> (L.) DC.	H	AM	A	V
49	<i>Flaveria trinervia</i> (Spreng.) C. Mohr.	H	AF	A	M
50	<i>Helianthus annuus</i> L.	H	NA	A	CH
51	<i>Grangea maderaspatana</i> (L.) Poir.	H	AM	A	M
52	<i>Guizotia abyssinica</i> (L. f.) Olss.	H	AF	A	CH
53	<i>Lagasca mollis</i> Cav.	H	AM	A	NK
54	<i>Parthenium hysterophorus</i> L.	H	AM	A	M
55	<i>Sonchus brachyotus</i> DC.	H	EM	A	NK
56	<i>Sonchus oleraceus</i> L.	H	EM	A	V
57	<i>Synedrella nodiflora</i> (L.) Gaertn.	H	AM	A	M
58	<i>Tagetes erecta</i> L.	H	AM	P	M
59	<i>Tagetes patula</i> L.	H	AM	P	O
60	<i>Tithonia diversifolia</i> (Hemsley) A. Gray	H	AM	P	O
61	<i>Tridax procumbens</i> L.	H	AM	P	M
62	<i>Xanthium strumarium</i> L.	H	AM, NA	A	M
	BALSAMINACEAE				
63	<i>Impatiens balsamina</i> L.	H	AM	A	O
	BASELLACEAE				
64	<i>Basella alba</i> L. var. <i>cordifolia</i>	C	AF	P	M
	BIGNONIACEAE				
65	<i>Jacaranda acutifolia</i> Humb. & Bonpl.	T	AM	P	O
66	<i>Spathodea campanulata</i> Beauv.	T	AF	P	O
67	<i>Tabebuia argentea</i> (Bur. & Schum.) Britt.	T	AM	P	O
68	<i>Tecoma stans</i> (L.) Juss. ex H.B. & K. Nov	S	AM	P	O
	BIXACEAE				
69	<i>Bixa orellana</i> L.	T	AM	P	CH
	BRASSICACEAE				
70	<i>Brassica campestris</i> L.	H	MA	A	M
71	<i>Brassica juncea</i> (L.) Czern.	H	EM	A	M
72	<i>Brassica nigra</i> Koch.	H	EM	A	M
73	<i>Cardamine hirsuta</i> L.	H	AM	A	M
74	<i>Coronopus didymus</i> (L.) J. E. Sm.	H	AM	A	M
75	<i>Raphanus sativus</i> L.	H	EM	A	V
	BROMELIACEAE				
76	<i>Ananas comosus</i> (L.) Merr.	S	AM	P	EF
	BURSERACEAE				
77	<i>Bursera delpechiaoa</i> Poiss. ex Engl.	T	AM	P	CH
	CACTACEAE				
78	<i>Cereus peruvianus</i> (L.) Mill.	S	AM	P	NK
79	<i>Opuntia elatior</i> Mill.	S	AM	P	EF
	CAESALPINIACEAE				
80	<i>Bauhinia variegata</i> L.	T	AM	P	O
81	<i>Caesalpinia bunduc</i> (L.) Roxb.	S	AS	P	M
82	<i>Caesalpinia coriaria</i> Willd.	T	AM	P	O
83	<i>Caesalpinia pulcherrima</i> (L.) SW.	S	AM	P	O
84	<i>Cassia hirsuta</i> L.	S	AM	P	M
85	<i>Cassia javanica</i> L.	T	AM	P	O
86	<i>Cassia occidentalis</i> L.	H	AM	P	M
87	<i>Cassia roxburghii</i> DC.	T	AS	P	O

88	Cassia siamea Lamk.	T	AS	P	WO
89	Cassia tora L.	H	AM	P	M
90	Delonix regia (Boj. ex Hook.) Raf.	T	AM	P	M
91	Parkinsonia aculeata L.	T	AM	P	M
92	Peltophorum pterocarpum (DC.) Baker ex Heyne	T	AS	P	M
93	Tamarindus indicus L.	T	AF	P	EF
	CANNACEAE				
94	Canna indica L.	H	AM	P	M
	CARICACEAE				
95	Carica papaya L.	T	AM	P	EF
	CASUARINACEAE				
96	Casuarina equisetifolia J. R. & G. Forst.	T	AU	P	WO
	CLEOMACEAE				
97	Cleome gynandra L.	H	AF	A	M
98	Cleome viscosa L.	H	AS	A	M
	CONVOLVULACEAE				
99	Ipomoea batatas (L.) Lamk.	C	AM	P	V, ET
100	Ipomoea cairica (L.) Sw.	C	AF	P	M
101	Ipomoea carnea Jacq.	S	AM	P	M
102	Ipomoea hederifolia L.	C	AM	A	M
103	Ipomoea nil (L.) Roth,	C	AM	A	M
104	Ipomoea obscura (L.) Ker-Gawl.	C	AF, AS, AU	P	M
105	Ipomoea staphylina Roem. & Schult.	C	AS	P	NK
106	Merremia aegyptia (L.) Urb.	C	AM	P	M
	CRASSULACEAE				
107	Kalanchoe tubiflora (Harvey) Harnet.	H	MA	P	O
	CUCURBITACEAE				
108	Coccinia grandis (L.) Voigt	C	AF	P	V
	CYPERACEAE				
109	Cyperus difformis L.	H	AM	A	CH
	EUPHORBIAEAE				
110	Croton bonplandianum Baill.	H	AM	P	CH
111	Euphorbia heterophylla L.	H	AM	A	O
112	Euphorbia hirta L.	H	AM	A	M
113	Euphorbia milii Desmoul.	S	MA	P	O
114	Euphorbia prostrata Ait.	H	AM	A	NK
115	Euphorbia tirucalli L.	S	AF	P	M
116	Jatropha curcas L.	S	AM	P	CH
117	Jatropha glandulifera Roxb.	S	AS	P	M
118	Manihot esculenta Crantz.	S	AM	P	CH
119	Ricinus communis L.	S	AF	P	CH
	FABACEAE				
120	Arachis hypogea L.	H	AM	A	CH
121	Crotalaria pallida Ait.	S	FF	P	CH
122	Crotalaria retusa L.	H	AM	A	CH
123	Indigofera glandulosa Roxb. ex Willd.	H	AM	A	V, M
124	Indigofera linifolia (L. f.) Retz.	H	AF, AS, AU	A	M
125	Indigofera linnaei Ali	H	EA, AU	A	M
126	Sesbania bispinosa var. grandiflora Du Puy & Labat	H	AF, AS, AM	A/B	FO, RM
127	Stylosanthes fruticosa (Retz.) Alst.	H	AM	P	FO, M
	HYDROCHARITACEAE				
128	Vallisneria spiralis L.	H	AM	P	M
	LAMIACEAE				
129	Hyptis suaveolens (L.) Poit.	H	AM	A	M,CH
130	Leonotis nepetifolia (L.) R. Br.	H	AF	P	M
131	Mentha piperata L.	H	AM	A	M,CH
132	Ocimum americanum L.	H	AF	A	M,CH
133	Ocimum basilicum L.	H	AS	A	M
	LECYTHIDACEAE				
134	Couroupita guianensis Aubl.	T	AF	P	O
	LILIACEAE				
135	Gloriosa superba L.	C	AF	P	M,CH
	LINACEAE				
136	Linum usitatissimum L.	H	EA	A	M,CH
	LYTHRACEAE				
137	Lagerstroemia indica L.	S	EA	P	M
	MALVACEAE				
138	Abelmoschus esculentus (L.) Moench.	H	AF	A	EF
139	Hibiscus mutabilis L.	S	EA	P	O

140	Hibiscus rosa-sinensis var. Schizopetalus (Mast.) Dyer, Gard. Chron.	S	EA	P	O, M
141	Hibiscus trionum L.	H	AF	A	M
142	Malvastrum coromandelianum (L.) Garcke	H	AM	A	M
143	Sida acuta Burm. f.	H	AM	A	M
	MARTYNIACEAE				
144	Martynia annua (Houst. in Mart.) L.	H	AM	P	M
145	Swietenia mahogani (L.) Jacq.	H	AM	P	M
	MELIACEAE				
146	Melia azedarach L.	T	AS, EA	P	WO
	MIMOSACEAE				
147	Acacia auriculiformis A. Cuon.	T	AU	P	WO
148	Adenanthera pavonina L.	T	EA	P	M
149	Leucaena leucocephala (Lamk.) de Wit.	T	AM	P	FO
150	Mimosa pudica L.	H	AM	P	O
151	Pithecellobium dulce (Roxb.) Benth.	T	AM	P	FO
151	Prosopis juliflora (Sw.) DC.	S	AM	P	FO
	MORACEAE				
153	Ficus benjamina L.	T	AS	P	M, WO
	MUNTINGIACEAE				
154	Muntingia calabura L.	T	AM	P	EF, M
	MYRTACEAE				
155	Eucalyptus citriodora Hook. f.	T	AM	P	CH, WO
156	Psidium guajava L.	T	AM	P	EF
	NYCTAGINACEAE				
157	Bougainvillea spectabilis Willd.	S	AM	P	O
158	Mirabilis jalapa L.	H	AM	A	O
	ONAGRACEAE				
159	Ludwigia perennis L.	H	AF	P	M
	OXALIDIACEAE				
160	Averrhoa bilimbi L.	T	AM	P	O
161	Oxalis corniculata L.	H	NA	P	M
	PAPAVERACEAE				
162	Argemone mexicana L.	H	AM	A	M
	PASSIFLORACEAE				
163	Passiflora alata-caerulea Lindl.	C	AM	P	O
164	Passiflora edulis Sims	C	AM	P	O
165	Passiflora foetida L.	C	AM	P	O, M
	PHYLLANTHACEAE				
166	Phyllanthus amarus Schum. & Thonn.	H	AF, AM, AS	A	M
	POACEAE				
167	Arundo donax L.	H	NA	A	FO
168	Chloris barbata (L.) Sw.	H	AM	P	FO
169	Chloris virgata Sw.	H	AM	A	FO
170	Coix lacryma-jobi L.	H	AS	A	FO, EF
171	Dinebra retroflexa (Vahl) Panz.	H	AF, AS	P	FO
172	Imperata cylindrica (L.) Raeuschel.	H	AM	A	FO
173	Paspalidium flavidum (Retz.) A. Camus	H	AS	P	FO
174	Saccharum spontaneum L.	S	AS	P	FO
175	Setaria italica (L.) P. Beauv.	H	AF, AS, AM	P	FO
	Zea mays L.	H	AM	A	EF
176	POLYGONACEAE				
177	Antigonon leptopus Hook. & Am.	C	AM	P	O
178	Homalocladium platycladum (F. Muell.) L. N. Bailey.	H	AM	P	FO
179	Rumex acetosella L.	H	EA	P	V, M
	PONTEDERIACEAE				
180	Eichhornia crassipes (Mart.) Solms.	H	AM	P	FO
181	Monochoria hastata (L.) Solms.	H	AS, EA	A	M
	PORTULACACEAE				
182	Portulaca quadrifida L.	H	MA	A	V, M
	PRIMULACEAE				
183	Anagallis arvensis L.	H	EM	A	M
	PROTEACEAE				
184	Grevillea robusta A. Cunn. ex R. Br.	T	AU	P	WO
	PUNICACEAE				
185	Punica granatum L.	S	AS	P	EF
	SAPINDACEAE				
186	Dodonaea viscosa (L.) Jacq.	S	AM	P	M
	SCROPHULARIACEAE				
187	Scoparia dulcis L.	H	AM	A/P	M
	SIMAROUBACEAE				

188	<i>Ailanthus excelsa</i> Roxb.	T	AM	P	O,WO
	SOLANACEAE				
189	<i>Capsicum annum</i> L.	H	AM	A	M,CH
190	<i>Capsicum annum</i> L. var. <i>acuminata</i> Fingerh.	H	AM	A	M,CH
191	<i>Capsicum frutescens</i> L.	H	AM	A	M,CH
192	<i>Cestrum nocturnum</i> L.	S	AM	P	CH
193	<i>Datura metel</i> L.	S	AM	P	M
194	<i>Nicotiana plumbaginifolia</i> Vivo	H	AM	A	CH
195	<i>Nicotiana tabacum</i> L.	H	AM	A	CH
196	<i>Physalis minima</i> L.	H	AM	A	M
197	<i>Solanum erianthum</i> D. Don	S	AM	P	M
198	<i>Solanum lycopersicum</i> L.	H	AM	A	V, FO
199	<i>Solanum melogena</i> L. var. <i>incanum</i> (Willd.) Prain,	H	AF	P	V
200	<i>Solanum nigrum</i> L.	H	AM	A	M
201	<i>Solanum seafortianum</i> Andr.	C	AM	A	O
202	<i>Solanum torvum</i> Sw.	S	AM	P	M
	STERCULIACEAE				
203	<i>Waltheria americana</i> L. (syn: <i>W. indica</i> L.)	H	AM	P	M
	TILIACEAE				
204	<i>Corchorus olitorius</i> L.	H	AF, AS	A	M
205	<i>Triumfetta rhomboidea</i> Jacq.	S	AM	A	M
	TRAPACEAE				
206	<i>Trapa natans</i> L.	H	EA	P	V
	TYPHACEAE				
207	<i>Typha angustata</i> Bory & Chaub.	H	EM	P	TH, FO
208	<i>Typha angustifolia</i> L.	S	EM	P	TH, FO
	VERBENACEAE				
209	<i>Clerodendrum philippinum</i> Schuer	S	EA	P	O
210	<i>Clerodendrum splendens</i> Don.	C	AF	P	FO
211	<i>Lantana camara</i> L.	S	AM	P	M, BF
212	<i>Stachytarpheta jamaicensis</i> (L.) Vahl.	H	AM	A/P	M
	VITACEAE				
213	<i>Vitis vinifera</i> L.	C	EA	P	EF, FO
	ZINGIBERACEAE				
214	<i>Hedychium coronarium</i> Koen.	H	AS	P	O
	ZYGOPHYLLACEAE				
215	<i>Tribulus terrestris</i> L.	H	EM	P	M

HA = Habit. H = Herb, S = Shrub, C = Climber, T = Tree. OR = Origin. AF = Tropical Africa and Arabia, AM = Tropical America, AS = Tropical Asia, AU = Australasia, EA = East Asia (China, Japan), EM = Europe and Mediterranean, MA = Madagascar, NA = North America. LO = Longevity. A = Annual. A/B = Annual/Biennial; P, Perennial; A/P, Annual/Perennial. HT = Habitat. W = Wasteland, CF = Cultivated fields, RB = River or pond banks, F = Forests, AR = roadsides, AQ = Aquatic. US = Uses. FO = Fodder, M = Medicinal, RM = Rope making, O = Ornamental, V = Vegetable, NK = Not known, WO = Wood, CH = Bioactive Chemicals, EF = Edible fruit, HT = Hat thatching, BF = Biofuel.

4. DISCUSSION

Habit wise analysis shows that herbs with 119 species (56%) predominate followed by tree 42 (20%), shrubs 35 (16%) and climbers 20 (9%) (Fig.2).

Among the 68 families, Asteraceae is the most dominant family with 27 species(25%) followed by Ceasalpinaceae with 14 species(13%), Solanaceae with 14 species(13%), Euphorbiaceae with 10 species (9%), Poaceae with 10 species (9%), Convolvulaceae with 08 species (7%), Fabaceae with 08 species (7%), Apocynaceae with 07 species (6%), Amaranthaceae with 06 species (5%), Mimosaceae with 06 species(5%). The top ten families contribute 110 species with proportion of 50.92%. The 17 families represent one species each, i.e. Apocynaceae, Araceae, Areaceae, Balsaminaceae, Cactaceae, Liliaceae, Melastomataceae, Nyctaginaceae, Oxalidaceae, Papaveraceae, Passifloraceae, Piperaceae, Polygonaceae, Rubiaceae, Salviniaceae, Typhaceae and Urticaceae (Fig.3).

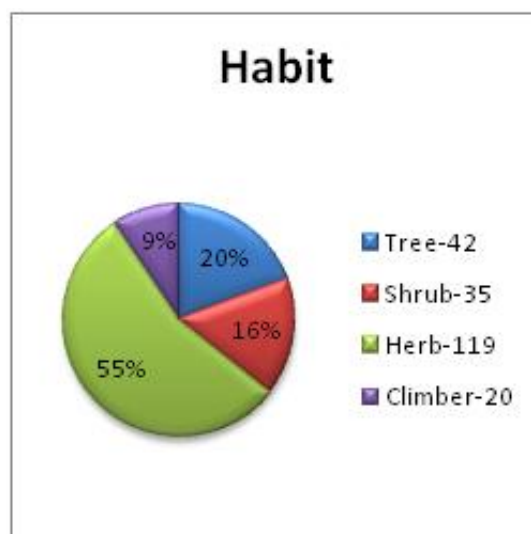


Fig.2 The habit of alien species of Ballari District

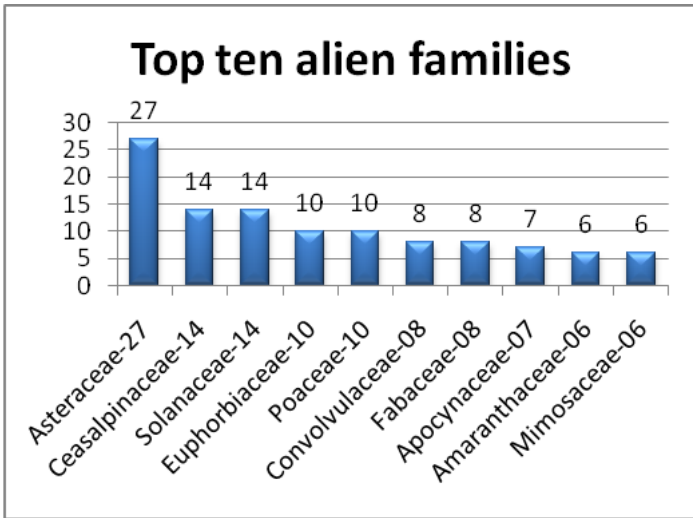


Fig.3 The top 10 alien family of Ballari District

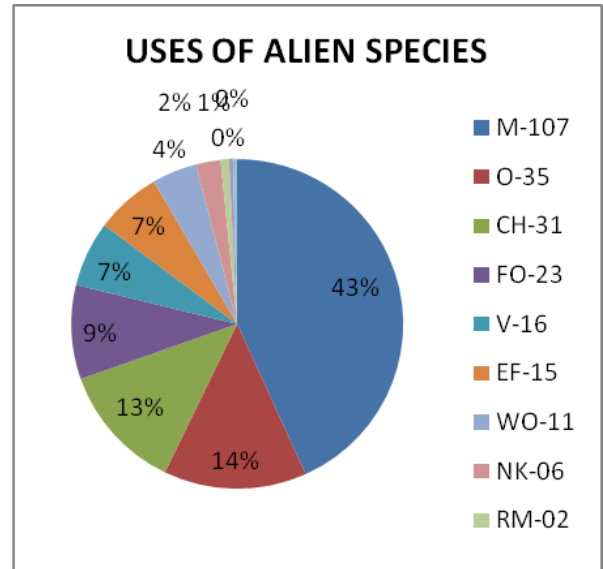


Fig 5 Uses of alien species in Ballari District

M = medicine, O = ornamental, CH = bioactive chemical, FO = fodder, V = vegetable, EF = Edible fruit, WO = wood, BF = biofuel, HT = thatching, NK = unknown, RM = rope.

Tropical America (with 126 species) region contribute the greatest to the number (54%) followed by tropical Africa & arabica with 37 species (16%). Tropical Asia with 28 species (12%). East Asia with 14 species(6%), Europe (incl. Mediterranean) with 13 species (5%), Madagascar with 07 species(3%), North America with 04 species (2%) (Fig.4).

Among the list of alien species some of them are used by the local people. About 43% of the alien species listed for Ballari district are used for medicinal purposes, followed by 14% ornamentals, 9% is used for fodder, 13% have bioactive chemicals, 7% are used as vegetables, 7% produce edible fruits, 1% produce fibres that can be used to make rope, 4% is used for wood and negligible amount for biofuel and thatching respectively (Fig.5).

5. CONCLUSION

Invasive floristic study of the Ballari district revealed a total of 215 species belonging to 168 genera and 68 families (Table 1). Plant invasions in the new areas alter indigenous community composition, deplete species diversity, affect ecosystem process, and thus cause huge economic and ecological imbalance. Removal of alien species, chemically or mechanically, may provide temporary control so there is a need to quantify the effect of obtrusive species and their control techniques on the territorial biodiversity and human wellbeing. It is essential to adopt scientific methods to control these alien species. 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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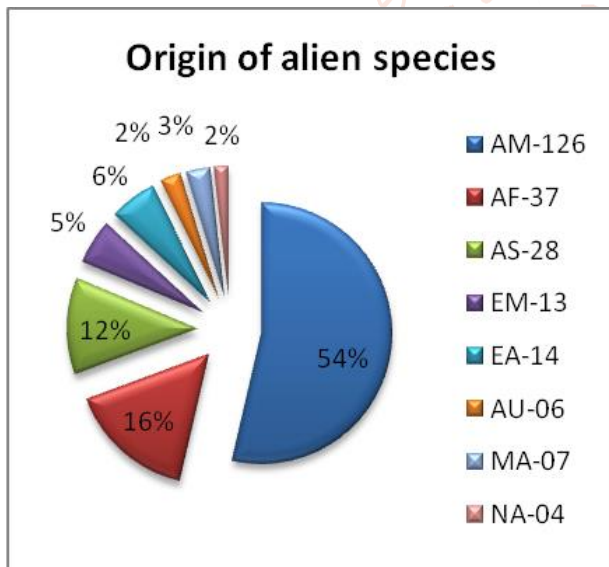


Fig 4 The origin of alien species of Ballari District

AM = Tropical America, AF = Tropical Africa, AS = Tropical Asia, EM = Europe (incl. Mediterranean), EA = East Asia, AU = Australasia, MA = Madagascar, NA = North America

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