



Origin, diversity and uses of Invasive Alien plant species in Utkal University Campus, Bhubaneswar, Odisha

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ABSTRACT

An exhaustive floristic survey was carried out during 2017-2018 in the Utkal University Campus, Bhubaneswar, Odisha state to assess the diversity, nativity and uses of invasive alien plants. From the study it was found that 60 species with 51 genera and under 34 different families were invasive alien plants. Analysis of habit revealed that the herbs were dominant with 45 species (75%) followed by shrubs (07), trees (02) and climbers (06) and the dominant family was Asteraceae with 10 (19.23%) species followed by Caesalpiniaceae (04), Convolvulaceae (03), Fabaceae (03), Lamiaceae (03), Verbenaceae (02), Amaranthaceae (02), Asclepiadaceae (02), Malvaceae (02) and Poaceae (02). These families included most invasive species, such as *Chromolaena odorata*, *Lantana camara*, *Hyptis suaveolens*, *Ageratum conyzoides*, *Parthenium hysterophorus*, *Eichhornia crassipes*, *Alternanthera philoxeroides*, and others. The dominance of Asteraceae species among all IAPS found in this region was resulted due to higher potential for adaptability and rapid growth. It was found from the literature that different native places of IAPS of Utkal University Campus were Tropical America (30), Tropical Africa (10), Tropical South America (6), , Brazil (3), West Indies (2), Mediterranean (1), Europe (1), Tropical Central South America (1), Tropical Central America (1), Peru (1), and Tropical West Asia (1). From the interaction with local residents and literature survey it was found that IAPS were used as medicine (50), fuel (25), ornamental (6), rope making (2) and leafy vegetable (4).

Keywords: Utkal University diversity, exotic, Invasive Alien Plant Species (IAPS)

INTRODUCTION

Invasion by the alien plant species were increased rapidly throughout the world during the present century and responsible for the homogenization

of floras which causes a substantial threat to biodiversity and ecological integrity of native habitats and ecosystems (Booth *et al.*, 2003; Hulme, 2003). Invasion by the species cause extensive effects on the habitats they invade, like impact on indigenous species diversity, soil nutrient composition, altering forest fire cycles and loss of productivity of invading ecosystems. It also becomes a threat to endangered or threatened plant species around the world (Pimentel *et al.*, 2005).

International Union for Conservation of Nature and Natural Resources (IUCN) defines Alien 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. These invasives are widely distributed in all kinds of ecosystems through-out the world, and include all categories of living organisms. Nevertheless, plants, mammals and insects comprise the most common types of invasive alien species in terrestrial environment.

The threat to biodiversity due to invasive alien species is considered second only to that of habitat destruction. Invasive species cause loss of biodiversity including species extinctions, and changes in hydrology and ecosystem function. 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, de-composition, nutrient content of soil, moisture availability, etc. Invasive species are thus a serious hindrance to conservation and sustainable use of biodiversity, with significant undesirable impacts on the goods and services provided by ecosystems. Biological invasions now operate on a global scale and will undergo rapid increase in this century due to interaction with other changes such as increasing globalization of markets, rise in global trade, travel and tourism. For effective management of invasive species, knowledge about their ecology, morphology, phenology, reproductive biology, physiology and photochemistry is essential.

The state of Odisha is located in the eastern part of India with 35% of forest area and a rich biodiversity region of India. Bhubaneswar, the capital city of modern Odisha, a site of celestial beauty, a rich store house of historical monuments, a centre of famous archeological remains has been a place of attention for larger number of visitors from different parts of

country and abroad every year. The natural flora and fauna of this region were also endowed with many potential resources.

As the Utkal University campus was a part of deciduous Vegetation region, it has many indigenous flora and introduced plants making it as green belt of Bhubaneswar City.

METHODOLOGY

Study Area: The Utkal University Campus is situated in the extreme north east of Khordha district of Odisha state and lie between 20.12°N to 20.25°N latitude and 85.44°E to 85.55°E longitude. It is located in the north side of Bhubaneswar City. The total area of this campus is about 399.9 acre in which 200 acres is covered with vegetation and two water bodies with rich aquatic vegetation are present at the east and north side in the campus. The University Campus enjoys a moderately hot humid climate experiencing maximum and minimum temperature of 41°C and 35°C respectively. It comes under tropical Savanna. The average rainfall is 1470 mm; the altitude varies from 20m to 45 m above mean sea level. The vegetation of Utkal University Campus broadly confirms to tropical deciduous forest type (Champion and Seths, 1968). Fig.1.

Study Design: The present study has been carried out in the Utkal University Campus and it is based on both Primary and secondary data collected on survey method. The primary data included information collected from personal survey and interaction with local residents. The secondary data involves analysis of published research data.

Methods: The study was conducted during 2017-18 to compile a comprehensive list of Invasive Alien Plant Species (IAPS). Interactions with the residents in the campus were made to collect information regarding various uses of Invasive alien Plant Species. Plant samples were collected, photographed and identified by referring "Flora of Orissa" (Saxena and Brahmam) and other available literatures collected plant specimens were processed to prepare Herbaria with by Voucher No. following the standard procedure given by BSI and were deposited in the Botany Department, Regional Institute of Education (NCERT), Bhubaneswar, Odisha.



Fig.1 Study Area (Utkal University Campus)

After an extensive review of literature, diversity, sources, nativity, uses and behaviour of alien plant species were analyzed (Mooney, 1987, Maheswari JK, 1975) and list was prepared. The nativity of species were represented based on the reports published by several workers. (Vavilov, NI 1951, Reddy, CS 2004, Reddy, CS, 2002, Pandey, RP, 1994.)

RESULTS AND DISCUSSION

The exhaustive floristic study of Utkal university Campus revealed that a total 60 plants (Table-1)

belonging to 51 genera under 34 families were invasive plant species with 45 herb species (75%) (Table-3, Fig.3) followed by 7 shrub (11.6%), 2 trees (3.33%) and 6 climbers (10%). Asteraceae was the dominant family with 10 (29.41%) (Table-4, Fig.4) followed by Caesalpiniaceae, Convolvulaceae, Fabaceae, Lamiaceae, Verbenaceae, Amaranthaceae, Asclepiaceae, Malvaceae, Poaceae. These top ten families contributed 34 species with a proportion of 56.6%. Genera wise analysis shows that *Cassia* with 4 species followed by *Ipomoea* (3 species), *Portulaca* (2 species), *Cleome* (2 species), *Calotropis* (2 species).

Table 1: List of Alien species recorded in Utkal University Campus of Bhubaneswar, Odisha

Sl.No.	Name of the Species	Family	Habit	Use	Nativity
1.	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Herb	M	Africa
2.	<i>Acanthospermum hispidum</i> DC.	Asteraceae	Herb	M	Brazil
3.	<i>Ageratum conyzoides</i> L.	Asteraceae	Herb	M	Tropical America
4.	<i>Alternanthera paronychioides</i> St. Hil	Amaranthaceae	Herb	M	Tropical America
5.	<i>Antigonum leptopus</i> Hook & Arn.	Polygonaceae	Climber	M	Tropical America
6.	<i>Argemone maxicana</i> L.	Papaveraceae	Herb	A,M	Tropical Central & South America
7.	<i>Azolla pinnata</i> R.Br.	Azollaceae	Herb	WT	Asia, Africa
8.	<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	Herb	M	Tropical America
9.	<i>Borassus flabellifer</i> L.	Arecaceae	Tree	H, Fo	Tropical Africa
10.	<i>Calotropis gigantean</i> R.Br.	Asclepiadaceae	Shrub	M	Tropical Africa
11.	<i>Calotropis procera</i> (Ait.) R.Br.	Asclepiadaceae	Shrub	M	Tropical Africa
12.	<i>Cassia alata</i> L.	Caesalpiniaceae	Tree	M	West Indies
13.	<i>Cassia hirsute</i> L.	Caesalpiniaceae	Shrub	M	Tropical America
14.	<i>Cassia occidentalis</i> L.	Caesalpiniaceae	Herb	C	Tropical South America
15.	<i>Cassia tora</i> L.	Caesalpiniaceae	Herb	M	Tropical South America
16.	<i>Celosia argentea</i> L.	Amaranthaceae	Herb	C,M	Tropical Africa
17.	<i>Chloris barbata</i> Sw.	Poaceae	Herb	Fo	Tropical America
18.	<i>Cleome ruidosperma</i> DC	Capparaceae	Herb	M	Tropical America
19.	<i>Cleome viscosa</i> L.	Capparaceae	Herb	M	Tropical America
20.	<i>Crotalaria pallida</i> Ait.	Fabaceae	Herb	C	Tropical America
21.	<i>Croton bonplandianus</i> Baill	Euphorbiaceae	Herb	C	Temperate South America
22.	<i>Cryptostegia grandiflora</i> R.Br.	Periplocaceae	Shrub	M	Madagascar
23.	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Climber	M	Mediterranean
24.	<i>Cyperus difformis</i> L.	Cyperaceae	Herb	C	Tropical America
25.	<i>Datura metel</i> L.	Solanaceae	Herb	M	Tropical America
26.	<i>Eclipta prostrate</i> (L.) L. Mant.	Asteraceae	Herb	M	Tropical America
27.	<i>Eichhornia crassipes</i> (Mart.) Solms-Laub.	Pontederiaceae	Aquatic Herb	Co, WT	Tropical America
28.	<i>Evolvulus nummularius</i> (L.) L.	Verbenaceae	Herb	C	Tropical America
29.	<i>Gnaphalium polycaulon</i> Pers.	Asteraceae	Herb	Nk	Tropical America
30.	<i>Grangea maderaspatana</i> (L.) Poir.	Asteraceae	Herb	M	Tropical South America
31.	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Herb	Ch	Tropical America
32.	<i>Impatiens balsamina</i> L.	Balsaminaceae	Herb	O	Tropical America
33.	<i>Indigofera lineaei</i> Ali	Fabaceae	Herb	Nk	Tropical Africa
34.	<i>Ipomea carnea</i> Jacq.	Convolvulaceae	Shrub	M	Tropical America
35.	<i>Ipomea pes-tigridis</i> L.	Convolvulaceae	Climber	M	Tropical Africa
36.	<i>Ipomea quamoclit</i> L.	Convolvulaceae	Climber	O, M	Tropical America
37.	<i>Lantana camara</i> L.	Verbenaceae	Shrub	Bsk, O	Tropical America
38.	<i>Leonotis nepetifolia</i> (L.) R.Br.	Lamiaceae	Herb	M	Tropical Africa
39.	<i>Ludwigia perennis</i> L.	Onagraceae	Herb	V	Tropical America
40.	<i>Macroptilium atropurpureum</i> (DC.) Urb.	Fabaceae	Climber	C	Tropical Africa

Table 1: Continued...

41.	<i>Martynia annua</i> L.	Martyniaceae	Herb	M	Tropical America
42.	<i>Mikania micrantha</i> Kunth.	Asteraceae	Climber	C	Tropical America
43.	<i>Mimosa pudica</i> L.	Mimosaceae	Herb	M	Brazil
44.	<i>Mirabilis jalapa</i> L.	Nyctaginaceae	Herb	O	Peru
45.	<i>Ocimum canum</i> Sims.	Lamiaceae	Herb	M	Tropical America
46.	<i>Opuntia stricta</i> (Haw.) Haw.	Cactaceae	Shrub	Nk	Tropical America
47.	<i>Oxalis corniculata</i> L.	Oxalidaceae	Herb	M	Europe
48.	<i>Parthenium hysterophorus</i> L.	Asteraceae	Herb	A	Tropical North America
49.	<i>Passiflora foetida</i> L.	Passifloraceae	Herb	O,M	Tropical South America
50.	<i>Pistia stratiotes</i> L.	Araceae	Herb	M	Tropical America
51.	<i>Portulaca oleracea</i> L. var. <i>oleracea</i>	Portulacaceae	Herb	M,V	Tropical South America
52.	<i>Portulaca quadrifida</i> L.	Portulacaceae	Herb	M	Tropical America
53.	<i>Ruellia tuberosa</i> L.	Acanthaceae	Herb	M	Tropical America
54.	<i>Saccarum. spontaneum</i> L.	Poaceae	Herb	Rope making	Tropical West Asia
55.	<i>Salvinia molesta</i> D.S. Mitch.	Salviniaceae	Herb	Nk	Brazil
56.	<i>Sida acuta</i> Brum.f.	Malvaceae	Herb	M	Tropical America
57.	<i>Spilanthes radicans</i> Jacq.	Asteraceae	Herb	Nk	Tropical South America
58.	<i>Stachytarpheta jamaicensis</i> (L.) Vahl.	Verbenaceae	Herb	M	Tropical America
59.	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	Herb	M	West Indies
60.	<i>Tridax procumbens</i> L.	Asteraceae	Herb	M	Tropical Central America

Abbreviations : A- Adulteration in food grains, Fu- Fuel, Bsk- Basket and mat making , C- Biologically active Compound, Co-Compost, Fo- Fodder, M-Medicine, Nk- Not known, O-Ornamental, V-Vegetable, , WT- Waste water treatment Wd- Wood

Table-2: Regions of Nativity of invasive alien plant species in Utkal University Campus of Bhubaneswar, Odisha

SI No.	Nativity/Origin	No of Species
01	Tropical America	30
02	Tropical Africa	10
03	Temperate South America	6
04	Brazil	3
05	West Indies	2
06	Mediterranean	1
07	Madagascar	1
08	Europe	1
09	Peru	1
10	Asia	1
11	Tropical Central America	1
12	Tropical North America	1
13	Tropical South America	1
14	Tropical West Asia	1

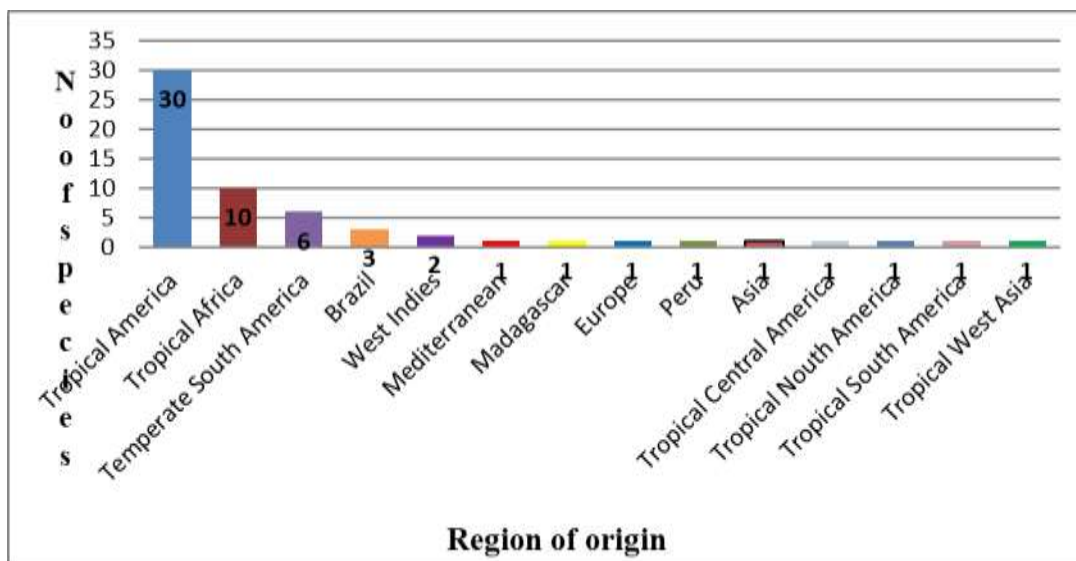


Fig.2 Nativity of Invasive alien plant species in Utkal University Campus, Bhubaneswar, Odisha

Table-3: Habit of invasive alien plant species in Utkal University Campus, Bhubaneswar, Odisha

Sl. No	Habit	No. of Species
01	Herbs	45
02	Shrubs	7
03	Trees	2
04	Climbers	6

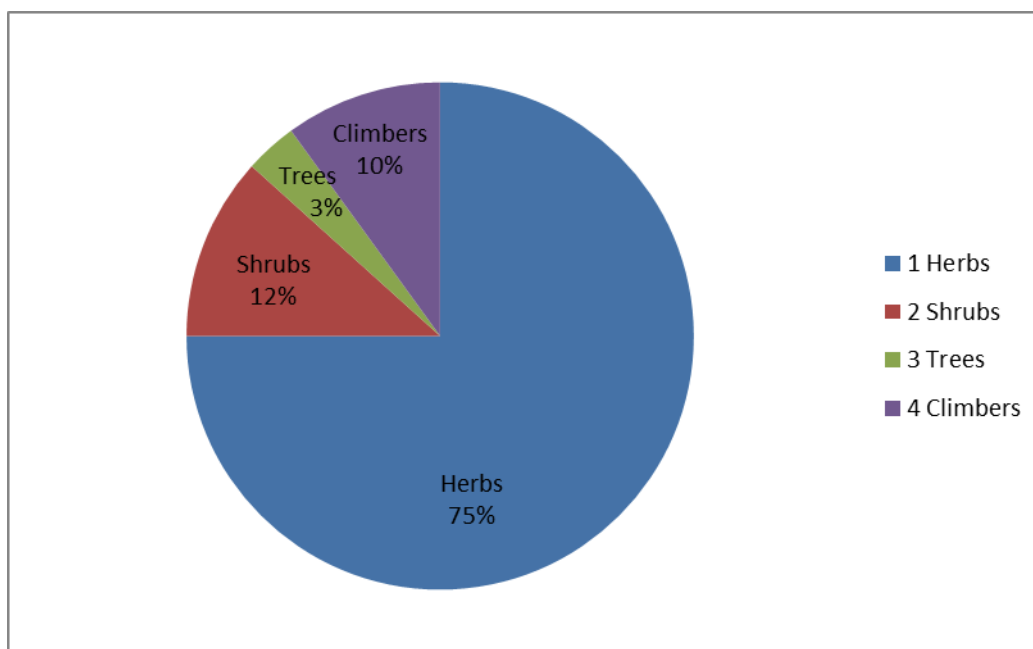
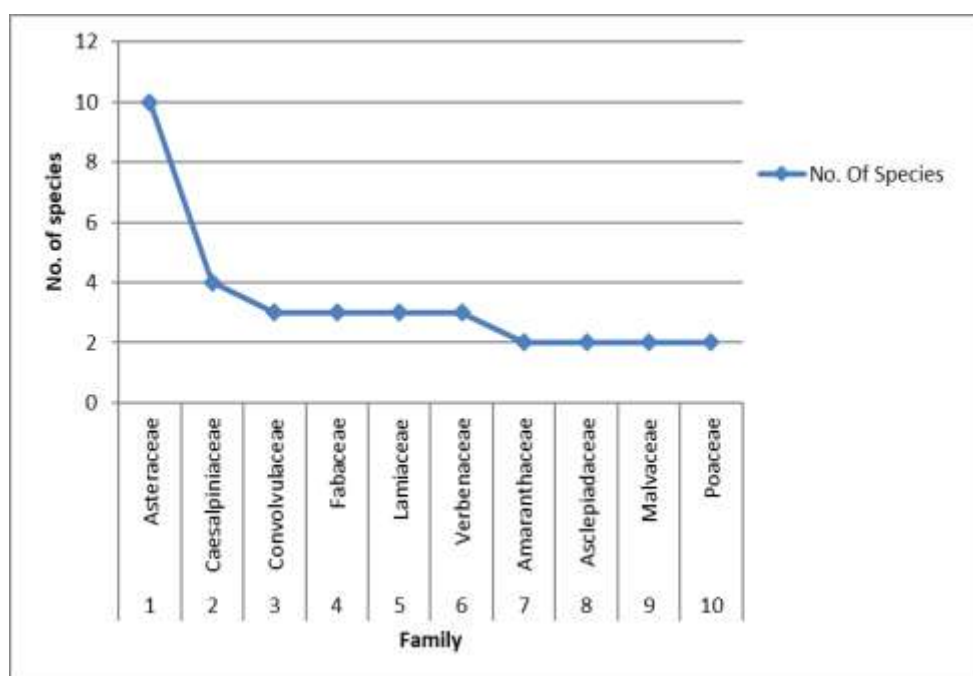


Fig.3 Habit of Invasive alien plant species in Utkal University Campus, Bhubaneswar, Odisha

Table 4 : Family Wise distribution of top 10 families of Invasive Alien Plant Species in Utkal University Campus, Bhubaneswar, Odisha

Sl.No.	Name Of Family	No. Of Species
1	Asteraceae	10
2	Caesalpiniaceae	4
3	Convolvulaceae	3
4	Fabaceae	3
5	Lamiaceae	3
6	Verbenaceae	3
7	Amaranthaceae	2
8	Asclepiadaceae	2
9	Malvaceae	2
10	Poaceae	2

**Fig.4 Family wise distribution of top 10 families of Invasive Alien Plant Species of Utkal University campus, Bhubaneswar, Odisha**

The predominance of the family Asteraceae species in invasive categories shows the high impact of this region. From Floristic study it was observed that half of the Invasive Alien Plant Species (IAPS) were growing well in this region and their populations were occupying the habitat of endemic flora. Many species of Invasive Alien plant species were introduced for economic/ commercial purpose like timber, Ornamental and green coverage. Some species were migrated to this region by transport of food grains from other regions. Climatic conditions of the regions become suitable for them and grow luxuriantly in the campus.

Argemone Mexicana, Cassia tora, Cleome viscosa, Croton bonplandinum, Eclipta prostrate, Ipomoea carnea, Mimosa pudica, Tridax procumbens were occupied most of the land cover in the campus. *Lantara camera, Hyptis suaveolens, Ageratum conyzoides, Tridax procumbens* were found dominant in this region. *Parthenium hysterophorus, Sida acuta, Cleome viscosa* were found along the road side in the campus. *Croton bonplandianum, Ageratum conyzoides, Eclipta prostrate, Mimosa pudica, Tridax procumbens, Chloris barbata* were occupied most of the area in the campus. (Plate-1)

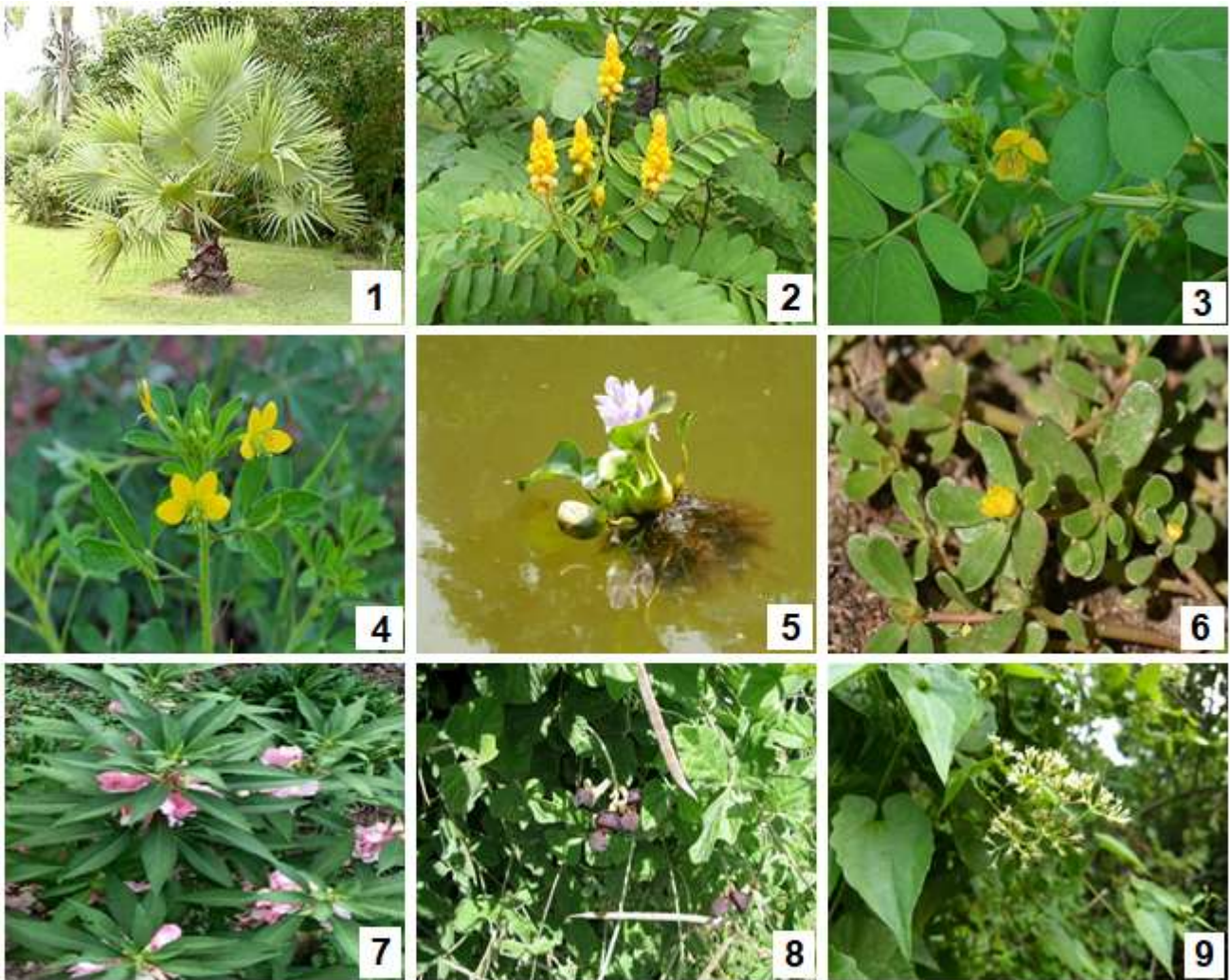


Plate 1: Invasive Alien Plant Species in Utkal University Campus, **1.** *Borassus flabellifer* L **2.** *Cassia alata* L. **3.** *Cassia tora* L. **4.** *Cleome viscosa* L. **5.** *Eichhornia crassipes* (mart.) Solms-Laub, **6.** *Portulaca oleracea* L. **7.** *Impatiens balsaminia* L. **8.** *Macroptilium atropurpureum* **9.** *Mikania micrantha* Kunth.

Although the negative impact of IAPS on endemic flora in this region, some of them were found to be useful to local people/residents in the campus. *Borassus flabellifer*, *Cassia alata* were used as timber and herbs like *Cleome viscosa*, *Croton bonplandianum*, *Mimosa pudica*, *Tridax procumbens*, *Datura metel*, *ocimum canum*, *Mirabilis jalapa* etc.were used as medicine for different diseases. *Portulaca quadrifida*, *Portulaca oleracea*, *Alternanthera paronychioides* were used as leafy vegetables by local residents. *Cyperus difformis* used as pest management. Details of the plant species and their uses were described in the Table-1.

It was also found from the literature that different native places of IAPS of Utkal University campus (Table-2, Fig.2) were Tropical America (30), Tropical Africa (10), Temperate south America (6), Brazil (3),

West Indies (2), Mediterranean (1), Madagascar (1), Europe (1), Peru(1), Asia(1), Tropical Central America (1), Tropical North America (1), Tropical South America (1), and Tropical West Asia (1).

CONCLUSION

Invasive alien plant species diversity in Utkal University Campus, Bhubaneswar is one of the major threats for endemic flora due to their aggressive colonizing ability and adaptability. Their populations are increasing rapidly is a major concern not only for local people, but also total district of Odisha, as it directly affects the agricultural economy, hence eradication of IAPS from this region is needed in an urgent basis. But the eradication procedure requires a

huge financial provision which is not so easy for this region. So, awareness among local people is only possible method to get rid of IAPS. Besides this, utilization of hidden medicinal potential can make IAPS beneficial to the people of the area. The effect of IAPS in and human health, economy, biodiversity is yet to be assessed in a broad spectrum in national and regional level. The current study can provide the status of IAPS in the region for further study and assessment.

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REFERENCES

- Booth BD, Murphy SP, Swanton CJ (2003) *Weed Ecology in Natural and Agricultural Systems*. CABI Publishing, Willing ford, Oxford shire, UK: 288
- Champion HG Seth SK (1968) *A Revised Forest Types of India*. Manager of Publications, Government of India, Delhi.
- Hajra PK Das BK (1982) Vegetation of Gangtok with Special Reference to Alien Plants, *India Forums*, 107: 554-566
- Hulme PE (2003) Biological invasions: Winning the science battles but losing the conservation war, *Oryx*. 37: 178-193
- Huxel GR (1999) Rapid displacement of native species by invasive species: effect of hybridization, *Biological Conservation*, 89: 143-52
- Lonsdale WM (1999) Global patterns of plant invasions and the concept of invisibility, *Ecology*, 80(5): 1522-1536
- Maheswari JK, Paul SR (1975) The exotic flora of Ranchi, *J Bombay Nat Hist. Soc*, 72(1): 158-88
- Mooney HA, Drake JA (1987) The ecology of biological invasions, *Environment*, 29(5): 12
- Pandey RP, Parmar PJ (1994) The exotic flora of Rajasthan, *J Econ Tax Bot*, 18(1): 105-210
- Pimentel D, Zuniga R, Morrison D (2005) Update on the environmental and economic costs associated with alien-invasive species in the United States. *Morrison*, 52: 273-288
- Reddy CS, Raju VS (2002) Additions to the weed flora of Andhra Pradesh, *India. J Econ Taxon Bot*, 26: 195-198
- Reddy CS, Reddy KN (2004) *Cassia rotundifolia* Pers. (Caesalpiniaceae): A new record for India, *J Econ Tax Bot*, 28: 73-4
- Reddy CS, Bagyanarayana G, Reddy KN, Raju VS (2008) *Invasive Alien Flora of India*, National Biological Information Infrastructure, USGS, USA
- Reddy CS (2008) Catalogue of Invasive Alien Flora of India, *Life Science Journal*, 5(2): 84-89
- Saxena HO, Brahmam M. (1996) *The Flora of Orissa*, Vol. I-IV, Orissa Forest Development Corporation, Bhubaneswar
- Sharma BD (1984) Exotic Flora of Allahabad, *Botanical Survey of India*, Dehra Dun,
- Vavilov NI (1951) The origin, variation, immunity and breeding of cultivated plants, *Chron Bot*, 13: 1-364.