



## INVASIVE ALIEN PLANT SPECIES IN SOME HILLY REGION OF DUMKA DISTRICT AND THEIR EFFECTS ON BIODIVERSITY

**\*Saurabh Dutta, Prasanjit Mukherjee and Shashi Kumar Gupta**

Plant Taxonomy and Ecological Research Laboratory, Department of Botany, K. K. M. College, Pakur  
Department of Chemistry, B. S. College, Lohardaga

### ABSTRACT

Dumka is situated under the topographic condition having uneven plateau with small hills. Soil is usually red and rich in iron & calcium. The peak rainy season is July to September with average 3.61 mm rainfall. The average minimum and maximum temperatures are 8°C and 20°C in January and 25°C and 40°C in June respectively. The forest area occupies 29.61% of the total land area of the state. Dumka district, (Jharkhand) is situated between 87°14'N - 87°25'N latitude and 24°20'E - 24°21'E longitude. It is situated on bank of river Mayurakshi. Its topography condition is uneven and plateau in nature with small hills. Biological invasions by alien plant species are considered one of the main factor in biodiversity loss. This is because the natural bio-geographical barriers of oceans, mountains, rivers, and deserts, which provided the isolation essential for unique species and ecosystems to evolve, have lost their effectiveness, due to the increase in economic globalization. This has resulted in an exponential increase in the movement of organisms from one part of the world to another through trade, transport, travel, and tourism, in some cases causing tremendous damage to the natural ecosystems of their new habitats. The effects may also worsen through time, sometimes through rapid population explosions after a long period of innocuous and restricted presence in an area.

**Keywords:** Invasive alien plant species, Biodiversity, conservation.

\*Corresponding author: saurabhdutta81@gmail.com

### INTRODUCTION

Alien or Invasive plant species may threaten native species as direct predators or competitors, as vectors of disease, or by modifying the habitat or altering native species. The threat posed to biodiversity is considered to that of habitat loss. It is now comparable with habitat loss as the lead cause of biodiversity loss. Invasive species may out-compete native species, repressing or excluding them and, therefore, fundamentally change the ecosystem. They may indirectly transform the structure and species composition of the ecosystem by changing the way in which nutrients are cycled through the ecosystem (McNeely *et al.*, 2001). Entire ecosystems may be placed at risk through knock-on effects. Given the critical role biodiversity places in the maintenance of

essential ecosystem functions, Invasive alien species may cause changes in environmental services, such as flood control and water supply, water assimilation, nutrient recycling, conservation and regeneration of soils.

Dumka district (Jharkhand) is situated between 87°14'N – 87°25'N latitude and 24°20'E – 24°21'E longitude. It is situated on bank of river Mayurakshi. Dumka flora has evolved over millions of years. Mountain ranges, rivers have separated populations and allowed a tremendous range of biodiversity to flourish. But expanding international trade and travel have broken down the sebarriers on a global scale, bringing species into direct contact with one another. This creates competition for precious food and

habitats, and whereas native species have resistance to local pests or diseases, they often have no or few, natural defenses against foreign species, and so they can literally be wiped out.

Invasive species, also known as invasive alien species or invasive non-native species, come in all shapes and sizes. Most non-Indian species were introduced intentionally, including trees and crops that are hardier or grow faster, ornamental garden plants. They may pose no problem until they escape or are released into the wild. Invasive species also pose a threat to people. Alien plants like giant hogweed provoke allergies and skin irritation and burns. Although not every alien species is harmful, the precautionary principle dictates that all incomers need to be identified, and authorities have to be ready to respond rapidly and deal with problems. Early detection and rapid response are most cost-effective and more likely to succeed than action after a species has become established.

Biodiversity discusses the complex relationship between biodiversity and the maintenance of essential ecosystem functions. Invasive may also affect native species by introducing pathogens or parasites that cause disease or kill native species. Among other things, both old and newly established Invasive alien species contribute to land degradation through soil erosion and the drawing down of water resources, reducing resources available to people and indigenous plants. Others produce leaf litter which poisons the soil, suppressing the growth of other plants, and in particular that of the understory. They may alter the environment in directions that are more favourable for them but less favourable to native species. This could include altering geomorphic processes (soil erosion rates, for instance, or sediment accretion), biogeochemical cycling, hydrological cycles, or fire or light regimes (Levine *et al.*, 2003).

## METHODOLOGY

The present study was conducted during June 2011–May 2013, to compile a comprehensive list of Alien or Invasive plant species. The study areas were visited at least twice in every season to capture the plants in their flowering and fruiting period same time in order to know their spread and invasiveness. The plant species were

brought into the laboratory, and identified on the basis of morphological and microscopic features using relevant available literatures (Mooney and Drake, 1987; Heywood, 1989; 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; Reddy *et al.*, 2008). The nativity of the species is provided based on Matthew, 1969; Maheswari and Paul, 1975; Sharma, 1984; Hajra and Das, 1982; Reddy *et al.*, 2000; Reddy & Raju, 2002; Reddy & Reddy, 2004; Murthy *et al.*, 2007. The herbarium of the concerned plant species were prepared and kept in the Plant Taxonomy and Ecological Research Laboratory, Department of Botany, K. K. M. College, Pakur.

## RESULTS AND DISCUSSION

Total 85 species under 31 families were documented as Invasive alien plant species. The 85 invasive alien species were shown along with family name, habit and nativity in table 1. Tropical America (with 55 species) region contribute the greatest to the number (65.1%) followed by tropical South America (10.5%). The other regions, which contribute minority, are Tropical Africa, Australia, Brazil, East Indies, Europe, Madagascar, Mascarene Islands, Mediterranean, Mexico, Peru, Temperate South America, Trop. North America, Trop. Central America Trop. West Asia and West Indies.

Habit wise analysis shows that herbs with 75 species (88.4%) predominant followed by shrubs (7), climbers (1) and trees (2). Of the 31 families, Asteraceae is the most dominant family with 21 species followed by Caesalpiniaceae (9), Solanaceae (4), Amaranthaceae (4), Papilionaceae (3), Tiliaceae (3), Asclepiadaceae (3), Euphorbiaceae (3), Poaceae (3) and Cyperaceae (3). The top ten families contribute 55 species with proportion of 55.17%. The 14 families represent one species each.

Surveys have shown that more than half of alien plant species currently spreading naturally were

intentionally introduced, and that most of the alien species that endanger local native ecosystems were first introduced for horticultural purposes. Thus reducing the intentional use of high-risk alien plants could reduce the spread and impact of invasive plants in the locality.

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 nature, 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 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.

The predominance of Asteraceae species in invasive category shows the high impact of neotropical flora on Dumka region. In addition to negative impact on indigenous flora and economy, some alien plants were very much useful to local people. *Borassus flabellifer* is an economically important species, introduced to India in ancient times. The cut flower stalks yield sugar and toddy, the fruits are roasted and eaten, leaves are used for thatching. Several alien weedy plants like *Argemone mexicana*, *Cassia tora*, *Cleome viscosa*, *Croton bonplandianum*, *Eclipta prostrata*, *Ipomoea carnea*, *Malachra capitata*, *Mimosa pudica*, *Physalis angulata*, *Tridax procumbens* were used in native medicine. *Alternanthera philoxeroides* and *Portulaca oleracea* were used as leafy vegetables. Some of the dominant alien plant species are depicted in Figure 1.

**Table -1-** List of Invasive Alien plant species in Hilly region of Dumka District :-

Sl. No.	Species	Family	Habit	Nativity
1	<i>Acacia mearnsii</i> De Wild	Mimosaceae	Tree	South east Australia
2	<i>Ageratum conyzoides</i> L.	Asteraceae	Herb	Trop. America
3	<i>Alternanthera tenella</i> Colla	Amaranthaceae	Herb	Trop. America
4	<i>Alternanthera philoxeroides</i> (Mart.) Griseb	Amaranthaceae	Herb	Trop. America
5	<i>Antigonon leptopus</i> Hook. & Arn.	Polygonaceae	Climber	Trop. America
6	<i>Argemonem exicana</i> L.	Papaveraceae	Herb	Trop. Central & South America
7	<i>Blainvillea acmella</i> (L.) Philipson	Asteraceae	Herb	Trop. America
8	<i>Bidens pilosa</i> L.	Asteraceae	Herb	Trop. America
9	<i>Blumea aeriantha</i> DC.	Asteraceae	Herb	Trop. America
10	<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	Herb	Trop. America
11	<i>Borassus flabellifer</i> L.	Arecaceae	Tree	Trop. Africa
12	<i>Blumea oblique</i> (L.) Druce	Asteraceae	Herb	Trop. America
13	<i>Calotropis gigantea</i> (L.) R.Br.	Asclepiadaceae	Shrub	Trop. Africa
14	<i>Calotropis procera</i> (Ait.) R.Br.	Asclepiadaceae	Shrub	Trop. Africa
15	<i>Cassia alata</i> L.	Caesalpiniaceae	Shrub	West Indies
16	<i>Cassia hirsute</i> L.	Caesalpiniaceae	Herb	Trop. America

17	<i>Cassia occidentalis</i> L.	Caesalpiniaceae	Herb	Trop. South America
18	<i>Cassia pumila</i> Lam.	Caesalpiniaceae	Herb	Trop. America
19	<i>Cassia tora</i> L.	Caesalpiniaceae	Herb	Trop. South America
20	<i>Cassia absus</i> L.	Caesalpiniaceae	Herb	Trop. America
21	<i>Cassia obtusifolia</i> L.	Caesalpiniaceae	Herb	Trop. America
22	<i>Cassia rotundifolia</i> Pers.	Caesalpiniaceae	Herb	Trop. South America
23	<i>Cassia uniflora</i> Mill.	Caesalpiniaceae	Herb	Trop. South America
24	<i>Catharanthus pusillus</i> (Murray) Don	Apocynaceae	Herb	Trop. America
25	<i>Celosia argentea</i> L.	Amaranthaceae	Herb	Trop. Africa
26	<i>Chamaesyce hirta</i> (L.) Millsp.	Euphorbiaceae	Herb	Trop. America
27	<i>Chloris barbata</i> Sw.	Poaceae	Herb	Trop. America
28	<i>Chromolaena odorata</i> (L.) King & Robinson	Asteraceae	Herb	Trop. America
29	<i>Chrozophora ottleri</i> (Geis.) Spreng.	Euphorbiaceae	Herb	Trop. Africa
30	<i>Cleome gynandra</i> L.	Cleomaceae	Herb	Trop. America
31	<i>Cleome viscosa</i> L.	Cleomaceae	Herb	Trop. America
32	<i>Conyza bipinnatifida</i> Wall.	Asteraceae	Herb	Trop. America
33	<i>Corchorus aestuans</i> L.	Tiliaceae	Herb	Trop. America
34	<i>Corchorus fascicularis</i> Lam.	Tiliaceae	Herb	Trop. America
35	<i>crassocephalum crepidioides</i> (Benth) Moore	Asteraceae	Herb	Trop. America
36	<i>Crotalaria pallida</i> Dryand	Papilionaceae	Herb	Trop. America
37	<i>Crotalaria retusa</i> L.	Papilionaceae	Herb	Trop. America
38	<i>Croton bonplandianum</i> Boil.	Euphorbiaceae	Herb	Temperate South America
39	<i>Cryptostegia grandiflora</i> R.Br.	Asclepiadaceae	Herb	Madagascar
40	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Herb	Mediterranean
41	<i>Cyperus difformis</i> L.	Cyperaceae	Herb	Trop. America
42	<i>Cyperus iria</i> L.	Cyperaceae	Herb	Trop. America
43	<i>Datura metel</i> L.	Solanaceae	Shrub	Trop. America
44	<i>Datura innoxia</i> Mill.	Solanaceae	Shrub	Trop. America
45	<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	Herb	SW Asia
46	<i>Echinochloa colona</i> (L.) Link	Poaceae	Herb	Trop. South America
47	<i>Echinochloa crusgalli</i> (L.) Beauv.	Poaceae	Herb	Trop. South America
48	<i>Eclipta prostrata</i> (L.) Mant.	Asteraceae	Herb	Trop. America
49	<i>Eichhornia crassipes</i> (C. Martius) Solms - Loub.	Pontederiaceae	Herb	Trop. America
50	<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae	Herb	Trop. America
51	<i>Euphorbia heterophylla</i> L.	Convolvulaceae	Herb	Trop. America
52	<i>Evolvulus nummularius</i> (L.) L.	Convolvulaceae	Herb	Trop. America

53	<i>Fuirena ciliaris</i> (L.) Roxb.	Cyperaceae	Herb	Trop. America
54	<i>Gnaphalium coarctatum</i> Willd.	Asteraceae	Herb	Trop. America
55	<i>Galinosoga parviflora</i> Cav.	Asteraceae	Herb	Trop. America
56	<i>Gnaphalium coarctatum</i> Willd.	Asteraceae	Herb	Trop. America
57	<i>Grangea maderaspatana</i> (L.) Poir.	Asteraceae	Herb	Trop. South America
58	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Herb	Trop. America
59	<i>Impatiens balsamina</i> L.	Balsaminaceae	Herb	Trop. America
60	<i>Indigofera astragalina</i> DC.	Papilionaceae	Herb	Trop. America
61	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Shrub	Trop. America
62	<i>Lantana camara</i> L.	Verbenaceae	Herb	Trop. America
63	<i>Leonotis nepetifolia</i> (L.) R.Br .	Lamiaceae	Herb	Trop. Africa
64	<i>Leucaena leucocephala</i> (Lam.) de Wit	Mimosaceae	Herb	Trop. America
65	<i>Ludwigia octovalvis</i> (Jacq.) Raven	Onagraceae	Herb	Trop. Africa
66	<i>Mecardonia procumbens</i> (Mill.) Small	Scrophulariaceae	Herb	Trop. North America
67	<i>Mimosa pudica</i> L.	Mimosaceae	Herb	Brazil
68	<i>Mirabilis jalapa</i> L.	Nyctaginaceae	Herb	Peru
69	<i>Nicotiana plumbaginifolia</i> Viv.	Solanaceae	Herb	Trop. America
70	<i>Ocimum americanum</i> L.	Lamiaceae	Herb	Trop. America
71	<i>Opuntia stricta</i> (Haw.) Haw.	Cactaceae	Herb	Trop. America
72	<i>Oxalis corniculata</i> L.	Oxalidaceae	Herb	Europe
73	<i>Parthenium hysterophorus</i> L.	Asteraceae	Herb	Trop. North America
74	<i>Portulaca oleracea</i> L.	Portulacaceae	Herb	Trop. South America
75	<i>Ruellia tuberosa</i> L.	Acanthaceae	Herb	Trop. America
76	<i>Solanum viarum</i> Dunal	Solanaceae	Herb	Trop. America
77	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Herb	Trop. America
78	<i>Sida acuta</i> Burm.f.	Malvaceae	Herb	Trop. America
79	<i>Sonchus oleraceus</i> L.	Asteraceae	Herb	Mediterranean
80	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	Verbenaceae	Herb	Trop. America
81	<i>Tridax procumbens</i> L.	Asteraceae	Herb	Trop. Central America
82	<i>Triumfetta rhomboidea</i> Jacq.	Tiliaceae	Herb	Trop. America
83	<i>Typha angustata</i> Bory. & Choub.	Typhaceae	Herb	Trop. America
84	<i>Urena lobata</i> L.	Malvaceae	Shrub	Trop. Africa
85	<i>Xanthium strumarium</i> L.	Asteraceae	Herb	Trop. America



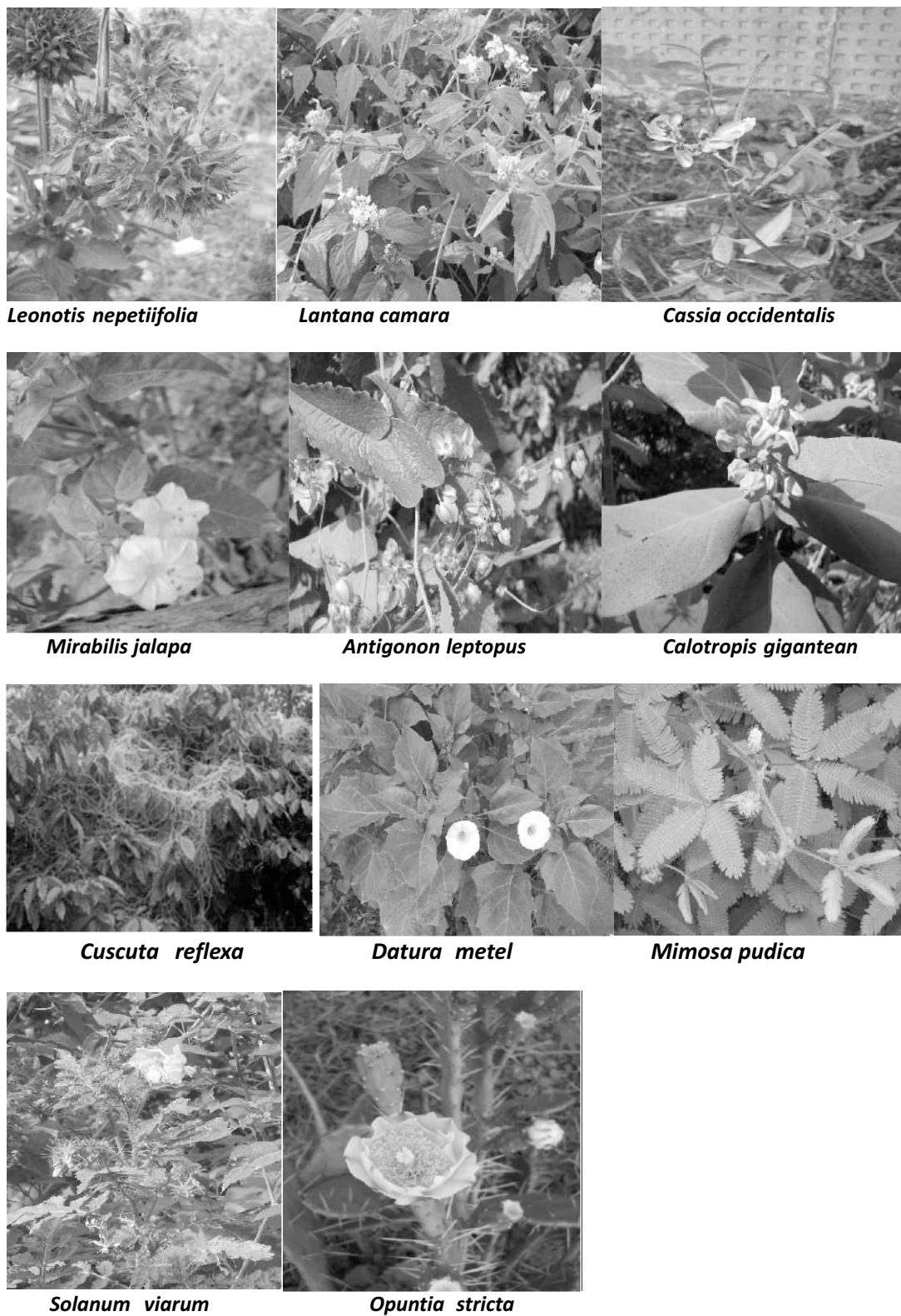


Fig. 1. Some photo of Invasive Alien plant species in Hilly region of Dumka District .

## REFERENCES

- Almeida, I. D. and Freitas, H. 2001. The alien and invasive flora of Portugal. *Bot. Complutensis*. 25: 317-327.
- Cowie, R. 2001. Does the Public Care about Species Loss? A Glimpse into the Public's Thinking. *Conservation Biology in Practice*. 2(3): 28-29.
- D'Antonio, C. M. and Vitousek, P. M. 1992. Biological Invasions by Alien Grasses: the Grass/fire Cycle and Global Change. *Annual Review of Ecology and Systematics*. 23: 63-7.
- Drake, J. A., Mooney, H. A., Di Castri, F., Groves, R., Kruger, F., Rejmanek, M. and Williamson, M. (eds.). 1989. *Biological Invasions: A Global Perspective*. John Wiley and Sons, New York.
- Elton, Charles, S. 2000. *The Ecology of Invasions by Animals and Plants*. University of Chicago Press, Chicago.
- Hajra, P. K. and Das, B. K. 1982. Vegetation of Gangtok with special reference to alien plants. *Indian For.* 107: 554-566.
- Heywood, V. 1989. Patterns, Extents, and Modes of Invasions by Terrestrial Plants. pp. 31-60 in J. Drake et al., (eds.), *Biological Invasions: A Global Perspective*, Wiley, NY.
- Huxel, G. R. 1999. Rapid Displacement of Native Species by Invasive Species: Effects of Hybridization. *Biological Conservation*. 89: 143-152.
- Jenkins, P. T. 1999. A global strategy for dealing with alien invasive species. *Invasive species and Biodiversity management* (eds. O.T. Sandlund, P.J. Schei and A. Viken), Vol. 24. 229-235. Kluwer Academic Publishers, London.
- Lonsdale, W. M. 1999. Global Patterns of Plant Invasions and the Concept of Invasibility. *Ecology*. 80:1522-1536.
- Maheswari, J. K. and Paul, S. R. 1975. The alien flora of Ranchi. *J. Bombay Nat. Hist. Soc.* 72(1): 158-188.
- Matthew, K. M. 1969. Alien flora of Kodaikanal and Palni hills. *Rec. Bot. Surv. India*. 20(1): 1-241.
- Mc Neely J. A., Mooney, H.A., Neville, L. E., Schei, P. and Waage, J. K. 2001. *A Global Strategy on Invasive Alien Species*. IUCN Gland, Switzerland, and Cambridge, U.K., in collaboration with the Global Invasive Species Programme.
- Mooney, H. A. and Drake, J.A. 1987. The Ecology of Biological Invasions. *Environment*. 29(5): 12.
- Mooney, H. A. and Hobbs, R. J. (eds.). 2000. *Invasive Species in a Changing World*. Island Press, Washington, D. C.
- Mooney, H. A. 1999. A global strategy for dealing with alien invasive species. *Invasive species and Biodiversity management* (eds. O. T. Sandlund, P. J. Schei and A. Viken), Vol. 24. Kluwer Academic Publishers, London.
- Murthy, E. N., Raju, V. S. and Reddy, C. S. 2007. Occurrence of alien *Hyptis suaveolens*. *Curr. Sci.* 93(9): 1203.
- Randall John, M. and Jane Marinelli (eds.). 1997. *Invasive Plants: Weeds of the Global Garden*. Brooklyn Botanic Garden, Brooklyn, New York.
- Reddy, C. S., Bhanja, M. R. and Raju, V. S. 2000. *Cassia uniflora* Miller: A new record for Andhra Pradesh, India. *Indian J. Forestry*. 23 (3): 324-325.
- Reddy, C. S. and Raju, V. S. 2002. Additions to the weed flora of Andhra Pradesh, India. *J. Econ. Taxon. Bot.* 26: 195-198.
- Reddy, C. S. and Reddy, K. N. 2004. *Cassia rotundifolia* Pers. (Caesalpiniaceae): A new record for India. *J. Econ. Tax. Bot.* 28: 73-74.
- Reddy, C. S., Bhagyanaryana, G., Reddy, K. N. and Raju, V. S. 2008. *Invasive Alien Flora of India*. National Biological Information Infrastructure, U. S. Geological Survey, U. S. A.
- Sharma, B. D. and Pandey, D. S. 1984. *Alien flora of Allahabad*. BSI, Calcutta.