



Invasive Alien Flora of Harda District of Madhya Pradesh

KEYWORDS

Satpura ranges, Malwa plateau, Narmada River, Harda, invasive alien species, Biodiversity, Native flora

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ABSTRACT

Intensive floristic survey has been carried out in different seasons from 2011 to 2015 by well planned schedule. A study was conducted to analyze the invasive alien species of Harda district of Madhya Pradesh. Harda district is located in south western part of Madhya Pradesh. Exotic species occurs outside their natural adapted ranges and dispersal potential. 145 exotic plant species have been recorded in Harda district which are distributed in 42 families of angiosperms. These are naturalized in study area which accounts 16 % of total flora. Of these highest numbers of 93 plants are distributed in native of tropical and subtropical America followed by Africa (19), Eurasia (16), European (6), China (2), Brazil (1) and others (8). Mentioning few of invasive plants in study area are *Eichhornia crassipes* (Mar.) Sol.; *Senna uniflora* (Mill.) Irw. & Bar.; *Argemone mexicana* L.; *Ocimum americanum* L.; *Parthenium hysterophorus* L.; *Merremia aegyptica* (L.) Urb. *Gliricidia sepium* (Jacq.) Walp., *Lantana aculeata* L. etc.

Introduction

Harda district is situated in the eastern part of Madhya Pradesh. Harda has been declared as a separate district by Government of Madhya Pradesh on 6th July, 1998. Earlier it was a part of Hoshangabad district. It lies in 21° 53' to 22°36' longitude and 76°47' to 77°20' latitude. Total area of the district is 2644.32 Sq. Km. of which forest covers 780.92 Sq. Km. It is bounded by Satpura ranges in the north and southern part of the district is covered by Satpura and extension of Malwa plateau. Soil of the Harda district is an important arena of its natural wealth. The soil is chiefly belongs to ash of Deccan trap and it is also called fertile black cotton soil. The study area is mainly drained by Narmada River and its tributaries are Ganjal, Anjal, Sukni, Midkul, Dedra Machak, Syani, and Kalimachak rivers. The normal rainfall of Harda district is 1124.2 mm. The normal annual mean maximum temperature 32.8°C and minimum temperature is 19.8°C.

Material and methods

Intensive floristic survey has been carried out in different seasons from 2011 to 2015 by well planned schedule, covering various vegetation types, altitudinal ranges, wastelands, and weeds of cultivated fields, road side, river banks, streams beds and all other conceivable ecological niches. For plant collection and preservation of voucher specimens standard methodology has been followed (Jain and Rao, 1977). Voucher specimen were collected in polybag and identified in the laboratory with the help of flora (Hooker, 1892-1897; Cook, 1903; Gamble et al., 1915; Haines, 1921-1924; Duthie, 1960; Verma et al., 1994; Mudgal et al., 1997; Naik et al., 1998; Singh et al., 2001; Singh and Kartikeyan, 2000;) and other available literature were also consulted for identification of plants. Photographs have been taken using digital camera. Recent up-to-date nomenclature of ICBN was followed. For changed name of families or botanical names latest classification of APG-III has been followed. Herbarium specimens were deposited in PMB Gujarati Science College, Indore.

Result and discussion

Naturalized species is defined as an introduced species, that can consistently reproduce and sustain populations over many generations without direct intervention by humans (Richardson et al., 2000). The biological invasion of alien

species is recognized as the second worst threat to the existence of biodiversity (CBD 2012). Invasive species homogenize the world's biota reduce global biodiversity richness (Mooney & Drake 1987). In India approximately 40% plant species are exotic (Singh 2012). 145 exotic plant species have been recorded in Harda district which are distributed in 42 families of angiosperms (table-1). These are naturalized in study area which accounts 16 % of total flora. These plants are suppressing the growth and development and reproduction of native flora. Of these highest numbers of 93 plants are distributed in native of tropical and subtropical America followed by Africa (19), Eurasia (16), European (6), China (2), Brazil (1) and others (8). Mentioning few of invasive plants in study area are *Eichhornia crassipes* (Mar.) Sol.; *Senna uniflora* (Mill.) Irw. & Bar.; *Argemone mexicana* L.; *Ocimum americanum* L.; *Parthenium hysterophorus* L.; *Merremia aegyptica* (L.) Urb. *Gliricidia sepium* (Jacq.) Walp., *Lantana aculeata* L. etc.

Conclusion

Present study is the first hand information towards documentation of invasive alien flora of Harda district. It is well known that the invasive species compete with indigenous species for nutrition, light, water and space. Through allelopathic effects, invasive species alter the population structure and natural dynamics of native biota. Distribution of notorious weeds has placed a strong effect on native flora, since many of these replaced much of the indigenous species probably because of their strong harmful effect. A total of 145 taxa have been recorded from study area which exhibit, rich and varied assemblage of angiosperm plant diversity. This study will be helpful as a guide for identification of different invasive alien angiosperm taxa. Eradication of some exotic species *Lantana aculeata* L., *Prosopis juliflora* (Sw.) DC., *Gliricidia sepium* (Jacq.) Walp., *Parthenium hysterophorus* L., *Pistia stratiotes* L., *Eichhornia crassipes* (Mart.) Solms. is urgently required otherwise these species may uproot the several native species due to their high invasiveness.

Acknowledgement

I would like to express my boundless and great respect to my supervisor Dr. Sudip Ray Department of Botany, P.M.B. Gujarati Science College Indore for his guidance during this entire study. It gives me pleasure to record my deep sense gratitude to Dr. K. Modi Principal, and Dr. S. Nagar,

Ex-Principal, P. M. B. Gujarati Science College Indore for providing research and library facilities. I also thank Dr. J. S. Sikka, Head, Department of Botany for their kind cooperation and valuable suggestions. My sincere thanks are due to forest officials for their co-operation and allowing me to carry out plant exploration work in Harda forest division. I extend my profound thanks to Dr. V.B. Diwanjee Ex-Head, Department of Botany, Holkar Science College, Indore; Dr. B. K. Shukla Senior Scientist, Botanical Survey of India, Allahabad and Dr. S. R. Yadav, Shivaji University, Kolhapur, Maharashtra, for their help in identifying some plant specimens.

Table - 1: Exotic flora of the Harda district of Madhya Pradesh, India

| S.N. | Botanical name | Family | Nativity |
|------|--|------------------|---------------|
| 1 | <i>Acanthospermum hispidum</i> DC. | Compositae | Brazil |
| 2 | <i>Aerva lanata</i> (L.) Juss. | Amaranthaceae | Trop. America |
| 3 | <i>Aerva sanguinolenta</i> (L.) Blume | Amaranthaceae | Trop. America |
| 4 | <i>Aeschynomene aspera</i> L. | Leguminosae | Trop. America |
| 5 | <i>Alternanthera paronychioides</i> A.St.-Hil. | Amaranthaceae | Trop. America |
| 6 | <i>Alternanthera pungens</i> Kunth | Amaranthaceae | Trop. America |
| 7 | <i>Alternanthera sessilis</i> (L.) R.Br. ex DC. | Amaranthaceae | Trop. America |
| 8 | <i>Amaranthus spinosus</i> L. | Amaranthaceae | Trop. America |
| 9 | <i>Semecarpus anacardium</i> L.f. | Anacardiaceae | West Indies |
| 10 | <i>Anagallis arvensis</i> L. | Primulaceae | Eurasia |
| 11 | <i>Annona squamosa</i> L. | Annonaceae | Trop. America |
| 12 | <i>Argemone mexicana</i> L. | Papaveraceae | Trop. America |
| 13 | <i>Argemone ochroleuca</i> Sweet | Papaveraceae | Trop. America |
| 14 | <i>Asparagus racemosus</i> Willd. | Asparagaceae | Sri Lanka |
| 15 | <i>Asphodelus tenuifolius</i> Cav. | Xanthorrhoeaceae | Trop. America |
| 16 | <i>Bidens biternata</i> (Lour.) Merr. and Sherff | Compositae | Trop. America |
| 17 | <i>Blainvillea acmella</i> (L.) Philipson | Compositae | Trop. America |
| 18 | <i>Blumea eriantha</i> DC. | Compositae | Trop. America |
| 19 | <i>Blumea obliqua</i> (L.) Druce | Compositae | Trop. America |
| 20 | <i>Blumea lacera</i> (Burm.f.) DC | Compositae | Trop. America |
| 21 | <i>Cajanus scarabaeoides</i> (L.) Thouars | Leguminosae | Africa |
| 22 | <i>Calotropis gigantea</i> (L.) Dryand. | Apocynaceae | Africa |
| 23 | <i>Calotropis procera</i> (Aiton) Dryand. | Apocynaceae | Africa |
| 24 | <i>Cardamine trichocarpa</i> Hecht ex. Rich | Brassicaceae | Trop. America |
| 25 | <i>Carissa carandas</i> L. | Apocynaceae | South Africa |
| 26 | <i>Chamaecrista absus</i> (L.) Irwin and Barn. | Leguminosae | Trop. America |
| 27 | <i>Senna hirsuta</i> (L.) Irwin and Barneby | Leguminosae | Trop. America |
| 28 | <i>Senna obtusifolia</i> (L.) Irwin and Barneby | Leguminosae | Trop. America |
| 29 | <i>Senna occidentalis</i> (L.) Link | Leguminosae | Trop. America |
| 30 | <i>Senna siamea</i> (Lam.) H.S.Irwin and Barn. | Leguminosae | Trop. America |
| 31 | <i>Senna sophera</i> (L.) Roxb. | Leguminosae | Trop. America |

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|----|---|----------------|---------------|
| 32 | <i>Senna tora</i> (L.) Roxb. | Leguminosae | Trop. America |
| 33 | <i>Senna uniflora</i> (Mill.) Irwin and Barn. | Leguminosae | Trop. America |
| 34 | <i>Chamaecrista pumila</i> (Lam.) Larsen | Leguminosae | Trop. America |
| 35 | <i>Cassia fistula</i> L. | Leguminosae | Trop. America |
| 36 | <i>Celosia argentea</i> L. | Amaranthaceae | Trop. Africa |
| 37 | <i>Chloris barbata</i> Sw. | Poaceae | Trop. America |
| 38 | <i>Chrozophora rotleri</i> (Geis.) Juss. ex Spreng. | Euphorbiaceae | Trop. America |
| 39 | <i>Cichorium intybus</i> L. | Compositae | Europe |
| 40 | <i>Citrullus colocynthis</i> (L.) Schrad. | Cucurbitaceae | West Africa |
| 41 | <i>Cleome chelidonii</i> L.f. | Cleomaceae | Trop. Africa |
| 42 | <i>Cleome gynandra</i> L. | Cleomaceae | Trop. Africa |
| 43 | <i>Cleome simplicifolia</i> (Camb.) Hook & Thoms | Cleomaceae | Trop. America |
| 44 | <i>Cleome viscosa</i> L. | Cleomaceae | Trop. America |
| 45 | <i>Convolvulus arvensis</i> L. | Convolvulaceae | Europe |
| 46 | <i>Corchorus aestuans</i> L. | Malvaceae | Trop. Africa |
| 47 | <i>Corchorus fascicularis</i> Lam. | Malvaceae | Trop. America |
| 48 | <i>Corchorus olitorius</i> L. | Malvaceae | Trop. Africa |
| 49 | <i>Corchorus trilocularis</i> L. | Malvaceae | Trop. Africa |
| 50 | <i>Crotalaria pallida</i> Aiton | Leguminosae | Trop. America |
| 51 | <i>Crotalaria retusa</i> L. | Leguminosae | Trop. America |
| 52 | <i>Crotalaria medicaginea</i> Lam. | Leguminosae | South Europe |
| 53 | <i>Croton bonplandianus</i> Baill. | Euphorbiaceae | South America |
| 54 | <i>Cryptostegia grandiflora</i> Roxb. ex R.Br. | Apocynaceae | Trop. America |
| 55 | <i>Cuscuta chinensis</i> Lam. | Convolvulaceae | Mediterranean |
| 56 | <i>Cuscuta reflexa</i> Roxb. | Convolvulaceae | Mediterranean |
| 57 | <i>Cynodon barberi</i> Rang. & Tadul. | Poaceae | Trop. America |
| 58 | <i>Cynodon dactylon</i> (L.) Pers. | Poaceae | Trop. America |
| 59 | <i>Cyperus difformis</i> L. | Cyperaceae | Trop. America |
| 60 | <i>Cyperus iria</i> L. | Cyperaceae | Trop. America |
| 61 | <i>Cyperus rotundus</i> L. | Cyperaceae | Eurasia |
| 62 | <i>Datura ferox</i> L. | Solanaceae | Trop. America |
| 63 | <i>Datura innoxia</i> Mill. | Solanaceae | Trop. America |
| 64 | <i>Datura metel</i> L. | Solanaceae | Trop. America |
| 65 | <i>Digera muricata</i> (L.) Mart. | Amaranthaceae | South Asia |
| 66 | <i>Echinochloa colona</i> (L.) Link | Poaceae | Trop. America |
| 67 | <i>Echinochloa stagnina</i> (Retz.) Beauv. | Poaceae | Trop. America |
| 68 | <i>Eclipta prostrata</i> (L.) L. | Compositae | Trop. America |
| 69 | <i>Eichhornia crassipes</i> (Mart.) Solms | Pontederiaceae | Trop. America |
| 70 | <i>Emilia sonchifolia</i> (L.) DC. ex DC. | Compositae | Trop. Africa |
| 71 | <i>Euphorbia heterophylla</i> L. | Euphorbiaceae | Trop. America |
| 72 | <i>Euphorbia hirta</i> L. | Euphorbiaceae | Trop. America |
| 73 | <i>Euphorbia hypericifolia</i> L. | Euphorbiaceae | Trop. America |

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|-----|--|----------------|-----------------|
| 74 | <i>Euphorbia thymifolia</i> L. | Euphorbiaceae | Trop. America |
| 75 | <i>Evolvulus alsinoides</i> (L.) L. | Convolvulaceae | Trop. America |
| 76 | <i>Grewia asiatica</i> L. | Malvaceae | Sri Lanka |
| 77 | <i>Guizotia abyssinica</i> (L.f.) Cass. | Compositae | Trop. America |
| 78 | <i>Heliotropium ellipticum</i> Ledeb. | Boraginaceae | South America |
| 79 | <i>Holoptelea integrifolia</i> Planch. | Ulmaceae | Pacific islands |
| 80 | <i>Hyptis suaveolens</i> (L.) Poit. | Lamiaceae | Trop. America |
| 81 | <i>Imperata cylindrica</i> (L.) Rausch. | Poaceae | Trop. America |
| 82 | <i>Indigofera astragalina</i> DC | Leguminosae | Trop. Africa |
| 83 | <i>Indigofera linifolia</i> (L.f.) Retz. | Leguminosae | Trop. America |
| 84 | <i>Indigofera linnaei</i> Ali | Leguminosae | Trop. Africa |
| 85 | <i>Leonotis nepetiifolia</i> (L.) R. Br. | Lamiaceae | Trop. Africa |
| 86 | <i>Ludwigia octovalvis</i> (Jacq.) Raven | Onagraceae | Trop. America |
| 87 | <i>Lysiloma latisiliquum</i> (L.) Benth.) | Leguminosae | Trop. America |
| 88 | <i>Ludwigia octovalvis</i> (Jacq.) Raven | Onagraceae | Trop. Africa |
| 89 | <i>Ludwigia perennis</i> L. | Onagraceae | Trop. Africa |
| 90 | <i>Malvastrum coromandelianum</i> (L.) Gar. | Malvaceae | Trop. America |
| 91 | <i>Manilkara hexandra</i> (Roxb.) Dubard | Sapotaceae | South America |
| 92 | <i>Martynia annua</i> L. | Martyniaceae | Trop. America |
| 93 | <i>Medicago polymorpha</i> L. | Leguminosae | Middle east |
| 94 | <i>Medicago sativa</i> L. | Leguminosae | Middle east |
| 95 | <i>Melia azedarach</i> L. | Meliaceae | Iran |
| 96 | <i>Melilotus officinalis</i> subsp. <i>alba</i> (Medik.) Ohashi and Tateishi | Leguminosae | Eurasia |
| 97 | <i>Melochia corchorifolia</i> L. | Malvaceae | Trop. America |
| 98 | <i>Merremia aegyptia</i> (L.) Urb. | Convolvulaceae | Trop. America |
| 99 | <i>Mimosa hamata</i> Willd. | Leguminosae | Brazil |
| 100 | <i>Mimosa pudica</i> L. | Leguminosae | Brazil |
| 101 | <i>Monochoria vaginalis</i> (Burm.f.) Presl | Pontederiaceae | Trop. America |
| 102 | <i>Nicotiana plumbaginifolia</i> Viv. | Solanaceae | Trop. America |
| 103 | <i>Ocimum americanum</i> L | Lamiaceae | Trop. America |
| 104 | <i>Opuntia elatior</i> Mill. | Cactaceae | South America |
| 105 | <i>Oxalis corniculata</i> L. | Oxalidaceae | Europe |
| 106 | <i>Panicum antidotale</i> Retz. | Poaceae | China |
| 107 | <i>Parthenium hysterophorus</i> L. | Compositae | Trop. America |
| 108 | <i>Pedaliium murex</i> L., | Pedaliaceae | Trop. America |
| 109 | <i>Pennisetum glaucum</i> (L.) R.Br. | Poaceae | Trop. America |
| 110 | <i>Pennisetum pedicellatum</i> Trin. | Poaceae | Trop. America |
| 111 | <i>Dicliptera paniculata</i> (Forssk.) Darbysh.) | Acanthaceae | Trop. America |
| 112 | <i>Phalaris minor</i> Retz. | Poaceae | America |
| 113 | <i>Phoenix sylvestris</i> Roxb | Arecaceae | West Asia |
| 114 | <i>Phyllanthus amarus</i> Schum. and Thonn. | Phyllanthaceae | Middle east |
| 115 | <i>Physalis minima</i> L. | Solanaceae | Trop. America |

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|-----|---|----------------|---------------|
| 116 | <i>Pistia stratiotes</i> L. | Araceae | Trop. America |
| 117 | <i>Pithecellobium dulce</i> (Roxb.) Benth. | Leguminosae | South America |
| 118 | <i>Portulaca oleraceae</i> L. | Portulacaceae | Trop. America |
| 119 | <i>Portulaca quadrifida</i> L. | Portulacaceae | Trop. America |
| 120 | <i>Prosopis juliflora</i> (Sw.) DC. | Leguminosae | Cent. America |
| 121 | <i>Ricinus communis</i> L. | Euphorbiaceae | Africa |
| 122 | <i>Ruellia tuberosa</i> L. | Acanthaceae | Trop. America |
| 123 | <i>Saccharum spontaneum</i> L. | Poaceae | Trop. Asia |
| 124 | <i>Scoparia dulcis</i> L. | Plantaginaceae | Trop. America |
| 125 | <i>Sesbania bispinosa</i> (Jacq.) W.Wight | Leguminosae | Trop. America |
| 126 | <i>Sesbania sesban</i> (Linn.) Merr. | Leguminosae | South Africa |
| 127 | <i>Sida acuta</i> Burm. f. | Malvaceae | Trop. America |
| 128 | <i>Solanum americanum</i> Mill. | Solanaceae | Trop. America |
| 129 | <i>Solanum torvum</i> Sw. | Solanaceae | Trop. America |
| 130 | <i>Sonchus asper</i> (L.) Hill | Compositae | Europe |
| 131 | <i>Sonchus brachyotus</i> DC. | Compositae | Europe |
| 132 | <i>Sonchus oleraceus</i> (L.) L. | Compositae | Europe |
| 133 | <i>Spermocoe articularis</i> L.f. | Rubiaceae | Trop. America |
| 134 | <i>Sphaeranthus indicus</i> L. | Compositae | Africa |
| 135 | <i>Sporobolus capillaris</i> Miq. | Poaceae | Australia |
| 136 | <i>Stachytarpheta jamaicensis</i> (L.) Vahl | Verbenaceae | Trop. America |
| 137 | <i>Tamarix ericoides</i> Rottler and Willd. | Tamaricaceae | Africa |
| 138 | <i>Tribulus terrestris</i> L. | Zygophyllaceae | Trop. America |
| 139 | <i>Tridax procumbens</i> (L.) L. | Compositae | Cent. America |
| 140 | <i>Typha angustifolia</i> L. | Typhaceae | Trop. America |
| 141 | <i>Urena lobata</i> L. | Malvaceae | Trop. Africa |
| 142 | <i>Vigna trilobata</i> (L.) Verdc. | Leguminosae | Cent. Africa |
| 143 | <i>Waltheria indica</i> L. | Malvaceae | Trop. America |
| 144 | <i>Xanthium strumarium</i> L. | Compositae | Trop. America |
| 145 | <i>Ziziphus jujuba</i> Mill. | Rhamnaceae | China |

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