Original Research Article

Alien Flora of Haveri District, Karnataka, India

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ABSTRACT

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| The present is an account of alien species in the Haveri District in India with additional information on the habit and native range of each plant. During this study, a total of 282 alien species belonging to 225 genera in 67 families were identified and listed from various localities in the district. Of them, dicotyledons were 244 species belonging to 54 families and monocotyledons comprising 38 species come under 13 families. Among the total number of alien species, 28% are native to Tropical America. Analysis of the habit shows that herbs have included 140 species, followed by 60 trees, 57 shrubs and 25 climbers. Among 67 families, Fabaceae is the most dominantly invasive family with 46 species. There is an urgent need to prepare regional data on (invasive) alien species diversity to find out the impact on native vegetation and explore the worldwide pattern of species invasion. |

*Keywords: Alien plants; Invasive species; impacts; Phyto-diversity; Plant invasions;*

1. INTRODUCTION

Invasions by alien plant species lead to major conservation issues throughout the world and are viewed as an important component of human-caused global change which results in the loss of biodiversity (Lodge, 1993; Vitousek *et al*. 1997). Invasions have faster growth rates and biomass production compared to native species. The most competitive ability, vegetative reproduction, rapid establishment, efficient dispersal methods, and highest reproductive efficiency include the production of numerous seeds and other traits that help them adapt to new habitats (Sharma *et al*. 2005; Simberloff *et al*. 2005). At least 10% of the world’s vascular plants (300,000) have the potential to affect native biota and invade other ecosystems, in direct or indirect ways (Singh *et al*. 2006). About 18% of the Indian flora are aliens, of which 55% are native to the Americas, 30% to Asia and 15% to Europe & Central Asia (Nayar 1977; Singh *et al*. 2010). The increased anthropogenic activity and international trade, transport and travel beyond biogeographic barriers have caused the introduction and establishment of alien species in new regions (Dawson *et al.* 2017).

Alien species are introduced accidentally or purposefully outside their native distributional geographic ranges, for example, in India 14.25 million hectares of farmland were invaded by *Parthenium hysterophorus* L. within a tenure of 200 years of introduction. It is also reported to be a health hazard, particularly to farm laborers. Frequent contact with this plant causes allergy, dermatitis, eczema, asthma, constant sneezing, cough, fever and gangrene (Bahar 2000; Love *et al*. 2009; Dasgupta 2010). Another invasive species, *Lantana camara* L. increases the incidence of sleeping sickness in both wild and domesticated animals, as well as human beings (Mack *et al.* 2000). It is estimated that as many as 50% of invasive species, in general, can be classified as ecologically harmful, based on their actual impacts (Richardson *et al.* 2000). Few alien plants were used in the preparation of Ayurvedic formulations and some cultivated alien species provide food, medicine, fuel, & fodder to local communities (Kull *et al.* 2007; Shiddamallayya *et al.* 2010). There is an urgent necessary to prepare data on the distribution of native and alien species to perform a risk assessment of plant invasions (Cronk & Fuller, 1995).

Previous studies on the diversity of alien flora in India comprising 1,599 species, belonging to 161 families, and constituting 8.5% of the total Indian vascular flora. Andhra University, Visakhapatnam (Surendra *et al*. 2013); Eastern Ghats in Northern Andhra Pradesh (Naidu, *et al*. 2015); Jhabua district in Madhya Pradesh (Wagh & Jain (2015); Rohilkhand region (UP) (Kumari, *et al*. 2016); Uttarakhand (Arora *et al*. 2022).

In Karnataka state, few studies were undertaken to document the invasive flora of the state, they are alien flora of the Gadag district (Kambhar & Kotresha 2011). Dharwad district (Kotresha *et al*. 2011). A total of 390 weeds were collected and documented, Asteraceae was the dominant family with 41 weed species from Karnataka (Sagar 2018). 215 alien species belonging to 68 families were documented from the Ballari district (Kotresh & Siddeshwari 2020). Ecological impacts of invasive alien flora in Devarayanadurga Reserve Forest, Tumakuru district (Mouna & Kotresha 2022) enumerated 144 species belonging to 51 families. 312 species belonging to 79 families along with habit, habitat, nativity, mode of introduction invasive status, and uses of alien plant species in Hassan district (Kumar & Nagayya, 2022).

2. material and methods

**2.1. Study area:** The Haveri district is situated in the central part of Karnataka state (Figure 1). Haveri district is famous for Cardamom garlands, the marketing of red chilies in Byadagi and cotton marketing in Ranebennur. It is located between north latitudes 14̊ 17’ 02” to 15̊ 15’ 01” and east longitudes 75̊ 0’35” to 75̊ 49’23” falling in the Survey of India (SOI). The total area of Haveri district is 4851.26 hectares it covers 2.52% of the total area of Karnataka State out of this forest cover is 474.54 hectares (9.78%). (Shiddamallayya *et al*. 2015). There are 2 wildlife sanctuaries, namely, 1. Bankapura Peacock Conservation Reserve and 2. Ranebennur Blackbuck Sanctuary (Mamatha and Hosetti, 2018; Makanur and Kotresha, 2022).



**Figure 1. Map of study area Haveri district. Karnataka**

**2.2.** **Data collection:**

The plant specimens were collected from different localities in the study area and from different habitats in different seasons from November 2020 to August 2023. The localities were selected in such a manner to cover forest, natural vegetation, grasslands, hilltops, marshy places, cultivated fields and riparian vegetation to document alien plants from the Haveri district. All the collected specimens were identified with the aid of previously published literature and flora such as Bailey, 1949 Repr.; Cooke, 1958; Blatter & McCann, 1984 Repr; Saldanha, 1984 & 1996; Prasad & Singh, 2002; Gamble, 2008 Repr.; Saldanha & Nicolson, 1976; Manjunatha *et al*. 2004 and Bhat, 2014; specimens were labelled with recently accepted names and its family as per the recent classification of angiosperms APG IV (Chase *et al*., 2016). The native ranges of each species were recorded from Internet resources such as, <http://www.hear.org/pier/>, <http://www.tropicos.org/>, <http://www.invasivespeciesinfo.gov/plants/main.shtml> and *Plants of World Online* and *GRIN-Germplasm Resources Network*.

3. results and discussion

Floristic enumeration of the Flora of Haveri district resulted in 877 species belonging to 124 families. Out of these 282 species belonging to 225 genera and 67 families were documented as alien. Of them, dicotyledons were dominant with 244 species belonging to 192 genera and 54 families and Monocotyledons comprising 38 species comes under 33 genera and 13 families (Figure 2).

**Figure 2. Distribution of Dicots and Monocots**

The analysis of the origin of alien species shows that 58 species originated from Tropical America and contributed the highest number (28 %) of invasions, followed by Tropical Africa with 28 species that share (14%) of alien flora. Mexico (21), China (17), South America (14), Central America (12), Africa (10), America, Madagascar and the Mediterranean each contribute (8), Afghanistan and Brazil 5 species each. Egypt (4), Australia (3), Central Asia and West Indies with 2 species each (Figure 3).

**Figure 3. Nativity of alien plants of the Haveri district**

Habit-wise investigation shows that herbs were predominant with 140 species, it shares around 50% of the total invasive flora of Haveri district, followed by 60 trees (21%), 57 shrubs (20%) and 25 climber species (9%) (Figure 4). Among 67 families, Fabaceae has shown the greatest number of invasives with 46 species (16%), the second highest family was Asteraceae with 28 species (10%) of total alien flora. Followed by Poaceae (17), Malvaceae (16), Solanaceae (14), Euphorbiaceae (13), Apocynaceae and Convolvulaceae (12), Amaranthaceae (8) and Asparagaceae (5) (Figure 5). The above-mentioned 10 families contribute more than half 61% of alien species, other 51 families share 39% of invasives.

**Figure: 4. Habit wise classification of alien plants**

**Figure 5. Ten dominant families in the study area**

*Alternanthera pungens* Kunth, *Ageratum conyzoides* L., *Chromolaena odorata* (L.) R.M. King & H. Rob., *Mikania micrantha* Kunth, *Parthenium hysterophorus* L., *Croton bonplandianus* Baill., *Acacia auriculiformis* A.Cunn. ex Benth., *Gliricidia sepium* (Jacq.) Walp., *Prosopis juliflora* (Sw.) DC, *Stachytarpheta jamaicensis* (L.) Vahl and *Lantana camara* L were the common and major invasive alien species observed throughout the district.

 The present study showed similarities, the maximum number of invasions from Tropical America and herbaceous flora was dominant compared with previous works in Karnataka, Kotresha *et al*., 2011, listed 306 alien species from 71 families from various localities in the Dharwad. Out of them, 59% were native to Tropical America. Kambhar and Kotresha (2011) enumerated the alien flora from the Gadag district, which resulted in a total of 141 species belonging to 112 genera and 40 families in which most of the invasions (88 species) were from the Tropical America region. 215 species of 68 families were enlisted from the Ballari district (Kotresha and Siddeshwari, 2020).

Field observations indicated that invasive plant species such as *Chromolaena odorata,* *Lantana camara*, *Eucalyptus globulus*, *Senna siamea* and *Dodonaea viscosa* are considered very harmful invasions in the natural forests of the district. Because of their rapid seed production and ability to spread fast, have an allelopathic effect on native plants. They are often also a health hazard to humans and domestic animals. *Mikania micrantha* H.B.K. is commonly known as mile-a-minute as it possesses a phenomenal growth rate of 8 to 9 cm within a day (Choudhury, 1972). It spreads up to the top of the canopy and creates a dense cover that damages or kills other plants by blocking light and can smother even mature trees (Bora and Babu, 2021). *Parthenium hysterophorus,* *Celosia argentea*, *Corchorus olitorius* and *Euphorbia heterophylla* *Tridax procumbens* are considered a major problem in crop fields and loss of native biodiversity because of their fast growth and production of great numbers of small seeds they affect the yield of crops. *Pontederia crassipes* and *Ipomoea carnea* have become a nuisance in aquatic habitats, a major problem in boat navigation, block irrigation systems and drainages, reduce the aesthetic value of open water sources.

Table 1. Checklist of Invasive alien species in Haveri district, Karnataka

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| **Scientific Name** | **Family** | **Ha****bit** | **Nativity range** |
| *Abelmoschus ficulneus* (L.) Wight. & Arn. | Malvaceae | S | Madagascar, Pakistan to N. Australia |
| *Acacia auriculiformis* A.Cunn. ex Benth. | Fabaceae | T | Tropical Australia |
| *Acanthospermum hispidum* DC. | Asteraceae | H | South America |
| *Acmella radicans* (Jacq.) R.K. Jansen | Asteraceae | H | Tropical America |
| *Adansonia digitata* L. | Malvaceae | T | Tropical & S. Africa, S. Arabian Peninsula |
| *Aeschynomene americana* L. | Fabaceae | H | Tropical & Subtropical America |
| *Aeschynomene indica* L. | Fabaceae | H | South East USA |
| *Agave americana* L. | Asparagaceae | S | Mexico |
| *Agave amica* (Medik.) Thiede & Govaerts | Asparagaceae | H | Central & S. Mexico |
| *Agave angustifolia* Haw. | Asparagaceae | S | Mexico to Central America |
| *Ageratum conyzoides* L. | Asteraceae | H | Mexico |
| *Ageratum houstonianum* Mill. | Asteraceae | H | Mexico to Central America |
| *Albizia lebbeck* (L.) Benth. | Fabaceae | T | Tropical Himalaya |
| *Allamanda schottii* Pohl | Apocynaceae | S | French Guiana, SE. & S. Brazil to Argentina |
| *Allium cepa* L. | Amaryllidaceae | H | Central Asia. |
| *Allium sativum* L. | Amaryllidaceae | H | Central Asia to NE. Iran |
| *Aloe vera* (L.) Burm.f. | Asphodelaceae | H | Mediterranean, Canary Islands |
| *Alstonia scholaris* (L.) R.Br. | Apocynaceae | T | Australia, Asia |
| *Alternanthera pungens* Kunth | Amaranthaceae | H | America |
| *Alysicarpus bupleurifolius* (L.) DC. | Fabaceae | H | China to Queensland |
| *Amaranthus blitum* L. | Amaranthaceae | H | Peru to Brazil and N. Argentina |
| *Amaranthus spinosus* L. | Amaranthaceae | H | Mexico to Tropical America. |
| *Amaranthus viridis* L. | Amaranthaceae | H | SE. Mexico to Tropical America. |
| *Amorphophallus paeoniifolius* (Dennst.) Nicolson | Araceae | H | Madagascar |
| *Anacardium occidentale* L. | Anacardiaceae | T | Tropical America |
| *Anethum graveolens* L | Apiaceae | H | N. Africa to Chad, Iran to Arabian Peninsula |
| *Annona muricata* L. | Annonaceae | T | Tropical America |
| *Annona reticulata* L.  | Annonaceae | T | Tropical America |
| *Annona squamosa* L. | Annonaceae | T | Central America, West Indies |
| *Antigonon leptopus* Hook. & Arn. | Polygonaceae | C | South America |
| *Apluda mutica* L. | Poaceae | H | Mascarenes, Socotra, Asia to W. Pacific |
| *Aponogeton natans* (L.) Engl. & Kr. | Aponogetonaceae | H | Myanmar, S. Sri Lanka |
| *Arachis hypogaea* L. | Fabaceae | H | Bolivia |
| *Areca catechu* L. | Arecaceae | T | Philippines |
| *Arthraxon lanceolatus* (Roxb.) Hochst. | Poaceae | H | Eritrea to S. Africa, Pakistan to China and Sunda Islands |
| *Asclepias curassavica* L. | Apocynaceae | H | Tropical America |
| *Asparagus racemosus* Willd. | Asparagaceae | S | Tropical Africa to N. Australia |
| *Bauhinia purpurea* L. | Fabaceae | T | South China, Southeast Asia |
| *Bidens biternata* (Lour.) Merr. & Sherff ex Sherff | Asteraceae | H | Tropical Africa |
| *Boerhavia erecta* L. | Nyctanginaceae | H | Tropical & Subtropical America |
| *Bougainvillea glabra* Choisy | Nyctanginaceae | S | Brazil |
| *Brassica juncea* (L.) Czern. | Brassicaceae | H | Caucasus |
| *Brassica oleracea* L. | Brassicaceae | H | Atlantic coasts of Great Britain, France and Spain |
| *Brugmansia suaveolens* (Humb. & Bonpl. ex Willd.) Bercht. & J.Presl | Solanaceae | S | Brazil |
| *Caesalpinia pulcherrima* (L.) Sw. | Fabaceae | S | Tropical America |
| *Calliandra haematocephala* Hassk. | Fabaceae | S | Bolivia |
| *Calyptocarpus vialis* Less. | Asteraceae | H | Tropical America |
| *Canavalia ensiformis* (L.) DC. | Fabaceae | C | Tropical & Subtropical America |
| *Canna indica* L. | Cannaceae | H | Tropical & Subtropical America. |
| *Capparis decidua* (Forssk.) Edgew. | Capparaceae | S | Mauritania to Andaman & Nicobar Islands |
| *Capsicum annuum* L. | Solanaceae | H | Mexico to Guatemala |
| *Careya arborea* Roxb. | Lecythidaceae | T | Afghanistan to NW. Peninsula Malaysia |
| *Carica papaya* L. | Caricaceae | T | Mexico to Venezuela |
| *Carthamus tinctorius* L.  | Asteraceae | H | Central & E. Türkiye to Iran |
| *Cascabela thevetia* (L.) Lippold | Apocynaceae | T | Tropical America |
| *Casearia elliptica* Willd.  | Salicaceae | T | Madagascar |
| *Cassia javanica* L. | Fabaceae | T | Southeast Asia |
| *Catharanthus roseus* (L.) G.Don | Apocynaceae | H | Madagascar |
| *Catunaregam spinosa* (Thunb.) Tirveng. | Rubiaceae | S | Pakistan to S. China and W. Malesia |
| *Ceiba pentandra* (L.) Gaertn. | Malvaceae | T | Africa |
| *Celosia argentea* L. | Amaranthaceae | H | Tropical Africa |
| *Cenchrus americanus* (L.) Morrone | Poaceae | H | Benin to S. Tropical Africa |
| *Cenchrus purpureus* (Schumach.) Morrone | Poaceae | H | Sahara to Tropical Africa, Aldabra, Arabian Peninsula |
| *Centrosema pubescens* Benth. | Fabaceae | C | Tropical America |
| *Chloris radiata* (L.) Sw. | Poaceae | H | Mexico to Tropical America |
| *Chromolaena odorata* (L.) R.M. King & H. Rob. | Asteraceae | S | America |
| *Cicer arietinum* L. | Fabaceae | H | SE. Turkey to Iran |
| *Citrullus colocynthis* (L.) Schrad. | Cucurbitaceae | C | Macaronesia, Medit., Tropical Africa to N. Kenya |
| *Citrullus lanatus* (Thunb.) Matsum. & Nakai | Cucurbitaceae | C | E. Sahara |
| *Cleome viscosa* L. | Cleomaceae | H | Tropical Africa, S. Arabia to Tropical Australia. Malaysia |
| *Clitoria terneata* L. | Fabaceae | C | Cape Verde, Tropical & S. Africa, Arabian Peninsula |
| *Cocculus hirsutus* (L.) Diels | Menispermaceae | C | S. Africa, Arabian Peninsula, SE. Pakistan to S. China. |
| Cocos nucifera L. | Arecaceae | T | Central Malesia to SW. Pacific |
| *Commelina erecta* L. | Commelinaceae | H | America, Tropical & S. Africa, Arabian Peninsula |
| *Conyza japonica* (Thunb.) Less. | Asteraceae | H | Afghanistan to Japan and Philippines |
| *Coriandrum sativum* L. | Apiaceae | H | E. Medit. to Pakistan |
| *Cosmos caudatus* H.B.Kunth | Asteraceae | H | Central America |
| *Couroupita guianensis* Aublet | Lecythidaceae | T | South America |
| *Craterostigma nummulariifolium* (D.Don) Eb. Fisch., Schäferh. & Kai Müll. | Linderniaceae | H | Tropical Africa, Madagascar |
| *Crotalaria pallida* Aiton | Fabaceae | S | Central America |
| *Crotalaria retusa* L. | Fabaceae | H | Southeast Asia |
| *Croton bonplandianus* Baill. | Euphorbiaceae | H | Temperate South America |
| *Cryptostegia grandiflora*R.Br. | Apocynaceae | S | Madagascar |
| *Cucumis sativus* f. *hardwickii*(Royle) W.J.de Wilde & Duyfjes | Cucurbitaceae | C | Himalaya to China and N. Thailand |
| *Cuminum cyminum* L. | Apiaceae | H | Iraq to Afghanistan |
| *Cuscuta campestris* Yunck. | Convolvulaceae | C | N. America |
| *Cynoglossum zeylanicum* (Vahl) Brand | Boraginaceae | H | Afghanistan to S. Japan and Philippines |
| *Cyperus flavidus* Retz. | Cyperaceae | H | Europe to Japan, S. Africa to E. Australia |
| *Dactyloctenium aegyptium* (L.) P.Beauv. | Poaceae | H | South America |
| *Datura discolor* Bernh. | Solanaceae | H | W. Central U.S.A. to Honduras |
| *Datura ferox* L. | Solanaceae | H | Texas to Mexico |
| *Datura innoxia* Mill. | Solanaceae | S | Mexico |
| *Datura stramonium* L. | Solanaceae | S | N. America |
| *Delonix regia* (Hook.) Raf. | Fabaceae | T | Madagascar |
| *Dendrolobium triangulare* (Retz.) Schindl | Fabaceae | S | Nepal to Taiwan and Malesia |
| *Desmanthus virgatus* (L.) Willd | Fabaceae | H | Texas to S. America |
| *Dicoma tomentosa* Cass. | Asteraceae | H | Tropical Africa |
| *Digera muricata* (L.) Mart. | Amaranthaceae | H | Egypt to E. Kenya and Malesia |
| *Distimake aegyptius* (L.) A.R.Simões & Staples | Convolvulaceae | C | Tropical & Subtropical America, Tropical Africa |
| *Distimake tuberosus* (L.) A.R.Simões & Staples | Convolvulaceae | C | Mexico to Tropical America |
| *Dodonaea viscosa* N. Jacq. | Sapindaceae | S | Tropical & Subtropical Coasts |
| *Dopatrium junceum* (Roxb.) Ham. ex Benth. | Plantaginaceae | H | Tropical Africa to Central China and N. Australia |
| *Duranta erecta* L. | Verbenaceae | S | America |
| *Echinochloa crus-galli* (L.) P.Beauv. | Poaceae | H | Paleotropics |
| *Echinops echinatus* Roxb. | Asteraceae | H | Afghanistan |
| *Eclipta prostrata* (L.) L. | Asteraceae | H | Temp. & Subtropical America. |
| *Ehretia aspera* Willd. | Boraginaceae | T | Pakistan to Hainan and Peninsula Malaysia |
| *Eleusine coracana* (L.) Gaertn. | Poaceae | H | W. Tropical Africa to Socotra and Angola |
| *Epiphyllum oxypetalum* (DC.) Haw. | Cactaceae | C | Central Mexico to Nicaragua |
| *Erigeron bonariensis* L.  | Asteraceae | H | Mexico to S. Tropical America |
| *Erigeron sumatrensis* Retz. | Asteraceae | H | S. Tropical America |
| *Eryngium foetidum* L. | Apiaceae | H | Central America |
| *Eucalyptus globulus* Labill. | Myrtaceae | T | Australia |
| *Eucalyptus leucoxylon* F. Muell. | Myrtaceae | T | SE. Australia |
| *Euphorbia balbisii* Boiss. | Euphorbiaceae | H | Leeward Islands |
| *Euphorbia heterophylla* L. | Euphorbiaceae | H | Central America |
| *Euphorbia hirta* L. | Euphorbiaceae | H | Tropical America |
| *Euphorbia hypericifolia* L. | Euphorbiaceae | H | Tropical & Subtropical America |
| *Euphorbia tirucalli* L. | Euphorbiaceae | T | Africa |
| *Euphorbia tithymaloides* L. | Euphorbiaceae | H | Florida, Mexico to Tropical America |
| *Euphorbia umbellata* (Pax) Bruyns | Euphorbiaceae | S | Tropical Africa |
| *Evolvulus nummularius* (L.) L. | Convolvulaceae | H | Tropical America |
| *Ficus racemosa* L. | Moraceae | T | Pakistan to N. Queensland |
| *Ficus religiosa* L. | Moraceae | T | SE. Pakistan to Myanmar |
| *Flueggea leucopyrus* Willd. | Phyllanthaceae | S | Ethiopia to Somalia, Pakistan to China, Sri Lanka. |
| *Flueggea virosa* (Roxb. ex Willd.) Royle | Phyllanthaceae | S | Paleotropics |
| *Gliricidia sepium* (Jacq.) Walp. | Fabaceae | T | South America |
| *Gloriosa superba* L. | Colchicaceae | C | Paleotropics |
| *Glycine max* (L.) Merr. | Fabaceae | H | Russian Far East to China and Temp. E. Asia |
| *Gomphrena celosioides* Mart. | Amaranthaceae | H | South America |
| *Gossypium arboreum* L. | Malvaceae | S | Pacific, Mexico to Ecuador and NE. Brazil |
| *Grangea maderaspatana* (L.) Poir. | Asteraceae | H | Africa |
| *Grevillea robusta* A.Cunn. ex R.Br. | Proteaceae | T | Eastern Australia |
| *Grewia tiliifolia* Vahl | Malvaceae | T | Tonga |
| *Guazuma ulmifolia* Lamk. | Malvaceae | T | Central America, Java |
| *Guizotia abyssinica* (L.f.) Cass. | Asteraceae | H | Tropical Africa |
| *Harrisia bonplandii* (J.Parm. ex Pfeiff.) Britton & Rose | Cactaceae | S | Bolivia to N. Argentina |
| *Helianthus annuus* L. | Asteraceae | H | SW. U.S.A. to Mexico |
| *Heliotropium indicum* L. | Boraginaceae | H | Peru to Brazil and N. Argentina. |
| *Hibiscus cannabinus* L. | Malvaceae | S | Africa |
| *Hibiscus panduriformis* Burm.f. | Malvaceae | S | Tropical Old World |
| *Hibiscus rosa-sinensis* L. | Malvaceae | S | Vanuatu |
| *Hibiscus schizopetalus* (Mast.) Hook.f. | Malvaceae | S | Kenya to E. Tanzania |
| *Hibiscus vitifolius* L. | Malvaceae | S | Tropical & Subtropical Old World |
| *Indigofera arrecta* Hochst. ex A. Rich. | Fabaceae | S | Africa |
| *Ipomoea alba* L. | Convolvulaceae | H | Tropical America |
| *Ipomoea batatas* (L.) Lamk. | Convolvulaceae | C | Mexico to Venezuela and Ecuador |
| *Ipomoea cairica* (L.) Sweet | Convolvulaceae | H | Mediterranean |
| *Ipomoea carnea* (L.) Sweet | Convolvulaceae | S | South America |
| *Ipomoea hederifolia* L. | Convolvulaceae | C | Tropical America |
| *Ipomoea nil* (L.) Roth.  | Convolvulaceae | C | Tropical & Subtropical America |
| *Ipomoea triloba* L. | Convolvulaceae | C | Tropical America |
| *Jacaranda mimosifolia* D.Don | Bignoniaceae | T | South America |
| *Jatropha curcas* L. | Euphorbiaceae | T | New World tropics |
| *Jatropha gossypiifolia* L. | Euphorbiaceae | S | Mexico to Tropical America |
| *Kalanchoe pinnata* (Lam.) Pers. | Crassulaceae | H | Madagascar |
| *Kigelia africana* (Lam.) Benth. | Bignoniaceae | T | Africa |
| *Lagascea mollis* Cav. | Asteraceae | H | Tropical America |
| *Lagenaria siceraria* (Molina) Standl. | Cucurbitaceae | C | W. Tropical Africa to Ethiopia and Tanzania |
| *Lantana camara* L. | Verbenaceae | S | Central America |
| *Leucaena leucocephala* (Lam.) de Wit | Fabaceae | T | Tropical America |
| *Leucas nutans* (Roth) Spreng. | Lamiaceae | H | Pakistan to Myanmar |
| *Libidibia coriaria* (Jacq.) Schltdl. | Fabaceae | T | West Indies |
| *Limnocharis flava* (L.) Buchenau | Alismataceae | H | Mexico to Tropical America |
| *Linum usitatissimum* L. | Linaceae | H | Turkey to Iran |
| *Livistona chinensis* R.Br. | Arecaceae | T | Japan to China |
| *Ludwigia hyssopifolia* (G.Don) Exell | Onagraceae | H | S. Mexico to Tropical America |
| *Luisia zeylanica* Lindley | Orchidaceae | H | Sri Lanka |
| *Macroptilium atropurpureum* (DC.) Urb. | Fabaceae | H | America |
| *Macroptilium lathyroides* (L.) Urb. | Fabaceae | H | Tropical America |
| *Manihot esculenta* Pohl. | Euphorbiaceae | S | Brazil |
| *Manilkara zapota* (L.) P.Royen | Sapotaceae | T | Mexico to Colombia |
| *Markhamia lutea* (Benth.) K.Schum. | Bignoniaceae | T | Uganda |
| *Martynia annua* L. | Martyniaceae | S | Central America, Mexico |
| *Mecardonia procumbens* (Mill.) Small | Plantaginaceae | H | Tropical America |
| *Megathyrsus maximus* (Jacq.) B.K.Simon & S.W.L.Jacobs | Poaceae | H | Tropical & S. Africa, Arabian Peninsula |
| *Melaleuca glauca* (DC.) Craven | Myrtaceae | T | Western Australia |
| *Melinis repens* (Willd.) Zizka | Poaceae | H | Africa to Arabian Peninsula |
| *Melochia corchorifolia* L. | Malvaceae | H | Tropical & Subtropical Old World |
| *Merremia emarginata* (Burm.f.) Hallier.f. | Convolvulaceae | H | Southeast Asia |
| *Mesosphaerum suaveolens* (L.) Kuntze | Lamiaceae | S | Central America |
| *Microcos paniculata* L. | Malvaceae | S | Pakistan to China and Malesia |
| *Mikania micrantha* Kunth | Asteraceae | C | Tropical & Subtropical America |
| *Mimosa hamata* Willd. | Fabaceae | S | S. America |
| *Mimosa pudica* L. | Fabaceae | H | South America |
| *Mirabilis jalapa* L. | Nyctanginaceae | H | Peru |
| *Morus alba* L. | Moraceae | S | Central China |
| *Muntingia calabura* L. | Muntingiaceae | T | Tropical America |
| *Musa paradisiaca* L. | Musaceae | S | wet tropical biome |
| *Nerium oleander* L. | Apocynaceae | S | Medit. to Myanmar. |
| *Nicotiana plumbaginifolia* Viv. | Solanaceae | H | Tropical America |
| *Ocimum americanum* L. | Lamiaceae | H | Paleotropics |
| *Opuntia cochenillifera* (L.) Mill. | Cactaceae | S | Centrl America |
| *Opuntia elatior* Mill. | Cactaceae | S | S. Caribbean, Costa Rica to Venezuela |
| *Oryza sativa* L. | Poaceae | H | China |
| *Oxalis corniculata* L. | Oxalidiaceae | H | Mexico to Venezuela and Peru, Caribbean |
| *Oxystelma esculentum* (L.f.) Sm. | Apocynaceae | C | Egypt to NE. Tanzania, S. China and Australia. |
| *Panicum paludosum* Roxb. | Poaceae | H | Kriti, Egypt to S. Africa |
| *Parkia biglandulosa* Wight & Arn. | Fabaceae | T | Southeast Asia |
| *Parkinsonia aculeata* L. | Fabaceae | T | Tropical America |
| *Parthenium hysterophorus* L. | Asteraceae | H | America |
| *Paspalum distichum* L. | Poaceae | H | Russian Far East to Vietnam and Temp. E. Asia |
| *Paspalum vaginatum* Sw. | Poaceae | H | Tropical & Subtropical America |
| *Passiflora foetida* L. | Passifloraceae | C | Tropical America |
| *Phyllanthus acidus* (L.) Skeels | Phyllanthaceae | T | Brazil |
| *Phyllanthus amarus* Schum. & Thonn. | Phyllanthaceae | H | America |
| *Phyllanthus urinaria* L. | Phyllanthaceae | H | Tropical East Asia |
| *Physalis angulata* L. | Solanaceae | H | Tropical America |
| *Pilea microphylla* (L.) Liebm. | Urticaceae | H | South America |
| *Pithecellobium dulce* (Roxb.) Benth. | Fabaceae | T | Tropical America |
| *Plumeria alba* L. | Apocynaceae | T | Central America, Caribbean |
| *Polygala elongata* Klein ex Willd. | Polygalaceae | H | Sicilia |
| *Pontederia crassipes* Mart. | Pontederiaceae | H | South America |
| *Portulaca grandiflora* Hook. | Portulacaceae | H | Tropical America |
| *Portulaca oleracea* L. | Portulacaceae | H | Macaronesia, Tropical Africa, Medit. to Pakistan |
| *Prosopis juliflora* (Sw.) DC | Fabaceae | T | Tropical America |
| *Psidium guajava* L. | Myrtaceae | T | S. Tropical America |
| *Punica granatum* L. | Lythraceae | T | NE. Türkiye to W. & N. Pakistan |
| *Pupalia lappacea* (L.) Juss. | Amaranthaceae | S | Mozambique to S. Africa, E. Afghanistan to Myanmar |
| *Raphanus sativus* L.  | Brassicaceae | H | Medit |
| *Rauvolfia tetraphylla* L. | Apocynaceae | H | West Indies |
| *Ricinus communis* L. | Euphorbiaceae | S | Tropical Africa |
| *Rorippa indica* (L.) Hiern | Brassicaceae | H | Central Tropical Africa, N. Egypt to Philippines.  |
| *Roystonea regia* (Kunth) O.F. Cook | Arecaceae | T | Florida, Mexico to Central America, Caribbean |
| *Ruellia tuberosa* L. | Acanthaceae | H | Tropical America |
| *Saccharum officinarum* L. | Poaceae | S | New Guinea |
| *Salvadora persica* L. | Salvadoraceae | T | Africa to Syria and Arabian Peninsula |
| *Samanea saman* (Jacq.) Merr. | Fabaceae | T | Central & South America |
| *Sansevieria cylindrica* Bojer ex Hook. | Asparagaceae | H | S. Tropical Africa |
| *Sauromatum venosum* (Dryand. ex Aiton) Kunth | Araceae | H | Tropical Africa to China  |
| *Scadoxus multiflorus* (Martyn) Raf. | Amaryllidaceae | H | Tropical & S. Africa to SW. Arabian Peninsula |
| *Scoparia dulcis* L. | Plantaginaceae | H | Tropical America |
| *Senegalia ferruginea* (DC.) Pedley | Fabaceae | S | Australia |
| *Senna alata* (L.) Roxb. | Fabaceae | S | South America |
| *Senna hirsuta* (L.) H.S.Irwin & Barneby | Fabaceae | H | Tropical America |
| *Senna occidentalis* (L.) Link | Fabaceae | H | Tropical America |
| *Senna siamea* (Lam.) H.S.Irwin & Barneby | Fabaceae | T | Southeast Asia |
| *Senna sophera* (L.) Roxb. | Fabaceae | S | Tropical America |
| *Senna surattensis* (Burm. f.) H.S. Irwin & Barneby | Fabaceae | S | Southeast Asia |
| *Sesbania grandiflora* (L.) Poir. | Fabaceae | T | Indonesia |
| *Setaria italica* (L.) P.Beauv. | Poaceae | H | China |
| *Sida acuta* Burm.f | Malvaceae | H | Pantropical |
| *Simarouba glauca* DC. | Simaroubaceae | T | North America |
| *Solanum anguivi* Lam. | Solanaceae | H | Tropical & S. Africa, Madagascar |
| *Solanum erianthum* D. Don | Solanaceae | S | South America |
| *Solanum lycopersicum* L. | Solanaceae | H | Peru |
| *Solanum seaforthianum* Andrews | Solanaceae | C | Brazil |
| *Solanum torvum* Sw. | Solanaceae | S | Pantropical |
| *Solanum tuberosum* L. | Solanaceae | H | W. & S. South America to NW. Venezuela |
| *Sonchus oleraceus* L. | Asteraceae | H | Europe to Medit., Sahara to Arabian Peninsula. |
| *Spathodea campanulata* P.Beauv. | Bignoniaceae | T | Tropical Africa |
| *Spermacoce verticillata* L. | Rubiaceae | H | Tropical America |
| *Spilanthes paniculata* Wall. ex DC. | Asteraceae | H | China Taiwan, Laccadives to Queensland. |
| *Stachytarpheta cayennensis* (Rich.) Vahl | Verbenaceae | S | Tropical America |
| *Stachytarpheta jamaicensis* (L.) Vahl | Verbenaceae | H | Tropical America |
| *Stemodia verticillata* (Mill.) Hassl. | Plantaginaceae | H | Tropical America |
| *Striga asiatica* (L.) Kuntze | Orobanchaceae | H | Africa to Arabian Peninsula |
| *Stylosanthes hamata* (L.) Taub. | Fabaceae | H | Tropical America |
| *Swietenia mahagoni* (L.) Jacq. | Meliaceae | T | S. Florida to Caribbean. |
| *Synedrella nodiflora* (L.) Gaertn. | Asteraceae | H | Tropical & Subtropical America |
| *Tagetes erecta* L. | Asteraceae | H | Mexico to Guatemala |
| *Tamarindus indica* L. | Fabaceae | T | Tropical Africa |
| *Tecoma stans* (L.) Kunth | Bignoniaceae | T | America |
| *Tectona grandis* L.f. | Lamiaceae | T | Southeast Asia and Malesia |
| *Telosma pallida* Craib | Apocynaceae | C | Pakistan to Taiwan. |
| *Thunbergia alata* Bojer ex Sims | Acanthaceae | C | Tropical Africa |
| *Thunbergia grandiflora* (Roxb. ex Rottl.) Roxb. | Acanthaceae | C | Africa |
| *Tithonia diversifolia* (Hemsl.) A.Gray  | Asteraceae | S | Tropical south America |
| *Tragia hildebrandtii* Muell.-Arg. | Euphorbiaceae | H | Ethiopia to Malawi |
| *Trapa natans* L. | Lythraceae | H | Eurasia, NW. Africa |
| *Trichodesma indicum* (L.) Lehmann | Boraginaceae | H | Afganistan to Thailand, Philippines. |
| *Tridax procumbens* L. | Asteraceae | H | Central America |
| *Trigonella foenum-graecum* L. | Fabaceae | H | Iraq to N. Pakistan |
| *Triumfetta rhomboidea* N. Jacq. | Malvaceae | H | Pantropical |
| *Vachellia farnesiana* (L.) Wight & Arn. | Fabaceae | T | Tropical America |
| *Vigna unguiculata* (L.) Walp. | Fabaceae | H | Cape Verde, Tropical & S. Africa |
| *Vitex negundo* L. | Lamiaceae | S | S. Somalia, Iran to Japan and Marianas. |
| *Waltheria indica* L. | Malvaceae | H | Pantropical |
| *Wattakaka volubilis* (L.f.) Stapf | Apocynaceae | S | Pakistan to S. China and W. Malesia. |
| *Xanthium strumarium* L. | Asteraceae | S | N. America, Peru to Brazil and S. South America. |
| *Zea mays* L. | Poaceae | H | Central & SW. Mexico to W. Guatemala |
| *Ziziphus mauritiana* Lam. | Rhamnaceae | T | Cape Verde, African Sahara to Australia |

**Abbrevations:** H. Herb; C. Climber; S. Shrub; T. Tree.

4. Conclusion

The present paper provides information on the status of alien plant species in Haveri District. The majority of the alien species show that 58 species are native to Tropical America (28 %). Our study represented that the extent and contribution of alien species and their naturalization cannot be considered safe for native and endemic flora. Haveri district, which is a transitional zone between the dry zones of Karnataka and Western Ghats ‘hotspot’ belt is globally designated for priority of conservational activities. The Western Ghats are known as a treasure of endemic species and rich native flora. Already badly affected by the invasion of alien plant species, the need for effective control must be emphasized. This compiled work will serve a significant information gap regarding alien species and will aid in the development of conservation plans and management strategies.

References

Arora, S., Kumar, A., Balodi, K. N. & Arunachalam, K. (2022) Alien flora of Uttarakhand, Western Himalaya: a comprehensive review. *Journal of Threatened Taxa.* 26;14(8):21529-52.

Bahar, N. (2000). Studies on occurrence and control measure of *Parthenium hysterophorus* L. *Indian Forester*. 126(8):903-4.

Bailey, L. H. (1949). Manual of cultivated plants most commonly grown in the continental United States and Canada. The MacMillan Company, New York (Rev. Edn.).

Bhat, G. K. (2014). Flora of South Kanara. Akriti Prints, Mangalore, India.

Blatter, E. & McCann, C. (1984). The Bombay Grasses. Bishen Singh Mahendra Pal Singh, Dehradun.

Bora, A. R. & Babu, D. S. (2021) Biology and Distribution of the Invasive Alien Weed *Mikania micrantha* -A Review. *Int. J. Curr. Microbiol. App. Sci*, 10(03), pp.2044-2049.

Chase, M.W., Christenhusz, M.J., Fay, M.F., Byng, J.W., Judd, W.S., Soltis, D.E., Mabberley, D.J., Sennikov, A.N., Soltis, P.S. and Stevens, P.F., (2016). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society*, 181(1), pp.1-20.

Choudhury, A. K. (1972). Controversial Mikania climber – a threat to the forests and agriculture. *Indian Forester,* 98: 178-86.

Cooke, T. (1958). The Flora of the Presidency of Bombay. Vol. 1-3. Bishen Singh Mahendra Pal Singh, Dehradun.

Cronk, Q. C. &Fuller J. L. (2014). Plant invaders: the threat to natural ecosystems. Routledge.8.

Dasgupta, A. K. (2010). 'Congress grass'. *Current science*. 99(3).

Dawson, W., Moser, D., Van Kleunen, M., Kreft, H., Pergl, J., Pyšek, P., Weigelt, P., Winter, M., Lenzner, B., Blackburn, T. M. & Dyer, E. E. (2017). Global hotspots and correlates of alien species richness across taxonomic groups. *Nature Ecology & Evolution*. 12;1(7):0186. <https://doi.org/10.1038/s41559-017-0186>.

Gamble, J. S. (2008). Flora of the Presidency of Madras 11 parts (1-7 Gamble & 8-11 by Fischer), Bishen Singh Mahendra Pal Singh, Dehradun; (Reprint edition).

<http://www.hear.org/pier/>

<http://www.invasivespeciesinfo.gov/plants/main.shtml>

<http://www.tropicos.org/>

<https://powo.science.kew.org/>

<https://surveyofindia.gov.in/>

Kambhar, S. V. & Kotresha, K. (2011). A study on alien flora of Gadag District, Karnataka, India. *Phytotaxa*. 2011; 4;16(1):52-62. DOI: <https://doi.org/10.11646/phytotaxa.16.1.4>.

Kotresh, K. & Siddeshwari, M. (2020). Alien flora of Ballari district, Karnataka, India. *International Journal of Trends in Scientific Research and Development*. 5(1):167-73.

Kotresha, K., Kambhar, S. V. & Harihar, N. S. (2011). Studies on phyto-diversity, alien species and their status in Dharwad District, Karnataka, India. *National Proceeding of Biodiversity and Biotechnology for Sustainable Development*. Karnataka University, Dharwad, India. 6-25.

Kull, C. A., Tassin, J. & Rangan, H. (2007). Multifunctional, scrubby, and invasive forests. *Mountain Research and Development*. 27(3):224-231. <https://doi.org/10.1659/mrd.0864>.

Kumar, G. P. & Nagayya, S. (2022). Invasive alien plant species of Hassan District, Karnataka, India. *Journal of Threatened Taxa*. 26;14(9):21870-90.

Kumari, B. K., Singh, S. P., Singh, A. P., Raj Kumar, R. K., Verma, S. V. (2016). A preliminary survey of invasive alien angiosperms of Rohilkhand region (UP), India. Plant Archives 16; 1. pp. 45-50

Lodge, D. M. (1993). Biological invasions: lessons for ecology. *Trends in ecology & evolution*. 1;8(4):133-137.

Love, A., Babu, S. & Babu, C. R. (2009). Management of Lantana, an invasive alien weed, in forest ecosystems of India. *Current Science.* 25:1421-29.

Mack, R. N., Simberloff, D., Mark Lonsdale, W., Evans, H., Clout, M., & Bazzaz, F. A. (2000). Biotic invasions: causes, epidemiology, global consequences, and control. *Ecological applications*, *10*(3), 689-710.

Makanur, N. S. & Kotresha, K. (2022). Wild Medicinal Plants of Ranebennur Blackbuck Sanctuary, Haveri District, Karnataka, India. *Journal of Economic & Taxonomic Botany.* *(Scientific Publishers).* 1;46(3&4);132-138.

Mamatha, M. D. & Hosetti, B. B. (2018). Census study on blackbucks *Antilope cervicapra* (L.) in Hullathi section of Ranebennur Wildlife Sanctuary (RWLS), Ranebennur, Haveri district, Karnataka. *Int J Zool Appl Biosci.* 3:283-8. doi:org/10.5281/ zenodo.1312331.

Manjunatha, B. K., Krishna, V. & Pullaiah, T. (2004). Flora of Davanagere District, Karnataka, India. Regency Publications.

Mouna, S. & Kotresha, K. (2022). Ecological Impacts of Invasive Alien Flora in Devarayanadurga Reserve Forest, Tumakuru District, Karnataka. *Journal of Plant Science & Research.* 9(2). pp. 1-9. ISSN: 2349-2805

Naidu, M. T., Kumar, O. A., & Venkaiah, M. (2015). Invasive alien plant species in tropical forests of Eastern Ghats in northern Andhra Pradesh, India. *Indian Forester*, *141*(4), 428-432.

Nayar, M. P. (1977). Changing patterns of the Indian flora. Bulletin Botany Survey of India. *Nelumbo*, 145-155.

Richardson, D. M., Pyšek, P., Rejmanek, M., Barbour, M. G., Panetta, F. D., & West, C. J. (2000). Naturalization and invasion of alien plants: concepts and definitions. *Diversity and distributions*, *6*(2), 93-107.

Sagar, K. (2018). Weed Flora of Karnataka-Current Status and Future Prospects. *World Journal of Pharmaceutical Research.* 7(5), 1305-11. DOI: 10.20959/wjpr20185-11328

Saldanha, C. J. & Nicolson, D. H. (1976). Flora of Hassan District, Karnataka, India. Amerind Publishing Co. Pvt. Ltd. Lucknow.

Saldanha, C. J. (1996). Flora of Karnataka Vol. 2. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Saldanha, C. J. (1984). Flora of KarnatakaVol. 1. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Sharma, G. P., Singh, J. S., & Raghubanshi, A. S. (2005). Plant invasions: emerging trends and future implications. *Current science*, 726-734.

Shiddamallayya, N., Rao, R. V., Venkateshwarlu, G., Giri, S. K., & Doddamani, S. H. (2015). Traditional local health practices of Haveri, Karnataka. *Unique J Ayurvedic Herbal Med*, *3*, 135-45.

Shiddamallayya, N., Rao, V. R., Shantha, T. R., Shubhasree, M. N., Shashidhar, H. D., Venkateswarlu, G., & Sridhar, B. N. (2010). Invasive alien flora of Karnataka in Indian system of medicine (Ayurveda). *Journal of Economic and Taxonomic Botany*, *34*(3), 564-579.

Simberloff, D., Parker, I. M. & Windle, P. N. (2005). Introduced species policy, management, and future research needs. Frontiers in Ecology and the Environment. 3(1):12-20.

Singh, J. S., Gupta, S. R. & Singh, S. P. (2006). Ecology environment and resource conservation. Anamaya Publishers. New Delhi.

Singh, K. P., Shukla, A. N. & Singh J. S. (2010). State-level inventory of invasive alien plants, their source regions and use potential. *Current Science.* 10:107-14.

Surendra, B., Muhammed, A. A. & Raju, S. A. (2013). Invasive alien plant species assessment in urban ecosystem: a case study from Andhra University, Visakhapatnam, India. *International Research Journal of Environmental Science.* 2(5):79-86.

Vitousek, P. M., D'antonio, C. M., Loope, L. L., Rejmanek, M. & Westbrooks, R. (1997). Introduced species: a significant component of human-caused global change. *New Zealand Journal of Ecology.* 1:1-6.

Wagh, V. V., & Jain, A. K. (2015). Invasive alien flora of Jhabua district, Madhya Pradesh, India. *International Journal of Biodiversity and Conservation*, *7*(4), 227-237.