



Journal of **Plant Sciences**

ISSN 1816-4951



Academic
Journals Inc.

www.academicjournals.com

Research Article

An Extensive and Intensive Investigation of Harmful Invasive Alien Species of Nashik District (M.S.), India

Bhagwat W. Chavre

Department of Botany, Arts, Commerce and Science College, Nandgaon, Nashik, Maharashtra, India

Abstract

Background and Objective: In India, many foreign plants have been introduced intentionally or non-intentionally which further occupied nearly every habitat of the country. These foreign plants are commonly known as invasive plants which do not occur naturally in the region but rapidly proliferate in the area where they were introduced. This study observes the harmful invasive alien species. **Materials and Methods:** Many invasive plants were previously observed in the different regions of the Nashik District. The author made frequent visits to various parts during the period, July, 2019 to December, 2021 and collected invasive plant specimens. The collected plants were identified by using local district and state floras and other types of taxonomic literature. **Results:** In the present survey, recorded 94 invasive plants species belonging to 33 families. Asteraceae was found to be the dominant family including 18 species. Most of the plants recorded were from terrestrial habitats and predominantly herbs. The majority of plants recorded in this paper are of American origin (72%) followed by African (12%). **Conclusion:** It is observed that these invasive alien species posed several negative implications on the local environment and biodiversity. Some of these plants do have some medicinal applications.

Key words: Invasive plants, Nasik, biodiversity, threats, medicinal applications

Citation: Chavre, B.W., 2022. An extensive and intensive investigation of harmful invasive alien species of Nashik District (M.S), India. J. Plant Sci., 17: 83-87.

Corresponding Author: Bhagwat W. Chavre, Department of Botany, Arts, Commerce and Science College, Nandgaon, Nashik, Maharashtra, India
Tel: +9975813558

Copyright: © 2022 Bhagwat W. Chavre. This is an open access article distributed under the terms of the creative commons attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

Competing Interest: The authors have declared that no competing interest exists.

Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

An invasive plants species is one that blowouts its natural habitat and may impact the native diversity and overall structure and function of ecosystems in which it gets introduced¹. The invasive alien species negatively impact biodiversity and the ecosystem. Different protected areas including wildlife sanctuaries and national parks from different parts of India are found affected by invasive species like *Lantana* and *Eupatorium*².

It is reported that once established in a particular region, invasive plants start competing with the native flora in several ways. Invasive plants occupy more area thereby reducing the growing ability of original native inhabitants³. Sometimes they show allelopathic effects on the native tree seedlings and seeds¹. Due, to their overcrowding, sometimes they invite fires and ultimately soil erosion^{4,5}. It is also reported that some invasive plants species establish underground mutualism with some soil fungi and check growth and germination of the native plant species⁶. Not only they are deadlier to native plants, but they also impose many ill effects on local animals, birds and human being too. Many invasive plant species are proved to be responsible for decreased bird diversity are toxic to livestock and affects many health problems to human being⁷. It is also reported that various invasive species caused great economic losses in agriculture⁸.

Nashik is located in the North-Western part of the state of Maharashtra which is having extended ranges of Western Ghats. The forests in the region vary from evergreen to dry deciduous types⁹. Many researchers made Floristic, ethnobotanical and geographical studies of the different parts of district⁹⁻¹². But, it is not yet explored for the invasive alien species. This study collects data on invasive alien plants species found grown in different parts of the Nashik District.

MATERIALS AND METHODS

Study area: The data of invasive plants are collected by extensive exploration of various regions of Nashik District from July, 2019 to December, 2021. Plants information is collected from forest regions, riverbanks, hilltops, valleys, croplands, wastelands, river water, pond water, dam water etc. The plants were collected and identified by using local flora and published literature^{13,14}. For this study author intensively and extensively explored different regions of Nashik District and collected information of plants. The plants were identified with their vernacular names, morphological characters and other related literature. For their positive and negative impacts

on local plant diversity, rounds of discussions were taken with local farmers, botanists and personnel of the forest department.

RESULTS AND DISCUSSION

During the present work, authors recorded information of a total of 94 invasive alien plants species belonging to a total of 33 families. The detailed information of recorded plants is given in Table 1. Asteraceae being the dominant family contains about 18 plants invasive species. It is followed by Amaranthaceae (7 species), Euphorbiaceae, Convolvulaceae, Poaceae (6 species each), Solanaceae, Caesalpiniaceae (5 species), Malvaceae (4 species), Asclepiadaceae, Tiliaceae, Papilionaceae, Lamiaceae, Mimosaceae (3 species each). Families, Cleomaceae and Pontederiaceae are represented by only two species however rest of the families have only one species each. Invasive alien species were recorded predominantly in terrestrial habitat (92%) and very few species are aquatic and marshy (8%) in habitat. The aquatic alien species like *Eichhornia crassipes*, *Salvinia molesta*, *Pistia stratiotes*, *Typha angustata* have occupied most of the freshwater bodies of the district. Similar results have been recorded by other researchers^{15,16}.

It is observed that out of total recorded plants herbs are the dominant habit composed of about 74% in total invasive plants. Shrubs, trees, grasses, twiners and climbers are comparatively very few in numbers. Annuals are predominant alien plants which are represented by about 70 species out of total observed species.

The majority of plants recorded in this paper are of American origin (72%) followed by African (12%) and the rest of the plants are found to be originated from the different regions of the world including, Australia, West Asia, Brazil, Mediterranean, Peru, Madagascar, East Indies and Afghanistan⁸.

Literature survey reveals that invasive species pose various harmful impacts including reduction in local plant diversity, prevention of growth of local plants, out-competing of local plant seeds, alterations in plant and animal habitats, compete pollinating agents. The invasive species like *Datura innoxia* and *Datura stramonium* are observed to be fatal for the seedling growth of native plants¹⁷. Invasive species cause serious problems to cultivated lands and grasslands which is ultimately troublesome to local farmers and causes loss in crop productivity¹⁵. Many invasive plants like *Parthenium hysterophorus*, *Eupatorium odoratum*, *Hyptis suaveolens* and *Ageratum conyzoides* are reported to outcompete crops

Table 1: List of invasive alien species of Nashik District

Name of the Plants	Family	Nativity	Habit	Habitat
<i>Acanthospermum hispidum</i> DC.	Asteraceae	Brazil	Annual herb	Terrestrial
<i>Aerva javanica</i> (Burm.f.) Juss. ex Schult.	Amaranthaceae	Tropical America	Annual herb	Terrestrial
<i>Ageratum conyzoides</i> L.	Asteraceae	Tropical America	Annual herb	Terrestrial
<i>Alternanthera paronychioides</i> St. Hill.	Amaranthaceae	Tropical America	Annual herb	Terrestrial
<i>Alternanthera pungens</i> Kunth in H.B. and K.	Amaranthaceae	Tropical America	Annual herb	Terrestrial
<i>Alternanthera tenella</i> Colla	Amaranthaceae	Tropical America	Perennial herb	Terrestrial
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Tropical America	Annual herb	Terrestrial
<i>Antigonon leptopus</i> Hook. and Arn.	Polygonaceae	Tropical America	Climbing shrub	Terrestrial
<i>Argemone mexicana</i> L.	Papaveraceae	Tropical Central and South America	Annual herb	Terrestrial
<i>Bidens pilosa</i> L.	Asteraceae	Tropical America	Annual herb	Terrestrial
<i>Blainvillea acmella</i> (L.)	Asteraceae	Tropical America	Annual herb	Terrestrial
<i>Blumea eriantha</i> DC.	Asteraceae	Tropical America	Annual herb	Terrestrial
<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	Tropical America	Annual herb	Terrestrial
<i>Blumea obliqua</i> (L.) Druce	Asteraceae	Tropical America	Annual herb	Terrestrial
<i>Calotropis gigantea</i> (L.) R.Br.	Asclepiadaceae	Tropical Africa	Perennial shrub	Terrestrial
<i>Calotropis procera</i> (Ait.) R.Br.	Asclepiadaceae	Tropical Africa	Perennial shrub	Terrestrial
<i>Cassia obtusifolia</i> L.	Caesalpinaceae	Tropical America	Annual herb	Terrestrial
<i>Cassia occidentalis</i> L.	Caesalpinaceae	Tropical South America	Annual undershrub	Terrestrial
<i>Cassia pumila</i> Lam.	Caesalpinaceae	Tropical America	Annual herb	Terrestrial
<i>Cassia tora</i> L.	Caesalpinaceae	Tropical South America	Annual undershrub	Terrestrial
<i>Cassia uniflora</i> Mill.	Caesalpinaceae	Tropical South America and West Indies	Annual undershrub	Terrestrial
<i>Catharanthus pusillus</i> (Murray) G. Don	Apocynaceae	Tropical America	Annual herb	Terrestrial
<i>Celosia argentea</i> L.	Amaranthaceae	Tropical Africa	Annual herb	Terrestrial
<i>Chloris barbata</i> Sw.	Poaceae	Tropical America	Annual grass	Terrestrial
<i>Chrozophora rotthleri</i> (Geis.) Spreng	Euphorbiaceae	Tropical Africa	Annual herb	Terrestrial
<i>Cleome gynandra</i> L.	Cleomaceae	Tropical America	Annual herb	Terrestrial
<i>Cleome viscosa</i> L.	Cleomaceae	Tropical America	Annual herb	Terrestrial
<i>Conyza semi pinnatifida</i>	Asteraceae	Tropical America	Annual herb	Terrestrial
<i>Convolvulus arvensis</i> L.	Convolvulaceae	Europe	Annual herb	Terrestrial
<i>Corchorus aestuans</i> L.	Tiliaceae	Tropical America and Africa	Herb	Terrestrial
<i>Corchorus tridens</i> L.	Tiliaceae	Tropical Australia and Africa	Herb	Terrestrial
<i>Corchorus trilocularis</i> L.	Tiliaceae	Tropical Africa	Herb	Terrestrial
<i>Crotalaria retusa</i> L.	Papilionaceae	Tropical America	Undershrub	Terrestrial
<i>Croton bonplandianum</i> Baill.	Euphorbiaceae	South America	Annual herb	Terrestrial
<i>Cryptostegia grandiflora</i> R.Br.	Asclepiadaceae	Madagascar	Climbing shrub	Terrestrial
<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Mediterranean	Parasitic herb	Terrestrial
<i>Cyperus iria</i> L.	Cyperaceae	Tropical America	Annual herb	Aquatic
<i>Datura innoxia</i> Mill.	Solanaceae	Tropical America	Undershrub	Terrestrial
<i>Datura metel</i> L.	Solanaceae	Tropical America	Undershrub	Terrestrial
<i>Digera muricata</i> (L.) Mart.	Amaranthaceae	South West Asia	Annual herb	Terrestrial
<i>Dinebra retroflexa</i> (Vahl) Panz.	Poaceae	Tropical America	Annual grass	Terrestrial
<i>Echinochloa crus galli</i> (L.) Beauv.	Poaceae	South America	Annual grass	Terrestrial
<i>Echinops echinatus</i> Roxb.	Asteraceae	Afghanistan	Annual herb	Terrestrial
<i>Eclipta prostrata</i> (L.) Mant.	Asteraceae	Tropical America	Annual herb	Terrestrial
<i>Eichhornia crassipes</i> (C. Martius)	Pontederiaceae	Tropical America	Floating herb	Aquatic
<i>Emilia sonchifolia</i> (L.) DC.	Asteraceae	Tropical Africa	Annual herb	Terrestrial
<i>Euphorbia heterophylla</i> L.	Euphorbiaceae	Tropical America	Annual herb	Terrestrial
<i>Euphorbia hirta</i> L.	Euphorbiaceae	Tropical America	Annual herb	Terrestrial
<i>Euphorbia indica</i> Lamk.	Euphorbiaceae	South America	Annual herb	Terrestrial
<i>Glossocardia bosvallea</i> (L.f.) DC.	Asteraceae	East Indies	Annual herb	Terrestrial
<i>Grangea maderaspatana</i> (L.) Poir.	Asteraceae	South America	Annual herb	Terrestrial
<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Tropical America	Undershrub	Terrestrial
<i>Impatiens balsamina</i> L.	Balsaminaceae	Tropical America	Annual herb	Terrestrial
<i>Imperata cylindrica</i> (L.)	Poaceae	Tropical America	Perennial grass	Terrestrial
<i>Indigofera glandulosa</i> Roxb. ex Willd.	Papilionaceae	Tropical America	Annual herb	Terrestrial
<i>Indigofera linifolia</i> (L.f.) Retz.	Papilionaceae	South America	Annual herb	Terrestrial
<i>Ipomoea carnea</i> Jacq. Enum.	Convolvulaceae	Tropical America	Perennial shrub	Terrestrial
<i>Ipomoea eriocarpa</i> R.Br.	Convolvulaceae	Tropical Africa and Madagascar	Annual herb	Terrestrial
<i>Ipomoea hederifolia</i> L.	Convolvulaceae	Tropical America	Annual twiner	Terrestrial
<i>Ipomoea pes-tigridis</i> L.	Convolvulaceae	East Africa	Annual herb	Terrestrial

Table 1: Continuous

Name of the Plants	Family	Nativity	Habit	Habitat
<i>Ipomoea quamoclit</i> L.	Convolvulaceae	Tropical America	Annual twiner	Terrestrial
<i>Lagascea mollis</i> Cav.	Asteraceae	Central America	Annual herb	Terrestrial
<i>Lantana camara</i> L.	Verbenaceae	Tropical America	Perennial shrub	Terrestrial
<i>Leonotis nepetifolia</i> (L.) R.Br.	Lamiaceae	Tropical Africa	Annual herb	Terrestrial
<i>Leucaena leucocephala</i> (Lam.) de Wit	Mimosaceae	Tropical America	Tree	Terrestrial
<i>Malachra capitata</i> (L.) L.	Malvaceae	Tropical America	Annual herb	Terrestrial
<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	Tropical America	Annual herb	Terrestrial
<i>Martynia annua</i> L.	Pedaliaceae	Tropical America	Annual herb	Terrestrial
<i>Mecardonia procumbens</i> (Mill.) Small	Scrophulariaceae	North America	Annual herb	Terrestrial
<i>Mimosa pudica</i> L.	Mimosaceae	Brazil	Perennial herb	Terrestrial
<i>Mirabilis jalapa</i> L.	Nyctaginaceae	Peru	Undershrub	Terrestrial
<i>Monochoria vaginalis</i> (Burm. f.) C.	Pontederiaceae	Tropical America	Herb	Aquatic
<i>Ocimum americanum</i> L.	Lamiaceae	Tropical America	Annual herb	Terrestrial
<i>Opuntia stricta</i> (Haw.) Haw.	Cactaceae	Tropical America	Shrub	Terrestrial
<i>Oxalis corniculata</i> L.	Oxalidaceae	Europe	Annual herb	Terrestrial
<i>Parthenium hysterophorus</i> L.	Asteraceae	North America	Annual herb	Terrestrial
<i>Pennisetum purpureum</i> Schum.	Poaceae	Tropical America	Annual grass	Terrestrial
<i>Peristrophe paniculata</i> (Forssk.) Brummitt	Acanthaceae	Tropical America	Annual herb	Terrestrial
<i>Physalis angulata</i> L.	Solanaceae	Tropical America	Annual herb	Terrestrial
<i>Physalis pruinosa</i> L.	Solanaceae	Tropical America	Annual herb	Terrestrial
<i>Pistia stratiotes</i> L.	Araceae	Tropical America	Floating herb	Aquatic
<i>Portulaca quadrifida</i> L.	Portulacaceae	South America	Annual herb	Terrestrial
<i>Prosopis juliflora</i> (Sw.) DC.	Mimosaceae	Mexico	Shrub or tree	Terrestrial
<i>Saccharum spontaneum</i> L.	Poaceae	West Asia	Perennial grass	Marshy land
<i>Salvinia molesta</i> D.S. Mitch.	Salviniaceae	Brazil	Aquatic fern	Aquatic
<i>Sida acuta</i> Burm.f.	Malvaceae	Tropical America	Annual herb	Terrestrial
<i>Solanum americanum</i> Miller.	Solanaceae	Tropical America	Annual herb	Terrestrial
<i>Sonchus asper</i> (L.) Hill	Asteraceae	Mediterranean region	Annual herb	Terrestrial
<i>Synadenium grantii</i> Hook. f.	Euphorbiaceae	Tropical America	Succulent shrub	Terrestrial
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Tropical America	Annual herb	Terrestrial
<i>Tridax procumbens</i> L.	Asteraceae	Central America	Annual herb	Terrestrial
<i>Typha angustata</i> Bory. and Chaub.	Typhaceae	Tropical America	Perennial herb	Marshy land
<i>Urena lobata</i> L.	Malvaceae	Tropical Africa	Shrub	Terrestrial
<i>Xanthium strumarium</i> L.	Asteraceae	Tropical Africa	Annual herb	Terrestrial

for water and nutrition which reduces crop yield and forage quality^{16,18}. It has so many harmful impacts on the local environment which include, alterations in soil chemistry, changes in soil structure and profile causing soil erosion, responsible for forest fires and disturb physical, chemical and biological nature of an ecosystem^{15,19,20}. Aquatic plants like *Eichhornia* effects original native flora and fauna by forming clogs in water. Such aquatic plants pollute water bodies and disturb public water supply as well as irrigation system¹⁶. Invasive species like *Ageratum conyzoides*, *Parthenium hysterophorus*, *Lantana camara*, *Calotropis procera*, shows some health issues to human as well as animals which include allergic reactions, severe skin abrasions, temporary and permanent blindness and such another harmful effects¹⁷. Many invasive species have replaced local grazing vegetation thereby cause poisoning in livestock and wildlife¹⁹. Invasive plants like *Parthenium hysterophorus*, *Lantana camara*, *Typhus* sp., *Eichhornia crassipes* provides a home for many pathogens/flies like *Glossina* which causes many diseases like tuberculosis, slipping sickness, allergy etc., in man²¹.

Apart from their negative activities, some invasive alien species plays some important roles in medicine. They show anti-cancerous, antidiabetic, antimicrobial, antitubercular and other pharmacological uses. An important invasive species, *Lantana camera* is useful to control blood sugar levels. Similarly, *Amaranthus spinosus*, *Cassia alata* and *Argemone mexicana* show antidiabetic properties. *Parthenium hysterophorus*, *Euphorbia hirta*, *Solanum nigrum* shows active cytotoxic activity. Some plants like *Ageratum conyzoides* shows anti-tubercular activity. Even contains some compounds like wedelolactone are responsible for its anti-HIV activity. *Cuscuta reflexa*, *Catharanthus pusillus* is also potent against HIV. Many other medicinal uses of various alien medicinal plants have been reported^{22,23}.

CONCLUSION

It is reported that all the recorded plants in the present study are widely distributed in the various regions of Nashik District. Invasive alien species enumerated here in are

originated from various countries of the world. The plants are found growing in terrestrial and aquatic habitats which lead to many complications over native flora and fauna. It is also noted that invasive alien species pose many implications on the environment and agriculture. It is also reported that many invasive alien species cause many severe diseases to humans and animals. It is a need for time to manage invasive alien species by careful handling issues associated with environmental conflicts.

SIGNIFICANCE STATEMENT

This study discovered the alien invasive plants of Nashik District that can be beneficial for the better understanding of obstructions in the growth of the local plant and animal diversity. This study will help the researchers to uncover the critical areas of alien invasive plants of Nashik District and their negative impacts on local biodiversity that many researchers were not able to explore. Thus a new theory on impacts of alien invasive plants of Nashik District may be arrived at.

REFERENCES

- Thiébaud, G., M. Tarayre and H. Rodríguez-Pérez, 2019. Allelopathic effects of native versus invasive plants on one major invader. *Front. Plant Sci.*, Vol. 10. 10.3389/fpls.2019.00854.
- Han, S.J., Y.S. Dong, Z.C. Cai and C.C. Song, 2008. Chinese terrestrial ecosystem carbon cycle and biogeochemical processes. Science Press, Beijing. pp: 258-320.
- Gioria, M., P. Pyšek and B.A. Osborne, 2016. Timing is everything: Does early and late germination favor invasions by herbaceous alien plants? *J. Plant Ecol.*, 11: 4-16.
- Keeley, J.E., 2006. Fire management impacts on invasive plants in the Western United States. *Conserv. Biol.*, 20: 375-384.
- Brooks, M.L., C.M. D'Antonio and D.M. Richardson, 2004. Effects of invasive alien plants on fire regimes. *BioScience*, 54: 677-688.
- Geisen, S., F.C. Hooven, O. Kostenko, L.B. Snoek and W.H. Putten, 2021. Fungal root endophytes influence plants in a species-specific manner that depends on plant's growth stage. *J. Ecol.*, 109: 1618-1632.
- Schirmel, J., M. Bundschuh, M.H. Entling, I. Kowarik and S. Buchholz, 2015. Impacts of invasive plants on resident animals across ecosystems, taxa, and feeding types: A global assessment. *Global Change Biol.*, 22: 594-603.
- Reddy, C.S., 2008. Catalogue of invasive alien flora of India. *Life Sci. J.*, 5: 84-89.
- Sanjayrao, K.S. and G.V. Sanjay, 2019. Studies on ethno botanical plants used by tribal community of Nashik District, Maharashtra, India. *J. Medic. Plant Studies*, 7: 200-202.
- Khairnar D.N., 2010. Studies on some threatened and endemic ethnomedicinal plants of Nashik District (North Sahyadri), Maharashtra. *Nat. Environ. Pollut. Technol.*, 9: 299-303.
- Patil, M.V. and D.A. Patil, 2001. Folk medicine of Nashik District (Maharashtra), India. *Ancient Sci. Life*, 20: 26-30.
- Sonawane, V.B., 2019. Ethnobotanical and medicinal plant study in Trimbakeshwar Taluka, District Nashik, (MS), India. *J. Drug Delivery Ther.*, 9: 529-534.
- Auti, S.G., S.S. Kambale, K.V.C. Gosavi and A.N. Chandore, 2020. Floristic diversity of Anjaneri Hills, Maharashtra, India. *J. Threat. Taxa*, 12: 16295-16313.
- Pawar B.R., S.A. Survase and H.B. Waghire, 2011. Addition to the flora of Nashik District. *Bioinfolet*, 8: 232-234.
- Patil, D.A., 2017. Invasive alien species in Khandesh Region Maharashtra: India: Diversity, implications and measures. *Sch. Acad. J. Biosci.*, 5: 867-876.
- Deshmukh, U.B., M.B. Shende and O.S. Rathor, 2015. Invasive alien angiospermic plants from Chamorshi Tehsil of Gadchiroli District of Maharashtra, India. *Int. Res. J. Bio. Sci.*, 4: 40-45.
- Deshmukh, U.B., E.S. Reddy and O.S. Rathor, 2017. Invasive alien angiosperms diversity from Bhiwapur Tehsil, Nagpur District of Vidarbha Region (M.S.), India. *Int. J. Innovative Res. Multidisciplinary field*, 3: 434-439.
- Kumar A. and S. Prasad, 2013. Threats of invasive alien plant species. *Int. Res. J. Manag. Sci. Technol.*, 4: 605-604.
- Rothe, S.P. and D.A. Dhale, 2016. Impact of invasive plants in changing pattern of native biodiversity from Vidarbha Region of Maharashtra State. *Int. J. Res. Stud. Biosci.*, 4: 19-21.
- Lone, P.A., J.A. Dar, K. Subashree and D. Raha *et al.*, 2019. Impact of plant invasion on physical, chemical and biological aspects of ecosystems: A review. *Trop. Plant Res.*, 6: 528-544.
- Rai, P.K. and J.S. Singh, 2020. Invasive alien plant species: Their impact on environment, ecosystem services and human health. *Ecol. Indic.*, Vol. 111. 10.1016/j.ecolind.2019.106020.
- Saxena, S. and P.B. Rao, 2018. Invasive alien plants: Valuable elixir with pharmacological and ethnomedicinal attributes. *Int. J. Trend Sci. Res. Dev.*, 2: 2063-2092.
- Chavre B.W. and R.K. Patil, 2021. Invasive plant species of Maharashtra State: A review. *Sustainability Agric. Food and Environ. Res.*, Vol. 11. 10.7770/safer-V11N1-art2585.