

Checklist of exotic herbs used by the peoples of Sambalpur district of Odisha, India

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ABSTRACT: This study consolidated the uses of exotic herb by the peoples of Sambalpur district, Odisha, India based on both bibliographic sources and field studies. A total of 50 herb species belonging to 43 genera and 26 families are reported from the study area. Asteraceae family contributed ten number of species (20%), i.e. highest in number; six species from Amaranthaceae (12%); four species from Poaceae (8%), three species from Onagraceae (6%), two species each from five families viz. Capparaceae (4%), Euphorbiaceae (4%), Lamiaceae (4%), Malvaceae (4%) and Portulacaceae (4%); one species each from rest 17 families. Annuals comprised about 82% and the remaining (18%) are perennials. Among the 50 species, a total of 33 (69%) species are native to Trop. America, each of 2(5%) number of species are native to America and Europe respectively. The use of exotic herb for different purposes as indicated by local people is also discussed here. This study provides a comprehensive and updated checklist of the herb species of Sambalpur district which will serve as a tool for conservation of the local biodiversity.

KEY WORDS: Nativity, Invasive species, biodiversity, Sambalpur

I. INTRODUCTION

IUCN (International Union for Conservation of Nature and Natural Resources) defines invasive species as an alien species which established in natural or semi-natural ecosystems or habitat and threatens to native biological diversity. A large number of invasive species worldwide were introduced accidentally through transportation or intentionally for commercial purposes, value to human health and economic purposes^[3]. These introduced plant species are called as exotic species or alien species. The exotic species invade the new region after well adapted to the environment. They have the potential to grow in any environmental conditions and are easily invasive to the new

environment. Invasive alien plant species (IAPs) are grown in such a way that they become as more dangerous to sustainable development^[15]. As a result, we are facing the great challenge of biodiversity loss all over the globe. These groups of plant species act as the main cause for threat to the native biological diversity. They show various effects on the environment and economy of nonnative ecosystems. The exotic or alien plant species not only show negative impacts, but also they have much economic benefits. At the present invasion alien species are cultivated to provide food, medicine, fuel, or fodder to local communities^[22]. The international trade of the products is helpful for introduction of these invasive alien species. Globally the introduction of IAPs leads to the huge loss of biodiversity and agriculture crops and health problems like respiratory illness^[12]. Invasive plants affect the ecosystem functions, ecosystem processes, primary productivity, hydrology, geomorphology and biogeochemical cycle of an area^[28]. These species do not separate native plant diversity but compete with the local community for the limited natural resources and alter the rule of existence for all species^[33]. Litter of these invasive plants decomposed very slowly than those of the native plant community^[23, 28]. Invasion of plants creates serious problems to the ecosystems by changing the structure, composition, and function of natural ecosystem^[8-10]. The rapid reproduction and growth rate, high dispersal ability, physiological adaptations to new conditions, and ability to survive on various ecosystems are the common characteristics of invasive plants. The IAPs have the ability to associate with human beings very easily. When the invasive plants colonized to grow in new areas, it can change the soil structure and composition of that area. It is reported that the agricultural lands are more threatened by IAPs because they are introduced by the crop seeds, garden plants, and wind breakers^[16].

Collection of baseline data about their invasion status, growth form and life cycle are the first and most important step for effective and proper management of IAPs. Precisely distinguishing between native and alien species is necessary not only when developing conservation and vegetation management plans but also for improving our understanding of the different components of biodiversity^[15]. Sambalpur district is one of the ten districts of western Odisha. This district is located in the Mahanadi river basin. It has a total area of 6702km² and 60% of the district is covered by dense forest. Sambalpur district is located at 21.466°N 83.983°E. It is bounded by Deogarh district to the east, Jharsuguda district to the west, Sundargarh district to the north and Subarnapur and Angul district in the south. The economy of this district is mainly depending on agriculture and forest.

II. MATERIALS AND METHOD

During January 2013 to April 2020, intensive floristic surveys were undertaken in different areas of Sambalpur district, in such a way that each location could be studied in every season of the year. Sambalpur district is one of the ten districts of western Odisha. This district is located in the Mahanadi river basin. It has a total area of 6702km² and 60% of the district is covered by dense forest. Sambalpur district is located at 21.466°N 83.983°E. It is bounded by Deogarh district to the east, Jharsuguda district to the west, Sundargarh district to the north and Subarnapur and Angul district in the south. The total population of the district is 1,041,099 as per the census report 2011. Sambalpur has a sex ratio of 973 females for every 1000 males and a literacy rate of 76.91%. At the time of the 2011 Census of India, 78.80% of the population in the district spoke Odia, 4.98% Kisan, 3.98% Hindi, 3.42% Munda and 1.49% Kharia as their first language. The economy of this district is mainly depending on agriculture and forest. Forest plays a key role in the revenue generation of this district. The people living neighboring to the reserved forests of Sambalpur Forest Division are greatly reliant on these forests. The herbal plants were represented alphabetically according to their scientific names, family, habit, nativity, and uses. For identification of plants local flora books were used^[14, 24] and for nativities previous published literatures were used^[1, 2, 4-6, 8-13, 17-20, 25, 26, 30-32].

III. RESULTS

A total of 50 exotic herbs (43 genera) affiliate to 26 nos. of families were recorded from the Sambalpur district of Odisha. The habit of the herbs was observed to be Annual and perennial. The nativities of the species shown are from various countries of the world. The herbs were used for various purposes like Food, Fodder, Fuel, Vegetable, Ornamental, medicine, noxious etc. by the people of the district (**Table: 1**). The affiliated 26 families of herbs have shown the various level of contribution, like Asteraceae shows the maximum percentage of contribution (20%) followed by Amaranthaceae (12%), Poaceae (8%), Onagraceae (6%), were as Capparaceae, Euphorbiaceae, Lamiaceae, Malvaceae, Portulacaceae as 4% each. Rests of the families have contribution of 2% each (**Table: 2**). The habit of the herbs shows the interesting results where 82% of the species are annual and rest 18% are perennial (**Figure: 1**). The Nativity of the 50 herbs recorded, belongs to 14 different countries. Among these maximum percentage are from Tropical America (69%), followed by America (5%) and Europe (3%). Rest of the species from the countries contributes 2% each (**Figure 2**). All the herbs though they are away from their place of origin play an important role in the life of human beings. It is such that 38% of the species are used as medicine, 36% as other use. Fodder, ornamental, vegetables, noxious etc. contribute 4% each. 2% of species are used as soil binder, 2% as soil thatching. Rests of the 4% of the species are there whose economic value is not known (**Figure: 3**).

IV. DISCUSSION

In this present manuscript we had reported a total of 50 exotic herbs (43 genera) affiliate to 26 nos. of families from the Sambalpur district of Odisha. Alien species have been classified into naturalized and noxious species by various workers^[8, 28, 39]. Many reports say different alien species become noxious after naturalized. *Ageratum conyzoides* L., *Argemone mexicana* L., *Blumea lacera* (Burm.f.) DC., *Cassia tora* L., *Hyptis suaveolens* (L.) Poit., *Parthenium hysterophorus* L., *Xanthium indicum* L. and *Xanthium strumarium* L. were some noxious species found during the study. *Parthenium hysterophorus* L. was one of the highly noxious and abundantly grown plant species next to *Ageratum conyzoides* L. From the taxonomical study, Asteraceae was the most dominant invasive family which dominated all other species due to its

adaptive nature of seeds in different areas. The plant species have high reproductive potential to produce minute seeds so fast which disperse in new area through wind, air, and water. From the literature study, it was found that Asteraceae was more invasive in other areas of India [4, 16, 25-29, 31] and also all over the world. Mallick et al. (2019) also found Asteraceae as the most dominating group of weeds among all other plant family groups [7]. Parthenium hysterophorus L. was another noxious plant of this family which could cause black fever disease. It grows very rapidly as its seeds disperse and grow so fast in new area which become invasive later. Annuals (82%) showed dominance over perennials (18%) among the invasive species as annuals complete life cycle and produce seeds to disperse in a short period in a year. Herbs have more tolerance to harsh condition and have great viability to grow in any condition which helps to become more invasive than others.

V. CONCLUSION

In this present paper we had reported about the use of 50 exotic herbs belong to 43 genera and 26 families from the Sambalpur district of Odisha. It is a first attempt to prepare a checklist of invasive herb species which will help to understand the presence, distribution and reproduction of herbs in Sambalpur district of Odisha. Present work will provide a better way to plan for early detection of invasion and establishment of routine monitoring of invasive plant by land managers, taxonomist, agriculturist, botanist and ecologist. One of the advantages of this work is that a few species have a great medical importance.

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Table: 1. List of exotic herbs, their families, habit, nativity and uses.

Sl. no	Plant Species	Family	Habit	Nativity	Uses
1	Aerva lanata (L.) Juss. ex. Schult.	Amaranthaceae	P	Madagascar	M
2	Aeschynomene indica L.	Fabaceae	A	North America	Fu
3	Ageratum conyzoides L.	Asteraceae	A	Trop. America	Nox
4	Alternanthera sessilis (Linn) DC.	Amaranthaceae	P	Trop. America	V, M
5	Amaranthus spinosus L.	Amaranthaceae	A	Trop. America	V
6	Argemone mexicana L.	Papaveraceae	A	S. America (Seventeenth cent.)	M, Nox
7	Bidens pilosa L.	Asteraceae	A	Trop. America	M, Fo
8	Blumea lacera (Burm.f.) DC.	Asteraceae	A	Trop. America	Nox, M
9	Cardiospermum halicacabum L.	Sapindaceae	A	Trop. America	M
10	Cassia tora L.	Caesalpiaceae	A	S. America (1824)	V, Nox, M
11	Celosia argentea L.	Amaranthaceae	A	Trop. America	V, M
12	Chenopodium album L.	Chenopodiaceae	A	Europe	V
13	Chloris barbata Sw.	Poaceae	P	Trop. America	Fo, Fu
14	Chromolaena odorata L.	Asteraceae	A	Trop. America	M
15	Cleome gynandra L.	Capparaceae	A	Trop. America	M
16	Cleome viscosa L.	Capparaceae	A	Trop. America	V, M

17	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	A	Mediterranean	M
18	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	P	Trop. America	M
19	<i>Echinochloa colona</i> (L.) Link	Poaceae	A	Trop. America	Fo
20	<i>Eclipta prostrata</i> L.	Asteraceae	A	Trop. America (Bf1824)	M
21	<i>Eichhornia crassipes</i> (Mart.) Solm.	Pontederiaceae	P	Trop. America	St
22	<i>Euphorbia heterophylla</i> auct. Non L.	Euphorbiaceae	A	Trop. America	O
23	<i>Euphorbia hirta</i> L.	Euphorbiaceae	A	Trop. America	M
24	<i>Evolvulus nummularius</i> L.	Convolvulaceae	P	Trop. America	M
25	<i>Gomphrena celosioides</i> Mart.	Amaranthaceae	A	S. America	Fo
26	<i>Gomphrena globosa</i> L.	Amaranthaceae	A	America	O
27	<i>Heliotropium indicum</i> L.	Boraginaceae	A	S. America	M
28	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	A	Trop. America	M, Nox
29	<i>Ludwigia adscendens</i> (L.) Hara	Onagraceae	A	Trop. America	Sb
30	<i>Ludwigia octovalvis</i> (Jacq.) Raven	Onagraceae	A	Trop. America	M, Sb
31	<i>Ludwigia perennis</i> L.	Onagraceae	A	Trop. America	M, Sb
32	<i>Melochia corchorifolia</i> L.	Sterculiaceae	A	Trop. America	NK
33	<i>Mimosa pudica</i> L.	Mimosaceae	P	Brazil	M
34	<i>Ocimum canum</i> Sims	Lamiaceae	A	Trop. America	M
35	<i>Oxalis corniculata</i> L.	Oxalidaceae	A	Europe	M
36	<i>Parthenium hysterophorus</i> L.	Asteraceae	A	Trop. America	Nox
37	<i>Phyla nodiflora</i> (L.) Greene	Verbenaceae	A	Trop. America	M
38	<i>Pistia stratiotes</i> L.	Araceae	P	Trop. America	M, St
39	<i>Portulaca oleracea</i> L.	Portulacaceae	A	Trop. S. America	M, V
40	<i>Portulaca quadrifida</i> L.	Portulacaceae	A	Trop. America	M, V
41	<i>Ruellia tuberosa</i> L.	Acanthaceae	A	Trop. America	NK
42	<i>Scoparia dulcis</i> L.	Scrophulariaceae	A	Trop. America	M
43	<i>Sida acuta</i> Burm.f.	Malvaceae	A	Trop. America	M
44	<i>Solanum nigrum</i> L.	Solanaceae	A	Trop. America	M
45	<i>Tridax procumbens</i> L.	Asteraceae	P	Mexico	M
46	<i>Urena lobata</i> L.	Malvaceae	A	Trop. Africa	Fib, Fu
47	<i>Vernonia cinerea</i> L.	Asteraceae	A	S. America	M
48	<i>Xanthium indicum</i> L.	Asteraceae	A	Trop. America	M, Nox
49	<i>Xanthium strumarium</i> L.	Asteraceae	A	Trop. America	M, Fu, Nox

50	Zea mays L.	Poaceae	A	America	F, Fu, Fo
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Note: F, food; FT, fruit; O, ornamental; NK, not known; M, medicinal; Fu, fuel; V, vegetable; Sp, species; Nox, noxious; Sa, sacred plant; Sb, soil binder; Ch, chemical compounds; Ave, avenue; T, thatching; A, annual; P, perennial.

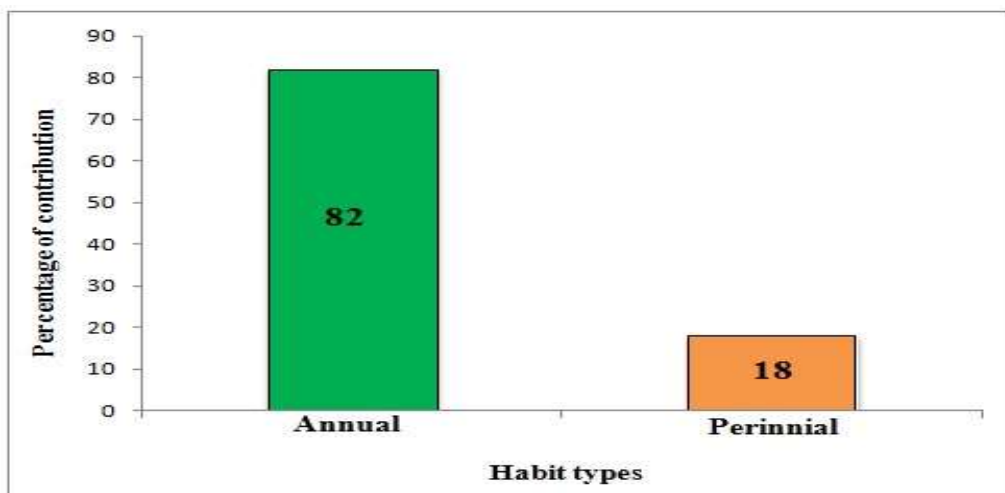


Figure 1: Percentage of contribution of annual and perennial exotic herbs

Table 2: Percentage of contribution of families among the recorded herbs

Sl.no	Family	Percentage of contribution
1	Acanthaceae	2
2	Amaranthaceae	12
3	Araceae	2
4	Asteraceae	20
5	Boraginaceae	2
6	Caesalpiaceae	2
7	Capparaceae	4
8	Chenopodiaceae	2
9	Convolvulaceae	2
10	Cuscutaceae	2
11	Euphorbiaceae	4
12	Fabaceae	2
13	Lamiaceae	4
14	Malvaceae	4
15	Mimosaceae	2
16	Onagraceae	6
17	Oxalidaceae	2
18	Papaveraceae	2
19	Poaceae	8
20	Pontederiaceae	2
21	Portulacaceae	4
22	Sapindaceae	2

23	Scrophulariaceae	2
24	Solanaceae	2
25	Sterculiaceae	2
26	Verbenaceae	2

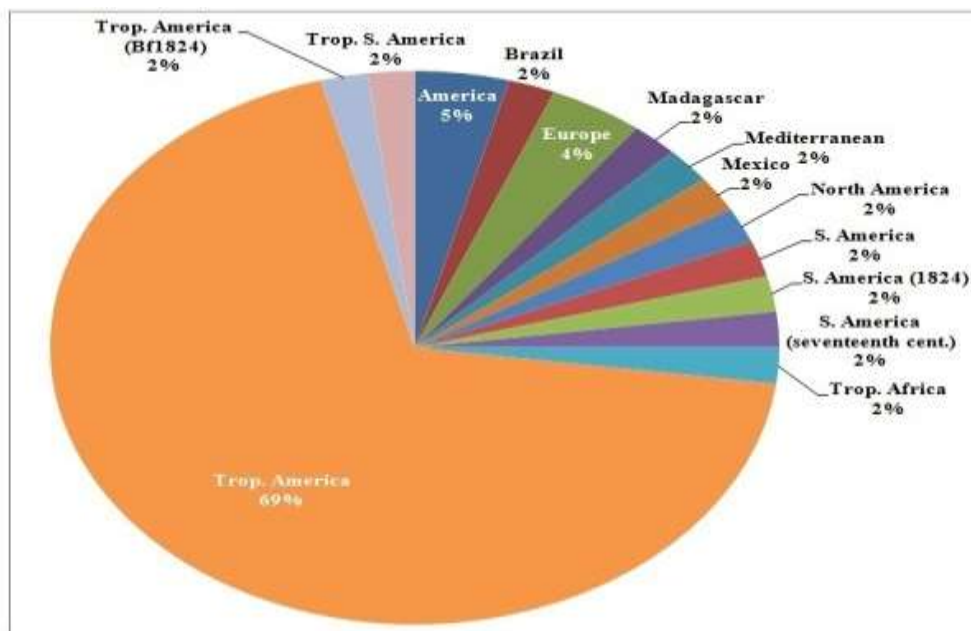


Figure 2: Percentage of contribution of countries from where the herbs have its origin

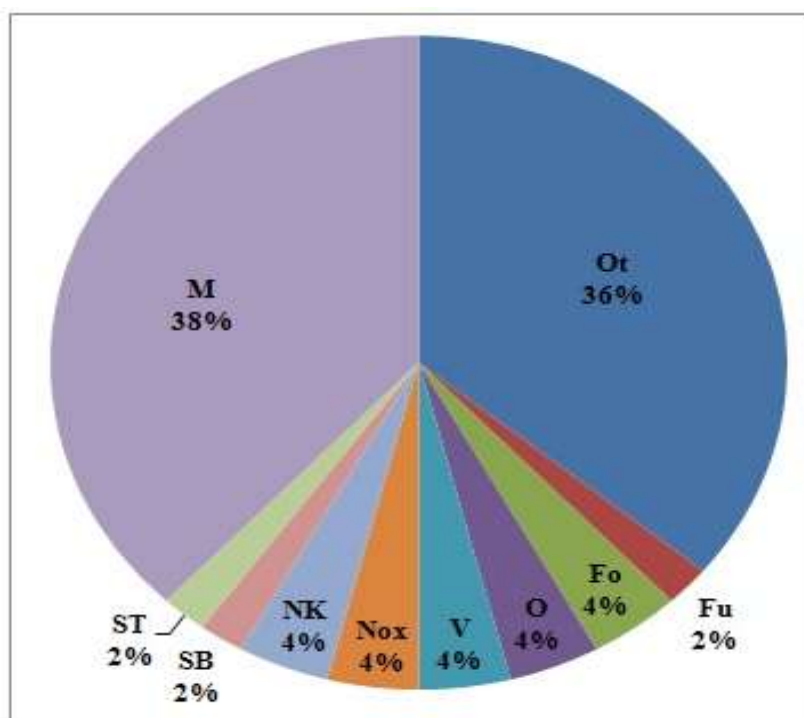


Figure 3: Percentage of contribution of exotic herbs for various uses

REFERENCES

- [1]. Acharya BC, Subudhi HN, Panda SP. Check list of economic plants of Rourkela and adjoining regions (Sundargarh district)—Odisha. *Bulletin of Pure and Applied Sciences-Botany*. 2010;29:53-57.
- [2]. Das K, Duarah P. Invasive alien plant species in the roadside areas of Jorhat, Assam: Their harmful effects and beneficial uses. *International Journal of Engineering Research and Applications*. 2013;3(5):353-358.
- [3]. Ewel JJ, Dennis JO, Joy B, Curtis CD, Carla MD, Luis DG, Doria RG, Richard JH, Alan H, Keith RHCEH, Marcy LH, Roger RBL, William GL, Lloyd LL, David HL, Svata ML, Ariel EL, Peter BM, David M.R, Peter MV. Deliberate introductions of species: Research needs. *BioScience* 49.8 (1999):619–630.
- [4]. Heywood V. Patterns, extents, and modes of invasions by terrestrial plants. In: Drake J et al., editors. *Biological Invasions: A Global Perspective*. New York: Wiley; 1989. pp. 31-60.
- [5]. Kumar P, Choudhury AK. Exotic species invasion threats to forests: A case study from the Betla national park, Palamu, Jharkhand, India. *Tropical Plant Research*. 2016;3(3):592-599.
- [6]. Lal HS, Singh S, Kumar A, Mishra PK, Mishra K. Study of invasive and alien species in Jharkhand, India and its impact on environment. *Journal of Ethnobiology and Traditional Medicine*. 2012;117:167-177.
- [7]. Mallick SC, Ekka NJ, Kumar S, Sahu SC. Invasive Alien Flora in and around an Urban Area of India, Diversity and Ecology of Invasive Plants, Sahu SC and Kumar S, *IntechOpen*,2019;DOI:10.5772/intechopen.88725.
- [8]. Maslo S. Preliminary list of invasive alien plant species (IAS) in Bosnia and Herzegovina. *Herbologia*. 2016;16(1):1-14.
- [9]. Moktan S, Das AP. Diversity and distribution of invasive alien plants along the altitudinal gradient in Darjeeling Himalaya, India. *Pleione*. 2013;7(2):305-313.
- [10]. Mooney HA, Hobbs RJ, editors. *Invasive Species in a Changing World*. Washington, D.C., USA: Island Press; 2000.
- [11]. Naidu NT, Kumar OA, Venkaiah M. Invasive alien plant species in tropical forests of Eastern Ghats in northern Andhra Pradesh, India. *Indian Forester*. 2015;141(4):428-432.
- [12]. Nayak SK, Satapathy KB. Diversity, uses and origin of invasive alien plants in Dhenkanal district of Odisha, India. *International Research Journal of Biological Sciences*. 2015;4(2):21-27.
- [13]. Negi PS, Hajra PK. Alien flora of Doon valley, northwest Himalaya. *Current Science*. 2007;92(7):968-978.
- [14]. Panda S, Das AP. *Flora of Sambalpur (Orissa)*. M/s Bishen Singh Mahendra Pal Singh Publication; 2004.
- [15]. Preston G, Williams L. Case study: The working for water programme: Threats and successes. *Service Delivery Review*. 2003;2(2):66-69.
- [16]. Rao RR, Murugan R. Impact of exotic adventives weeds on native biodiversity in India: Implications for conservation. In: Rai LC, Gaur JP, editors. *Invasive Alien Species and Biodiversity in India*. Varanasi: Banaras Hindu University; 2006. pp. 93-109.
- [17]. Rastogi J, Rawat DS, Chandra S. Diversity of invasive alien species in Pantnagar flora. *Tropical Plant Research*. 2015;2(3):282-287.
- [18]. Reddy CS, Bagyanarayana G, Reddy KN, Raju VS. *Invasive Alien Flora of India*. USGS, USA: National Biological Information Infrastructure; 2008.
- [19]. Reddy CS, Rangaswamy M, Pattanaik C, Jha CS. Invasion of alien species in wetlands of Samaspur bird sanctuary, Uttar Pradesh, India. *Asian Journal of Water, Environment and Pollution*. 2009;6(3):43-50.
- [20]. Reddy CS. Catalogue of invasive alien flora of India. *Life Science Journal*. 2008;5(2):85-87.
- [21]. Richardson DM, Pyšek P, Rejmánek M, Barbour MG, Dane Panetta F, West CJ. Naturalization and invasion of alien plants: Concepts and definitions. *Diversity and Distributions*. 2000;6(2):93-107.
- [22]. Roder W, Dorji K, Wangdi K. Implications of white clover introduction in east Himalayan grasslands. *Mountain Research and Development*. 2007;27:268-273.
- [23]. Rothstein DE, Peter, MV, Breana LS. An exotic tree alters decomposition and nutrient cycling in a Hawaiian montane forest. *Ecosystems*. 2004;7(8):805 – 814.



- [24]. Saxena HO, Braham M. The Flora of Orissa. Vol. 4. Bhubaneswar, Odisha, India: Orissa Forest Development Corporation Ltd; 1994-1996.
- [25]. Sekar CK, Manikandan R, Srivastava SK. Invasive alien plants of Uttarakhand Himalaya. Proceedings of the National Academy of Sciences, India Section B: Biological Sciences. 2012;82(3):375-383.
- [26]. Sekar K. Invasive alien plants of Indian Himalayan region-Diversity and implication. American Journal of Plant Sciences. 2012;3:177-184.
- [27]. Sharma GP, Singh JS, Raghubanshi AS. Plant invasions: Emerging trends and future implications. Current Science. 2005;88:726-734.
- [28]. Sheikh DK, Dixit AK. Occurrence of invasive plant in three phytogeographical region of Bilaspur district of Chhattisgarh. Annals of Plant Sciences. 2017;6(12):1872-1878.
- [29]. Singh KP, Shukla AN, Singh JS. State-level inventory of invasive alien plants, their source regions and use potential. Current Science. 2010;99(1):107-114.
- [30]. Singh TB, Das AK, Singh PK. Study of alien and invasive flora of valley district of Manipur and their control. International Journal of Innovative Research in Science, Engineering and Technology. 2015;1(2):616-626.
- [31]. Srivastava S, Dvivedi A, Shykla RV. Invasive alien species of terrestrial vegetation of north eastern Uttar Pradesh. International Journal of Forest Research. 2014;2014:1-9.
- [32]. Udaykumar M, Bharathidasan E, Sekar T. Invasive alien flora of Thiruvallur District, Tamil Nadu, India. Scholars Academic Journal of Biosciences. 2014;2(4):295-306.
- [33]. Vitousek PM, Carla MD, Lloyd LL, Marcel R, Randy W. Introduced species: a significant component of human-caused global change. New Zealand Journal of Ecology. 1997;(21):1-16.