

Alien Plants Distribution and Ecology in the Temple-Courtyards of Himachal Pradesh (N.W. Himalaya)

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INTRODUCTION

Invasion of alien plant species in recent times has been recognized as the second worst threat after habitat destruction (CBD 2005). Due to increasing trade and improved transcontinental transport, the flora of Indian subcontinent have been subjected to various changes thereby resulting in the introduction of alien species from various parts of the globe. Earlier, enough studies have been done to characterize invasive aliens from different regions of India, viz., Allahabad (Shama 1984), Doon Valley (Negi & Hajra 2007), Gangtok (Hajra & Das 1982), Kanda Plateau-M.P. (Maheshwari 1960), Kashmir Himalaya (Singh & Mishri 1974; Singh & Kachroo 1983), Kodaikanal and Palni Hills (Matthew 1969), Rajasthan (Pandey & Parmar 1994), Ranchi (Mahashwari & Paul 1975), South Gujarat (Kshirsagar 2005) and Upper Gangetic Plain (Raizada 1935, 1936) but no attempt has been made till todate to characterize and document the purpose of introduction of alien plant species in the temple courtyards of Himachal Pradesh as well as elsewhere in the world. There is no gainsaying the fact that the temple-courtyards have been regarded universally as rich centers of useful economic plants diversity protected on religious grounds and such studies are of paramount importance to formulate strategies for the effective management of aliens (Pysek et al. 2004). Paucity of information in this regard necessitated the present investigation.

MATERIALS AND METHODS

The Study Area

Himachal Pradesh, one of the hilly states of India located in the northern region, abounds in awe-inspiring landscapes, beautiful temples built in the traditional (Shikhara type, Pagoda-like, Dome-shaped or Pentroof type) style and rich folk arts and culture, sprawls in the northwestern lap of the Himalaya

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between 30⁰22' to 33⁰12' north latitude and 75⁰47' to 79⁰04' east longitude with an area of 55,673 sq kms (Fig. 1). It is regarded as rich repository of herbals, and is inhabited by a number of diverse ethnic communities, viz., Gaddis, Gujjars, Kinners or Kanauras, Jads, Lahaulis, Pangwals and Swangalas with distinct differences in socio-economic and socio-cultural conditions which have been protected and practiced for centuries. Of the twelve districts delineated for the state, area-wise, Hamirpur with 1,118 sq kms (2.01%) is the smallest and Lahaul-Spiti covers the largest area of 13,835 sq kms (24.85%). Due to variations in elevation and aspect, there is great diversification in the climate conditions of H.P. It varies from hot and sub-humid tropical (450-900 m) in the southern low tracts, warm and temperate (900-1,800 m) cool and temperate (900-1,800 m) and cold alpine and glacial (2,400-4,800 m) in the northern and eastern mountains ranges. The entire population of the state is estimated to be around 6,077,248 in number according to 2001 census.



Figure 1: Map of Himachal Pradesh showing location of the various temples

THE METHODOLOGY

Collection of Data

For collecting first hand information on the plants in the courtyards of temples of H.P., intensive and extensive surveys (Fig., 1) were conducted in all the twelve districts over a period of five years (2002-2007). Field tours to these temples were planned in such a way as to collect plant species either in flowering or fruiting stage. Field tours to these temples were planned in such a way as to collect plant species either in flowering or fruiting stage. Besides, first hand information on ethnobotanical aspects was

collected through interviews from knowledgeable people (temple priests, members of temple committee, old experienced informants, medicinemen, village head, etc.) for which the proforma designed by Jain and Goel (1995) was modified to gather data for this purpose. Uses of plants narrated by a person were cross-checked and considered notable only if the author observed actual application, or similar application was reported by at least three informants. Information pertaining to the nativity of the species was obtained from all possible sources (Bailey 1949; Bentley & Trimen 2008; Hajra & Das 1982; Khuroo et al. 2004; Maheshwari and Paul 1975; Matthew 1969; Murthy et al. 2007; Nayar 1977; Pandey and Parmar 1994; Reddy 2008; Reddy and Raju 2002; Reddy & Reddy 2004; Reddy et al. 2000; Saxena 1991; Sharma 1984; Wasson 2003; Weber 2003). For information pertaining to the nativity of the species, the data provided have been based on Bailey (1949), Bentley and Trimen (2008), Hajra and Das (1982), Khuroo et al. (2004), Maheshwari and Paul (1975), Matthew (1969), Murthy et al. (2007), Nayar (1977), Pandey and Parmar (1994), Reddy (2008), Reddy and Raju (2002), Reddy and Reddy (2004), Reddy et al. (2000), Saxena (1991), Sharma (1984), Wasson (2003) and Weber (2003), and all the available floristic works for the region.

METHODOLOGY OF STUDY

The herbarium sheets of all the collected temple plants were dried, preserved and mounted as per standard herborizing practices outlined by Jain and Rao (1977). The specimens were identified using regional floras and various revisionary and monographic works and later got authenticated by carefully matching with the specimens at the herbaria of Botanical Survey of India (BSI), Northern Circle and Forest Research Institute (FRI), Dehra Dun. Nomenclature of these taxa was confirmed from Bennet (1986) and Wielgorskaya (1995). The voucher specimens of all the presently studied taxa were deposited in the herbarium section of Ethnobotanical Laboratory, Department of Biosciences, H.P. University, Shimla.

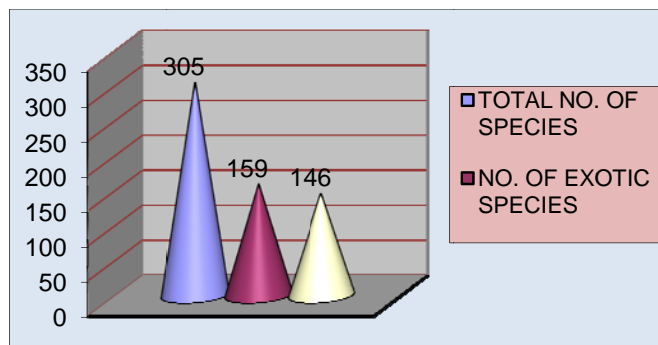
RESULTS AND DISCUSSION

Present inventorization of the alien/exotic plants in the temple-courtyards of H.P. reveals the occurrence of 159 species belonging to 133 genera under 63 families (Table, 1). Statistically, the ratio of exotic species has been estimated to 52.13% while the representation for native species conformed to 47.87%. In comparison, the exotics are more in occurrence than the natives in temple-yards of Himachal Pradesh (Fig., 2). For the alien plant spp in the temple-courtyards of H.P., habit-wise analysis (Table 2) indicates that the flora abounds in 21 annual herbs, 4 biennial herbs, 34 perennial herbs, 47 trees, 14 climbers, 34 shrubs, 3 undershrubs and 2 subshrubs. Among these, the herbaceous elements predominate the alien flora. Dicotyledonous species contribute maximum proportion (136 spp) to the exotic/alien plant species grouped under 112 genera and 53 families (Table 1), followed by Monocots (17 spp) distributed in 16

genera and 7 families (Amaryllidaceae, Arecaceae, Cannaceae, Cyperaceae, Iridaceae, Liliaceae, Poaceae) and Gymnosperms (6 spp) represented by 5 genera and 3 families, which include Araucariaceae (*Araucaria columnaris* (Forster) Hooker), Cupressaceae (*Cupressus sempervirens* Linn., *Juniperus chinensis* Linn., *Thuja orientalis* Linn., *Thuja plicata* D. Don) and Cycadaceae (*Cycas revoluta* Thunb.). Of the 63 alien families, Asteraceae predominate with 14 species, followed by Rosaceae (11), Fabaceae (9), Solanaceae (9), Euphorbiaceae (7), Amaryllidaceae (6), Malvaceae (6), Bignoniaceae (5), Acanthaceae (4), Convolvulaceae (4), Cupressaceae (4), Lamiaceae (4), Liliaceae (4), Myrtaceae (4), Salicaceae (4), Verbenaceae (4), Moraceae (3), Nyctaginaceae (3), Oleaceae (3), Poaceae (3), Apocynaceae (2), Asclepiadaceae (2), Crassulaceae (2), Sapindaceae (2) and Scrophulariaceae (2). Relatively, the top 20 families contribute 111 species with proportion of 63.52% (Table 3). The remaining 38 families, viz. Amaranthaceae, Apiaceae, Araliaceae, Araucariaceae, Arecaceae, Aristolochiaceae, Brassicaceae, Buxaceae, Cannabinaceae, Cannaceae, Caprifoliaceae, Caricaceae, Caryophyllaceae, Chenopodiaceae, Cycadaceae, Cyperaceae, Ebenaceae, Geraniaceae, Hydrangeaceae, Iridaceae, Juglandaceae, Lauraceae, Lythraceae, Magnoliaceae, Onagraceae, Papaveraceae, Passifloraceae, Pedaliaceae, Platanaceae, Proteaceae, Punicaceae, Ranunculaceae, Rubiaceae, Rutaceae, Sambucaceae, Sapotaceae, Tropaeolaceae and Violaceae are represented by one species each. Likewise, the predominant genera with highest number of aliens are *Prunus* and *Rosa* (4 each), *Clerodendrum*, *Hibiscus*, *Ipomoea*, *Salix* (3 each), *Asclepias*, *Bougainvillea*, *Cestrum*, *Chrysanthemum*, *Cosmos*, *Datura*, *Euphorbia*, *Pyrus*, *Salvia*, *Tecoma*, *Thuja*, *Zephyranthes* (2 each).

Table, 1
Statistical Synopsis of the Alien Temple Plants of H.P.

Plant Group	Number of Families	Number of Genera	Number of Sp.	Percentage of alien Sp.
Dicotyledons	53	112	136	85.54
Monocotyledons	7	16	17	10.69
Gymnosperms	3	5	6	3.77
Total	63	133	159	100



Figure, 2: Total Number of Exotic and Indigenous Species in the Temple-Courtyards of H.P.

With regard to the nativity status of the exotic aliens of the temple-courtyards of Himachal Pradesh (Fig. 3; Table, 3), present study revealed that North and South American (Brazil, Chile, Mexico, Venezuela, West Indies, United States, etc.) elements contribute the greatest percentage of species (41.51%), followed by Asia (Afganistan, Bangladesh, Bhutan, China, Japan, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, etc.) 38.99%, Europe (Austria, Belgium, Bulgaria, France, Germany, Greece, Italy, Romania, Spain, Switzerland, Ukraine, etc.) 23.27%, Common Origin (Asia, America, Africa, Europe and Australia) 23.27%, African Continent (Algeria, Egypt, Ethiopia, Ghana, Kenya, Morocco, South Africa, Tunisia, Zimbabwe, etc.) 20.75%, and Australia 6.92%. In comparison the American elements contribute 55% to the alien flora of the whole of India while as the European elements are represented by only 15% (Nayar, 1977). Homogenisation of earth's biota has been reported to be due to increasing global trade and transport and consequently resulted in the translocation of species either deliberately or by accident (Drake et al. 1989; Kowarik 2003; Perrings et al. 2005).

Table 2
Alien Plants in the Temple-Courtyards of Himachal Pradesh

Sr. No.	Botanical Name	Family	Growth Habit	Division	Origin	Mode/Purpose of Introduction
1.	<i>Acacia dealbata</i> Link.	Fabaceae	T	D	Aus	Orn
2.	<i>Acalypha wilkesiana</i> M. Arg.	Euphorbiaceae	S	D	Eur	Orn
3.	<i>Achras zapota</i> Linn.	Sapotaceae	T	D	Ame	Orn, Edi, Hort
4.	<i>Aloe vera</i> (Linn.) Burm. f.	Liliaceae	P	M	Afr	Orn, Edi, Med
5.	<i>Althaea rosea</i> (Linn.) Cav.	Malvaceae	B	D	Asi	Orn, Sac, Mat-Cul
6.	<i>Amaryllis reginae</i> Linn.	Amaryllidaceae	P	M	Ame	Orn
7.	<i>Antirrhinum majus</i> Linn.	Scrophulariaceae	P	D	Asi, Eur, Afr	Orn
8.	<i>Araucaria columnaris</i> (Forster) Hooker	Araucariaceae	T	G	Eur	Orn
9.	<i>Aristolochia elegans</i> Mast.	Aristolochiaceae	C	D	Ame	Orn
10.	<i>Asclepias curassavica</i> Linn.	Asclepiadaceae	U	D	Ame	Orn
11.	<i>Asclepias physocarpa</i> (E. Mey.) Schlecht.	Asclepiadaceae	S	D	Afr	Orn
12.	<i>Asparagus densiflorus</i> (Kunth) Jessop	Liliaceae	P	M	Afr	Orn
13.	<i>Beloperone guttata</i> Brand.	Acanthaceae	S	D	Ame	Orn
14.	<i>Bougainvillea glabra</i> Choisy	Nyctaginaceae	C	D	Ame	Orn
15.	<i>Bougainvillea spectabilis</i> Willd.	Nyctaginaceae	C	D	Ame	Orn, Sac, Med, Mat-Cul
16.	<i>Brassica oleracea</i> var. <i>capitata</i> Linn.	Brassicaceae	B	D	Eur	Edi, Cro

17.	<i>Broussonetia papyrifera</i> L'Herit. ex Vent.	Moraceae	T	D	Asi	Edi, Mat-Cul, Fod
18.	<i>Bryophyllum calycinum</i> Salisb.	Crassulaceae	P	D	Afr	Orn, Med
19.	<i>Buxus sempervirens</i> Linn.	Buxaceae	T	D	Asi, Eur, Afr	Orn
20.	<i>Calendula officinalis</i> Linn.	Asteraceae	A	D	Aus, Eur	Orn, Sac
21.	<i>Callistemon lanceolatus</i> DC.	Myrtaceae	T	D	Aus	Orn
22.	<i>Callistephus chinensis</i> Nees	Asteraceae	A	D	Asi	Orn
23.	<i>Canna indica</i> Linn.	Cannaceae	P	M	Ame	Orn, Sac
24.	<i>Capsicum annuum</i> Linn.	Solanaceae	U	D	Ame	Edi, Mat-Cul, Cro
25.	<i>Carica papaya</i> Linn.	Caricaceae	T	D	Ame	Orn, Edi, Med, Hort
26.	<i>Centaurea cyanus</i> Linn.	Asteraceae	A	D	Asi, Eur	Orn
27.	<i>Cestrum diurnum</i> Linn.	Solanaceae	S	D	Ame	Orn
28.	<i>Cestrum nocturnum</i> Linn.	Solanaceae	S	D	Ame	Orn, Sac
29.	<i>Chamaerops humilis</i> Linn.	Arecaceae	S	M	Eur, Afr	Orn
30.	<i>Chlorophytum capense</i> Kuntze	Liliaceae	P	M	Afr	Orn
31.	<i>Chrysanthemum indicum</i> Linn.	Asteraceae	P	D	Asi	Orn, Sac
32.	<i>Chrysanthemum leucanthemum</i> Linn.	Asteraceae	P	D	Ame, Eur	Orn
33.	<i>Cinnamomum camphora</i> (Linn.) Nees and Eberm.	Lauraceae	T	D	Asi	Orn, Sac, Med
34.	<i>Citrus maxima</i> (Burm. f.) Merrill	Rutaceae	T	D	Asi	Edi, Hort
35.	<i>Clerodendrum philippinum</i> Schauer	Verbenaceae	S	D	Asi	Orn, Sac, Med
36.	<i>Clerodendrum splendens</i> G. Don.	Verbenaceae	C	D	Afr	Orn
37.	<i>Clerodendrum thomsonae</i> Balf.	Verbenaceae	S	D	Afr	Orn
38.	<i>Convolvulus arvensis</i> Linn.	Convolvulaceae	P	D	Asi, Eur, Afr	Orn, Fod
39.	<i>Cosmos bipinnatus</i> Cav.	Astreaeae	A	D	Ame	Orn, Sac
40.	<i>Cosmos sulphureus</i> Cav.	Astreaeae	P	D	Ame	Orn, Sac
41.	<i>Cupressus sempervirens</i> Linn.	Cupressaceae	T	G	Asi, Eur, Afr	Orn, Sac
42.	<i>Cycas revoluta</i> Thunb.	Cycadaceae	T	G	Asi	Orn
43.	<i>Cynodon dactylon</i> (Linn.) Pers.	Poaceae	P	M	Afr	Sac, Med, Fod
44.	<i>Cyperus flabelliformis</i> Rottb.	Cyperaceae	P	M	Afr	Orn, Mat-Cul
45.	<i>Dahlia rosea</i> Cav.	Asteraceae	P	D	Ame	Orn, Sac
46.	<i>Datura fastuosa</i> Linn.	Solanaceae	S	D	Ame	Orn, Sac, Med
47.	<i>Datura innoxia</i> Mill.	Solanaceae	S	D	Ame	Orn, Sac
48.	<i>Daucus carota</i> Linn.	Apiaceae	B	D	Asi, Eur, Afr	Edi, Cro
49.	<i>Delphinium ajacis</i> Linn.	Ranunculaceae	A	D	Aus, Eur	Orn
50.	<i>Dianthus barbatus</i> Linn.	Caryophyllaceae	B	D	Asi, Eur	Orn
51.	<i>Diospyros lotus</i> Linn.	Ebenaceae	T	D	Asi	Orn
52.	<i>Dodonaea viscosa</i> (Linn.) Jacq.	Sapindaceae	S	D	Ame, Aus	Orn, Fod
53.	<i>Dolichos lablab</i> Linn.	Fabaceae	P	D	Asi, Afr	Edi, Cro
54.	<i>Duranta repens</i> Linn.	Verbenaceae	S	D	Ame	Orn, Med, Mat-Cul
55.	<i>Erigeron alpinus</i> Linn.	Asteraceae	P	D	Asi, Eur, Afr	Orn
56.	<i>Eriobotrya japonica</i> (Thunb.) Lindl.	Rosaceae	T	D	Asi	Orn, Edi, Hort
57.	<i>Eucalyptus tereticornis</i> Sm.	Myrtaceae	T	D	Aus	Orn, Med, Mat-Cul
58.	<i>Euphorbia milii</i> Des Moul.	Euphorbiaceae	S	D	Afr	Orn
59.	<i>Euphorbia pulcherrima</i> Willd. ex Klotzsch.	Euphorbiaceae	S	D	Ame	Orn
60.	<i>Ficus carica</i> Linn.	Moraceae	T	D	Asi, Eur, Afr	Orn, Edi, Hort
61.	<i>Gaillardia pulchella</i> Foug.	Asteraceae	A	D	Ame	Orn
62.	<i>Gomphrena globosa</i> Linn.	Amaranthaceae	A	D	Ame	Orn
63.	<i>Grevillea robusta</i> A. Cunn. ex R. Br.	Proteaceae	T	D	Aus	Orn
64.	<i>Hamelia patens</i> Jacq.	Rubiaceae	S	D	Ame	Orn
65.	<i>Helianthus annuus</i> Linn.	Asteraceae	A	D	Ame	Orn, Sac, Cro
66.	<i>Hibiscus mutabilis</i> Linn.	Malvaceae	S	D	Asi	Orn
67.	<i>Hibiscus rosa-sinensis</i> Linn.	Malvaceae	S	D	Asi	Orn, Sac
68.	<i>Hibiscus syriacus</i> Linn.	Malvaceae	S	D	Asi	Orn, Sac
69.	<i>Humulus lupulus</i> Linn.	Cannabinaceae	P	D	Eur	Orn, Mat-Cul
70.	<i>Hydrangea macrophylla</i> (Thunb.) DC.	Hydrangeaceae	S	D	Asi	Orn, Sac
71.	<i>Hymenocallis littoralis</i> (Jacq.) Salisb.	Amaryllidaceae	P	M	Ame	Orn
72.	<i>Ipomoea cairica</i> (Linn.) Sweet	Convolvulaceae	C	D	Asi, Afr	Orn
73.	<i>Ipomoea purpurea</i> (Linn.) Roth.	Convolvulaceae	C	D	Ame	Orn, Med
74.	<i>Ipomoea quamoclit</i> Linn.	Convolvulaceae	C	D	Ame	Orn
75.	<i>Iris germanica</i> Linn.	Iridaceae	P	M	Eur	Orn
76.	<i>Jacaranda acutifolia</i> Humb. and Bonpl.	Bignoniaceae	T	D	Ame	Orn
77.	<i>Jasminum primulinum</i> Hemsl. ex Baker	Oleaceae	S	D	Asi	Orn, Sac
78.	<i>Jatropha pandurifolia</i> Andr.	Euphorbiaceae	S	D	Ame	Orn
79.	<i>Juglans regia</i> Linn.	Juglandaceae	T	D	Asi, Eur	Sac, Edi, Med, Mat-Cul, Hort
80.	<i>Juniperus chinensis</i> Linn.	Cupressaceae	S	G	Asi	Orn
81.	<i>Justicia gendarussa</i> Linn. f.	Acanthaceae	S	D	Asi	Orn

82.	<i>Kochia trichophylla</i> Voss.	Chenopodiaceae	A	D	Asi, Eur	Orn
83.	<i>Lagerstroemia indica</i> Linn.	Lythraceae	T	D	Asi	Orn, Med
84.	<i>Leucaena leucocephala</i> (Lam.) de Wit	Fabaceae	T	D	Ame, Asi	Orn, Fod
85.	<i>Ligustrum lucidum</i> Aiton	Oleaceae	T	D	Asi	Orn, Sac
86.	<i>Litchi chinensis</i> Sonn.	Sapindaceae	T	D	Asi	Edi, Hort
87.	<i>Lonicera japonica</i> Wall.	Caprifoliaceae	C	D	Asi	Orn, Med
88.	<i>Lycopersicon esculentum</i> Mill.	Solanaceae	P	D	Ame	Edi, Med, Cro
89.	<i>Magnolia grandiflora</i> Linn.	Magnoliaceae	T	D	Ame	Orn, Sac
90.	<i>Malva verticillata</i> Linn.	Malvaceae	A	D	Asi	Orn
91.	<i>Malva viscosa</i> Linn.	Malvaceae	S	D	Ame	Orn
92.	<i>Mentha piperita</i> Linn.	Lamiaceae	P	D	Eur	Orn, Edi, Med
93.	<i>Mimosa pudica</i> Linn.	Fabaceae	A	D	Ame, Asi	Orn, Med
94.	<i>Mirabilis jalapa</i> Linn.	Nyctaginaceae	P	D	Ame	Orn, Sac, Med
95.	<i>Morus alba</i> Linn.	Moraceae	T	D	Ame, Asi, Eur	Orn, Sac, Edi, Mat-Cul, Fod
96.	<i>Narcissus tazetta</i> Linn.	Amaryllidaceae	P	M	Asi, Eur, Afr	Orn
97.	<i>Nicandra physaloides</i> (Linn.) Gaertn.	Solanaceae	A	D	Ame	Orn,
98.	<i>Ocimum kilimandscharicum</i> Gurke	Lamiaceae	U	D	Afr	Orn,
99.	<i>Oenothera drummondii</i> Hook f.	Onagraceae	A	D	Ame	Orn
100.	<i>Olea glandulifera</i> Wall.	Oleaceae	T	D	Asi, Aus	Orn
101.	<i>Papaver rhoeas</i> Linn. var. <i>latifolia</i> Prain	Papaveraceae	A	D	Eur	Orn
102.	<i>Passiflora caerulea</i> Linn.	Passifloraceae	C	D	Ame	Orn
103.	<i>Pedilanthus tithymaloides</i> (Linn.) Poit.	Euphorbiaceae	Ss	D	Ame	Orn
104.	<i>Pelargonium hortorum</i> Bailey	Geraniaceae	P	D	Afr	Orn
105.	<i>Petunia hybrida</i> Vilm.	Solanaceae	A	D	Ame	Orn
106.	<i>Phaseolus vulgaris</i> Linn.	Fabaceae	C	D	Ame	Edi, Cro
107.	<i>Pisum sativum</i> Linn.	Fabaceae	A	D	Asi, Eur, Afr	Edi
108.	<i>Platanus orientalis</i> Linn.	Platanaceae	T	D	Eur	Orn
109.	<i>Plumeria acutifolia</i> Poirlet	Apocynaceae	T	D	Ame	Orn
110.	<i>Polianthes tuberosa</i> Linn.	Amaryllidaceae	P	M	Ame	Orn
111.	<i>Populus nigra</i> Linn.	Salicaceae	T	D	Asi, Eur, Afr	Orn, Sac, Mat-Cul, Fod
112.	<i>Prunus amygdalus</i> Batsch.	Rosaceae	T	D	Eur, Afr	Edi, Med, Hort
113.	<i>Prunus armeniaca</i> Linn.	Rosaceae	T	D	Ame, Asi, Aus, Eur	Edi, Hort
114.	<i>Prunus domestica</i> Linn.	Rosaceae	T	D	Asi, Eur	Edi, Hort
115.	<i>Prunus persica</i> (Linn.) Batsch	Rosaceae	T	D	Ame, Asi, Aus	Edi, Med, Hort
116.	<i>Psidium guajava</i> Linn.	Myrtaceae	T	D	Ame	Edi, Med, Mat-Cul, Hort
117.	<i>Punica granatum</i> Linn.	Punicaceae	T	D	Asi	Orn, Sac, Edi, Med, Hort
118.	<i>Pyrostegia venusta</i> (Ker.-Gawl.) Miers	Bignoniaceae	C	D	Ame	Orn
119.	<i>Pyrus communis</i> Linn.	Rosaceae	T	D	Asi, Eur	Sac, Edi, Hort
120.	<i>Pyrus malus</i> Linn.	Rosaceae	T	D	Asi, Eur	Sac, Edi, Hort
121.	<i>Ricinus communis</i> Linn.	Euphorbiaceae	S	D	Afr	Med, Mat-Cul
122.	<i>Robinia pseudoacacia</i> Linn.	Fabaceae	T	D	Ame	Orn, Sac, Mat-Cul, Fod
123.	<i>Rosa alba</i> Linn.	Rosaceae	S	D	Asi	Orn, Sac
124.	<i>Rosa banksiae</i> R. Br.	Rosaceae	C	D	Asi	Orn, Sac
125.	<i>Rosa indica</i> Linn.	Rosaceae	S	D	Asi	Orn, Sac, Med
126.	<i>Rosa multiflora</i> Thunb.	Rosaceae	S	D	Asi	Orn, Sac
127.	<i>Ruellia tuberosa</i> Linn.	Acanthaceae	P	D	Ame	Orn
128.	<i>Russelia equisetiformis</i> Cham. and Schl.	Scrophulariaceae	S	D	Ame	Orn
129.	<i>Saccharum officinarum</i> Linn.	Poaceae	P	M	Aus	Sac, Edi, Med, Cro
130.	<i>Salix alba</i> Linn.	Salicaceae	T	D	Asi, Eur	Orn, Sac
131.	<i>Salix babylonica</i> Linn.	Salicaceae	T	D	Asi	Orn, Sac, Mat-Cul, Fod
132.	<i>Salix fragilis</i> Linn.	Salicaceae	T	D	Asi, Eur	Orn, Mat-Cul, Fod
133.	<i>Salvia coccinea</i> Juss.	Lamiaceae	P	D	Ame	Orn, Sac
134.	<i>Salvia splendens</i> Sellow ex Roemer and J.A. Schultes	Lamiaceae	Ss	D	Ame	Orn
135.	<i>Sambucus nigra</i> Linn.	Sambucaceae	S	D	Eur	Orn
136.	<i>Sansevieria trifasciata</i> Prain	Liliaceae	P	M	Afr	Orn
137.	<i>Sapium sebiferum</i> (Linn.) Roxb.	Euphorbiaceae	T	D	Asi	Orn, Med
138.	<i>Schefflera arboricola</i> (Hayata) Merr.	Araliaceae	S	D	Asi	Orn
139.	<i>Sempervivum arboreum</i> Linn.	Crassulaceae	P	D	Eur, Afr	Orn
140.	<i>Sesamum orientale</i> Linn.	Pedaliaceae	A	D	Afr	Sac, Edi, Med, Fod, Cro
141.	<i>Solanum tuberosum</i> Linn.	Solanaceae	P	D	Ame	Edi, Cro
142.	<i>Syzygium jambos</i> (Linn.) Alston	Myrtaceae	T	D	Asi	Orn, Edi, Hort
143.	<i>Tagetes erecta</i> Linn.	Asteraceae	A	D	Ame	Orn, Sac, Med
144.	<i>Tamarindus indica</i> Linn.	Fabaceae	T	D	Asi, Afr	Orn, Sac, Edi, Med, Mat-

contd.

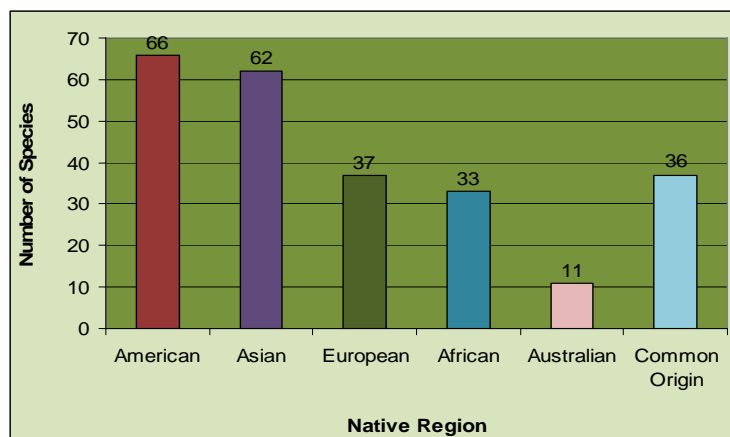
						Cul
145.	<i>Tecoma radicans</i> Juss.	Bignoniaceae	C	D	Ame	Orn
146.	<i>Tecoma stans</i> (Linn.) Juss. ex H.B.K.	Bignoniaceae	T	D	Ame	Orn, Sac
147.	<i>Tecomaria capensis</i> (Thunberg) Spach.	Bignoniaceae	S	D	Afr	Orn
148.	<i>Thevetia nerifolia</i> Juss ex Steud.	Apocynaceae	T	D	Ame	Orn, Sac, Med
149.	<i>Thuja orientalis</i> Linn.	Cupressaceae	T	G	Asi	Orn, Sac
150.	<i>Thuja plicata</i> D. Don	Cupressaceae	T	G	Ame	Orn
151.	<i>Thunbergia erecta</i> (Benth.) T. Anders.	Acanthaceae	S	D	Afr	Orn
152.	<i>Tithonia tagetiflora</i> Desf.	Asteraceae	P	D	Ame	Orn
153.	<i>Tropaeolum majus</i> Linn.	Tropaeolaceae	A	D	Ame	Orn
154.	<i>Viola tricolor</i> Linn.	Violaceae	A	D	Asi, Eur	Orn
155.	<i>Wisteria sinensis</i> (Sims) Sweet	Fabaceae	C	D	Asi	Orn
156.	<i>Zea mays</i> Linn.	Poaceae	A	M	Ame	Edi, Fod, Cro
157.	<i>Zephyranthes candida</i> (Lindl.) Herb.	Amaryllidaceae	P	M	Ame	Orn
158.	<i>Zephyranthes grandiflora</i> Lindl.	Amaryllidaceae	P	M	Ame	Orn
159.	<i>Zinnia elegans</i> Jacq.	Asteraceae	S	D	Ame	Orn, Sac

Orn = Ornamental; Sac = Sacred; Edi = Edible; Med = Medicinal; Mat-Cul = Material Culture; Hort = Horticultural; Fod = Fodder; Cro = Crop; Asi = Asia; Eur = Europe; Ame = America; Aus = Australia; Afr = Africa; T = Tree; S = Shrub; C = Climber; A = Annual Herb; B = Biennial Herb; P = Perennial Herb; Ss = Subshrub; U = Undershrub; D = Dicot; M = Monocot; G = Gymnosperm

Table 3

Native Status of Alien Plants in the Temple courtyards of H.P.

Sr. No.	Continent/ Country	Species	Genera	Families
1.	Asia (Afganistan, Bangladesh, Bhutan, China, Japan, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, etc.)	62	52	31
2.	North and South American Continent (Brazil, Chile, Mexico, Venezuela, West Indies, United States, etc.)	66	57	31
3.	African Continent (Algeria, Egypt, Ethiopia, Ghana, Kenya, Morocco, South Africa, Tunisia, Zimbabwe, etc.)	33	32	24
4.	Europe (Austria, Belgium, Bulgaria, France, Germany, Greece, Italy, Romania, Spain, Switzerland, Ukraine, etc.)	37	33	27
5.	Australian Continent	11	10	9
6.	Common Origin (Asia, America, Africa, Europe and Australia)	36	31	20



Figure, 3: Native Status of Exotic/Alien Plants in the Temple courtyards of H.P.

The study also brought to light that a large number of plant species have been introduced intentionally in the temple-courtyards of Himachal Pradesh for various purposes, e.g., 134 (84.28%) as ornamentals, 47 (29.56%) as sacred plants, 32 (20.13%) as food plants, 31 (19.50%) as medicinal plants, 18 (11.32%) for their material culture, 16 (10.06%) for horticultural purposes, 12 (7.55%) as fodder plants, and 11 (6.92%) as crop plants. Enumerative details of various species employed for the aforesaid categories have also been enlisted (see Tables, 2). It is evident that majority of the exotic plant species occurring in the temple-courtyards of Himachal Pradesh were introduced intentionally for ornamental purposes.

Of the 173 invasive alien species documented for India (Reddy 2008), eight species namely *Asclepias curassavica* (Asclepiadaceae), *Calotropis procera* (Asclepiadaceae), *Datura innoxia* (Solanaceae), *Ipomoea quamoclit* (Convolvulaceae), *Leucaena leucocephala* (Fabaceae), *Mimosa pudica* (Fabaceae), *Mirabilis jalapa* (Nyctaginaceae) and *Ruellia tuberosa* (Acanthaceae) do occur in the temple-courtyards of Himachal Pradesh. Contrarily, it is worthy of mention that excepting *Datura innoxia*, none of the remaining species enjoy the status of invasive aliens and posed serious threat to the native flora in the state of Himachal Pradesh.

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