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Alien Plant Species (APS) and their Indigenous Uses: A Study from Nanda Devi Biosphere Reserve (NDBR), West Himalaya, India

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ABSTRACT

The present study deals with alien plant species (APS), their diversity, ecological amplitude and indigenous use know how in a part of Nanda Devi Biosphere Reserve of west Himalaya. A total of 63 APS belonging to 53 genera and 37 families were identified. Maximum APS belong to Asteraceae family, followed by Polygonaceae, Brassicaceae, Liliaceae and Rosaceae. There were 52 herbaceous APS, 5 shrubs and 6 trees. The ecological amplitude of APS was 2000 to 4500m although different kinds of APS varies with altitudinal changes, however, six of the APS has an ecological amplitude of >1500 m. The APS were used by the the inhabitants in different ailments like, stomach disorder, headache, dysentery, rheumatism and many other purposes. The roots, rhizomes, tubers, bulbs, leaves, barks, fruits, seeds, aerial parts, and stems are used for the treatment of various ailments. Monitoring of these species using quadrat method for understanding the dynamics of the species populations is suggested.

Key words: Alien Plant species, medicinal plants, ecological amplitude

Introduction

Alien species are those species which have their origin in far distant

geographical regions around the world and in due course of time they have established themselves to new ecosystems and habitats of native species in other biogeographical regions. It has now been established through many studies around the world that alien plant species inhabit an area of native ones and alter the edaphic and habitat conditions in a diversity of ways and mechanisms. They are capable enough to alter the ecosystem properties like structure and composition of biotic as well as abiotic components. Alien species generally have fast reproduction and comparatively easy establishment in a diversity of habitats and ecosystems. Such species at times become invasive and may threaten the existence of native ones. However, it is also true that all the aliens are not invasive and some have adapted to the new habitats/ ecosystems and also have got place in the local cultural and beliefs of native societies by virtue of their properties. Many of such species are very valuable as they have many medicinal properties associated with them. Humans in and around such ecosystems have evolved along with such species through generations and also much of indigenous knowledge has evolved through these generations or years out of their own experiments. Such indigenous knowledge and exploitation of alien species for some or other beneficial properties keeps their population in check and thus, better management of such species and ecosystems may be ensured.

The inhabitants of the IHR utilize the biodiversity in various forms, i.e., medicine, food, fuel, fodder, timber, making agricultural tools, ûber, religious, and various other purposes (Samant & Dhar, 1997) (Samant, Dhar, & Palni, 1998). Local healers have information and understanding on a wide range of medicinal plants that are useful to cure the common ailments (Vidyarthi et al., 2013). Many studies have appeared so far on the diversity, distribution and indigenous uses of plant species from various parts of Indian Himalayan Region (IHR) (Bodh et al., 2019; Boktapa & Sharma, 2010; Chauhan, 1999; Devi et al., 2019; Jain, 1991; Joshi et al., 1999, 2001; Kumar et al., 2019; Kumari et al., 2019; Maikhuri et al., 1998b, 1998a; Rana & Samant, 2011; R. S. Rawat et al., 2009; Samant, 1999; Samant et al., 2007, 2011; Samant, Dhar, & Palni, 1998; Samant, Dhar, & Rawal, 1998; Samant & Pant, 2006; Semwal et al., 2010; Sharma et al., 2018; Sood et al., 2001; Vidyarthi et al., 2013).

As far as studies concerning alien species and their impacts on the ecosystem are concerned, many such studies have been carried out in different regions around the world (Cambray, 2003; Groves,

2002, 2011; Lambdon et al., 2008; Pimentel et al., 2001; Pyšek et al., 2017; Richardson et al., 2005; Richardson & Rejmánek, 2011; Williamson, 2002). Studies from various parts of India include (Matthew, 1999; Negi & Hajra, 2007; Srivastava et al., 2014; Surendra et al., 2013; Wagh & Jain, 2018; K. Walter, 2011; K. J. Walter & Armstrong, 2014) and Indian Himalayan Regions particularly on non-native / APS(Dar & Reshi, 2015; Dogra et al., 2009; Joshi, 2003; Joshi et al., 1999, 2001; Khanduri et al., 2017; Khuroo et al., 2011; Kohli et al., 2008; Kosaka et al., 2010; Moktan & Das, 2013; Negi & Hajra, 2007; Samant & Joshi, 2005; Samant, 1999; Sekar, 2012; Sekar et al., 2012, 2015) invasive APS and their adverse impacts on the ecosystem health has also been appeared in different journals over the past few decades (Bhatt et al., 2011; Dogra et al., 2009; Kannan et al., 2013; Kumar & Prasad, 2014; Mukherjee et al., 2017). However, some studies have also appeared on uses and benefits of alien species (Sandilyan & van't Klooster, 2016; Sekar et al., 2015; Semenya et al., 2012; Wagh & Jain, 2018).

The authors through this paper have attempted to unfold a positive aspects of APS as they are not always harmful, but they also bring new opportunities with them. Therefore, this paper mainly focusses on diversity, ecological amplitude and medicinal use values of non-native or APS recorded from Nanda Devi Biosphere Reserve (NDBR), West Himalaya, India.

Methodology

Extensive surveys were conducted during 1998 to 2003 in Buffer Zone villages as well as forest ecosystems of Nanda Devi Biosphere Reserve (NDBR) by the authors. Information on local names, altitudinal range and life forms of the species and indigenous uses of the various alien plan species (APS) was collected through personal interviews and interactions with inhabitants of the areas. Each species was collected and identified with the help of florulas (Naithani, 1984, 1985; Osmaston, 1927; Purohit & Samant, 1995; G. S. Rawat, 1984; Samant, 1987, 1994).

Anonymous (Anonymous, 1970), and Samant et al. (Samant, Dhar, & Palni, 1998) have been followed for identifying APS species. The information on the medicinal uses of APS is based on primary as well as secondary information (Jain, 1991; Joshi et al., 1999; Pangtey et al., 1989; G. S. Rawat & Pangtey, 1987; Samant et al., 1996; Samant & Mehta, 1994).

Results

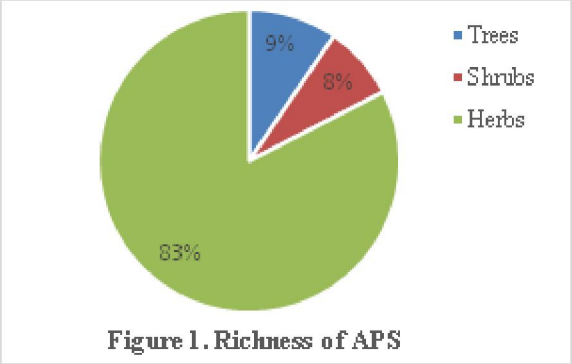

Figure 1. Richness of APS

(1) Diversity of APS: In this study, sixty three (63) alien species were identified and recorded between an altitudinal ranges of 2000 to 4500m amsl in different life forms i.e., trees, shrubs, herbs and ferns. Diversity of herbaceous life forms was highest (83%), followed by trees and shrubs, respectively (Figure 1). The APS belongs to 53 genera and thirty seven (37) families. Maximum seven (07) APS belonged to family Asteraceae, followed by five (05) to Polygonaceae, and four APS each to Brassicaceae, Liliaceae and Rosaceae. Whereas twenty three families had representation of only one APS. There were 52 herbaceous APS, 5 shrubs and 6 tree APS. The information regarding families with alien species is given in Table 1.

Table 1. Plant families and alien species

Family	*Alien species*
Achyranthaceae	*Achyranthes aspera* L., *Achyranthes bidentata* Bl.
Apiaceae	*Carum carvi* L., *Seseli sibirieum* (L.) Boiss.
Araceae	*Arisaema flavum* (Forsk.) Schott.
Araliaceae	*Hedera nepalensis* Koch.
Asteraceae	*Adenostemna lavenia* (L.) Kuntze, *Artemisia maritima* (Cl.) Pamp., *Artemisia nilagarica* (Cl.) Pamp., *Bidens pilosa* L., *Blumea laciniata* (Roxb.) DC., *Tagetes minuta* L., *Taraxacum officinale* Weber
Berberidaceae	*Berberis aristata DC.*
Brassicaceae	*Arabidopsis thaliana* (L.)Heynh., *Capsella bursa-pastoris* (L.) Medic., *Raphanus sativus* L., *Thlaspi arvense* L.
Cannabinaceae	*Cannabis sativa* L.
Caryophyllaceae	*Stellaria media* (L.) Vill.
Chenopodiaceae	*Chenopodium foliolosum* (Moench.) Asch.
Commelinaceae	*Commelina bengalensis* L.
Cucurbitaceae	*Cucumis melo* L., *Cucurbita maxima* Duch. ex Lam., *Melothria heterophylla* (Lour.) Cogn.

Cupressaceae	*Juniperus communis* L.
Dioscoreaceae	*Dioscorea deltoidea* Kunth
Elaeagnaceae	*Elaeagnus parviflora* Wall. ex Royle, *Hippophae salicifolia* Don
Ericaceae	*Gaultheria fragrantissima* Wall.
Fabaceae	*Parochetus communis* Don
Gentianaceae	*Lomatogonium cariathiacum* (Wulf.) Br.
Geraniaceae	*Geranium nepalense* Sw.
Helvellaceae	*Morchella esculenta* (L.) Pers.
Hypoxidaceae	*Curculigo orchioides* Gaertn.
Lamiaceae	*Clinopodium vulgare* L., *Thymus linearis* Benth.
Liliaceae	*Allium cepa* L., *Allium humile* Kunth., *Allium wallichii* Kunth., *Polygonatum verticillatum* L.
Moraceae	*Ficus palmata* Forsk.
Oleaceae	*Jasminum humile* L.
Oxalidaceae	*Oxalis corniculata* L.
Paeoniaceae	*Paeonia emodi* Wall.
Plantaginaceae	*Plantago lanceolata* L.
Polygonaceae	*Fagopyrum tataricum* (L.) Gaertn., *Fagopyrum esculentum* (L.) Moench., *Polygonum nepalense* Meisn., *Rumex acetosa* L., *Rumex nepalensis* Spr.
Ranunculaceae	*Anemone rivularis* Ham., *Ranunculus diffusus* DC.
Rhamnaceae	*Rhamnus virgatus* Roxb.
Rosaceae	*Fragaria nubicola* Lindl., *Prunus armeniaca* L., *Prunus cornuta* (Royle) Steud., *Prunus persica* Batsch.
Rubiaceae	*Galium rotundifolium* L.
Scrophulariaceae	*Lindenbergia indica* (L.) Kuntze
Violaceae	*Viola biflora* L., *Viola canescens* Wall., *Viola pilosa* Bl.
Vitaceae	*Parthenocissus himalayana* (Planch.) Royle

Table 2. Ecological Amplitude of APS

Ecological Amplitude	*No. of species*
<500m	20
500 - <1000m	25
1000m-<1500m	13
>1500m	6

(2) APS and Ecological Amplitude: Ecological amplitude of the APS is presented in Table 2. Among the aliens recorded from the study area, six species had very wide range of distribution (EA of >1500m).

These species were *Prunus armeniaca* L., *Capsella bursa-pastoris* (L.) Medic., *Rumex nepalensis* Spr., *Taraxacum officinale* Weber, *Polygonatum verticillatum* L. and *Viola biflora* L. Whereas thirteen species had more than 1000m of EA and rest of the species had narrow EA of less than 1000m.

Various APS identified from NDBR and their place of origin are presented in Table 3.

Table 3. APS of NDBR and their place of origin

Native regions	*Name of Species*
Africa	*Ficus palmata* Forsk.
America	*Fragaria nubicola* Lindl., *Tagetes minuta* L.
Amphig	*Oxalis corniculata* L.
Arab	*Ficus palmata* Forsk., *Arisaema flavum* (Forsk.) Schott.
As Centr	*Cannabis sativa* L.
As et Afr Trop et Subtrop	*Polygonum nepalense* Meisn.
As Occ Ind Or Malaya Afr Austr	*Rumex nepalensis* Spr.
As Temp	*Prunus persica* Batsch.
As Trop	*Achyranthes bidentata* Bl., *Curculigo orchioides* Gaertn., *Jasminum humile* L., *Melothria heterophylla* (Lour.) Cogn.
As Trop Or Sub trop	*Cucurbita maxima* Duch. ex Lam.
Bor	*Fragaria nubicola* Lindl.
Europe	*Raphanus sativus* L.
Europe Afr Or As Temp	*Hedera nepalensis* Koch.
Europe As Bor	*Fagopyrum esculentum* (L.) Moench., *Fagopyrum tataricum* (L.) Gaertn., *Lomatogonium cariathiacum* (Wulf.) Br., *Plantago lanceolata* L., *Polygonatum verticillatum* L., *Prunus cornuta* (Royle) Steud. *Rumex acetosa* L. *Thlaspi arvense* L.
Europe As et Afr Bor	*Thymus linearis* Benth.
Europe As Temp	*Galium rotundifolium* L.
Europe Oriens	*Allium wallichii* Kunth., *Seseli sibiricum* (L.) Boiss.
Europe Oriens As Bor	*Carum carvi* L.
Europe Reg Caucas Sibir	*Artemisia maritima* (Cl.) Pamp.
Geront Temp	*Stellaria media* (L.) Vill.
Geront Trop	*Achyranthes aspera* L., *Adenostemna lavenia* (L.) Kuntze, *Commelina bengalensis* L., *Cucumis melo* L.

Ind Occ Amer Austr	*Bidens pilosa* L.
Ind Or	*Ficus palmata* Forsk., *Allium humile* Kunth., *Anemone rivularis* Ham., *Berberis aristata DC., Dioscorea deltoidea* Kunth*, Lindenbergia indica* (L.) Kuntze*, Parthenocissus himalayana* (Planch.) Royle
Ind Or As Bor	*Rhamnus virgatus* Roxb.
Ind Or China	*Geranium nepalense* Sw.
Ind Or Malaya	*Blumea laciniata* (Roxb.) DC., *Gaultheria fragrantissima* Wall., *Ranunculus diffusus* DC.
Ind Or Malaya Afr	*Parochetus communis* Don
Ind Or Malaya China	*Viola canescens* Wall., *Viola pilosa* Bl.
Japan	*Elaeagnus parviflora* Wall. ex Royle, *Hippophae salicifolia* Don
Persia Baluchist	*Allium cepa* L.
Reg Bor et Austr	*Chenopodium foliolosum* (Moench.) Asch.
Reg Bor Temp	*Clinopodium vulgare* L., *Viola biflora* L.
Reg Bor Temp Austr	*Taraxacum officinale* Weber
Reg Bor Temp et Arct	*Juniperus communis* L.
Reg Caucas	*Prunus armeniaca* L.
Reg Temp	*Arabidopsis thaliana* (L.)Heynh., *Capsella bursa-pastoris* (L.) Medic.
Reg Temp Bor	*Artemisia nilagarica* (Cl.) Pamp.
Sibir	*Paeonia emodi* Wall.
Temp et Trop	*Oxalis corniculata* L.
Trop	*Tagetes minuta* L., *Ficus palmata* Forsk.

Abbreviations used: Ind Or=Indian Oriental; Reg Himal=Himalayan Region; Reg Caucas=Caucasus Region As=Asia; Afr=Africa; Austr=Australia; Am=America; Trop=Tropical; Bor=Borealis; Occ=Occidentalis; Arab=Arabia; Temp=Temperate; Baluchist=Baluchistan; Subtrop=Subtropical; Geront=Gerontia; Amphig=Amphigaea; and Arct=Arctic

(3) Indigenous uses of APS: In the present study, an attempt has been made to identify alien species with proven value for they have been used by the native communities for relieving themselves from a number of day-today ailments, as the plants and their parts were used for the treatments of many ailments, such as stomach disorder, fever, headache, toothache and other ailments etc. Detailed list of such species with their use values have been presented in Table 4.

Table 4. Non-native species, their altitudinal distribution and indigenous uses

Taxa	*Local name*	*Altitudinal range (m)*	*Life Form*	*Part used*	*Indigenous Medicinal Uses*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Achyranthaceae					
Achyranthes aspera L.	Latjira	2000-3000	H	W P	Antifertility in women, dysentery, ear and eye complaints, leucoderma, pains in ribs and body, piles, skin disorder, stomachache, toothache
Achyranthes bidentata Bl.	Adhajhar	2000-2200	H	W P	Fever, whooping cough, jaundice
Apiaceae					
Carum carvi L.	Kala Jeera	2500-4000	H	Sd	Carminative, cold, cough, fever, stomach disorder; edible
Seseli sibiricum (L.) Boiss.	Takkar	3000-3500	H	Lf, Rt	Mental disorder
Araceae					
Arisaema flavum (Forsk.) Schott.	Bang	3500-4000	H	Bb	Skin diseases
Araliaceae					
Hedera nepalensis Koch.	-	2300-3500	Sh	Lf, Fr	Stimulent, diaphoretic, cathartic, rheumatism
Asteraceae					
Adenostemna lavenia (L.) Kuntze	-	2200-2800	H	Lf	Antiseptic, insect bite, cuts, wounds
Artemisia maritima Pamp.	-	3500-4500	H	W P	Anthelmintic, antiseptic on cuts, gastric, blood (Cl.) purifier
Artemisia nilagarica Pamp.	Pati, Kunj	2000-2700	H	W P	Abscess, analgesic, anthelmintic, antiseptic, (Cl.) antispasmodic, asthama, ear complexes, epilepsy

(Contd...)

(Contd...)

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Bidens pilosa L.	Samasa, Ara- Ka- jhar,	2000-2500	H	W P	Cough, cuts, diarrhoea, ear & eye complaints, headache, inflamation, leprosy, skin disorder, snakebite, sores, wounds; edible
Blumea laciniata (Roxb.) DC.	-	2200-2600	H	Lf	Eczema, skin disorder
Tagetes minuta L.	Gutti	2200-2500	H	W P	Aromatic
Taraxacum officinale Weber	Kanphul	2200-4000	H	W P	Blisters, blood purifier, bowels, diuretic, dislocation of joints, dysentery, foment, gastric ulcers, headache kidney diisorder, liver complaints, tonic vertigo, wounds
Berberidaceae					
Berberis aristata DC.	Kilmora	2200-3000	Sh	Rt, Br, Fr	Rat & snake bite, boil, eye complaints, anticancer, blood pressure, hypoglacaemic; edible
Brassicaceae					
Arabidopsis thaliana (L.)Heynh.	-	3000-3600	H	W P	Treatment of sores in the mouth
Capsella bursa-pastoris (L.) Medic.	-	2000-4000	H	W P	Blood pressure, diarrhoea, dropsy
Raphanus sativus L.	Mooli	2000-3500	H	Lf, Sd, Rt	Acidity, rashes, ringworm, skin eruption; edible
Thlaspi arvense L.	-	3200-4200	H	W P	Wounds, cuts, pulmonary infection, swelling
Cannabinaceae					
Cannabis sativa L.	Bhang	2000-3000	H	Lf, Br, Sd, Fr, Fl,	Antihelminthic, appetite, bowel complaints, bronchitis, cuts dyspepsia, ear and eye complaints, gonorrhoea, narcotic, piles, skin disorder, skin eruption, cold, cough, convulsions, cramps, epilepsy, laxative, nervine stimulant, paralysis of tonge, sleep pills, sores, tetanus; edible

(Contd...)

(Contd...)

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Caryophyllaceae					
Stellaria media (L.) Vill.	Wolmara	2000-2500	H	WP	Bone fracture; edible
Chenopodiaceae					
Chenopodium foliolosum (Moench.) Asch.	-	3000-4000	H	Lf	Edible
Commelinaceae					
Commelina bengalensis L.	-	2200-2500	H	Lf, Rt	Fever, diarrhoea, liver disorder; edible
Cucurbitaceae					
Cucumis melo L.	Kharbooza	2000-2700	H	Fr, Sd	Cooling, stomach disorder
Cucurbita maxima Duch. ex Lam.	Kaddu	2000-3000	H	Fr, Sd	Intestinal worms; edible
Melothria heterophylla (Lour.) Cogn.	Gwalkakri	2200-2500	H	Rt, Lf, Fr	Antifertility, cuts, diabetes, fever, stomachache; edible
Cupressaceae					
Juniperus communis L.	Pallas	3500-4500	Sh	Fr, Lf	Aromatic, incense
Dioscoreaceae					
Dioscorea deltoidea Kunth	Gun	2400-2800	H	Tu	Edible
Elaeagnaceae					
Elaeagnus parviflora Wall. ex Royle	Gewai	2200-3000	T	WP	Pulmonary disorder; edible

(Contd...)

(Contd...)

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Hippophae salicifolia Don	Garchuk	2500-3000	T	Br, Fr	Cuts, ulcer, wounds; edible
Ericaceae					
Gaultheria fragrantissima Wall.	Jalan-thrait	3000-4000	H	Lf, Fr	Cough, cold; edible
Fabaceae					
Parochetus communis Don	Khia-knoi	2100-2800	H	Fl	Stomach disorder
Gentianaceae					
Lomatogonium cariathiacum (Wulf.) Br.	Tikta	3500-4000	H	WP	Antipyretic, cold, cough
Geraniaceae					
Geranium nepalense Sw.	Laljari	2200-3200	H	Rt	Cuts, jaundice, toothache, ulcer, wounds, stomach complexes,
Hypoxidaceae					
Curculigo orchioides Gaertn.	Talmuli, Turum		2400-3000	H	WP Stomach disorder, scorpion and snake bite, wounds, skin diseases, itching, cough, cold
Lamiaceae					
Clinopodium vulgare L.	-	2400-3800	H	Lf, Infl	Astringent, carminative, heart tonic
Thymus linearis Benth.	Ban ajwain	2500-4000	H	WP	Eye complaints, vermicidal, liver & skin disorder; edible
Liliaceae					
Allium cepa L.	Piyaj	2000-2500	H	Bb, Lf	Antihelminthic, asthma, nose bleeding, blisters,

(Contd...)

(Contd...)

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
					boils, bronchitis, diuretic, ear complaints, eye complaints, expectorant, giddiness, insect bites, itching, piles, ringworm, rubefacient, sedative, skin disorder, stomach disorder, vomiting, wounds; edible
Allium humile Kunth.	Dum, Kotsi	3300-4000	H	Lf	Edible
Allium wallichii Kunth.	-	3300-3600	H	Bb	Edible
Polygonatum verticillatum L.	Khol,	2300-4000	H	Tu	Aphrodisiac, appetite, nervine tonic, tonic; edible
Moraceae					
Ficus palmata Forsk.	Bedu	2000-2200	T	Fr	Dysentery, indigestion, laxative; edible
Oleaceae					
Jasminum humile L.	Sungli	2500-3500	Sh	Br, Rt	Sinus, skin disorder
Oxalidaceae					
Oxalis corniculata L.	Khatta-mitha	2000-2500	H	W P	Appetite, corns, cuts, dysentery, fever, jaundice, rickets, scurvey, stomachache, swelling, wart; edible
Paeoniaceae					
Paeonia emodi Wall.	Chandra	2300-2700	H	Rt, Lf, St	Blood purifier, cuts, ulcers, wounds, dysentery, colic, convulsions, dropsy, epilepsy, hysteria, mental disorder, rheumatism, urinary complaints
Plantaginaceae					
Plantago lanceolata L.	Kashur-gula	2600-3200	H	Lf	Blood purifier
Polygonaceae					
Fagopyrum esculen- (L.) Moench.	Ugal	2200-3500	H	Rt, Fr, Lf	Lung disorder, rheumatism, typhoide, urinary *tum* complaints; edible

(Contd...)

(Contd...)

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Fagopyrum tataricum (L.) Gaertn.	Phaphar	2000-3500	H	Lf	Edible
Polygonum nepalense Meisn.	Ratnala	2000-3500	H	WP	Swelling
Rumex acetosa L.	Chuk	3500-4000	H	Sh, Lf, Fr	Edible
Rumex nepalensis	Khuldia	2000-4200	H	Lf, Rt, Tw	Boils, colic, cooling, diuretic, purgative, scurvy, Spr. swelling of muscle; edible
Ranunculaceae					
Anemone rivularis Ham.	Jangali kakar	2400-3000	H	Lf, WP	Ear complaints, maggots in sores, fracture
Ranunculus diffusus DC.	-	2500-3800	H	WP	Boils
Rhamnaceae					
Rhamnus virgatus Roxb.	Chato, Chadna		2400-3000	Sh	Fr Emetic, purgative, affection of spleen
Rosaceae					
Fragaria nubicola Lindl.	Bhuila	2500-3500	H	Fr	Edible
Prunus armeniaca L.	Chuli	2000-3800	T	Fr	Edible
Prunus cornuta (Royle) Steud.	Jamun	2490-3500	T	Sd	Rheumatism, wounds; edible
Prunus persica	Aaru, Khumani	2400-2600	T	Sd, Fr,	Antiseptic, eczema, headache, Batsch. scabies; edible
Rubiaceae					
Galium rotundifolium L.	Jharjharia	2000-3000	H	WP	Bronchitis, sorethroat, tonsil, wounds

(Contd...)

(Contd...)

(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Scrophulariaceae					
Lindenbergia indica (L.) Kuntze	Dhol, Gazdar	2000-2400	H	Lf	Bronchitis, skin eruption, sore throat, toothache
Violaceae					
Viola biflora L.	Banafsha	2700-4300	H	Lf, Fl, Sd,	Cold, cough, skin disorder, antiseptic, antispasmodic, laxative, diaphoretic
Viola canescens Wall.	Banafsha	2000-3500	H	Lf, Fl	Asthma, bronchitis, cold, cough, eye disorder, malaria
Viola pilosa Bl.	Banafsha	2000-2600	H	W P	Antipyretic, bilious, cold, cough, diaphoretic, fever, lung disorder, purgative
Vitaceae					
Parthenocissus himalayana (Planch.) Royle	-	2200-3500	H	Fr	Edible

Discussion

APS also known as non-native species are those species which have their origin elsewhere and in the course of time they have established in some new habitat/ecosystem or biogeographical region. With changes in climatic conditions particularly increase in temperature, diversity of alien species is also changing and they are progressively establishing themselves in higher latitudes and higher altitudes. It has also been noticed that these species are usually hardy and are capable of surviving in adverse conditions with minimal nutrition availability. APS are generally regarded as disturbing elements in an ecosystem, however, all of them are not harmful. Only those species which become invasive, may pose serious threats to the native ones. An increasing body of evidence supports this view and invasive APS are found to have markedly significant reducing effects in the species richness of invaded plant communities world-(Gaertner et al., 2009; Powell et al., 2011; Vila et al., 2011). However, the evidence base for alien plant species impacts is strongly biased towards results drawn from only a dozen species and may not be representative of the majority of alien plant invasions(Hulme et al., 2013). Majority of the alien species do not have adverse impacts in an ecosystem, however, only invasive species do have adverse impacts. It has been shown in a study that it is only a minority of alien species, approximately 10%, that are associated with statistically significant declines in native species richness (Bernard-Verdier & Hulme, 2015).

Although the alien species have their origin elsewhere and in the course of time they have immigrated to the pristine ecosystems and habitats. Many of these species are now so well established in the various ecosystems that local inhabitants have given them some local names and they use whole plant or various parts of the plant in a diversity of ways. Many of such aliens have proved to be quite useful for being medicinally or for other reasons important for the inhabitants. Such properties of APS can be utilized for the benefit of human societies. Even the management of invasive species is possible by identifying its utilizable property and utilization of the same can effectively control their population. In fact, many of the alien species are medicinally important species and some parts or whole plant is used for curing many ailments. It has been evident from our study that inhabitants of NDBR do have knowhow of medicinal uses of sixty three (63) APS. They use these APS in curing several ailments. Such APS can prove to be very useful if their option value is utilized appropriately. Further, it will also help in better conservation and management of such species.

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