Palatability status of the Flora of Koh-e-Safaid Range Upper Kurram Valley, Khyber PakhtunKhwa North West Pakistan

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Research

Abstract

Background: The current study was carried out in Upper Kurram, Khyber Pakhtunkhwa, Pakistan from 2015 to 2019. Grazing is the most common of the land uses by domestic and wild animals. Grazing is the most significant biotic stress in terrestrial ecosystem after the fire factor.

Objectives: Objectives of the study were; to find out the Palatability status of the Flora of Koh-e-Safaid Range Upper Kurram Valley, KP Pakistan; to record the flora of grazing and browsing livestock preferences in the field.

Methodology: The palatability of plant species was recorded by observing the grazing livestock in the field. Cattle were visually observed to determine their preferences. All the information's were confirmed from local elders. Palatable species were categorized into Highly Palatable (HP), Mostly Palatable (MP), Less Palatable (LP), Rarely Palatable (RP) and Non-Palatable (NP).

Results: The current study reported five palatability classes based on their utilization by animals. Highest number of plants fell under the group of highly palatable plants 261 (39.90%) which includes *Cynodon dactylon, Dicanthium annulatum, Medicago sativa* and *Rubus fruticosus.* The number of mostly palatable plants were 148 (22.62%) such as *Alopecurus agrestis*, *Brachiaria ramosa*, *Gagea reticulata, Melica persica, Polypogon viridis*. The number of rarely palatable plants were 73 (11.16%) such as *Allium griffithianum, Achyranthes aspera*, *Alteranthera pungens*, and *Dioscorea deltoidea*, while 27 (4.12%) plants were observed less palatable such as *Coronopus didymus, Carthamus oxyacantha and Ranunculus afghanicus.* A total of 145 (22.17%) plants were observed as non-palatable of which *Abies pindrow*, *Agave americana, Alajja rhomboidea, Cedrus deodara* and *Hertia intermedia* were significant among the non-palatable species.

Conclusions: Various factors impact the palatability of plants in different localities of the world. These factors include morphology, phenology, minerals and secondary metabolites in a plant. Like most herbivores, it preferred smaller leaves with a smaller specific leaf area and a higher dry matter content in the leaf. Phenological changes

associated with climate change are related to the seasonal availability and palatability of food plants. The presence of minerals like Ca, Mg and K, Fe, Mn, Mg and Ca in different palatable plants in Kurram indicates the reason for their palatable condition. Secondary metabolites such as glycosides, alkaloids, nitrates and others such as oxalate, lectins and tannins have an adverse effect on the taste of plants.

Keywords: Palatability, grazing, species, Kurram, Pakistan

Background

Phytosociologically the vegetation and forests of Koh-e-Safaid slopes are Sino-Japanese type (Gilani *et al.* 2003). The natural forests of Kurram cover about 08 % of its area while the Parachinar Forest Department has planted about 12 % area. The land under cultivation is 35 % while the rest of 47 % is barren. The major forest type of the Kurram is dry tropical forest and subalpine scrub by (Hussain *et al.* 2013). The area is very rich in plant resources however; little ecological work has been done. The Dry Tropical vegetation covers the Southern parts while, dry Temperate and Alpine vegetation types are found in the Northern parts of the area (Hussain *et al.* 2012; Badshah *et al.* 2016). Palatability is the property of a plant being acceptable to eating or the degree to which animals like forage plants based on its taste (Hussain and Durrani 2009; Ali *et al.* 2018). The percentage accessibility of palatable species dropped during winter season and generally affected the grazing animals (Ibrar 2003). During this season livestock are bound to use the non-palatable plants. Some of the nutritional complications correlated to the development and reproduction of animals were low minerals contents in the soil and fodder plants in the particular environment. The concentration of macro and micro elements varies in forage plants at different growth stages (Dastagir *et al.* 2014). Various factors impact the palatability of plants in different localities of the world. These factors include morphology, phenology, minerals and secondary metabolites in a plant (Jackson and Ash 2001; Ibrar 2003; Hussain and Durrani 2009). Herbivores preferred smaller leaves with lower specific leaf area and higher leaf dry matter content. Climate change related shifts in phenology are correlated with the seasonal availability and palatability of food plants. The presence of minerals like Ca, Mg and K, Fe, Mn, Mg and Ca levels species in district Kurram indicates the reason behind palatable status of selected palatable plants at different phenological stages (Hussain *et al.* 2021). A major constraint to the use of some of the livestock feeds is the presence of toxic and plant secondary metabolite such as Glycosides, Alkaloids, Nitrates and Others like Oxalate, Lectins, and tannins. These constituents have different but adverse effects on animal performance including loss of appetite and reductions of dry matter intake and nutrients digestibility. They are produced in plants for protective purposes for the plants itself and to adapt to environmental stresses. Some of them are deleterious and some are beneficial, some of which may be nutritionally valuable, but many have no nutritional value or nutritionally detrimental effects (Attia, 2015).This increase in the forage quality of forbs is reported to have improved diet quality and feed intake for grazing animals (Le *et al.* 2009). Some forbs are more palatable in their pre-reproductive stage while the others are consumed more in their reproductive and post-reproductive stages. It has been observed that goats prefer shrubs and cattle grasses and forbs (Khan, 2006). Launchbaugh *et al.* (1990) stated that the degree of overlap between sheep and goats in dry season is greater because of inaccessibility of forbs. Black and Kenney (1984) highlighted that sheep prefer the plants in fresh form to dried form due to taste and experience. Pfister and Malechek (1986) reported that flowers and fruits were important in animal diet during different seasons. Migongo and Hansen (1987) have observed that sheep of East Africa consume more than 50 % grasses in all seasons. Wahid (1990) stated that goats and sheep diet contained (53-81 %) shrubs in different rangelands of Balochistan. On the basis of preferences, animals may be categorized as foliovores, grazers, grainvores and browsers (Gunasekran *et al.* 2014). The objectives of the study were; to find out the palatability status of the Flora of Koh-e-Safaid Range Upper Kurram Valley, KP, Pakistan; to record the flora of grazing and browsing livestock preferences in the study area.

Materials and Methods

Study area

Koh-e-Safaid Range is a tribal territory banding Pakistan with Afghanistan in Kurram Agency. It lies between 33°20′ to 34° 10′ N latitudes and 69° 50′ to 70° 50′ E longitudes (Fig. 1).This area is federally administered by the Government of Pakistan. The Agency is surrounded on the east by Orakzai and Khyber agencies, in the southeast by Hangu district, and in the south by North Waziristan Agency and Nangarhar and Pukthia of Afghanistan lies on its west. The highest range of Koh-e-Safaid is Sikaram peak with, 4728 m height. The area is well-populated with many small, fortified villages receiving irrigation water from Kurram River that flows through it. The weather of the Agency is mostly pleasant in summer; however, in winters, freezing temperature is experienced, and sometimes falls to −10 °C. The weather charts website "Climate-Charts" ranked it as the fourth coldest location in Pakistan.

Autumn and winter are usually dry seasons while summer and spring receive much of the precipitation (Hussain *et al.* 2018; Hussain *et al.* 2019) (Fig.1).

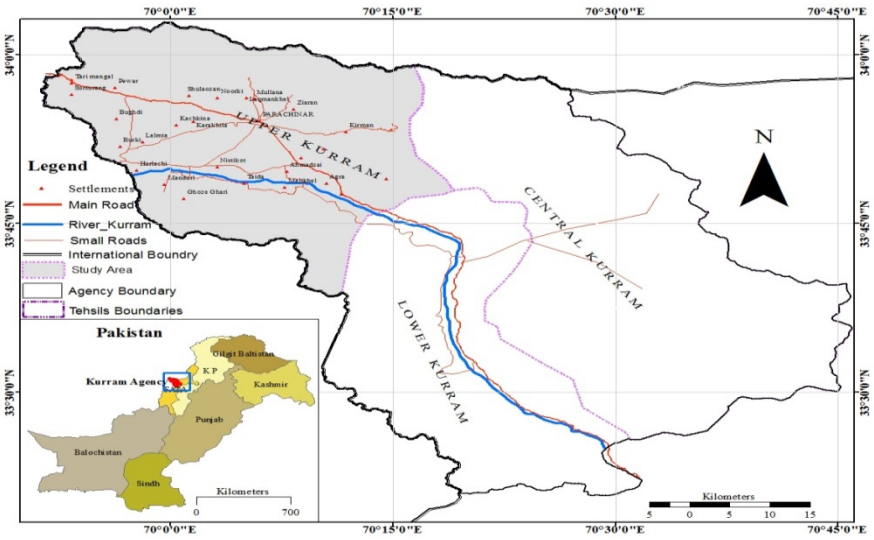

Figure 1. Map of the study area

Survey

Differential plant palatability was recorded by daily monitoring of individual animals' grazing preferences for different plant species, plant parts, and plant conditions for four consecutive years (2015 to 2019) from spring to summer and summer to winter repeatedly in different areas of Upper Kurram district, Pakistan.

Grazing animals

A total of five animals i.e. goat, cow, sheep, and donkey were studied for their preference as different animals have different plant selection options for grazing and grazing. All animals were personalized for the presence of humans; it was possible to notice your favorite grazing from a few meters. Data analysis was finalized with the help of group deliberations among different age groups of the research area comprising genders, villagers and pastoralists of the society. Information on plant palatability was obtained from local experts through personal interviews.

Palatability classes of plants

Palatable species were categorized based on consumption into Highly Palatable (HP), Very Palatable (MP), Less Palatable (LP), Rarely Palatable (RP), and Unpalatable (NP) following (Hussain and Durani 2009; Ali *et al.* 2016; Hussain *et al.* 2016; Hussain et *al.* 2020).

Plants anthology and safeguarding

Data were classified, tabulated, analyzed and performed for final declaration. The plants were collected, dried and preserved for identification. Plants were identified with the help of available literature (Ali and Qaiser, 1995) and specimens were deposited in the herbarium, Department of Botany, University of Peshawar, Pakistan.

Result and Discussion

Study on the plant palatability revealed that 261(39.90%) out of 654 plants were highly palatable, 148 (22.62%) plants were mostly palatable, 73 (11.16%) plants were rarely palatable, 27 (4.12%) plants were less palatable, and 145 plants were non palatable as shown in (Table 1). In the field, animal first choice may be recorded by direct observation of what is being eaten or by a calculation of the progressive consumption of the plants themselves (Palkova and Leps 2008). Palatability is positively associated with nitrogen concentration, water content of leaves and negatively correlated with carbon content as well as carbon/nitrogen ratio in aerial parts of plant body (Schuur *et al.* 2001; Ahmad *et al.* 2014; Tariq *et al.* 2015; Zi-Li Yin *et al.* 2017). Palatability is also influenced by various other features like period, phase of pregnancy, general health, and preference for forage species and appetite of animal (Khan *et al.* 2012). Various factors impact the palatability of plants in different localities of the world. These factors include morphology, phenology, minerals and secondary metabolites in a plant (Ibrar 2003; Hussain and Durrani 2009; Khan and Hussain 2012). Herbivores preferred smaller leaves with lower specific leaf area and higher leaf dry matter content. Climate change related shifts in phenology are correlated with the seasonal availability and

palatability of food plants. The minerals concentration of Ca, Mg and K, Fe, Mn, Mg and Ca levels increased at pre-reproductive to post reproductive stage of selected species in district Kurram indicates the reason behind palatable status of selected palatable plants at different phenological stages (Hussain *et al.* 2021). A major constraint to the use of some of the livestock feeds is the presence of toxic and plant secondary metabolite such as Glycosides, Alkaloids, Nitrates and Others like Oxalate, Lectins, and tannins. These constituents have different but adverse effects on animal performance including loss of appetite and reductions of dry matter intake and nutrients digestibility. They are produced in plants for protective purposes for the plants itself and to adapt to environmental stresses. Some of them are deleterious and some are beneficial, some of which may be nutritionally valuable, but many have no nutritional value or nutritionally detrimental effects (Attia, 2015).

Woody plants have the ability to increase soil nutrients concentration and can influence the quality of forbs by improving dry matter digestibility and nitrogen contents in the leaves. Phenological aspects of the plants may affect the palatability of plants by animals due to accumulation and concentration of certain elements (Miller and Thompson 2005; Gunasekran *et al.* 2014). Reviewing of literature confirmed that the elemental concentrations increases or decreases in different phenological stages plant species (Milewski and Madden, 2006). Some grazing animals prefer to consume a plant in its fresh form while others in dry form due to presence of different natural products and morphological adaptation. On the basis of preferences, animals may be categorized as foliovores, grazers, grainvores and browsers (Ibrahim *et al.* 2015; Hussain *et al.* 2016).

Palatability and related characteristics

The current study reported five palatability classes based on their utilization by animals. Highest number of plants fell under the group of highly palatable plants 261 (39.90%) which includes *Amaranthus viridis, Cynodon dactylon, Dicanthium annulatum, Medicago sativa*, *Rubus fruitcosus and Rumex dentatus* (Fig.4). The number of mostly palatable plants were 148 (22.62%) such as *Alopecurus agrestis*, *Brachiaria ramosa*, *Gagea reticulata, Melica persica, Polypogon viridis*. The number of rarely palatable plants were 73 (11.16%) such as *Allium griffithianum, Achyranthes aspera*, *Alteranthera pungens*, *Dioscorea deltoidea, Daphne mucronata, Tagetes minuta, Verbena officinalis* and *Xanthium spinosum* while 27 (4.12%) plants were observed less palatable such as *Coronopus didymus, Carthamus oxyacantha, Diospyros kaki, Ranunculus afghanicus, Sophora mollis* and *Tulipa stellata.* A total of 145 (22.17%) plants were observed as non-palatable of which *Abies pindrow*, *Agave americana, Alajja rhomboidea, Cedrus deodara*, *Cupressus sempervirens*, *Ephedra gerardiana, Equisetum arvense*, *Euphorbia helioscopia, Hertia intermedia* were chief among the non-palatable species (Figure 2, 3).

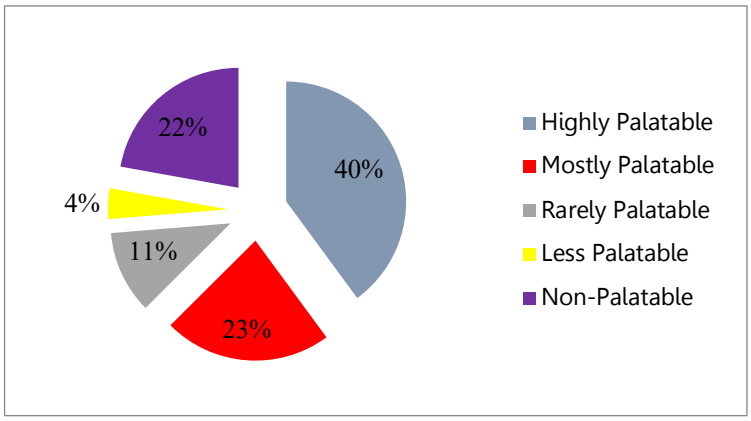

Figure 2. Percentage of palatable classes

The grazing stress helps the species richness of non-palatable species of an area. Due to over grazing some non-palatable plants is preferred to be consumed (Gorade and Datar 2014). Reduced palatability of plants by livestock is often due to presence of chemicals such as volatile oils, spines, hairs, rigidity, rough texture, bad odor and poor taste. A total of 412 plants were eaten fresh by the livestock. Livestock utilized a bulk of 190 plants in dry condition while 85 species were eaten in fresh as well as dry. Phenology affects the palatability of plants, and it is a common observation for most of the plants that the older they get the less palatable, they become. It is mainly due to the decreasing moisture content in plants with age (Ibrahim *et al.* 2015). A total of 396 species were consumed by cows, 278 species by horses, 263 species by donkeys, 502 by goats and 493 by sheep in Upper Kurram. The shepherds take sheep to pastures during the spring and summer season where 346 species were observed to be grazed and browsed. Results for animal preferences with similar nature are reported by (Angasa and Baars 2001; Hussain and Durrani 2008; Milewski and Madden 2006; Sultan *et al.* 2009).

Table 1. Checklist of the flora regarding the palatability status of Koh-e-Safaid Range Upper Kurram

S.No	Division/ Family/Species	Palatability Classes					Animal Observation										
		NP	RP	LP	MP	HP	A	L	I	F	D	B	C	G	S	D	H
A. Pteridophytes																	
	1. Adiantaceae																
1	*Adiantum venustum* D. Don	-	+	-	-	-	-	+	-	+	-	-	+	+	+	-	-
2	*Adiantum capillus–veneris* L.	-	+	-	-	-	-	+	-	+	-	-	+	+	+	-	-
	2. Aspleniaceae																
3	*Asplenium trichomane*s L.	-	+	-	-	-	-		-	+	-	-	+	+	+	-	-
	3. Dennstaedtiaceae																
4	*Pteridium aquilinum* (L.) Kuhn	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4. Equisetaceae																
5	*Equisetum arvense* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B. Gymnosperm																	
	5. Cupressaceae																
6	*Cupressus sempervirens* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	*Cupressus funebris* Endl.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	*Juniperus communis* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	*Juniperus excelsa* M.eBieb	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	*Thuja orientalis* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6. Ephedraceae																
11	*Ephedra gerardiana* Wall. Ex. Stapf	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	*Ephedra intermedia* Schrenk & C.A. Mey	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7. Pinaceae																
13	*Abies pindrow*(Royle. ex D. Don.) Royle	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	*Cedrus deodara* (Roxb. ex. Lamb.) G. Don	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	*Picea smithiana* (Wall.) Boiss	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	*Pinus gerardiana* Wall. ex D. Don	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	*Pinus halepensis* Mill.	+		-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	*Pinus roxburghii* Sarg.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	*Pinus wallichiana* A.B. Jacks.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	8. Taxacacea																
20	*Taxus fauana* Nan Li & R.R. Mill.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C. Angiosperm																
	Monocotyledons																
	9. Agaveaceae																
21	*Agave americana* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	10. Alliaceae																
22	*Allium cepa* L.	-	+	-	-	-	-	+	+	+	-	-	+	+	+	-	-

23	*Allium sativum* L.	-	+	-	-	-	-	+	+	+	-	-	+	+	+	-	-
24	*Allium caspium* (Pall.) M.B ieb.	-	+	-	-	-	-	+	+	+	-	-	+	+	+	-	-
25	*Allium griffithianum* Boiss	-	+	-	-	-	-	+	+	+	-	-	+	+	+	-	-
26	*Allium neapoltinum* Cirillo	-	+	-	-	-	-	+	+	+	-	-	+	+	+	-	-
27	*Allium robustum* Kar. & Kir.	-	+	-	-	-	-	+	+	+	-	-	+	+	+	-	-
28	*Allium senescens* L.	-	+	-	-	-	-	+	+	-	-		+	+	+	-	-
	11. Amaryllidaceae																
29	*Ixiolirion tataricum* (Pall.) Schult. & Schult. f.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	*Narcissus jonquilla* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	*Narcissus tazetta* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	12. Araceae																
32	*Arisaema jacquemontii* Blume	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	*Arisaema utile* Hook. f. ex Engl.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	13. Areceae																
34	*Nannorrhops ritchieana* (Griff.) Aitch.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	14. Asparagaceae																
35	*Asparagus adscendens* Roxb.	-	-	+	-	-	+	-	-	+	-	-	-	+	-	-	-
36	*Polygonatum verticillatum* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	15. Colchicaceae																
37	*Colchicum robustum* (Bunge) Stef.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
38	*Colchicum luteum* Baker	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	16. Cyperaceae																
39	*Cyperus eleusinoides* Kunth	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
40	*Cyperus rotundus* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
	17. Dioscoreaceae																
41	*Dioscorea deltoidea* Wall Griseb.	-	+	-	-	-	+	+	+	+	-	-	-	-	+	-	-
	18. Iridaceae																
42	*Iris germanica* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
43	*Iris pallida* Lam.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44	*Moraea sisyrinchium* (L.) Ker-Gawl.	-	+	-	-	-	+	+	+	+	-	-	-	-	+	-	-
	19. Juncaceae																
45	*Juncus bufonius* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
46	*Juncus inflexus* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
	20. Liliaceae																
47	*Gagea pratensis* (Pers.) Dumort.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
48	*Gagea reticulate* (Pall.) Schult. & Schult.f .	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
49	*Hemerocallis fulva* (L.) L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50	*Lilium polyphyllum* D. Don	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
51	*Notholirion thomsonianum* (Royle) Stapf	-	-	+	-	-	+	+	+	+	-	-	+	+	+	-	-
52	*Tulipa lehmanniana* Merckl.	-	-	+	-	-	+	+	+	+	-	-	+	+	+	+	+

53	*Tulipa clusiana* DC.	-	-	+	-	-	+	+	+	+	-	-	+	+	+	+	+
54	*Tulipa stellate*aL.	-	-	+	-	-	+	+	+	+	-	-	+	+	+	+	+
	21. Orchidaceae																
55	*Goodyera repens* (L.) R. Br.	-	+	-	-	-	-	+	-	+	-	-	-	+	-	-	-
56	*Zeuxine strateumatica* (L.) Schlt.	-	+	-	-	-	-	+	-	+	-	-	-	+	-	-	-
	22. Poaceae																
57	*Agrostis munroana* Aitch. & Hemsl.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
58	*Agrostis viridis* Gouan	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
59	*Alopecurus agrestis* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
60	*Alloteropsis cimicina* (L.) Stapf.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
61	*Apluda mutica* L	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
62	*Aristida adscensionis* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
63	*Aristida cyanantha* Steud.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
64	*Arundo donax* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	*Aristida mutabilis* Trin. & Rupr.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
66	*Avena sativa* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
67	*Avena fatua* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
68	*Bromus catharticus* Vahl	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
69	*Bromus hordeaceus* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
70	*Bromus remosus* Huds	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
71	*Bromus pectinatus* Thunb	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
72	*Bromus tectorium* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
73	*Brachiaria ramose*a(L.) Stapf.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
74	*Calamagrostis decora* Hook.f .	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
75	*Calamagrostis emodensis* Griseb	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
76	*Calamagrostis holociformis* Jaub. & Spach	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
77	*Carex sempervirens* Vill.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
78	*Cenchrus ciliaris* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
79	*Cymbopogon jwarancusa* (Jones) Schult	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
80	*Cynodon dactylon* (L.) Pers.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
81	*Dactylis glomerata* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
82	*Dicanthium annulatum* (Forssk.) Stapf	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
83	*Digitaria sanguinalis* (L.) Scop.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
84	*Echinochloa crus-galli* (L.)P.Beauv	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
85	*Eragrostis amabilis* (L.) Wight & Arn.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
86	*Eragrostis cilianensis* (All.) Janch.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
87	*Eragrostis minor* Host	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
88	*Festuca gigantea* (L.) Vill.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
89	*Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+

90	*Hordeum murinum* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
91	*Hordeum spontaneum* K. Koch.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
92	*Hemarthria sibirica* (Gand.) Ohwi	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
93	*Hyparrhenia hirta* (L.) Stapf	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
94	*Imperata cylindrical* (L.) Raeusch.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
95	*Koelaria cristata* (L.) Link	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
96	*Koelaria macrantha* (Led) Schult	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
97	*Koeleria phleoides* Vill. Pers.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
98	*Kobresia schoenoides* (C.A. Mey.) Steud.	-	-	-	+	-	+	+	+	+	+	-	+	+	+	-	+
99	*Lolium temulentum* L.	-	-	-	+	-	+	+	+	+	+	-	+	+	+	-	+
100	*Lolium perenne* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	+
101	*Muehlenbergia montana* (Nutt.) Hitchc.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	+
102	*Melica jacquemontii* Decne	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
103	*Melica persica* Kunth.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
104	*Oryza sativa* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
105	*Paspalidium flavidum* (Retz.) A. Camus	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
106	*Pennisetum flaccidum* Griseb	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
107	*Pennisetum orientale* Rich.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
108	*Phleum paniculatum* Huds.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
109	*Piptatherum aequiglume* Roshev.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
110	*Oryzopsis gracilis* (Mez) Pilg.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
111	*Piptatherum miliaceum* (L.) Coss.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
112	*Piptatherum lateral* Munro ex Aitch	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
113	*Poa annua* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
114	*Poa alpina* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
115	*Poa pratensis* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
116	*Polypogon viridis*(Gouan) Breistr.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
117	*Rostraria cristata* (L.) Tzvelev	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
118	*Saccharum griffithii* Munro. ex Aitch.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
119	*Saccharum rufipilum* Steud.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
120	*Setaria verticillata* (L.) P. Beauv.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
121	*Setaria viridis* (L.) P. Beauv.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
122	*Setaria pumila* (Poir) Roem. & Schult.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	+
123	*Sorghum halepense* (L.) Pers.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	+
124	*Stipa sibirica* (L.) Lam.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	+
125	*Tetrapogon villosus* Desf.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	+
126	*Themeda anathera* (Nees ex Steud.) Hack.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	+
127	*Triticum aestivum* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
128	Zea mays L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
	23. Potamogetonaceae																

129	*Potamogeton oblongus* Viv	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	24. Typhaceae																
130	*Typha minima* Funck	-	+	-	-	-	-	+	-	+	-	-	+	+	+	+	+
	D. Dicotyledons																
	25. Acanthaceae																
131	*Strobilanthes glutinosus* Nees	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
132	*Strobilanthes urticifolia* Wall. ex Kuntze	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	26. Amaranthaceae																
133	*Ruellia tuberosa* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
134	*Achyranthes aspera* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
135	*Alteranthera pungens* Kunth.	-	+	-	-	-	-	+	-	+	-	-	+	+	+	-	-
136	*Amaranthus albus* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
137	*Amaranthus caudatus* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
138	*Amaranthus blitum* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
139	*Amaranthus hybridus* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
140	*Amaranthus spinosus* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
141	*Amaranthus viridis* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
142	*Celosia argentea* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
	27. Anacardiaceae																
143	*Cotinus coggyria* Scop.	-	+	-	-	-	-	+	-	+	-	-	+	+	+	+	+
	28. Apiaceae																
144	*Berula erecta* (Huds.) Coville	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
145	*Bupleurum falcatum* L.	-	+	-	-	-	-	+	-	+	-	-	+	+	+	+	+
146	*Bupleurum longicaule* Wall. ex DC.	-	+	-	-	-	-	+	-	+	-	-	+	+	+	+	+
147	*Chaerophyllum reflexum* Aitch.	-	+	-	-	-	-	+	-	+	-	-	+	+	+	+	+
148	*Conopodium majus* (Gouan) Loret	-	+	-	-	-	-	+	-	+	-	-	+	+	+	+	+
149	*Coriandrum sativum* L.	-	+	-	-	-	-	+	-	+	-	-	+	+	+	+	+
150	*Eryngium corallinum* Mathias & Constance	-	+	-	-	-	-	+	-	+	-	-	+	+	+	+	+
151	*Foeniculum vulgare* Miller.	-	-	+	-	-	+	-	-	+	-	-	+	+	+	-	-
152	*Pimpinella diversifolia* DC.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	+
153	*Levisticum officinale* W.D.J.Koch	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	+
154	*Pleurospermum stylosum* C.B. Clarke	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	+
155	*Scandix pecten-veneris* L.	-	+	-	-	-	-	+	-	+	-	-	+	+	+	+	+
156	*Seseli libanotis* (L.) Koch	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-
157	*Torilis laptophylla* (L.) Rchb. f.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
158	*Torilis arvensis* (Huds.) Link	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
159	*Trachyspermum ammi* (L.) Sprague	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
	29. Apocynaceae																
160	*Nerium oleander* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	30. Araliaceae																

161	*Hedera nepalensis* K. Koch	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	31. Asclepiadaceae																
162	*Caralluma tuberculata* N.E. Br.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
163	*Calotropis procera* (Aiton) Dryond	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
164	*Periploca calophylla* (Baill) Roberty	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
165	*Vincetoxicum cardiostephanum* (Rech. f.) Rech. f.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	32. Asteraceae																
166	*Achillea wilhelmsii* K. Koch	-	+	-	-	-	+	+	+	+	-	-	-	+	+	-	-
167	*Rhaponticum repens* (L.) Hidalgo	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-
168	*Anaphalis margratacea* (L.) Benth	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
169	*Anaphalis triplinervis* Sims ex C.B Clarke	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
170	*Artemisia absynthium* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
171	*Artemisia biennis* Willd.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
172	*Artemisia maritime* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
173	*Artemisia persica* Boiss	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
174	*Artemisia scoparia* Waldst. & Kit	-	-	+	-	-	+	-	-	+	-	-	+	+	+	+	+
175	*Artemisia tournefortiana* Reichb	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
176	*Artemisia vulgaris* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
177	*Bellis perennis* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
178	*Bidens pilosa* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
179	*Carpesium cernuum* L.	-	+	-	-	-	+	+	+	+	-	-	-	+	+	-	+
180	*Carthamus oxyacantha* M. Bieb	-	+	-	-	-	+	+	+	+	-	-	-	+	+	+	+
181	*Carduus edelbergiii* Rech.f.	-	-	+	-	-	+	+	+	-	-	+	-	+	+	-	-
182	*Centaurea iberica* Trevir. ex Spreng.	-	+	-	-	-	+	+	+	+	-	-	-	+	+	-	-
183	*Cichorium intybus* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+
184	*Cirsium arvense* (L.) Scop.	-	-	-	+	-	+	+	+	+	-	-	-	-	-	+	+
185	*Cirsium falconeri* (Hook.f) Petr.	-	-	-	+	-	+	+	+	+	-	-	-	-	-	+	+
186	*Cirsium verutum* (D.Don) spreng)	-	-	-	+	-	+	+	+	+	-	-	-	-	-	+	+
187	*Cirsium vulgare* (Savi) Ten	-	-	-	+	-	+	+	+	+	-	-	-	-	-	+	+
188	*Cirsium wallichii* DC.	-	-	-	+	-	+	+	+	+	-	-	-	-	-	+	+
189	*Cnicus benedictus* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	*Conyza bonariensis* (L.) Cronquist	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
191	*Conyza canadensis* (L.) Cronquist	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
192	*Cousinia thomsonii* C.B. Clarke.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+
193	*Crepis sancta* (L.) Bornm.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
194	*Cynaria scolymus* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+
195	*Echinochloa colona* (L.) Link	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
196	*Echinop cornigerus* DC.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
197	*Eryngium corallinum* Mathias & Constance	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
198	*Galinsoga parviflora* Cav.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-

199	*Hertia intermedia* (Boiss) Kuntze	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
200	*Heteropappus altaicus* (Willd.) Novopokr.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	+
201	*Jurinea dolomiaee* Boiss.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
202	*Lactuca serriola* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
203	*Launaea procumbens* (Roxb.) Ramayya & Rajjagopal	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
204	*Leontopodium himalayanum* DC.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
205	*Matricaria chamomilla* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	+
206	*Onopordum acanthium* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
207	*Parthenium hysterophorus* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
208	*Phagnalon niveum* Edgew.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
209	*Pseudognaphalium luteoalbum* (L.) Hilliard. & B.L. Burtt.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
210	*Saussurea albescens* (DC) Sch. Bip	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
211	*Senecio chrysenthemoides* D.C	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
212	*Seriphidium kurramense* (Qazilb.)Y.R. Ling	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
213	*Silybum marianum* (L.) Gaertn.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
214	*Scorzonera raddeana* C. Winkl.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
215	*Sonchus asper* (L.) Hill	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
216	*Tagates minuta* L.	-	+	-	-	-	-	-	+	+	+	+	-	+	-	-	-
217	*Tanacetum artemisioides* Sch. Bip. ex Hook. f.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
218	*Taraxacum officinale* Webb.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
219	*Tragopogon gracilis* D. Don	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
220	*Xanthium spinosum* L.	-	+	-	-	-	-	+	+	+	+	+	-	+	-	-	-
221	*Xanthium strumarium* L.	-	+	-	-	-	-	+	+	+	+	+	-	+	-	-	-
	33. Balsaminaceae																
222	*Impatiens lemannii* Hook.f.& Thomoson	-	+	-	-	-	-	+	+	+	+	+	-	+	-	-	-
223	*Impatiens brachycentra* Kar. & Kir.	-	+	-	-	-	-	+	+	+	+	+	-	+	-	-	-
	34. Berberidaceae																
224	*Berberis aitchisonii* Ahrendt	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
225	*Berberis calliobotrys* Bien. ex Koehne	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
226	*Berberis lycium* Royle	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
227	*Berberis parkeriana* C.K. Schneid.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
228	*Berberis vulgaris* L.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
	35. Betulaceae																
229	*Betula utlis* D. Don	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
	36. Boraginaceae																
230	*Arnebia speciosa* Aitch. & Hemsl.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
231	*Asperugo procumbens* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
232	*Buglossoides arvensis* (L.) I.M. Johnst.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
233	*Cynoglossum glochidiatum* Wall. ex. Benth	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+

234	*Cynoglossum lanceolatum* Forssk.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
235	*Pseudomertensia anjumiae* Kazmi. in J Arn.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
236	*Heliotropium strigosum* Willd.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
237	*Nonea edgeworthii* DC.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
238	*Nonea taurica* Ledeb.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
239	*Onosma dichroantha* Bioss.	-	-	+	-	-	-	-	-	+	-	-	+	+	+	-	+
	37. Brassicaceae																
240	*Alliaria petiolata* (M. Bieb.) Cavara & Grande	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	+
241	*Alyssum desertorum* Stapf	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
242	*Arabidopsis wallichii* (Hook. f.& Thomson) N. Busch	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
243	*Brassica rapa* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
244	*Capsella bursa-pastoris* (L.) Medik	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
245	*Cardaria draba* (L.)Desv.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
246	*Cardaria chalepensis* (L.) Hand.-Mazz	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
247	*Chorispora tennella* (Pall) DC.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
248	*Coronopus didymus* (L.) Sm.	-	-	+	-	-	+	+	+	+	-	-	+	+	+	-	-
249	*Descurainia sophia* (L.) Webb ex Prantl	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
250	*Eruca sativa* Mill.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
251	*Erysimum melicentae* Dunn	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
252	*Erysimum repandum* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
253	*Isatis costata* C.A. Mey	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
254	*Isatis tinctoria* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
255	*Lepidium apetalum* Willd.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
256	*Lepidium daraba* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
257	*Lepidium latifolium* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
258	*Lepidium sativum* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
259	*Lepidium virginicum* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
260	*Malcolmia africana* (L.) R. Br.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
261	*Malcolmia cabulica* (Boiss.) Hook. f. & Thomson	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
262	*Nasturtium officinale* R. Br.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
263	*Neslia paniculata* subsp *thracica* (Velen.) Bornm.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
264	*Rhnapanus raphanistrum* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
265	*Rorippa islandica* (Oeder) Borbas	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
266	*Sisymbrium irio* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	+
267	*Sisymbrium sophia* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	+
268	*Sisymbrium loeselii* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	+
269	*Thlaspi andersonii* (Hook. f. & Thomson.) O.E. Schulz	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
270	*Thlaspi perfoliatum* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
271	*Thlaspi arvense* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
	38. Buddlejaceae																

272	*Buddleja crispa* Benth.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	39. Buxucaceae																
273	*Buxus papillosa* C.K. Schneid.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	40. Cactaceae																
274	*Opuntia monacantha* Haw.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	41. Campanulaceae																
275	*Campanula colorata* Wall.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
276	*Campanula tennuissima* Dunn	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
277	*Codonopsis ovata* Benth.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
	42. Canabinaceae																
278	*Cannabis sativus* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	+
	43. Capparidaceae																
279	*Cleome ariana* Hedge & Lamond	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
	44. Caprifoliaceae																
280	*Lonicera myrtillus* Hook. f. & Thomson	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
281	*Lonicera parvifolia* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
282	*Lonicera quinqueloculari*s Hardw.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
283	*Viburnum cotinifolium* D. Don	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	45. Caryophyllaceae																
284	*Arenaria orbiculata* Royle ex Edgew. & Hook. f.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
286	*Arenaria serpyllifolia* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
287	*Cerastium glomeratum* Thuill.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
288	*Dianthus orientalis* Admas	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
289	*Lepyrodiclis holosteoides* (C.A.Mey) Fenzl ex Fisch. & C.A Mey	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
290	*Silene conoidea* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
291	*Silene gonosperma* (Rupr.) Bocquet.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
292	*Silene vulgaris* (Moench) Garcke	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
	46. Ceasalpinaceae																
293	*Stellaria media* (L.) Vill.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
294	*Cassia senna* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
	47. Celastraceae																
295	*Gleditsia triacanthos* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
296	*Euonymus japonicus* Thunb.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
297	*Gymnosporia rolyleana* Wall.ex Lawson	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	48. Chenopodiaceae																
298	*Maytenus wallichiana* (Spreng) D.C.S Raju & Babu	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
299	*Atriplex lasiantha* Boiss	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
300	*Blitum virgatum* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
301	*Chenopodium album* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+

302	*Chenopodium ambrosioides* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
303	*Dysphania botrys* (L.) Mosyakin & Clemants	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
304	*Chenopodium murale* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
	49. Convolvulaceae																
305	*Salsola kali* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
306	*Convolvulus arvensis* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
307	*Ipomoea purpurea* (L.) Roth.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
308	*Ipomoea hederaceae* Jacq.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
	50. Crassulaceae																
309	*Hylotelephium ewersii* Ledeb.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
310	*Rhodiola pachyclados*(Aitch. & Hems) H. Ohba	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
311	*Rhodiola rosea* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
312	*Rhodiola wallichiana* (Hook.) S. H. Fu	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
313	*Rosularia adenotricha* (Wall. ex Edgew.) C.A. Jansson	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
314	*Sedum hispanicum* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
315	*Sedum niveum* Davidson	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
316	*Sedum ewerssi* Ledeb.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
317	*Sedum pachyclados* Aitch. & Hemsl.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
318	*Sedum adenotrichum* Wall.ex Edgew.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	51. Cucurbitaceae																
319	*Citrullus colocynthis* (L.) Schrad.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-
320	*Cucumis melo* L.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-
321	*Cucumis sativus* L.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-
322	*Cucurbita maxima* Duchesne	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-
	52. Cuscutaceae																
323	*Cuscuta reflexa* Roxb.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	53. Cyperaceae																
324	*Carex cardiolepis* Nees	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
325	*Cyperus flavescens* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
326	*Cyperus longus* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
327	*Cyperus rotundus* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
328	*Erioscirpus comosus* (Wall.) Palla	-	+	-	-	-	+	+	+	+	+	+	+	+	+	+	+
329	*Kobresia scirpina* Willd.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
330	*Scirpus maritimus* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
331	*Scirpus setaceus* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
	54. Dipsacaceae																
332	*Dipsacus inermis* Wall.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
333	*Scabiosa columbaria* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
	55.Ebenaceae																
334	*Diospyros kaki* L.	-	-	+	-	-	-	+	-	+	-	-	+	+	+	-	-

335	*Diospyros lotus* L.	-	-	+	-	-	-	+	-	+	-	-	+	+	+	-	-
	56. Elaeagnaceae																
336	*Elaeagnus angustifolia* L.	-	-	+	-	-	-	+	-	+	-	-	+	+	+	-	-
	57. Ericaceae																
337	*Monotropa hypopitys* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
338	*Rhododendron afghanicum* Aitch. & Hemsl.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
339	*Rhododendron hypenanthum* Balf. f	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	58. Euphorbiaceae																
340	*Andrachne cordifolia* (Decne.) Müll. Arg.	-	-	+	-	-	-	+	-	+	-	-	+	+	+	-	-
341	*Andrachne telephioidies* L.	-	-	+	-	-	-	+	-	+	-	-	+	+	+	-	-
342	*Chrozophora tinctoria* (L.) A. Juss.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
343	*Euphorbia gerardiana* Jacq.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
344	*Euphorbia granulata* Forssk.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
345	*Euphorbia helioscopia* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
346	*Euphorbia falcata* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
347	*Euphorbia prostrata* Aiton	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
348	*Euphorbia wallichii* Hook. f.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
349	*Ricinus communis* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	59. Fagaceae																
350	*Quercus baloot* Griff.	-	-	-	-	+	-	+	+	+	-	-	+	+	+	+	+
351	*Quercus dilatata* Raf.	-	-	-	-	+	-	+	+	+	-	-	+	+	+	+	+
352	*Quercus petraea* (Matt.) Liebl.	-	-	-	-	+	-	+	+	+	-	-	+	+	+	+	+
353	*Quercus semicarpifolia* Sm.	-	-	-	-	+	-	+	+	+	-	-	+	+	+	+	+
	60. Fumariaceae																
354	*Corydalis govaniana* Wall.	-	-	-	-	+	-	+	+	+	-	-	+	+	+	+	+
355	*Fumaria indica* (Hausskn.) Pugsley	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
356	*Fumaria parviflora* Lam.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
	61. Gentianaceae																
357	*Gentiana kurroo* Royle	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
358	*Swertia petiolata* D. Don	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
	62. Geraniaceae																
359	*Erodium cicutarium* (L.) L'Her.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
360	*Erodium malacoides* (L.) L'Her.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
361	*Geranium himalayense* Klotzsch	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
362	*Geranium ocellatum* Jacquem	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
363	*Geranium rotundifium* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
	63. Grossulariaceae																
364	*Ribes alpinum* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+
365	*Ribes orientale* Desf.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+
366	*Ribes grossularia* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+

	64. Hammelidaceae																
367	*Parrotiopsis jacquemontiana* (Decne.) Rehder	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
368	*Aesculus indica* (Wall. ex Camb.) Hook. f.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	66. Hypericaceae																
369	*Hypericum aitchisonii* var. *blongifolium* Choisy	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
370	*Hypericum perforatum* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
371	*Hypericum pendulum* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	67. Juglandaceae																
372	*Juglans regia* L.	-	-	+	-	-	-	+	-	+	-	-	+	+	+	-	-
	68. Lamiaceae																
373	*Alajja rhomboidea* (Benth.) Ikonn	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
374	*Ajuga parviflora* Benth.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
375	*Clinopodium umbrosum* (M. Bieb.) Kuntze	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
376	*Dracocephalum nutans* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
377	*Isodon coetsa* (Buch.-Ham ex D. Don) Kudo	-	-	-	-	+	+	+	+	+	-	-	-	-	-	+	+
378	*Isodon rugosus* (Wall. ex Benth.) Codd	-	-	-	-	+	+	+	+	+	-	-	-	-	-	+	+
379	*Lamium amplexicaule* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
380	*Lavandula angustifolia* Mill	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
381	*Leonurus cardiaca* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
382	*Lallemantia royleana* (Benth.) Benth.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+
383	*Lycopus europaeus* L	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
384	*Marrubium vulgare* L.	-	-	-	+	-	+	+	+	+	-	-	-	-	-	+	+
385	*Mentha longifolia* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
386	*Mentha royleana* Wall. ex Benth.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
387	*Mentha spicata* subsp. *spicata* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
388	*Nepeta raphanorhiza* Benth.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
389	*Nepeta subincia* Benth.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
390	*Nepeta Kurramensis* Rech.f	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
391	*Nepeta laevigata* (D. Don) Hand. Mazz.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
392	*Ocimum basilicum* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
393	*Origanum vulgare* L.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-
394	*Perovskia atriplicifolia* Benth	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
395	*Phlomis bracteosa* Royle ex. Benth.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+
396	*Phlomis cashmeriana* Royle ex Benth.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
397	*Phlomis stewetii* HooK. f.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
398	*Prunella vulgaris* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
399	*Rabdosia rugosa* (Wall ex. Benth) H. Hara	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+
400	*Saliva aegyptiaca* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
401	*Saliva moorcroftiana* Wall. ex Benth.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
402	*Salvia nubicola* Wall. ex Sweet	-	-	-	+	-	+	+	+	+	-	-	+	+	+	+	+

403	*Salvia reflexa* Hornem.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
404	*Scutellaria linearis* Benth.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
405	*Scutellaria orentalis* L.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
406	*Stachys emodi* Hedge	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+
407	*Stachys parviflora* Benth.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
408	*Teucrium stocksianum* Boiss.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
409	*Teucrium royleanum* Wall. ex Benth.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
410	*Thymus linearis* .var. *linearis* Benth.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
411	*Thymus seiphyllum* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
412	*Vitex negundo* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
413	*Ziziphora tenuior* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-
	69. Loranthaceae																
414	*Viscum album* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
415	*Viscum articulatum* Burm.f.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	70. Lythraceae																
416	*Lagerstroemia indica* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	71. Malvaceae																
417	*Hibiscus trivonum* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
418	*Malva neglecta* Wallr.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
419	*Malva rotundifolia* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
420	*Malva sylvestris* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
	72. Meliaceae																
421	*Melia azedarach* L	-	-	+	-	-	+	+	+	+	-	-	+	+	+	-	-
	73.Mimosaceae																
422	*Prosopis juliflora* (Sw.) DC	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-
	73. Moraceae																
423	*Ficus carica* L.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
424	*Ficus caricoides L.*	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
425	*Ficus palmata* subsp. *virgata* Browicz.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
426	*Morus alba* L.	-	-	-	-	+	-	+	-	+	+	+	+	+	+	-	-
427	*Morus nigra* L.	-	-	-	-	+	-	+	-	+	+	+	+	+	+	-	-
	74. Nyctaginaceae																
428	*Mirabilis jalapa* L.	-	-	+	-	-	+	+	+	+	-	-	+	+	+	+	+
	75. Myrsinaceae																
429	*Myrsine africana* L.	-	-	+	-	-	+	+	+	+	-	-	-	+	+	+	+
	76. Morinaceae																
430	*Morina coulteriana* Royle	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+
431	*Morina longifolia* Wall.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+
432	*Morina persica* L.	-	-	-	-	+	+	+	+	+	+	-	-	+	+	+	+
	77. Myrtaceae																

433	*Eucalyptus viminalis* Labill.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
434	*Callistemon lanceolatus* (Sm.) Sweet	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	78. Oleaceae																
435	*Jasminum humile* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
436	*Jasminum officinale* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
437	*Olea ferruginea* (Sol.) Steud.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
438	*Syringa afghanica* C.K. Schneid.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	79. Onagraceae																
439	*Epilobium hirsutum* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
440	*Epilobium laxum* Royle	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
441	*Epilobium parviflorum* Schreb.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
442	*Oenothera rosea* L'Herit. ex Aiton	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
	80. Orchidaceae																
443	*Dactylorhiza hatagirea* (D. Don) Soo	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-
444	*Goodyera repens* (L.) R. Br.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	81. Orobanchaceae																
445	*Orobanche alba* Stephan	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
446	*Phelipanche aegyptiaca* (Pers.) Pomel	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	82. Oxalidaceae																
447	*Oxalis corniculata* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
	83. Paeoniaceae																
448	*Paeonia emodi* Wall. ex Royle	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
	84. Papaveraceae																
449	*Argemone mexicana* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
450	*Papaver pavonum* C.A. Mey	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
451	*Papaver rhoeas* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
452	*Papaver sominferum* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
453	*Roemeria hybrida* (L.)DC	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
	85. Papilionaceae																
454	*Arachis hypogaea* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
455	*Astragalus grahamianus* Benth.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+
456	*Astragalus psilacanthus* Boiss	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+
457	*Astragalus hemsleyi* Aitch & Baker.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+
458	*Astragalus kurramensis* Baker	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+
459	*Astragalus subumbellatus* Klotzsch.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+
460	*Astragalus psilocentros* Fisch.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+
461	*Astragalus rhizanthus* Benth.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	+	+
462	*Astragalus pseudopsilocanthus*	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
463	*Caragana brevispina* Benth.	-	-	-	-	+	+	+	+	+	+	+	-	+	+	-	-
464	*Caragana gerardiana* Benth.	-	-	-	-	+	+	+	+	+	+	+	-	+	+	-	-

465	*Desmodium elegans* DC	-	-	-	-	+	+	+	+	+	-	-	-	+	-	-	-
466	*Glycyrrhiza glandulifera* Wald st & Kit.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
467	*Hedysarum falconeri* Baker	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
468	*Indigofera heterantha* Brandis	-	-	-	-	+	+	+	+	+	+	+	-	+	+	-	-
469	*Indigofera tinctoria* L.	-	-	-	-	+	+	+	+	+	+	+	-	+	+	-	-
470	*Lathyrus aphaca* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
471	*Lathyrus sativus* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
472	*Lespedeza juncea* var. *variegate* (Cambess) All.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
473	*Lespedeza sericea* (Thunb.) Miq.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
474	*Lotus corniculatus* L.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
475	*Medicago lupulina* L.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
476	*Medicago sativa* L.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	+	+
477	*Onobrychis dealbata* Stocks.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
478	*Oxytropis campestris* (L.) DC.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
479	*Phaseolus lunatus* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
480	*Pisum sativum* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
481	*Sphora mollis* (Royle) Baker	-	-	+	-	-	+	+	+	+	+	+	-	+	+	-	-
482	*Robinia pseudoacacia* L.	-	-	-	-	+	+	+	+	+	+	+	-	+	+	-	-
483	*Trifolium pratense* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
484	*Trifolium repens* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
485	*Trifolium resupinatum* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
486	*Trigonella foenum-graeceum* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-
487	*Trigonella incisa* var. *geminiflora* (Bunge) Boiss.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
488	*Vicia hirsuta* (L.) Gray	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
489	*Vicia monantha* Retz.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
490	*Vicia sativa* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
	86. Plantaginaceae																
491	*Plantago ciliata* Boiss.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
492	*Plantago lanceolata* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
493	*Plantago major* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
494	*Plantago ovata* Phil.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
495	*Veronica anagallis –aquatica* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-
	87. Platanceae																
496	*Platanus orientalis* L.	-	-	+	-	-	+	+	+	+	+	+	+	+	+	-	-
	88. Plumbaginaceae																
497	*Limonium cabulicum* (Boiss.) Kuntze	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
498	*Acantholimon lycopodioides* (Girard) Boiss.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
499	*Acantholimon ulicinum* (Willd.ex. Schult.)Boiss.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
	89. Podophyllaceae																
500	*Podophyllum hexandrum* Royle	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

501	*Podophyllum emodi* Wall ex. Royle	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	90. Polygalaceae																
502	*Polygala abyssinica* R.Br. ex Fresen.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
	91. Polygonaceae																
503	*Aconogonon alpinum* (L.) Schur	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
504	*Bistorta amplexicaulis* (D. Don) Greene	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
505	*Bistorta affinis* (D. Don) Greene	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
506	*Fagopyrum esculentum* Moench.	-	-	+	-	-	+	+	+	+	-	-	+	+	+	-	-
507	*Fallopia dumetorum* (L.) Holub.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
508	*Persicaria glabra* (Willd.) M. Gomez	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
509	*Persicaria maculosa* Gray	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
510	*Polygonum aviculare* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
511	*Polygonum paronychiodes* C.A. Mey.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
512	*Polygonum plebejum* R.Br.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
513	*Rumex dentatus* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
514	*Rumex hastatus* D.Don	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
515	*Rumex nepalensis* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
516	*Rumex obtusifolius* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
517	*Rheum spiciforme* Royle.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
	92. Portulaceae																
518	*Portulaca oleracea* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
519	*Portulaca quadrifida* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
	93. Primulaceae																
520	*Anagallis arvensis* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
521	*Androsace rotundifolia* Hardw.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
522	*Androsace himalacia* var. *kurramensis* Y.J. Nasir	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+
523	*Cortusa brotheri* Pax ex. Lipsky	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-
524	*Dionysia tapetodes Bunge*	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
525	*Primula denticulata* Sm.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	94. Punicaceae																
526	*Punica granatum* L.	-	-	+	-	-	+	+	+	+	+	+	+	+	+	-	-
527	*Aconitum chasmanthum* Stapf ex Holmes	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	95. Ranunculaceae																
528	*Aconitum kurramense* Qureshi & Chaudhri	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
529	*Aconitum violiceum* Rchb.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
530	*Actaea spicata* L.	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-
531	*Adonis aestivalis* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
532	*Anemone tetrasepala* Royle.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
533	*Aquilegia moorcroftiana* var. *afghanica* (Bruhl) Riedl	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-
534	*Aquilegia pubiflora* Wall. ex Royle	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-	-

535	*Caltha alba* Cambess.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
536	*Clematis grata* Wall.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-
537	*Clematis graveolenus* Lindl.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-
538	*Clematis robertsiana* Aitch. & Hemsl.	-	-	-	+	-	+	+	+	+	+	+	+	+	+	-	-
539	*Delphnium brunonianum* Royle	-	-	+	-	-	+	+	+	+	+	+	+	+	+	-	-
540	*Ranunculus afghanicus* Aitch. & Hemsl.	-	-	+	-	-	+	+	+	+	+	+	+	+	+	+	+
541	*Ranunculus arvensis* L.	-	-	+	-	-	+	+	+	+	+	+	+	+	+	+	+
542	*Rununculus hirtellus* Royle	-	-	-	+	-	+	+	+	+	-	-	-	+	+	+	+
543	*Thalictxum pedunculatum* Edgew.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
	96. Resedaceae																
544	*Reseda luteola* L.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
	97. Rhamnaceae																
545	*Rhamnus purpurea* Edgew.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
546	*Sageretia thea* var. *thea* (Osbeck)M.C Johnst.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
547	*Zizyphus vulgaris* Lamk.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
	98. Rosaceae																
548	*Agrimonia pilosa* Ledeb.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
549	*Cotonester bacillaris* Wall. ex Lindl.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
550	*Cotoneaster microphyllus* Wall. ex Lindl.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
551	*Cotoneaster macrophylla* Wall. ex Lindl.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
552	*Cotoneaster nummularia* Fisch. & C. A. Mey.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
553	*Cotoneaster tomentosus* Lindl.	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
554	*Crataegus songarica* K. Koch	-	-	-	-	+	+	+	+	+	-	-	-	+	+	-	-
555	*Crataegus oxycantha* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
556	*Duchesnea indica* (Andr.) Focke	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
557	*Filipendula vestita* (Wall. ex. G.Don) Maxim.	-	-	+	-	-	+	+	+	+	-	-	+	+	+	-	-
558	*Fragaria indica* Andrews	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
559	*Fragaria nubicola* (Hook. f.) Lindl. ex Lacaita	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
560	*Fragaria vesca* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
561	*Potentilla argyrophylla* var. *astroguinea* (Lodd.,G. Lodd. & W. Lodd.) Hook. f.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
562	*Potentilla fragarioides* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
563	*Potentilla gerardiana* Lindl. ex. Lehm	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
564	*Potentilla grisea* var. *grisea* Juz.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
565	*Potentilla libanotica* Boiss & Spruner	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
566	*Potentilla monanthes* Wall. ex. Lehm.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
567	*Potentilla nepalensis* Hook. f.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
568	*Potentilla supina* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
569	*Poterium sanguisorba* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	+	+
570	*Prunus aitchisonii* (Korsh.) Kitam	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-

571	*Prunus armeniaca* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
572	*Prunus avium* (L.) L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
573	*Prunus cerasus* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
574	*Prunus communis* (L.) Fritsch	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
575	*Prunus domestica* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
576	*Prunus humilis* Bunge	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
577	*Prunus jacquemontii* Hook. f.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
578	*Prunus persica* (L.) Batsch	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
579	*Pyracantha coccinea* var. *pauciflora* (Poir.) Dippel	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
580	*Rosa alba* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
581	*Rosa beggeriana* Schrenk	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
582	*Rosa brunonii* Lindl.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
583	*Rosa canina* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
584	*Rosa ecae* Aitch.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
585	*Rosa banksiae* W. T. Aiton	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
586	*Rosa webbenia* Wall ex. Royle	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
587	*Rubus fruitcosus* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
588	*Sorbaria tomentosa* (Lindl.) Rehder.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
589	*Spiraea corymbosa* Raf.	-	+	-	-	-	-	+	+	+	-	-	-	+	+	+	+
590	*Spiraea vestita* Wall. ex G. Don	-	+	-	-	-	-	+	+	+	-	-	-	+	+	+	+
	99. Rubiaceae																
591	*Galium kurremensis* Nazim.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
592	*Galium tricornutum* Dandy	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
593	*Rubia cordifolia* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
594	*Rubia infundibularis* Hemsl. & Lace	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
	100. Rutaceae																
595	*Skimmia laureola* Siebold & Zucc.ex Wald	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	101. Salicaceae																
596	*Populus alba* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
597	*Populus afghanica* (Aitch. & Hemsl.) C.K. Schneid.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
598	*Populus nigra* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
599	*Salix alba* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
600	*Salix acmophylla*Boiss	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
601	*Salix babylonica* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
602	*Salix daphnoides* Vill.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
603	*Salix denticulata* Andersson	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
604	*Salix tetrasperma* Roxb.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
605	*Salix viminalis* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-
	102. Sambucaceae																
606	*Sambucus nigra* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	-

	103. Sapindaceae																
607	*Cardiospermum halicacabum* L.	-	-	-	-	+	-	+	+	+	-	-	+	+	+	-	-
608	*Dodonaea viscosa* Jacq.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	104. Saxifragaceae																
609	*Bergenia ciliata* (Haw.) Sternb.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
610	*Bergenia stracheyi* (Hook.f. & Thomson.) Engl.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	105. Scrophulariaceae																
611	*Euphrasia himalaica* Wettst.	-	-	-	-	+	-	+	+	+	-	-	+	+	+	-	-
612	*Leptorhabdos parviflora* (Benth.) Benth.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
613	*Pedicularis bicornuta* Klotzsch	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
614	*Pedicularis canadensis* L.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
615	*Pedicularis pyramidata* Royle ex. Benth.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
616	*Scrophularia nodosa* Benth	-	-	-	-	+	-	+	+	+	-	-	-	+	+	-	
617	*Scrophularia striata* Boiss.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
618	*Scrophularia scabiosaefolia* Benth.	-	-	-	-	+	-	+	+	+	-	-	-	+	+	+	+
619	*Verbascum erianthum* Benth.	-	+	-	-	-	-	-	+	+	-	-	+	+	+	+	+
620	*Verbascum speciosum* Schrad.	-	+	-	-	-	-	-	+	+	-	-	+	+	+	+	+
621	*Verbascum thapsus* L.	-	+	-	-	-	-	-	+	+	-	-	+	+	+	+	+
622	*Veronica anagallis-aquatica* L.	-	-	-	+	-	-	+	+	+	-	-	+	+	+	+	+
623	*Veronica polita* Fri.	-	-	-	+	-	-	+	+	+	-	-	+	+	+	-	-
	106. Simaroubaceae																
624	*Ailanthus altissima* (Mill) Swingle	-	-	-	+	-	-	+	-	+	-	-	+	+	+	-	-
	107. Smilacaceae																
625	*Smilax glaucophylla* Klotzsch	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	108. Solanacea																
626	*Capsicum annuum* L.	-	+	-	-	-	-	+	+	+	-	-	+	+	+	-	-
627	*Datura stramonium* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
628	*Hyoscyamus insanus* Stocks	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
629	*Lycopersicon esculentum* Mill.	-	-	-	+	-	-	+	+	+	-	-	+	+	+	-	-
630	*Petunia alba* M.C. Ferguson & Ottley	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
631	*Physalis divaricata* D. Don.	-	-	-	+	-	-	+	-	+	+	+	-	+	+	-	-
632	*Solanum elaeagnifolium* Cav.	-	-	-	+	-	+	+	+	+	-	-	-	+	+	-	-
633	*Solanum nigrum* L.	-	-	-	+	-	+	+	+	+	-	-	-	+	+	+	+
634	*Solanum surattense* Burm.f.	-	+	-	-	-	+	+	+	+	-	-	+	+	+	+	+
635	*Solanum villosum* Mill.	-	-	-	+	-	+	+	+	+	-	-	-	+	+	+	+
	109. Thymelaeaceae																
636	*Daphne mucronata* Royle	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
637	*Wikstroemia canescens* Wall. ex Meisn.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	110. Ulmaceae																
638	*Celtis australis* L.	-	-	-	+	-	-	+	-	+	-	-	-	+	+	-	-

639	*Celtis caucasica* Willd	-	-	-	+	-	-	+	-	+	-	-	-	+	+	-	-
	111.Urticaceae																
640	*Parietaria officinalis* L.	-	-	-	+	-	-	+	-	+	-	-	-	+	+	-	-
641	*Urtica dioica* L.	-	+	-	-	-	+	+	-	+	-	-	-	+	+	+	+
	12. Valerianaceae																
642	*Valeriana jatamansi* Jones	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
643	*Valeriana szovitsiana* C.A. Mey	-	+	-	-	-	+	+	+	+	-	-	+	+	+	-	-
	13. Verbenaceae																
644	*Phyla nodiflora* (L.) Greene	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
645	*Verbena officinalis* L.	-	-	-	+	-	+	+	+	+	-	-	+	+	+	-	-
646	*Vitex negundo* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	14. Violaceae																
647	*Viola biflora* L.	-	-	-	+	-	+	+	+	+	-	-	-	+	+	-	-
648	*Viola canescens* Wall ex. Roxb.	-	-	-	+	-	+	+	+	+	-	-	-	+	+	-	-
649	*Viola serpanus* Wall.	-	-	-	+	-	+	+	+	+	-	-	-	+	+	-	-
650	*Viola stocksii* Boiss.	-	-	-	+	-	+	+	+	+	-	-	-	+	+	-	-
	15. Vitaceae																
651	*Vitis vinifera* L.	-	-	-	-	+	+	+	+	+	-	-	+	+	+	-	-
	116. Zygophyllaceae																
652	*Fagonia indica* Burm. f.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
653	*Peganum harmala* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
654	*Tribulus terrestris* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Key to Abbreviations:
Palatability classes: NP-Not palatable, RP-Rarely palatable, LP-Less palatable, MP- Mostly Palatable, HP-Highly palatable
Part used: A- Aerial parts, L-Leaves, I-Inflorescence
Fodder: F-Fresh, D-Dry, B-Both fresh & dry
Livestock: C-Cow, G-Goat, S- Sheep, D- Donkey, H-Horse

a. Indigofera gerardiana; b. *Medicago sativa; c. Quercus baloot***;** d. *Rubus fruitcosus*

Figure 3. (a-d) Palatable plants of Koh-e-Safaid Range

In the field, animal first choice may be recorded by direct observation of what is being eaten or by a calculation of the progressive consumption of the plants themselves (Palkova and Leps 2008). Palatability is positively associated with nitrogen concentration, water content of leaves and negatively correlated with carbon content as well as carbon/nitrogen ratio in aerial parts of plant body (Schuur *et al.* 2001; Ahmad *et al.* 2014; Tariq *et al.* 2015; Zi-Li Yin *et al.* 2017). Palatability is also influenced by various other features like period, phase of pregnancy, general health, and preference for forage species and appetite of animal (Khan *et al.* 2012). Various factors impact the palatability of plants in different localities of the world. These factors include morphology, phenology, minerals and secondary metabolites in a plant (Ibrar 2003; Hussain and Durrani 2009). Like most herbivores, it preferred smaller leaves with a smaller specific leaf area and a higher dry matter content in the leaf. Phenological changes associated with climate change are related to the seasonal availability and palatability of food plants. The presence of minerals like Ca, Mg and K, Fe, Mn, Mg and Ca in different palatable plants in Kurram indicates the reason for their palatable condition. Secondary metabolites such as glycosides, alkaloids, nitrates and others such as oxalate, lectins and tannins have an adverse effect on the taste of plants. Woody plants have the ability to increase soil nutrients concentration and can influence the quality of forbs by improving dry matter digestibility and nitrogen contents in the leaves. Phenological aspects of the plants may affect the palatability of plants by animals due to accumulation and concentration of certain elements (Miller and Thompson 2005; Gunasekran *et al.* 2014). Reviewing of literature confirmed that the elemental concentrations increases or decreases in different phenological stages plant species (Milewski and Madden, 2006). Some grazing animals prefer to consume a plant in its fresh form while others in dry form due to presence of different natural products and morphological adaptation (Ibrahim *et al.* 2015; Hussain *et al.* 2016).

Conclusion

Study on the plant palatability revealed that 261 plants were highly palatable, 148 plants were mostly palatable, 73 plants were rarely palatable, 27 plants were less palatable, and 145 plants were non palatable. The mineral concentration was greatly affected during various phonological stages of plants and hence the presences of different concentrations of minerals were correlated to their palatability. From this study, it was observed that palatability does not only depend on plant species, but also depend on different factors such as animal type, plant habit, plant morphology, phenology, minerals composition, seasonal type, area habitat and weather. Like most herbivores, it preferred smaller leaves with a smaller specific leaf area and a higher dry matter content in the leaf. Phenological changes associated with climate change are related to the seasonal availability and palatability of food plants. The presence of minerals like Ca, Mg and K, Fe, Mn, Mg and Ca in different palatable plants in Kurram indicates the reason for their palatable condition. Secondary metabolites such as glycosides, alkaloids, nitrates and others such as oxalate, lectins and tannins have an adverse effect on the taste of plants. It is suggested that plant palatability should conform to the basis of elemental and nutritional value of plant species and also the animal food requirement in support of improving physical condition and output of domestic animals in the region.

Declarations

Abbreviations: NP-Not palatable, **RP**-Rarely palatable, **LP**-Less palatable, **MP**- Mostly Palatable, **HP**-Highly palatable**;** Part used: **A**- Aerial parts, **L**-Leaves, **I**-Inflorescence, Fodder: **F**-Fresh, **D-**Dry, **B**-Both fresh & dry; Livestock: **C**-Cow, **G-**Goat, **S**- Sheep, **D**- Donkey, **H**-Horse

Ethics approval and consent to participate: Prior informed consent (PIC) was obtained from all the respondents. The author belongs to the same locality and is well aware of the ethics and regulations of the community, so all the respondents answered the questions in the questionnaire on their own will.
Consent for publication: The manuscript does not contain any individual person's data.
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