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Insights of the Latest Naturalized Flora of Taiwan: Change in the Past Eight Years

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ABSTRACT: Naturalized flora of Taiwan has been increasing in the past six after the first catalogue was compiled in 2002. In order to probe into the increasing pattern behind this dramatic growth of potential invaders, we compiled and evaluated newly added naturalized species in a quest for better understanding. Furthermore, naturalized species shared with neighboring regions, such as Mainland China and Japan, were estimated as well. The results revealed that two-thirds of these newly recruited species naturalized before 2002, and only 77 actually naturalized after 2002. The proportion of naturalized flora in the native species pool increased from 8% to 12%. The compositions, origins, and life forms of these potential invaders before and after 2002 were similar with slight fluctuations presented in the ranks of the dominant families. Number of species shared with neighboring regions multiplied due to the fast growth of the naturalized flora in Taiwan; nevertheless, the number might be understated due to the inaccessibility of the latest naturalized floras from neighboring regions. The doubled flora of naturalized species in the past six years implies insufficient attention to plant invasions and lag phases of invasion. The expansion of naturalized flora in Taiwan also increased the pools of naturalized species shared with neighboring areas, including Mainland China and Japan.

KEY WORDS: Flora, naturalized species, plant invasion, Taiwan.

INTRODUCTION

Plant invasions are considered one of the most serious environmental threats to local ecosystems and biodiversity (D'Antonio and Hobbie, 2005; Mooney, 2005; Stachowicz and Tilman, 2005). Although composition of plant invasions have been studied in many regions (Meiners, 2007; McClain and Ebinger, 2008; Murphy et al., 2008), the results usually reflect small-scale fluctuations of local vegetation. The dynamics of naturalized/invasive flora, which demonstrate the overall pattern, vicissitude, and susceptibility of potential invaders, are seldom discussed, especially in regions experiencing escalating international trade.

To study the patterns of plant invasions, naturalized plants are often employed since naturalization implies successful reproduction and dispersal in newly colonized territories (Rejmánek and Richardson, 1996; Richardson et al., 2000; Daehler, 2001; Pyšek et al., 2002; Wu et al., 2003; Lake and Leishman, 2004; Pyšek et al., 2004). In Taiwan, the patterns of naturalized flora were first compiled and examined in 2002 (Wu et al., 2004a, b); however, the naturalized flora has subsequently almost doubled during the past six years (Chen et al., 2004, 2005, 2006, 2007; Hsu et al., 2004, 2005, 2006; Jung et al., 2005, 2006, 2008). This remarkable number of recent naturalizations, approximately 50 species per year, seemed to imply escalating plant invasions in Taiwan.

Several hypotheses have been proposed to account for the naturalization preferences of introduced species, including similar climates (Corlett, 1988, 1992) and distant phylogeny (Darwin, 1859; Rejmánek, 1998). Accordingly, particular patterns of naturalized floras might be present in regions circumstantially. In Taiwan, naturalized species have mainly originated from the Americas, especially its tropical regions, which approximate the tropical weather in southern Taiwan. Besides, the dominant genera of naturalized flora were considered as coming from tropical, warm or temperate regions as well. Although the most naturalized families were simply the largest families of the world, several important families of the naturalized flora in Taiwan were tropical families, such as Amaranthaceae (Wu et al., 2004a). Therefore, we assumed that the composition of newly added naturalized members might present an analogous formation.

The main purpose of this study was to re-evaluate the current pattern of plant invasions in Taiwan by comparing the naturalized flora before and after the year 2002, to better understand the dynamics of potential invaders in the past six years. Furthermore, we also sought to establish firm knowledge of potential invaders in Taiwan to take strict precautions against the booming connections with Mainland China slated to begin from the summer of 2008.

MATERIALS AND METHODS

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Study area

Taiwan, a west Pacific Rim island straddling the Tropic of Cancer, experiences subtropical weather in the north and a tropical climate in the south. Annual temperatures average 22º C to 25º C, and annual precipitation average is 3,000 mm (Hsieh, 2002). Taiwan proper has an area of 35,800 km^2, two-thirds of which are mountainous with numerous hills and peaks of 500 to 3,952 m. The western plains, 0 - 300 m in elevation, make up the rest of the island and accommodate most of the human population. Dramatic topographical differences, combined with diverse various climates from lowland tropical to alpine, result in a high diversity of habitats. Currently, about 50% of the island is covered by coniferous and broadleaf forests. A total of 4,216 native and naturalized species, belonging to 1,389 genera and 233 families, had been reported from Taiwan up to the year 2002. The majority of these species (2,776) are herbaceous, followed by trees (588), shrubs (426), lianas (248), and vines (177) (Hsieh, 2002). Of all native species, about 1,041 are endemic to Taiwan. Asteraceae and Poaceae are among the families that contribute the most to the endemic flora.

Naturalized Species

Two major sources of information on species naturalization were employed in our study: documents and personal field observations. Based on our previous compilation of naturalized flora (Wu et al. 2004b), we reviewed all of the available journal articles, government documents, and publications released after 2002 to update the list. All species exotic to Taiwan, with each species designated as naturalized, escaped or persistent after cultivation, or invasive, were compiled. Species introduced or cultivated without any evidence of being escaped were not considered. Herbarium records were reviewed to verify the naturalization status of introduced species sighted in the field without any documentation. Three main herbaria in Taiwan (HAST, TAI and TAIF), as well as a university herbarium, (NCKU), were visited, and voucher information on the specimen labels of specimens of naturalized species was examined, including locality and year of collection. Each naturalized species was listed alongside a referable document, either a journal article or a specimen (Appendix 1). Species mentioned in informal/ nonacademic literatures as naturalized or escaped were considered suspiciously naturalized and were not included if further proof of naturalization was not available.

Species information

For each naturalized and species suspected to be naturalized, we obtained and compiled its life history traits, such as habit and life form in the Raunkiaer system (Mueller-Dombois and Ellenberg, 1974), origin, year of the first record, from publications or reliable Internet databases, e.g. ISSG (http://www.issg.org/), and E-flora (http://www.efloras.org/index.aspx). The year of the first record referred to its first herbarium record or first documentation. Species reported after 2002 with specimen records before 2002 were categorized as intermediate species. Although the major herbaria in Taiwan accommodate about half a million specimens, the earliest specimens might not be available for every species. Therefore, only species with clear records were employed for further analyses.

Analysis

Information on naturalized species' taxonomic distribution, native areas, life forms, habits, year of the first available records, mode or purposes of introduction, and invasion status in Taiwan, was compiled for comparisons and further analyses. Weed lists for China and Japan, the nearest continental and island regions, were obtained from Wu et al., (in press) and The Weed Science Society of Japan (www.wssi.jp), to predict potential weeds shared by these regions. Species accumulation was plotted against the year (1957-2008).

RESULTS

Naturalized species increased 74% from 2002 to 2008; but only 77 species were actually naturalized after 2002 (Table 1). Among these additional naturalized species, 182 (70%) were intermediate species with herbarium records dated before 2002, but documented after 2002. The above-mentioned 77 species in 32 genera and four families resulted in a naturalization rate of 12.8 species per year in the past six years (2002-2008), an approximately 3.47-fold increase over the pre-2002 period (3.68 species/year). The average naturalization rate in the past 150 years (1860 to 2008) was 4.05 species per year. These new additions to the naturalized flora in Taiwan were mainly chameaphyte, followed by therophyte and cryptophytes.

The dominant families and genera of the intermediate species and of species naturalized after 2002 were very similar; however, the ranks of major contributing families of the current naturalized flora changed (Figs. 1 & 2). Among the new members of the naturalized flora, Poaceae was the most dominant family, followed by Fabaceae, Asteraceae, Acanthaceae and Euphorbiaceae. *Cyperus* and *Acmella* were the dominant genera, followed by *Bromus, Amaranthus*, and *Ipomoea*. As for the updated naturalized flora of Taiwan, Poaceae (81 species) replaced Fabaceae as the most dominant family, followed by Fabaceae (79 species), Asteraceae (74 species), Solanaceae (29 species), and Convolvulaceae

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Table 1. Numerical summary of naturalized plants species in Taiwan by taxonomic level and life-forms of Raunkiaer system.

	Naturalized before 2002			Intermediate			Naturalized after 2002			total
	Pteridophyta	Angiosperms		Pteridophyta	Angiosperms		Pteridophyta	Angiosperms		
		Dicot	Monocot		Dicot	Monocot		Dicoty	Monocot	
Family	1	50	9	3	19	3	1	2	1	89
Genus	1	177	46	3	84	22	1	20	11	365
Species	1	277	70	3	141	39	2	49	26	608
Life form-1										
Chamaephyte		237	50		109	25		35	17	473
Cryptophyte		2	13		3	7		3	4	32
Hemicryptophyte		9	6		1	7		4	5	32
Phaenophyte		29	0		27	0		4	0	60
Therophyte		0	1		0	0		1	0	2
Unknow		0	0		1	0		2	0	3
Life form-2										
Herb		212	70		90	38		40	26	476
Herb or Shrub		1	0		7	0		2	0	10
Liana		1	0		2	0		0	0	3
Shrub		28	1		14	0		2	0	45
Shrub or Tree		0	0		4	0		0	0	4
Tree		10	0		18	0		1	0	29
Vine		25	0		6	0		3	0	34
Unknow		0	0		0	0		1	0	1

(22 species). Additionally, the list of dominant genera remain unchanged over recent years, with most dominant genus still being *Ipomoea*, followed by *Solanum*, *Amaranthus*, *Croralaria,* and *Paspalum*. As for the origins of the naturalized species, America was the largest contributor of species naturalized before and after 2002, followed by Asia and Europe (Fig. 3).

The naturalized floras before and after year 2002 were mainly composed of newly naturalized genera. For intermediate species, 61.5% of the genera and 25% of the families were new to Taiwan. On the other hand, 62.5% of genera naturalized after 2002 and 25% of the families were new to Taiwan.

Current naturalized flora shared by Taiwan and neighboring countries increased dramatically as well (Fig. 4). Species shared by Taiwan and Japan increased about six times, and species shared by Taiwan and China rose about 7.8 times. Species shared by China and Japan also doubled. The naturalized species shared by these three regions rose about fourfold, from 27 species to 109 (Fig. 4).

DISCUSSION

The explosive increase of naturalized flora between 2002 and 2008 gave rise to a false alarm of deteriorating plant invasions in Taiwan after that country's entry into the WTO, since most of these new members had been naturalized before 2002 (Table 1). Two things may account for the delayed appearance of numerous intermediate species in herbarium records dated before 2002, insufficient taxonomical efforts and a recent outbreak of plant invasions. However, the latter might have been far more influential than the former. Plant systematics is a fully developed field in Taiwan, and specimens are preserved under well organized herbarium systems. The chance that these species could escape the frequent and deliberate collection activities routinely implemented by numerous taxonomists and amateurs is small. However, it is still possible that identification difficulties delayed the documentation process, since Poacease and Asteraceae, two taxonomically difficult families, were the major contributors to these new members of naturalized flora. Significant increases of Poaceae might be a result of recent identification efforts, since many of them were collected before the year 2000 and not well identified. These species might have experienced lag phases of different lengths in the past years before finally breaking out and receiving attention (Crooks and Soule, 2001). It is not known if fast growing international trade has shortened the lag phases of these intermediate species; nevertheless, the construction and domestic transportation accompanies a booming local economy might be underlining driving forces.

The naturalized species shared by any two of the three adjacent regions, Taiwan, Mainland China, and Japan, have multiplied (Fig. 4). The number of species shared between Taiwan and mainland China almost equals the number of invasive species recently reported

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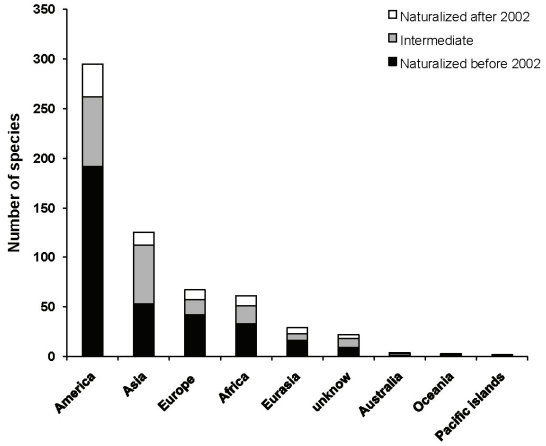


Fig. 1. The origins of naturalized floras before and after year 2002. Intermediate species indicated the species reported after 2002 with archived in major herbaria before year 2002.

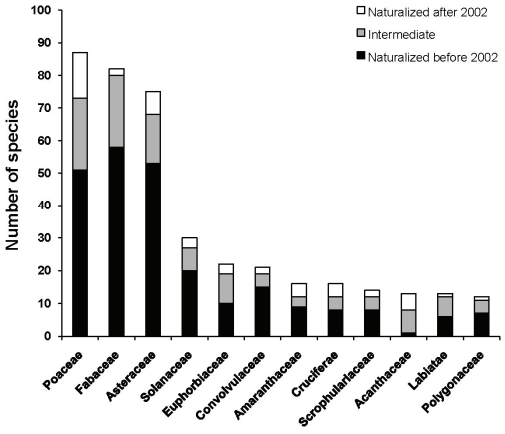


Fig. 2. The dominant families of naturalized floras before and after year 2002. Intermediate species indicated the species reported after 2002 with archived in major herbaria before year 2002.

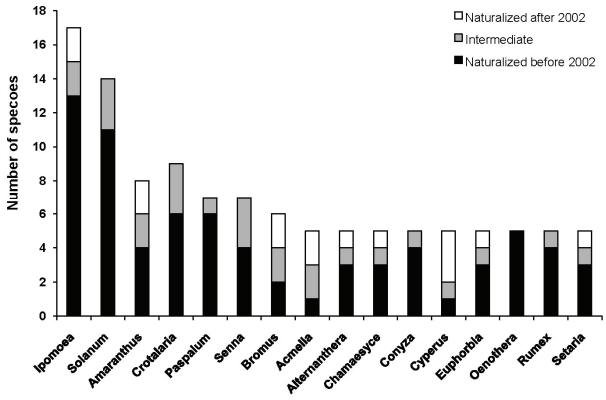


Fig. 3. The dominant genera of naturalized floras before and after year 2002. Intermediate species indicated the species reported after 2002 with archived in major herbaria before year 2002.

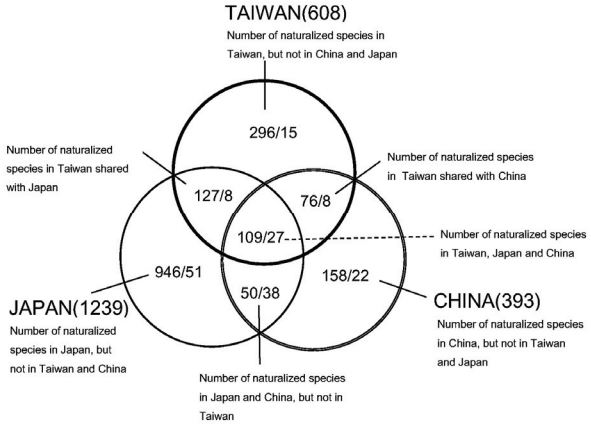


Fig. 4. A Venn diagram showing the overlap of the sets of naturalized species in and shared by Taiwan, China, and Japan.

by China ((Ding et al., 2008; Liu et al., 2006; Weber and Li, 2008). As the half-century long prohibition of direct transportation across the Taiwan Strait comes to an end, the warming of relations between Taiwan and China will inevitably lead to increased plant invasions. Long monitoring and detailed reports of naturalized floras from the neighboring regions are in urgent demand.

Compared to our first compilation (Wu et al., 2004a), Poaceae, Fabaceae, and Asteraceae, the most dominant families changed only in rankings and were still the three largest families in the world. Interestingly, the most dominant genera remained unchanged. In addition, the fact that the life forms and origins of the new members of naturalized species were identical with those of the first compilation confirmed that the environments and climates in Taiwan favored certain groups of introduced plants. Nevertheless, the fast growth of a few relatively neglected genera, such as *Cyperus*, *Acmella* and *Bromus,* have provided another perspective of potential invaders. *Cyperus* species were usually found in wetlands and river banks, the ecosystems of which were relatively obscure and poorly studied. On the other hand, *Bromus* species usually occur in montane nature reserves inhabited by many endemic and rare species in Taiwan (Wu et al., unpublished). Although they were still minorities compared to other big genera, their growth implied insufficient taxanomic attention to taxa difficult to identify. Moreover, their importance could be underestimated.

Although we have observed the expansion of naturalized flora, it is still very difficult to propose a list of suspicious invaders which deserve immediate attention without solid field data. Likewise, a scarcity of similar works carried out by neighboring regions also

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obstructed international efforts to prevent plant invaders. In East Asia, Taiwan and Korea are the only two areas that have provided formal publications of naturalized flora (Koh et al., 2000) while equivalent documents for China and Japan are still informally published. We hope that our work will call attention to the need for compiling naturalized floras since better understanding of potential invaders at home and in neighboring areas will definitely contribute to more effective prediction and prevention of plant invasions.

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Appendix 1. List of naturalized species of Taiwan.

Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Pteridophyta									
Adiantaceae									
Pityrogramma calomelanos (L.) Link	Tropical America	H	P			1968		+	1
Azollaceae									
Azolla caroliniana Willd.	North America	H	P		O	2006		+	2
Azolla japonica Fr. *et* Sav.	Japan	H	A		O	2007		+	3
Parkeriaceae									
Ceratopteris pteridoides (Hook.) Hieron.	West Indies, Central and South America and Vietnam	H	A/P		O	1971	1950	+	3
Salviniaceae									
Salvinia molesta D. S. Mitch.	South America	H	P		O	1996		+	3
Selaginellaceae									
Selaginella uncinata (Desv. *ex* Poir.) Spring	China	H	P		O	1979		+	3
Angiosperm									
Dicotyledon									
Acanthaceae									
Asystasia gangetica (L.) T. Anderson subsp. *micrantha* (Nees) Ensermu	Africa, India, Sri Lanka	H	P	Ch		2005	1910	+	4
Blechum pyramidatum (Lam.) Urban.	Tropical America	H	P	Ch		1896		+	1
Hygrophila corymbosa (Blume) Lindau	South East Asia	H	P	Ch	O	2001		+	3
Hygrophila difformis (L. f.) Blume	India, Southeast Asia	H	P	Ch	O	2000		+	3
Hygrophila stricta (Nees) Lindau	Southeast Asia	H	P	Ch		2004			3
Justicia comata (L.) Lam.	Tropical America	H	A	Ch		2006			2
Justicia gendarussa Burm. f.	India to southern China, Malaysia, Philippines and Java	S	P	Ch		1906			2
Ruellia bittoniana Leonard	Mexico	H	P	Ch	O	2004			3
Ruellia tuberosa L.	Central and South America	H	P	Ch		1978		+	3
Strobilanthes cusia (Nees) Kuntze	India, China	H	P	Ch		1982		+	3
Thunbergia alata Bojer *ex* Sims	Africa	H	P	Ch	O	1904	1910	+	3

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Appendix 1. Continued.

Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Thunbergia fragrans Roxb.	India, Vietnam , China	V	P	Ch		2002	1910	+	3
Thunbergia grandiflora Roxb.	India, Bangladesh	V	P	Ch	O	1929		+	3
Aizoaceae									
Trianthemum portulacastrum L.	Pantropical	H	P	Ch		1930			1
Amaranthaceae									
Alternanthera bettzickiana (Regel) Nicholsen	Brezil	H	P	Ch		1928		+	1
Alternanthera paronychioides St. Hil.	Tropical America	H	P	Ch	O	1969	1920	+	1
Alternanthera philoxeroides (Mart.) Griseb.	Central America	H	P	Ch	O	1934		+	1
Alternanthera reineckii Briquet	South America	H	P		O	2004			3
Alternanthera sessilis (L.) R. Br.	West Indies, Mexico and Central America	H	A	Ch		1970		+	3
Amaranthus caudatus L.	America	H	A	Ch		1976	1928	+	2
Amaranthus dubius Mart. *ex* Thell.	New World	H	A	Ch		2002		+	5
Amaranthus hybridus L.	Tropical America	H	A	Ch		2000		+	2
Amaranthus lividus L.	Tropical Africa and Asia	H	A	Ch		1965		+	1
Amaranthus patulus Betoloni	Tropical America	H	A	Ch		1934		+	1
Amaranthus retroflexus L.	Tropical Africa	H	A	Ch		2004		+	6
Amaranthus spinosus L.	Tropical America	H	A	Ch		1864		+	1
Amaranthus viridis L.	Tropical America	H	A	Ch	C/M	1864		+	1
Celosia argentea L.	Arica and Tropical America	H	A	Ph	C/M	1896	1661	+	1
Gomphrena celosioides Mart.	Brazil and Tropical America	H	P	He	M/O	1969		+	1
Pupalia micrantha Hauman	Tropical Africa, Madagascar, Philippines and Luzon	H	P	Ch		2006		+	7
Anacardiaceae									
Rhus succedanea L. var. *dumoutieri* Kudo *et* Matsura	China	T	P	Ph	O	1931	1921	+	1
Apocynaceae									
Alstonia scholaris (L.) R. Br.	South Asia	T	P	Ph	C/O	1995		+	6
Tabernaemontana pandacaqui Poir	Micronesia	S	P	Ph	O	1896		+	1
Vinca rosea L.	East Africa	S	P	Ph	O	1915		+	3
Asclepiadaceae									
Asclepias curassavica L.	Tropical America	H	P	Ch	M/O	1896	1800	+	1
Asteraceae									
Acmella brachyglossa Cass.	Tropical America and West Indies	H	A	Ch		1992		+	8
Acmella ciliata (Kunth) Cass.	Northern South America	H	P	Ch	M	2006	1998	+	8
Acmella oleraceae (L.) R. K. Jansen	Tropical America	H	A	Ch	C	1943			3
Acmella paniculata (Wall. *ex* DC.) R. K. Jansen	South, Southeast Asia and South China	H	A	Ch		1907			1
Acmella uliginosa (Swartz) Cass.	West Indies, Venezuela, Brazil, Africa, Indonesia and Malaysia	H	A	Ch	M	2004		+	9
Ageratina adenophora (Spreng.) R. M.	Mexico	H	P	Ch		1987		+	1
Ageratina riparia (Regel) R.M. King & H. Rob.	Mexico	H/S	P	Ch		2002		+	50
Ageratum conyzoides L.	Tropical America	H	P	Ch	C/M/O	1916		+	1
Ageratum houstonianum Mill.	Mexico and Tropical America	H	A	Ch	C/M/O	1875	1911	+	1
Ambrosia artemisiifolia L.	North America	H	A	Ch		1978		+	1
Ambrosia psilostachya DC.	North America	H	A/P	Ch		2004		+	10
Aster subulatus Michaux var. *sandwicensis* (A. Gray) A. G. Jones	Hawaii	H	A	Ch	C	1982		+	1
Aster subulatus Michaux var. *subulatus* (A. Gray) A. G. Jones	North America	H	A	Ch	C/M	1982		+	1
Austroeupatorium inulifolium (Kunth) King & Robinson	Central and South America	H/S	P	Ch		2001		+	11
Bidens bipinnata L.	North America	H	A	Ch		1914		+	1
Bidens pilosa L.	North America	H	A	Ch		1915		+	12
Bidens pilosa L. var. *radiata* Sch. Bip.	North and Tropical America	H	A	Ch		1909		+	1
Billis perennis L.	Europe	H	P	Ch	O	1984	1911		3
Calyptocarpus vialis Less.	North America	H	P	Ch	O	1982		+	1

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Appendix 1. Continued.

Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Centratherum punctatum Cass. subsp. *fruticosum* (Vidal) Kirkman	Philippines	H/S	P	Ch		1983		+	1
Chromolaena odorata (L.) R.M. King & H. Rob.	Tropical America	H	P	Ch	M	1989		+	1
Chrysanthemum frutescens L.	Canary Islands	H	P	Ch	O	1917		+	13
Cichorium intybus L.	Europe	H	P	Ch	C/F/M	1976		+	1
Clibadium surinamense L.	Tropical America	S	P	Ch		1997		+	14
Conyza aegyptiaca (L.) Aiton	Tropical to subtropical Africa, Asia and Australia	H	A	Ch		1917		+	3
Conyza bonariensis (L.) Cronq.	South America	H	A/B	Ch		1982		+	1
Conyza canadensis (L.) Cronq. var. *pusilla* (Nutt.) Cronq.	North America	H	A	Ch		1998		+	1
Conyza canadensis (L.) Cronq.	North America	H	A	Ch	C/M	1917		+	1
Conyza sumatrensis (Retz.) Walker	South America	H	A	Ch	C/M	1927		+	1
Coreopsis tinctoria Nutt.	North America	H	A	Ch	O	1915	1911	+	3
Cosmos bipinnatus Cav.	Mexico	H	A	Ch	C/O	1935	1911	+	1
Cotula australis (Sieber ex Spreng.) Hook. f.	Australia	H	P	Ch		2008			50
Crassocephalum crepidioides (Benth.) S. Moore	Tropical Africa	H	A	Ch	C	1982		+	1
Eclipta zippeliana Blume	Malaysia and Philippines	H	A	Ch		1981		+	1
Elephantopus mollis Kunth	Tropical America	H	P	Ch	C/M	1906		+	1
Eleutheranthera ruderalis (Swartz) Sch.-Bip.	Tropical America	H	A	Ch		1996		+	15
Emilia fosbergii Nicolson	Africa	H	A	Ch	O	1998	1908	+	1
Emilia praetermissa Milne-Redh.	Africa	H	A	Ch	O	1997		+	62
Erechtites hieracifolia (L.) Raf. *ex* DC.	North America	H	P	Ch	C/M	1939			1
Erechtites valerianaefolia (Wolf *ex* Rchb.) DC.	South America	H	A	Ch		1964			1
Erigeron annuus (L.) Pers.	North America	H	A/B	Ch		1966		+	1
Erigeron bellioides DC.	South America	H	P	Ch		2005		+	50
Flaveria bidentis (L.) Kuntze	North America and Mexico	H	A	Ch		1987		+	51
Gaillardia pulchella Foug.	North America	H	A	Ch	C/O	1930	1911	+	1
Galinosoga parviflora Cav.	Tropical America	H	A	Ch		1967			1
Galinosoga quadriradiata Ruiz & Pav.	Tropical America	H	A	Ch		1987			1
Gnaphalium calviceps Fernald.	South America	H	A	Ch		1998		+	1
Gnaphalium pensylvanicum Willd.	Warm America	H	A	Ch	C/M	1988		+	1
Gnaphalium purpureum L.	Tropical America	H	A	Ch	M	1928		+	3
Gnaphalium spicatum Lam.	South America	H	P	Ch		1998		+	1
Guizotia abyssinica (L.f.) Cass.	Tropical Africa	H	A	Ch	C	2001		+	2
Gymnocoronis spilanthoides (D. Don *ex* Hook. & Arn.) DC.	America	H	P	Ch		2001		+	3
Gynura bicolor (Willd.) DC.	Himalaya to China	H	P	Ch	C	1915		+	1
Helianthus debilis Nuttall subsp. *Cucumerifolius* (Torrey & A. Gray) Heiser	North America	H/S	A/P	Ch		1999		+	52
Heteropappus hispidus (Thunb.) Less. subsp. *arenarius* Kitam.		H	P	Ch		1983		+	3
Hypochaeris microcephala (Sch. Bip.) Cabrera var. *albiflora* (Kuntze) Cabrera	South America	H	P	Ch		2005		+	63
Hypochaeris radicata L.	Europe	H	P	He		1973		+	1
Hypochaeris glabra L.	Europe	H	A/P	He		2007		+	16
Leucanthemum vulgare Lam.	Europe	H	P	He	O	1929		+	1
Matricaria matricarioides (Less.) Porter *ex* Britton	Eurasia	H	A	He		2006		+	3
Mikania micrantha H. B. K.	South America	V	P	Ch	M	2001		+	1
Parthenium hysterophorus L.	Tropical and South America	H	A	Ch	C	1986		+	1
Pluchea carolinensis (Jacq.) G. Don	Africa	S	P	Ch		1997		+	1
Pluchea sagittalis (Lam.) Gabera	South America	H	P	Ch		1998		+	1
Praxelis clematidea (Griseb.) R. M. King & H. Rob.	South America	H	P	Ch		1994		+	17
Pseudelephantopus spicatus (Juss.) C. F. Baker	South America	H	P	Ch		1911		+	1
Senecio inaequidens DC.	South Africa, Europe and Southern America			Ch		2005		+	18

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Appendix 1. Continued.

Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Senecio vulgaris L.	Europe and North Africa	H	A/B	Ch		1930		+	1
Solidago altissima L.	North America	H	P	Ch	O	1930	1967	+	1
Soliva anthemifolia R. Br. *ex* Less.	South America	H	A	He	M	1927		+	1
Soliva pterosperma (Juss.) Less	South America	H	A	He		1990		+	1
Sonchus arvensis L.	Eurasia	H	P	Ch	C/M	1913		+	1
Sonchus asper (L.) Hill	Europe	H	A	Ch		1927		+	1
Sonchus oleraceus L.	Europe	H	A	Ch	C/M	1904		+	1
Synedrella nodiflora (L.) Gaert.	South America	H	A	Ch	M/O	1914		+	1
Tagetes minuta L.	South America	H	A	Ch	M	2006		+	19
Taraxacum officibale Weber	Eurasia	H	P	He	C/M	1976			1
Tithonia diversifolia (Hemsl.) A. Gray	Mexico	H	P	Ph	M/O	1976	1910	+	1
Tridax procumbens L.	Tropical America	H	P	He	M	1930		+	1
Vernonia elliptica DC.	South Asia	V	P	Ch		1995		+	1
Wedelia trilobata (L.) Hitchc.	Tropical America	H	P	Ch	C	1982		+	1
Xanthium strumarium L.	Eurasia	H	A	Ch	C/M	1900		+	1
Balsaminaceae									
Impatiens balsamma L.	China, India and Malaysia	H	A	Ch	O	1922	1661		3
Impatiens walleriana Hook. f.	Africa	H	P	Ch	O	1998	1966	+	3
Basellaceae									
Anredera cordifolia (Tenore) van Steenis	Tropical America	V	P	Ch	O	1975	1975	+	1
Basella alba L.	Tropical Africa	V	P	Ch	O	1888	1661	+	1
Bignoniaceae									
Spathodea campanulata Beauv.	Tropical Africa	T	P	Ch	C/O	1997		+	6
Bombacaceae									
Bombax malabarica DC.	South Africa	T	P	Ph	O	1890	1645	+	1
Pachira macrocarpa (Schlecht. & Cham.) Walp.	Mexico and Central America	T	P	Ph	O	1949	1931		3
Boraginaceae									
Heliotropium indicum L.	Thailand and Southeast Asia	H	A	Ch	C/M	1888		+	1
Heliotropium procumbens Mill. var. *depressum* (Cham.) H. Y. Liu	South America	H	A/P	Ch		1979		+	1
Myosotis arvensis (L.) Hill	Europe	H	A	Ch		2002		+	1
Symphytum officinale L.	Europe	H	P	Ch	M	1984		+	13
Cabombaceae									
Cabomba caroliniana A. Gray	North America	H	P	Ch	O	1995		+	3
Cabomba piauhyensis A. Gray	South America	H	P	Ch	O	2004			3
Cactaceae									
Cereus peruvianus (L.) Mill.	South America	S	P	Ph	O	2004	1645	+	3
Hylocereus undatus (Haw.) Brown & R.	Central America	H/S	P	Ph	C	2004	1645	+	3
Opuntia dillenii (Ker) Haw.	West Indies and Mexico	S	P	Ph	O	1994	1645	+	3
Callitricheaceae									
Callitriche peploides Nutt.	North America	H	A	Ch		1997		+	1
Campanulaceae									
Hippobroma longiflora (L.) G. Don	America	H	P	Ch	M	1974		+	1
Lobelia alsinoides Lam. subsp. *hancei* (Hara) Lammers.	East Asia	H	P	Ch		1923		+	1
Triodanis biflora (Ruiz & Pav.) Greene	America	H	A	Ch		1991		+	1
Capparaceae									
Cleome rutidosperma DC.	Tropical Africa	H	P	Ch	C	1961		+	1
Caricacea									
Carica papaya L.	Tropical America	T	P	Ph	C	2004		+	3
Caryophyllaceae									
Arenaria serpyllifolia L.	Europe	H	A/B	Ch		1908		+	1
Drymaria diandra Bl.	Tropical America	H	P	Ch	O	1906		+	2
Spergula arvensis L.	Europe	H	A	Ch	F	1939		+	3
Stellaria media (L.) Vill.	Europe	H	A/B	Ch	C	1923		+	3
Chenopodiaceae									
Chenopodium ambrosioides L.	Mexico	H	A/P	Ch	C	1864		+	1
Convolvulaceae									
Argyreia nervosa (Burm. f.) Boj.	India	V	P	Ch		1918	1910	+	3

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Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Cuscuta campestris Yuncker	Central Europe	V	P	Ch		1964		+	3
Evolvulus nummularius (L.) L.	Tropical America	H	P	Ch		2008		+	53
Ipomoea alba L.	Tropical America	V	A	Ch	O	2004	1911	+	1
Ipomoea aquatica Forsk.	Asia	V	A	Ch	C/M	2004	1896	+	1
Ipomoea batatas (L.) Lam.	America	H	P	Ch	C	1909		+	3
Ipomoea cairica (L.) Sweet	Tropical Asia	V	P	Ch	M/O	1909	1896	+	1
Ipomoea carnea Jacq. subsp. *fistulosa* (Mart. *ex* Choisy) D. Austin	Tropical America	S	P	Ch		1928		+	1
Ipomoea eriocarpa R. Br.	Tropical Asia and Africa	V	A	Th		2006		+	20
Ipomoea hederacea (L.) Jacq.	Tropical America	H	A/B	Ch	O	1864	1967	+	1
Ipomoea hederifolia L.	America	H	A	Ch		2000	1967	+	1
Ipomoea indica (Burm. f.) Merr.	Micronesia	V	A/P	Ch	M/O	1907		+	1
Ipomoea mauritiana Jacq	Australia	V	P	Ch		1984		+	1
Ipomoea nil (L.) Roth.	South America	H	P	Ch	M	1921	1911	+	1
Ipomoea obscura (L.) Ker.-Gawl.	Tropical Asia, Africa, Pacific islands and Northern Australia	H	P	Ch	O	1909		+	6
Ipomoea purpurea (L.) Roth.	North and South America	H	A	Ch	O	2005	1972	+	21
Ipomoea quamoclit L.	South America	H	A/B	Ch	O	1896	1911	+	1
Ipomoea trifida (Kunth) G. Don	Tropical America	V	A	Ch	O	2004	1911	+	1
Ipomoea triloba L.	South America	V	P	Ch	O	1939		+	1
Ipomoea wrightii A. Gray	Tropical America	H	A	Ch		1984		+	1
Jacquemontia tamnifolia (L.) Griseb.	Tropical America	V	A	Ch		1984		+	1
Merremia tuberosa (L.) Rendle	Tropical America	L	P	Ch	O	1995	1910	+	1
Crassulaceae									
Bryophyllum pinnatum (Lam.) Kurz	Tropical Africa	H	P	Ch	C/M/O	1887		+	1
Kalanchoe tubiflora Raym.-Hemet	Madagascar	H	P	Ch	O	1974	1965	+	3
Sedum bulbiferum Makino	South China and Japan	H	B	Ch		1986		+	1
Sedum mexicanum Britt	Mexico and America	H	P	Ch	O	1932	1965	+	1
Cruciferae									
Capsella bursa-pastoris (L.) Medic.	Europe	H	A	Ch		1908		+	3
Cardamine flexuosa With.	Europe	H	A/B	Ch		1963		+	2
Coronopus didymus (L.) Smith	North America	H	A	Ch		1972		+	1
Coronopus integrifolius (DC.) Prantl	Africa	H	P	Ch		1906		+	2
Eutrema japonica (Miq.) Koidz.	Japan	H	P	Ch	C	1920		+	1
Lepidium bonariense L.	South America	H	A/P	Ch		2005		+	22
Lepidium virginicum L.	North America	H	B	Ch		1950		+	1
Nasturtium officinale R. Br.	Europe	H	P	Ch	C	1933		+	1
Rapistrum rugosum (L.) All.	Europe	H	A/B	Ch		2004		+	3
Rorippa austriaca (Crantz) Bess.	Europe	H	P	Ch		1990		+	1
Rorippa dubia (Pers.) H. Hara	Asia	H	A	Ch		1983		+	3
Rorippa palustris (L.) Bess.	North America	H	P	Ch		1988		+	1
Rorippa sylvestris (L.) Bess.	Eurasia	H	P	Ch		2005		+	23
Sisymbrium irio L.	Eurasia	H	A/B	Ch		2004		+	1
Sisymbrium orientale Thunb.	Europe	H	A	Ch		1980		+	1
Thlaspi arvense L.	Temperature Eurasia and Africa	H	A	Ch		2006		+	24
Cucurbitaceae									
Coccinia grandis (L.) Voigt	Tropical Africa	V	P	Ch		1994		+	1
Melothria pendula L.	North America	V	P	Ch		2001		+	1
Momordica charantia L.	Palaeotropics	V	A	Ch	C	1916		+	1
Momordica charantia L. var. *abbreviata* Ser.	Tropical Area	V	A	Ch		1991		+	25
Sechium edule (Jacq.) Sw.	Costa Rica, El Salvador, Guatemala and Mexico	H	P	Ch	C	1930		+	3
Sicyos angulatus L.	North America	V	A	Ch		2004		+	3
Euphorbiaceae									
Acalypha aristata Kunth	Tropical America	H	A	Ch		2000			53
Acalypha indica L.	Asia and Tropical Africa	H	A/P	Ch	O	1925		+	3
Aleurites montana (Lour.) Wils.	China	T	P	Ch	O	1934		+	6
Chamaesyce hirta (L.) Millsp.	Argentina and West Indies	H	A	Ch	M	1929		+	6
Chamaesyce hypericifolia (L.) Millsp.	Mexico, West Indies, Central and South America	H	A/P	Ch		2002		+	3
Chamaesyce hyssopifolia (L.) Small	North America	H	A	Ch		1987		+	1

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Appendix 1. Continued.

Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Chamaesyce maculata (L.) Samll	North America	H	A/P	Ch		1988		+	1
Chamaesyce serpens (H. B. & K.) Small	America	H	A/P	Ch		1987		+	1
Croton bonplandianus Baillon	South America	H/S	P	Ph		2004		+	26
Croton tiglium L.	India, Malaysia and South China	S	P	Ph	M	1905		+	1
Euphorbia cyathophora Murr.	North America	H	P	Ph	O	1910	1910	+	1
Euphorbia graminea Jacquin	South Mexico, Central and South America	H	P	Ch		2005		+	27
Euphorbia heterophylla L.	Tropical and South America	H	P	Ph	O	1984	1911	+	1
Euphorbia peplus L.	Europe	H	A	Ch		1907		+	1
Euphorbia tirucalli L.	Madagascar	S	P	Ph	M/O	1896	1645	+	1
Flueggea suffruticosa (Pall.) Baillon	Central and South America	S	P	Ph	M/O	1942		+	28
Manihot esculenta Crantz.	Brazil and Paraguay	S	A/P	Ph	C	1987	1925	+	3
Phyllanthus amarus Schum. & Thonn.	Tropical America	H	A	Ch		1919		+	2
Phyllanthus debilis Klein *ex* Willd.	Tropical Asia	H	A	Ch		1973		+	3
Phyllanthus tenellus Roxb.	Mascarene Islands and India	H	A	Ch		1996		+	1
Ricinus communis L.	Tropical Africa	H	P	Ph	C/M/O	1900	1645	+	1
Sapium sebiferum (L.) Roxb.	China	T	P	Ph	C/M/O	1897		+	1
Vernicia fordii (Hemsl.) Airy Shaw	China	T	P	Ph	C/M/O	1917	1915	+	6
Fabaceae									
Acacia farnesiana (L.) Willd.	Tropical America	S	P	Ph	O	1988	1645	+	1
Aeschynomene americana L.	America	H	P	Ch	F	1962		+	1
Aeschynomene americana L. var. *glandulosa* (Poir.) Rudd.	Tropical America	S	P	Ch	C	2008		+	2
Albizia lebbeck (L.) Benth.	Africa	T	P	Ph	C/O	1922	1896	+	1
Alysicarpus ovalifolius (Schum.) J. Leonard	Tropical Africa and Madagascar	H	A	Ch	C	1965		+	2
Alysicarpus rugosus (Willd.) DC.	Tropical Africa	H	A	Ch	F	1984		+	1
Alysicarpus vaginalis (L.) DC. var. *taiwanensis* Yang		H		Ch		1985		+	1
Arachis hypogea L.	Brazil	H	A	Ch	C/M	1910			3
Astragalus sinicus L.	Mainland China	H	B	Ch	C/F/M	1896		+	1
Bauhinia purpurea L.	Southeast Asia	T	P	Ph	O	1929	1903	+	25
Bauhinia variegata L.	East Asia, India and China	T	P	Ph	O	1984	1974	+	25
Cajanus cajan (L.) Millsp.	India	S	P	Ph	M	1909		+	1
Calopogonium mucunoides Desv.	Tropical America	H	A	Ch	F	1931		+	1
Canavalia ensiformis DC.	Mexico and Brazil	H	A	Ch	M	1931		+	1
Centrosema pubescens Benth.	South America	V	P	Ch	C	1962		+	1
Chamaecrista mimosoides (L.) Green	India and South China	H	P	Ch		1900		+	1
Chamaecrista nictitans (L.) Moench subsp. *patellaria* (DC. *ex* Collad.) H. S. Irwin & Barneby var. *glabrata* (Vogel) H. S. Irwin & Barneby	Tropical America	H	P	Ch		1910		+	1
Clitoria falcata Lam.	Tropical America	V	P	Ch		1995		+	1
Clitoria ternatea L.	Tropical America	V	P	Ch	F	1909		+	1
Crotalaria bialata Schrank	Tropical Asia	H	A	Ch	C	1931		+	1
Crotalaria incana L.	Tropical America	H	A	Ch	C	1931		+	1
Crotalaria lanceolata E. Mey.	Tropical Africa	H/S	P	Ch	C	1974		+	29
Crotalaria linifolia L. f.	Tropical Asia	H	P	Ch	C	1910		+	3
Crotalaria micans Link	South America	H	P	Ch	C	1931		+	1
Crotalaria pallida Ait. var. *obovata* (G. Don) Polhill	South Africa	S	A	Ch	C	1910		+	1
Crotalaria spectabilis Roth.	India	H	A	Ch	C	1962		+	3
Crotalaria triquetra Dalzell	Tropical Asia	H		Ch	C	1985		+	1
Crotalaria zanzibarica Benth.	Africa	H	A/P	Ch	C	1931		+	1
Dalbergia sissoo Roxb.	India	T	P	Ph	C/O	1916		+	1
Delonix regia (Bojer *ex* Hook.) Raf.	Madagascar	T	P	Ph	O	1942	1904	+	25
Derris elliptica (Roxb.) Benth.	Tropical Asia, Africa and Oceania	L	P	Ch		1937		+	3

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Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Desmanthus virgatus L.	Tropical America	S	P	Ch		1988		+	1
Desmodium intortum (DC.) Urb.	Tropical America	H	P	Ch	F	1962		+	1
Desmodium scorpiurus (Sw.) Desv.	Tropical America	H	P	Ch		1915		+	1
Desmodium tortuosum (Swartz) DC.	West Indies	H	A/P	Ch		1930		+	1
Desmodium uncinatum (Jacq.) DC.	Tropical America	H	P	Ch		1987		+	30
Glycine max (L.) Merrill	South Asia	H	A	Ch	C	1930		+	30
Haematoxylum campechianum L.	Central America and West Indies	T	P	Ph	C/O	1916		+	1
Indigofera pseudo-tinctoria Matsum.	Japan, central China	S	P	Ph	O	2002			63
Lablab purpureus (L.) Sweet	Asia	H	A	Ch	C	1903		+	1
Leucaena leucocephala (Lam.) De Wit	Tropical America	T	P	Ph	F/O	1916	1645	+	1
Lotus corniculatus L. var. *japonicus* Regel	Europe	H	P	Ch		1977		+	2
Macroptilium atropupureus (DC.) Urb.	Tropical America	H	P	Ch	F	1985	1960		1
Macroptilium lathyroides (L.) Urb.	Tropical America	H	A	Ch	F	1981		+	1
Medicago lupulina L.	Europe	H	A	Ch	C	1929		+	1
Medicago polymorpha L.	Europe	H	A	Ch	C	1909		+	1
Medicago sativa L.	Europe	H	P	Ch	C	1931		+	1
Melilotus indicus (L.) All.	Europe	H	B	Ch		1918		+	1
Melilotus officinalis (L.) Lam.	Europe	H	A/B	Ch	C	1984		+	1
Mimosa diplotricha C. Wight *ex* Sauvalle	Tropical America	S	P	Ph		1927	1965	+	1
Mimosa pigra L.	Tropical America	S	P	Ph	O	1976	1965	+	1
Mimosa pudica L.	Tropical America	S	P	Ph	O	1912	1645	+	1
Mucuna pruriens (L.) DC. var. *utilis* (Wall. *ex* Wight.) Burck.	Tropics	H	A/P	Ch	C/F	1918		+	1
Neonotonia wightii (Wight & Ann.) Lakey	Africa	H	P	Ch	C/F	1962		+	1
Neptunia gracilis Benth.	Australia	H	P	Ch	C	1996		+	25
Pachyrrhizus erosus (L.) Urb.	Tropical America	V	A/P	Ch	C/F	1917		+	1
Psoralea corylifolia L.	India, Malaysia and Indonesia	H	A	Ch	M	1984		+	1
Pueraria lobata (Willd.) Ohwi subsp. *thomsonii* (Benth.) H. Ohashi & Tateishi	Eastern and Southern Asia	L	P	Ch		1935		+	3
Senna alata (L.) Roxb.	Tropical America	S/T	P	Ch	O	1999	1906	+	6
Senna hirsuta (L.) Irwin & Barneby	America	H	A	Ch		1931		+	1
Senna occidentalis (L.) Link	South America	H	P	Ph		1988		+	1
Senna siamea (Lam.) Irwin & Barneby	India, Sri Lanka and Malaysia	T	P	Ph	O	1989		+	1
Senna sulfurea (Collad.) Irwin & Barneby	India, Ceylon, Australia and Polynesia	T	P	Ph	C/O	1942		+	1
Senna tora (L.) Roxb.	Tropical Asia and America	H	A	Ch	M	1929		+	3
Senna ×*floribunda* (Cav.) Irwin & Barneby	South America	S	P	Ph	M	1975			25
Sesbania cannabina (Retz.) Poir.	India, Malaysia, Java and Philippines	H	A	Ch	C	1914		+	1
Sesbania grandifloua (L.) Pers.	Tropical Asia	S/T	P	Ch	C	1930			6
Sesbania sesban (L.) Merr.	Tropical Asia	S	P	Ph	C	1910		+	28
Stizolobium cochinchinensis (Lour.) Burkart	South China	H	A	Ch		2004			3
Stylosanthes guianensis (Aubl.) Sw	Central and South America	H	P	Ch	F	1962		+	1
Tephrosia candida (Roxb.) DC.	India	S	P	Ph	C/F	1928		+	1
Tephrosia noctiflora Bojer *ex* Baker	Madagascar	H/S	A/P	Ph		1962		+	25
Trifolium dubium L.	Europe	H	A	Ch	C/F	1980		+	1
Trifolium pratense L.	Europe	H	P	Ch	C/F	1931		+	1
Trifolium repens L.	Europe	H	P	Ch	F	1916		+	1
Trigonella hamosa Forssk.	Middle East	H		Ch		1999		+	1
Vicia cracca L.	Eurasia	H	P	Ch		1931		+	28
Vicia hirsuta (L.) S. F. Gray	Northern Hemisphere	V	A	Ch		1927		+	1
Vicia sativa L. subsp. *nigra* (L.) Ehrh.	Europe	H	A	Ch		1923		+	1
Vicia tetrasperma (L.) Moench.	Europe	H	A/P	Ch		1928		+	1
Vigna radiata (L.) Wilczek	Thailand and Southeast Asia	H	A	Ch	C/M	1915		+	1
Vigna umbellata (Thunb.) Ohwi & Ohashi	Subtropical Asia	V	A	Ch	M	1915		+	1
Fumariaceae									
Fumaria officinalis L.	Europe	H	A			1997		+	31
Geraniaceae									
Erodium cicutarium (L.) L'Herit.	Europe and Africa	H	A/B	Ch		1995		+	1

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Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Erodium moschatum (L.) L'Herit.	Europe and Africa	H	A	Ch		1992		+	1
Geranium carolinianum L.	North America	H	P	Ch	C	1977		+	1
Geranium molle L.	Europe	H	P	Ch		2005		+	32
Geranium pusillum L.	Europe, northern Africa and western Asia	H	A/B	Ch		2001		+	33
Guttiferae									
Hypericum monogynum L.	China	S	P	Ph	O	1896		+	1
Hypericum patulum Thunb. *ex* Murray	China	S	P	Ph	O	1903		+	1
Haloragaceae									
Myriophyllum aquaticum (Vell.) Verdc.	South America	H	P	Ch		1996		+	1
Lauraceae									
Cinnamomum burmannii (Nees) Blume	Southeast Asia and Indonesia	T	P	Ph		1997			54
Labiatae									
Ajuga decumbens Thunb. *ex* Murray	Japan, Korea and South China	H	P	Ch		1975		+	1
Hyptis pectinata (L.) Poit.	Tropical America, Mexico, South Florida and Venezuela	H	P	Ch		2000		+	34
Hyptis rhomboides Mart & Gal.	Tropics	H	P	Ch	M	1896		+	1
Hyptis suaveolens (L.) Poir.	Tropical America	H	A	Ch	M	1920		+	6
Lamium hybridum Vill.	Europe and British Isles	H	A	Ch		2006		+	24
Lamium purpureum L.	Europe	H	A	Ch		2008		+	63
Mentha arvensis L. subsp. *piperascens* (Malinv.) Hara	East Asia	H	P	Ch	C/M	1966		+	6
Ocimum basilicum L.	Northeast India	H	A/P	Ch	M	1916		+	1
Ocimum gratissimum L.	Madagascar	H	P	Ch	M	1968		+	1
Ocimum sanctum L.	Tropical Asia	H	A	Ch	M	1999		+	35
Orthosiphon aristatus (Blume) Miq.	Asia	H	P	Ch	M	1938		+	35
Perilla frutescens (L.) Britt.	China	H	A	Ch	M	1896	1700	+	1
Salvia coccinea Juss. *ex* Murr.	Tropical America	H	P	Ch		1911	1911	+	1
Lythraceae									
Ammannia auriculata Willd.	Tropical Africa, Central Asia, India, East China, Australia, North and South America	H	A	Ch	O	1985		+	3
Ammannia coccinea Rottb.	North America	H	A	Ch	O	1987		+	1
Cuphea carthagenensis (Jacq.) Macbrids	Tropical America	H	P	Ch	O	1960		+	1
Rotala ramosior (L.) Koehne	North America	H	P	Ch	O	1982		+	1
Rotala rosea (Poir) C. D. K. Cook	Asia	H	P	Ch	O	1896		+	1
Malvaceae									
Abelmoschus moschatus (L.) Medicus	India, Malaysia to Pacific islands	H	A	Ch	C	1907		+	36
Abutilon crispum (L.) Medicus	Tropical America	H	P	Ch		1992		+	1
Abutilon grandifolium (Willd.) Sweet	Tropical America and Africa	S	P	Ch		1932		+	3
Abutilon striatum Dicks. *ex* Lindl.	Guatemala	S	P	Ch	O	1937		+	3
Malachra capitata (L.) L.	Tropical America	H	A/P	Ch	O	1987		+	1
Malva neglecta Wallr.	Warm regions of the old world	H	P	Ch	C	1973		+	1
Malva sinensis Cav.	China	H	A/B	Ch	C	1898		+	1
Malvastrum coromandelianum (L.) Garcke	Tropical America	H	A	Ch		1896		+	1
Malvastrum spicatum (L.) A. Gray	Tropical America	H	A	Ch		1930		+	1
Modiola caroliniana (L.) G. Don	South America	H/S	A/B/P	Ch		1944		+	3
Melastomataceae									
Clidemia hirta (L.) D. Don	Central and South America	S	P	Ch	O	1999		+	1
Meliaceae									
Swietenia macrophylla King	Tropical America	T	P	Ph	O/W	1983	1901	+	12
Swietenia mahogoni (L.) Jacq.	Tropical America	T	P	Ph	O/W	1915	1901		12
Molluginaceae									
Mollugo verticillata L.	Tropical America	H	A	Ch	O	1978		+	1
Moraceae									
Ficus religiosa L.	India, Myanmar and Sri Lanka	T	P	Ph	O	1922	1901	+	3

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Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Myrsinaceae									
Ardisia squamulosa Presl	Southeast Asia	T/S	P	Ph	O	1954		+	3
Myrtaceae									
Psidium guajava L.	Tropical America	T	P	Ph	C	1983		+	3
Syzygium jambas (L.) Alston	Tropical Asia and East Indian	T	P	Ph	C/M	1915	1661		3
Nelumbonaceae									
Nelumbo nucifera Gaertn.	China	H	P	Cr	O	1975	1905	+	3
Nyctaginaceae									
Boerhavia erecta L.	Tropical America	H	A	Ch		2003		+	1
Boerhavia coccinea Mill.	Tropical America, perhaps to the Caribbean Islands	H	P	Ch		1990		+	34
Mirabilis jalapa L.	Tropical America	H	P	Cr	O	1896	1661	+	1
Nymphaeaceae									
Nuphar japonicum DC.	Japan	H	P	Cr	C	1926		+	3
Nymphaea capensis Thunb.	Tropical Africa	H	P	Cr	O	2004		+	3
Nymphaea lotus L. var. *dentate* Schum. & Thonn.	South America and China	H	P	Cr	O	2004	1925	+	3
Nymphaea rubra Roxb. *ex* Andrews	Tropical Asia	H	P	Cr	O	2004	1925	+	3
Onagraceae									
Ludwigia decurrens Walt.	North America	H	A/P	Ch		1999		+	3
Oenothera biennis L.	North America	H	B	Ch	O	1986		+	1
Oenothera glazioviana Micheli	Europe	H	B	Ch	C	1987		+	1
Oenothera laciniata J. Hill	North America	H	P	Ch		1985		+	1
Oenothera stricta Ledeb. *ex* Link	South America	H	A/B	Ch		1985		+	1
Oenothera tetraptera Cav.	Mexico and North America	H	A/P	Ch	C	1962	1950	+	1
Oxalidaceae									
Oxalis corymbosa DC.	South America	H	P	Ch	O	1928	1900	+	1
Papaveraceae									
Argemone mexicana L.	West Indies	H	A	Ch	O	1913	1911	+	1
Papaver rhoeas L.	Europe, Africa and Asia	H	A/B	Ch	O	1978	1661	+	1
Passifloraceae									
Passiflora edulis Sims.	Brazil	V	P	Ch	C	1916	1901	+	1
Passiflora foetida L. var. *hispida* (DC. *ex* Triana & Planch.) Killip	South America	V	P	Ch	C/O	1938	1960	+	1
Passiflora suberosa L.	South America	H	P	Ch	O	1915	1907	+	1
Phytolaccaceae									
Phytolacca americana L.	North America	H	P	Ch	O	1962	1959	+	1
Rivina humilis L.	South America	H	P	Ch	O	1923		+	6
Piperaceae									
Peperomia pellucida Kunth	North America	H	P	Ch	O	1928		+	1
Piper betle L.	Uncertain origin	H	P	Ch	M	2004		+	3
Plantaginaceae									
Plantago lanceolata L.	Europe	H	P	He		1991		+	1
Plantago virginica L.	North America	H	A	He		1970		+	1
Plumbaginaceae									
Armeria maritima (Mill.) Willd.	Northern Hemisphere	H	P	He	O	2005		+	13
Plumbago zeylanica L.	Tropical Asia	H/S	P	Ch	M	1913	1645	+	3
Polygalaceae									
Polygala paniculata L.	Tropics	S	P	Ch		1926		+	1
Polygonaceae									
Antigonon leptopus Hook. & Arn.	Mexico	V	P	Ch	O	1916	1913	+	1
Fagopyrum cymosum (Trev.) Meisn.	China	H	P	Ch	O	1896		+	1
Fagopyrum esculentum Moench.	China	H	A	Ch	C/M	1923		+	3
Fagopyrum tataricum Gaertn.	Asia	H	A	Ch	C	2004		+	3
Persicaria capitata (Buchanan-Hamilton *ex* D. Don) H. Gross	Asia	H	P	Ch		1997		+	37
Polygonum aviculare L.	Europe	H	A	Ch	M	1983		+	1
Polygonum plebeium R. Br.	Europe	H	A	Ch	M	1967		+	2
Rumex acetosella L.	Eurasia	H	P	Ch	M	1928		+	1
Rumex crispus L.	Eurasia	H	P	Ch	M	1906		+	1
Rumex maritimus L.	Eurasia	H	A	Ch	M	1896		+	1
Rumex obtusifolius L.	Eurasia	H	P	Ch	C/F/M	1996		+	1

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Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Rumex crispus L. var. *japonicus* (Houtt.) Makino	Eurasia	H	P	Ch	C/M	1934		+	6
Portulacaceae									
Portulaca oleracea L. var. *granatus* Bailey	South America	H	A	Ch	O	1908		+	17
Portulaca pilosa L. subsp. *grandiflora* (Hook.) Greesink	Tropical America	H	A	Ch	O/M	1916	1911	+	1
Talinum paniculatum (Jacq.) Gaertn.	Tropical America	H	P	Cr	O/M	1898	1911	+	1
Primulaceae									
Anagalis arvensis L.	Eurasia	H	A/B	Ch	O	1915			3
Rosaceae									
Duchesnea indica (Andr.) Focke	China and East Asia	H	P	Ch	M	1913		+	1
Potentilla amurensis Maxim.	Asia	H	A	Ch	O	1943		+	3
Prunus japonica Thunb.	East China	T	P	Ph	O	1987	1936	+	3
Ranunculaceae									
Semiaquilegia adoxoides (DC.) Makino	China, South Korea and western Japan	H	P	Ch	M	2003		+	38
Rubiaceae									
Diodia virginiana L.	North America	H	P	Ch		1986		+	1
Hemidiodia ocimifolia (Willd.) Schum.	Tropical America	H	P	Ch		2006		+	2
Richardia brasiliensis Gomes	South America	H	A	Ch		1976		+	1
Richardia scabra L.	Tropical America	H	A	Ch	M	1973		+	1
Serissa serissoides (DC.) Druce	China and Japan	H	P	Ch	O	1896		+	1
Sherardia arvensis L.	Europe	H	A	Ch	O	2003		+	3
Spermacoce articularis L.	India	H	A	Ch		1908		+	1
Spermacoce assurgens Ruiz & Pavon	Tropical America	H	P	Ch		1984		+	1
Spermacoce latifolia Aublet	Tropical America	H	P	Ch		1942		+	1
Spermacoce mauritiana Gideon	Africa and Malesia	H	P	Ch		1986		+	17
Salicaceae									
Salix babylonica L.	China	T	P	Ph	C/M/O	1911	1700	+	3
Sapindaceae									
Cardiospermum halicacabum L.	Pantropical	H	P	Ch	O	1896		+	1
Euphoria longana Lam.	Southeast Asia	T	P	Ph	C/O	1911			3
Scrophulariaceae									
Bacopa carolineana Robinson	North America	H	P	Ch	O	2004			3
Digitalis lutea L.	Europe	H	P	Ch		1940		+	17
Digitalis purpurea L.	Europe	H	A/B	Ch	O	1911	1910	+	1
Dopatrium junceum (Roxb.) Buch. Ham. *ex* Benth.	China, Japan and Korea	H	A	Ch		1918		+	38
Limnophila heterophylla (Roxb.) Benth.	Southeast Asia	H	P		O	2004		+	3
Lindernia anagallidea (Michaux) Pennell	North America	H	A	Ch	O	1988		+	1
Lindernia dubia (L.) Pennell	North America	H	A	Ch		1987		+	1
Mecardonia procumbens (Mill.) Small	Tropical America	H	P	Ch		1999		+	1
Scoparia dulcis L.	Tropical America	H	A	Ch	M	1896		+	1
Torenia fournieri Lind.	Southeast Asia	H	A	Ch	O	1940	1911	+	3
Veronica arvensis L.	Europe	H	A	Ch	O	1992		+	1
Veronica hederifolia L.	Europe, North Africa and Western Asia	H	A	Ch		2008		+	55
Veronica peregrina L.	America, Siberia and Korea	H	A	Ch	O	1970		+	1
Veronica persica Poir.	Europe and West Asia	H	A/B	Ch	O	1911		+	1
Solanaceae									
Brugmansia suaveolens (Willd.) Bercht. & C. Presl	Brazil	S	P	Ph	O	1955	1910	+	1
Capsicum annuum L.	Mexico and South America	H	A	Ch	C	1896		+	1
Cyphomandra betacea (Cav.) Sendt.	Peru, Chile, Ecuador and Bolivia	T/S	P	Ph	C	2003			56
Datura inoxia Mill.	Mexico	H	A	Ch		1991		+	1
Datura metel L.	America	H	A	Ch	O	1896	1957	+	1
Datura stramonium L. var. *tatula* (L.) Torr.	Mexico	H/S	P	Ph	O	1992		+	17
Lycium chinense Mill.	China, Japan, and Korea	S	P	Ph	M	1896	1700	+	1
Lycopersicon esculentum var. *cerasiforme* (Dunal) A. Gary	Tropical America	H	A	Ch	O	1896	1928	+	1
Nicandra physalodes (L.) Gaertner	Peru	H	A	Ch	O	1917		+	3
Nicotiana alata Link & Otto	South America	H	P	Ch	O	2004		+	3

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Appendix 1. Continued.

Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Nicotiana longiflora Cav.	South America	H	A/P	Ch	O	1906		+	3
Nicotiana plumbaginifolia Viviani	America	H	A	Ch		2007		+	39
Nicotiana tabacum L.	South America	H	A	Ch	C	1907		+	3
Physalis angulata L.	America	H	A	Ch		1896		+	1
Physalis minima L.	Tropical Asia	H	A	Ch		2008		+	2
Physalis peruviana L.	America	H	P	Ch	O	1975		+	1
Physalis pubescens L.	America	H	A	Ch	M	1991		+	1
Solanum americanum Miller	South America	H	A	Ch	M	1907		+	1
Solanum capsicoides Allioni	Brazil	H	P	Ch	M	1899		+	1
Solanum diphyllum L.	Mexico and Central America	H	P	Ch	O	1928	1910	+	1
Solanum elaeagnifolium Cav.	Tropical America	S	P	Ch		2001		+	1
Solanum erianthum D. Don	Brazil	S	P	Ch	O	1896	1910	+	1
Solanum mammosum L.	South America	H/S	A/P	Ch	O	1981	1967	+	3
Solanum mauritianum Scopoli	South America	S/T	P	Ch		2001		+	3
Solanum melongena L.	South America	S	P	Ch	C/M	1896		+	1
Solanum pseudocapsicum L.	Madeira	S	P	Ch	O	1982	1972	+	1
Solanum rostratum Dunal	North America	H	A	Ch		2004		+	1
Solanum seaforthianum Ander.	Caribbean	V	P	Ch	O	1978	1910	+	1
Solanum sisymbriifolium Lam.	South America	H	A	Ch		1978		+	1
Solanum torvum Sw.	Caribbean	S	P	Ch	M	1896		+	1
Solanum tuberosum L.	Chile and Peru	H	A	Cr	C	1923		+	3
Sterculiaceae									
Waltheria americana L.	Hawaii	S	P	Ph	M	1910		+	6
Tamaricaceae									
Tamarix chinensis Lour.	Asia and Europe	T	P	Ph	M	1995		+	36
Tiliaceae									
Corchorus capsularis L.	Tropical Area	H	A	Ch	C	1912		+	28
Corchorus olitorius L.	Old world tropics	H	A	Ch	M	1896		+	1
Muntingia calabura L.	Tropical America	T	P	Ph	C	1936	1936	+	1
Trapaceae									
Trapa natans L. var. *bispinosa* Makino	China, Japan and Korea	H	P	Ch	C	1907		+	17
Umbelliferae									
Apium leptophyllum (Pers.) F. Muell.	Eurasia	H	P	Ch		1918		+	1
Eryngium foetidum L.	Tropical America	H	A	Ch	M	1926		+	1
Foeniculum vulgare (L.) Miller	Mediterranean region	H	P	Ch	C/M	1916		+	40
Hydrocotyle leucocephala Cham. & Schltdl.	South America	H	P	Hemi	O	2000		+	3
Hydrocotyle vulgaris L.	Europe	H	P	Hemi	O	2004		+	3
Urticaceae									
Boehmeria nivea (L.) Gaudich.	China	S	P	Ch	C/M	1918		+	17
Laportea aestuans (L.) Chew	Tropical America and Africa and Southeast Asia	H	A/P	Ch		2001		+	41
Pilea microphylla (L.) Liebm.	South America	H	A	Ch	O/M	1912		+	1
Pilea nummulariifolia (Swartz) Weddell	Tropical Americas	H	P	Ch	O	2008			57
Verbenaceae									
Clerodendrum chinense (Osbeck) Mabberley	South Asia	S	P	Ch	M	1896		+	1
Clerodendrum paniculatum L. var. *albiflorum* (Hemsl.) Hsieh	South Asia	S	P	Ch	O	1991		+	17
Duranta repens L.	Tropical America and Mexico	S	P	Ph	O	1896	1600	+	1
Lantana camara L.	West Indies	S	P	Ch	O	1903	1645	+	1
Stachytarpheta cayennensis (Rich.) Vahl	Tropical America	H	A	Ch	O	1967	1900	+	1
Stachytarpheta jamaicensis (L.) Vahl	Tropical America	S	P	Ch	O	1928	1900	+	1
Stachytarpheta urticaefolia (Salisb.) Sims.	Tropical Asia	S	P	Ch	O	1925		+	3
Tectona grandis L. f.	Southeastern Asia	T	P	Ph	W	1915		+	42
Verbena bonariensis L.	South America	H	P	Ch	O	1984		+	1
Verbena brasiliensis Vell.	South America	H	A	Ch	M	1991		+	1
Violaceae									
Viola arvensis Murray	Europe	H	A	Ch	O	1976		+	1
Vitaceae									
Cayratia maritima B. R. Takes	New Guinea	V	P	Ch		1999			2
Cissus sicyoides L.	Tropical America	V	P	Ch	O	1997		+	3
Monocotyledon									
Agavaceae									

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Appendix 1. Continued.

Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Agave americana L.	Mexico	H	P	He	O	2004	1645	+	1
Agave fourcroydes Lem.	Tropical America	S	P	He	O	1910		+	1
Agave gigantean L.	Mexico	H	P	He	O	1910			1
Agave sisalana Perr. *ex* Engelm.	Mexico	H	P	He	C/O	1890	1900	+	1
Araceae									
Amorphophallus paeoniifolius (Dennst.) Nicolson	Madagascar	H	P	Cr	O	1914		+	1
Colocasia esculenta (L.) Schott	Tropical Asia	H	P	Cr	C	1968		+	3
Colocasia esculenta (L.) Schott var. *antiquorum* (Schott.) Hubbard *et* Rehder	Tropical Asia	H	P	Cr	C	2004		+	3
Colocasia gigantea (Blume) Hook.	China, Laos and Vietnam	H	P	Cr	M	2004		+	1
Colocasia tonoimo Nakai.	China	H	P	Cr	O	2004		+	1
Pistia stratiotes L.	Tropical America	H	P	Cr	O	1922		+	3
Syngonium podophyllum Schott	Tropical America	H	P	Cr	O	1992	1968	+	3
Typhonium roxburghii Schott	South Asia	H	P	Cr	M	1994		+	1
Xanthosoma sagittifolium (L.) Schott	South America	H	P	Cr	O	1998	1935	+	1
Xanthosoma violaceum Schott	Tropical America	H	P	Cr	O	2000		+	1
Butomaceae									
Hydrocleys nymphoides (Willd.) Buchenau.	South America	H	P	He	O	1994	1969	+	3
Cannaceae									
Canna edulis Ker	Tropical America	H	P	He	O	1970		+	6
Canna indica L.	Tropical America	H	P	He	O	1896	1661	+	1
Canna warscewiczii Otto	South America	H	P	He	O	1934			17
Commelinaceae									
Callistia fragrans (Lindl.) Woodson	Mexico	H	P	Ch	O	2006			58
Setcreasea purpurea Boom	Central and North America	H	P	Ch	O	1995			3
Tradescantia fluminensis Vell.	Brazil	H	P	He	O	1987	1928	+	3
Zebrina pendula Schnizl.	Tropical America	H	P	Ch	O	2005	1965	+	3
Cyperaceae									
Cyperus alternifolius L.	Africa, Madagascar and Reunion	H	P	Ch	O	1961			59
Cyperus alternifolius L. subsp. *flabelliformis* (Rottb.) Kük.	Madagascar	H	P	Ch	O	1929	1901	+	1
Cyperus difformis L.	Southern Europe, Western and Tropical Asia	H	A	He	O	2004		+	3
Cyperus eragrostis Lam.	Tropical America	H	P	He	C	2001		+	5
Cyperus esculentus L.	Europe	H	P	He		2005		+	5
Cyperus prolifer Lam.	South Africa	H	P	He	O	2004	1901	+	3
Cyperus surinamensis Rottb.	Tropical American	H	P	He	O	2001		+	64
Kyllinga polyphylla Willd. *ex* Kunth	Tropical Africa	H	P	He	O	2007		+	16
Lepironia articulata (Retz.) Domin	Asia, Australasia and Pacific islands	H	P	Ch	C	1915		+	3
Hydrocharitaceae									
Egeria densa Planch.	Brazil	H		Ch	O	1992	1930	+	3
Limnobium spongia (Bosc) Steudel subsp. *laevigatum* (Humb. & Bonpl. *ex* Willd.) Lowden	South and Central America	H	P	Ch	O	2008		+	2
Vallisneria americana Michx.	North America	H	P	Ch	O	2004		+	3
Liliaceae									
Hemerocallis fulva (L.) L.	Asia	H	P	He	M	2005		+	13
Iridaceae									
Belamcanda chinensis (L.) DC.	China	H	P	Cr	M/O	1910	1830	+	12
Crocosmia ×*crocosmiiflora* (Lemoine) N. E. Br.	Africa	H	P	Cr	O	2006	1908		17
Gladiolus gandavensis Van Houtte	Mediterranean, Asia Minor and Africa	H	P	Cr	O	1992		+	13
Sisyrinchium atlanticum Bickn.	North America	H	P	Cr	O	1930	1911	+	1
Sisyrinchium exile Bickn.	South America	H	A	Cr	O	2005		+	2
Sisyrinchium iridifolium Kunth	Tropical America	H	P	Cr	O	1910	1911	+	1
Poaceae									
Agrostis avenacea J. F. Gmel.	Australia and Hawaii	H	A	Ch		2006		+	43
Agrostis stolonifera L.	Temperate regions of the Northern Hemisphere	H	P	Ch	O	2006		+	43
Alopecurus myosuroides Huds.	Europe	H	A	Ch		1897		+	1

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Appendix 1. Continued.

Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Alopecurus pratensis L.	Europe and northern Asia	H	P	Ch	C	2006		+	43
Anthoxanthum odoratum L.	Europe and Siberia	H	P	Ch	C	1999		+	1
Arrhenatherum elatius (L.) Presl f. *variegatum* Hitchc.	Japan	H	P	Ch	O	1970		+	1
Arthraxon lancifolius (Trin.) Hochst.	China, Southeastern and Southern Asia, Arabia and Eastern Africa	H	A	Ch		2000			24
Avena fatua L.	Europe	H	A	Ch	C	1961		+	1
Avena sativa L.	North Europe	H	A	Ch	C	1957		+	3
Axonopus affinis Chase	Tropical America	H	P	Ch	C/F/O	1953	1953	+	1
Axonopus compressus (Sw.) P. Beauv.	Tropical America	H	P	Ch	C/F/O	1960	1940	+	1
Brachiaria mutica (Forsk.) Stapf	Tropical Africa	H	P	Ch	F/O	1960		+	1
Briza minor L.	Mediterranean	H	P	Ch	O	1937	1930	+	1
Bromus carinatus Hook. & Arn.	Western America	H	A/P	Ch		1997		+	44
Bromus catharticus Vahl.	South America	H	A/B	Ch	C/F	1969		+	1
Bromus commutatus Schrad.	America and Europe	H	P	Ch		1993			60
Bromus hordeaceus L.	North America and Europe	H	A	Ch		2006		+	44
Bromus pubescens Muhl. *ex* Willd.	North America	H	P	Ch		2006		+	44
Bromus rigidus Roth	Europe	H	A/B	Ch	F	1978		+	1
Cenchrus ciliaris L.	Mediterranean, Africa, Arabia and South Asia	H	P	Ch	F	2004		+	45
Cenchrus echinatus L.	Tropical America	H	A	Ch		1934		+	1
Chloris barbata Sw.	Tropical America	H	A	Ch	F	1896		+	1
Chloris divaricata R. Br. var. *cynodontoides* (Bal.) Lazarides	Australia, Oceania and Hawaiian Islands	H	P	Ch		2001		+	34
Chloris gayana Kunth	Africa	H	A/P	Ch		1936		+	1
Chloris virgata Sw.	North America	H	A	Ch	F	1958		+	1
Coix lacryma-jobi L.	Tropical Asia	H	A	Ch	C/M	1914		+	3
Cymbopogon citratus (DC.) Stapf.	India and Sri Lanka	H	P	He	O	1954		+	6
Cymbopogon nardus (L.) Rendle	India and Sri Lanka	H	P	He	M	1910		+	6
Cynodon nlemfuensis Vanderyst	East and Central Africa	H	P	Ch		1980			61
Cynodon plectostachyum (Schum.) Pilger.	Africa	H	P	Ch	C/F	2004	1957	+	3
Dactylis glomerata L.	Europe	H	P	Ch	C/F	1957		+	1
Dendrocalamus latiflorus Munro	Southern China	H	P	Ch		1897			6
Deschampsia atropurpurea (Wahl.) Scheele	North America, Alaska and northern Europe	H	P	Ch		2006			43
Dichanthium annulatum (Forsk.) Stapf.	India	H	P	Ch		1969		+	1
Dichanthium aristatum (Poir.) C. E. Hubb.	India	H	P	Ch		1960		+	1
Digitaria sanguinalis (L.) Scop.	Europe	H	A	Ch		1954		+	1
Echinochloa frumentacea (Roxb.) Link	India	H	A	Ch	C	1940		+	1
Eragrostis ciliaris (L.) R. Br.	Paleotropics	H	A	Th		1970		+	1
Eragrostis curvula (Schrad.) Nees.	South Africa	H	P	Ch	F	1983	1977	+	46
Euchlaena mexicana Schradl.	Mexico	H	A	Ch	F	1904		+	1
Festuca arundinacea Schreb.	Eurasia	H	P	Ch	C	1977		+	1
Festuca elatior L.	Europe	H	P	Ch	O	2004		+	1
Holcus lanatus L.	Eurasia	H	P	Ch		2000		+	1
Leersia hexandra Sw.	North America	H	P	Ch		1910		+	3
Leptochloa fusca (L.) Kunth subsp. *fascicularis* (Lam.) N. Snow	North and South America	H	A	Ch		2005		+	2
Leptochloa fusca (L.) Kunth subsp. *uninervia* (J. Presl) N. Snow	Southern United States	H	A	Ch		2007		+	2
Lolium multiflorum Michx.	Europe and Africa	H	A/P	Ch	C/F	1956		+	1
Lolium perenne L.	Europe	H	A/P	Ch		1957		+	1
Melinis minutifora Beauv.	Africa	H	P	Ch	F	1969			1
Panicum dichotomiflorum Michx.	America	H	A	Ch		1969		+	1
Panicum maximum Jacq.	Tropical Africa	H	P	Ch	C	1928		+	1
Panicum miliaceum L.	Central Asia	H	A	Ch	C	1963		+	2
Panicum repens L.	Tropical and subtropical regions	H	P	Ch	C	1910		+	6
Paspalidium flavidum (Retz.)	Tropical Asia	H	P	Ch		1992		+	1
Paspalidium punctatum (Burm.) A. Camus	Tropical Asia	H	P	Ch		1940		+	17
Paspalum conjugatum Bergius	America	H	P	Ch	O	1926		+	1
Paspalum dilatatum Poir.	South America	H	P	Ch	C/F	1958		+	1

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Appendix 1. Continued.

Species	Origin	LF	HA	RS	U	FR	IR	W	RE
Paspalum fimbriatum Kunth	South America	H	A	Ch		1971		+	1
Paspalum notatum Flüggé	Tropical America	H	P	Ch	C/F/O	2000		+	2
Paspalum paniculatum L.	South America and West Africa	H	P	Ch		1999		+	1
Paspalum urvillei Steud.	Tropical America	H	P	Ch		1963		+	1
Paspalum virgatum L.	Jamaica	H	P	Ch		1972		+	1
Pennisetum cladestinum Hochst. *ex* Chiov.	Tropical Africa	H	P	Ch	C/F/O	1963	1958		1
Pennisetum polystachion (L.) Schult.	Tropical America	H	P	Ch		1960		+	1
Pennisetum purpureum Schumach.	Tropical Africa	H	P	Ch	C/F	1959		+	1
Phalaris arundinacea L.	Northern Hemisphere	H	P	Ch		1970		+	1
Phalaris canariensis L.	West Mediterranean	H	P	Ch		1984		+	1
Phyllostachys pubescens Mazel *ex* H. de Leh.	China	H	P	Ch	M/O	1923	1705	+	3
Poa compressa L.	Europe and Russia	H	P	Ch		2000		+	47
Poa pratensis L.	Europe	H	P	Ch		2006		+	47
Poa trivialis L.	Europe	H	P	Ch		2006		+	47
Polypogon monspeliensis (L.) Desf.	North Africa and Eurasia	H	A	Ch		1931		+	17
Rhynchelytrum repens (Willd.) C. E. Hubb.	Africa	H	A	Ch	C	1962		+	1
Setaria geniculata (Lam.) P. Beauv.	North America	H	P	Ch		1929		+	1
Setaria glauca (L.) P. Beauv.	Eurasia	H	A/P	Ch		1896		+	1
Setaria italica (L.) P. Beauv.	Africa	H	P	Ch	C	1917		+	1
Setaria palmifolia (Koen.) Stapf	Old world tropics	H	P	Ch	C	1907		+	6
Setaria sphacelata (Schumach.) Moss *ex* Stapf & Hubb.	Tropical and South Africa	H	P	Ch	C/F	2006		+	48
Sorghum bicolor (L.) Moench	Africa and Asia	H	A	Ch	C	1924		+	49
Sorghum halepense (L.) Pers.	Tropical America	H	P	Ch		1968		+	1
Spartina alterniflora Loisel.	North and South America	H	P	Ch		2008		+	60
Sporobolus tenuissimus (Mart. *ex* Schrank) Kuntze	Tropical America	H	A	Ch		2005		+	18
Stenotaphrum secundatum (Walt.) Kuntze	America	H	P	Ch	C/O	1975		+	2
Themeda japonica (Willd.) C. Tanaka	China, Korea and Japan	H	P	Ch		1978		+	6
Tripsacum dactyloides (L.) L.	America	H	P	Ch		2007			61
Vetiveria zizanioides (L.) Nash	Europe	H	P	Ch	O	1937		+	1
Vulpia myuros (L.) Gmel.	Europe to West Asia	H	A	Ch		1969		+	1
Zea mays L.	America	H	A	Ch	C/M	1905		+	1
Zizania latifolia (Griseb.) Stapf	Eastern Siberia, Japan, China and Indochina	H	P	Ch	C	1907		+	17
Zoysia japonica Steud.	China	H	P	Ch	O	1928		+	1
Pontederiaceae									
Eichhornia crassipes (Mart.) Solms	South America	H	P	He	O	1906	1898	+	1
Taccaceae									
Monochoria vaginalis (Burm. f.) Presl	South America	H	A	Ch	M	1913		+	42
Tacca leontopetaloides (L.) Kuntze	Madagascar	H	P	Cr	M	1904		+	1
Zingiberaceae									
Alpinia galanga (L.) Sw.	South Asia	H	P	Cr	M	1896		+	1
Curcuma domestica Valet	India	H	P	Cr	M	1896	1800	+	1
Curcuma zedoaria (Christm.) Roscoe	Asia	H	P	Cr	M	2004	1909	+	3
Hedychium coronarium Koenig	Himalaya	H	P	Cr	O	1910	1900	+	1
Zingiber officinale Roscoe	Tropical Asia	H	P	Cr	C	1896		+	1
Zingiber zerumbet (L.) Roscoe *ex* Smith	Tropical Asia	H	P	Cr		1914		+	36

LF: life form. H: herb; L: liana; V: vine; S: shrub; T: tree.
HA: habit. A: annual; B: biennial: P: perennial; A/B: annual or biennial; A/P: annual or perennial; A/B/P: annual or biennial or perennial.
RS: Raunkiaer system. Ch: chamaephyte; Cr: cryptophyte; H: hemicryptophyte; Ph: phanerophyte; Th: therophyte.
U: usage. C: cultivation; F: forage; O: ornamental; M: medicinal; W: wood.
FR: Year of the first record.
FI: Year of the first introduced record.
W: species listed in *Global Compendium of Weeds* (Randall, 2002).
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臺灣歸化植物組成變化

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摘要：從2002年完成了臺灣第一份歸化植物名錄後至今，臺灣的歸化植物物種數量持續的增加，為了探討急劇成長的歸化物種 (潛在入侵物種) 在這段時間的增加模式，我們匯整截至2009年底所有發表與野外記錄到歸化物種以求對整體現狀有更好的理解。此外，臺灣與鄰近區域交通貿易頻繁，物種交流機會頗多，本篇也就此鄰近三地共同歸化物種進行比對。結果顯示，過去七年之間所有新增的歸化物種中，僅有77種植物為2002年後所歸化，其餘的植物皆為2002年以前就已歸化，2002年之後才正式發表。歸化植物與原生植物物種的比例由8%上升為12%。2002年前後歸化物種的組成、起源與生活型在優勢科的排名相當類似，僅有些微變化。在過去七年期間，臺灣地區的歸化植物數量成長一倍，歸化植物數量的成長也增加了臺灣與鄰近區域，包括中國大陸和日本，共有的歸化植物數量。然而這些新增加的歸化植物多半在2002年以前就有標本採集記錄，顯示外來植物歸化狀態的更新發表速度緩慢，以管理防治的角度而言，可能造成反應不及的狀況。

關鍵詞：植物誌、歸化植物、入侵植物、臺灣。

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