



Invasive Alien Plant Species In Libya

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ABSTRACT

Invasive alien plant species in Libya were surveyed and documented based on field observation, and discussion with local people. A total of 29 species of invasive aliens in the flora of Libya have been documented, belong to 13 families, of which 12 families belong to dicotyledons and the only family belongs to Monocotyledons. The dominant families were Asteraceae with 7 species, followed by Amaranthaceae with 5 species. Life form analysis has shown that the herbaceous elements were predominated by 22 species, while shrubs were represented by 3 species and trees were represented by 4 species. The nativity showed that the alien species with an American origin have the majority with sixteen species. According to their intensity of invasion, the recorded species were classified into three categories, 12 species were found to be high invaders and spread elsewhere, and 12 species were found to be moderate invaders, while five species were categorized as new invasive. The results also showed that 17 species were categorized as noxious, 8 were classified as ornamental, while food and fodder species were represented by two species each.

Keyword: invasive species, alien species, introduced species, Flora Libya.

INTRODUCTION

Invasive alien plants are becoming a major concern, during the past two decades, and have caused extensive economic and ecological damage throughout the world. Therefore the effects of biological invasions are increasingly being recognized for their role in the degradation of biological diversity worldwide [1, 2]. Alien plants have various effects on the environment and economy of non-native areas, many of the exotic plants are of economic benefit and some have severe negative impacts. Some alien species, often cultivated, may provide food, medicine, fuel, or fodder to local communities [3, 4]. and some of them are responsible for endangerment and extinction of native species and has negative impact on crop production, forest regeneration, livestock grazing, and on human health [5, 6]. It is estimated that as many as 50% of invasive species, in general, can be classified as ecologically harmful, based on their actual impacts [7, 8].

Plant invasions dramatically affect the distribution, abundance, and reproduction of many native species [9]. Because of these ecological effects, alien species can also influence the evolution of natives exposed to novel interactions with invaders [10]. Evolutionary changes in natives in response to the selection from aliens are usually overlooked, yet common responses include altered anti-predator defenses, changes in the spectrum of resources and habitats used, and other adaptations that allow native populations to persist in invaded areas [11,12].

There are several well-recognized pathways through which alien species reach new areas, one of the most important is an intentional introduction. Many invasive tree species such as *Prosopis* spp. and *Acacia* spp. have been introduced because of their potential benefits, but while they have indeed provided some benefits, the unanticipated costs have often turned out to be greater. The traits that make an agroforestry species desirable may be those that make it more likely to be invasive [13].

Accidental introduction of aliens is also likely to increase. Trade is now recognized as an engine of development, increased trade means increased risks of aliens arriving in countries, placing greater responsibility for their detection on quarantine services. While all trade poses a risk, ballast water in ships is recognized as one of the most significant pathways of invasion for marine species [13].

Several countries have major tourism industries, and as more tourists visit a country, so the risk of accidental introductions increases. The very ecosystems and biodiversity that draw the tourists are themselves increasingly threatened as the number of tourists rises, an additional route through which IAS is introduced is in aid shipments, while others introduced as seed contaminants [13].

METHODS

The data on invasive alien plant species in Libya are scarce and insufficient due to deficiency of literature reviews and field surveys, therefore, this review is the first attempt to highlight the invasive alien plant species and to monitor their introduction and spread. Invasive alien species occurring in Libya were compiled based on field observation, and discussion with local people.

RESULTS

A total of 29 species of invasive aliens in the flora of Libya have been documented, these belong to 25 genera and 13 families, of which 12 families belong to dicotyledons with 22 genera and 26 species, and the only family belongs to Monocotyledons with 3 genera with one species each. The dominant families were Asteraceae with 7 species, followed by Amaranthaceae with 5 species, then the families Solanaceae, Fabaceae and Poaceae with 3 species each, while the rest of families represented by only one species each (Table, 1). The nativity, habit, and invasion ability were categorized, invasive alien plant species with American origin have the majority with sixteen species, out of them, 7 species were originated in Tropical America, 6 species in North America, 1 species in South America, 1 species in Central America and 1 species in both Americas. Life form analysis has shown that the herbaceous elements were predominated by 22 species, while shrubs were represented by 3 species and trees were represented by 4 species (Table 1).

The recorded species were categorized also according to their intensity of invasion and ability to spread into three categories, 12 species were found to be high invaders, and spread elsewhere, and 12 species were found to be moderate invaders, while five species were categorized as new invasive, they were recently introduced and newly recorded to the flora of Libya, they have

invasiveness nature and recorded as invasive species in many floras in the world, these are *Chloris gayana* [14]. *Oenothera laciniata* [15]. *Solanum rostratum*. [16]. *Amaranthus blithoides* [17]. *Artemisia vulgaris* [18]. *Verbesina encelioides* Benth. ex A. Gray [19]. These species have potential to spread and invade our natural and agricultural habitats, so there should be early monitoring and control plan to avoid their spread and harm effect (Table 1).

Many species with invasiveness origin were found to be weak invaders in our habitats and could not spread, some were disappeared early while others remain fragmented and restricted into small patches, may due to unfavorable environmental condition, or inability to compete with native species in our flora, some of which are, *Prosopis juliflora*, *Acacia occidentalis*, *Acacia*

farnesiana and others, therefore they excluded from here, because they don't pose any risk or threat to our habitats, and can't be considered as invasive to our habitats.

According to their impact and importance, the majority of the recorded alien species were categorized as noxious (17 species), and 8 species were introduced as ornamental, while food and fodder species were represented by two species each (Table 2).

The adverse impact of noxious species was in the form of competition for space with tillage or forage crops and harboring of pests or disease vectors, harmful to crops or native species. In addition to the efficient vegetative mode of propagation, the seeds of these species are mostly wind-distributed and may remain viable for several years.

Table 1. Checklist of the invasive alien plant species in Libya.

No	Family	Name	Nativity	Invasiveness	Habit
1	Aizoaceae	<i>Tetragonia tetragonoides</i> (Pall.) O. Kuntze	Newzealand	Moderate	Herb
2	Amaranthaceae	<i>Amaranthus blithoides</i> S. Watson.	North America	New	Herb
2	Amaranthaceae	<i>Amaranthus retroflexus</i> L.	C- America	Moderate	Herb
3	Amaranthaceae	<i>Beta vulgaris</i> L.	S. Europe & W. Asia	Moderate	Herb
5	Amaranthaceae	<i>Chenopodium album</i> L.	Europe	High	Herb
6	Amaranthaceae	<i>Chenopodium murale</i> L.	Tropical America	High	Herb
7	Apiaceae	<i>Anethum graveolens</i> L.	West Asia.	Moderate	Herb
8	Asteraceae	<i>Artemisia vulgaris</i> L.	America	New	Herb
9	Asteraceae	<i>Bidens pilosa</i> L.	Tropical America	Moderate	Herb
10	Asteraceae	<i>Erigeron bonariensis</i> L.	South America	High	Herb
11	Asteraceae	<i>Erigeron canadensis</i> L.	North America	Moderate	Herb
12	Asteraceae	<i>Sonchus oleraceus</i> L.	Mediterranean	High	Herb
13	Asteraceae	<i>Symphytichum subulatum</i> (Michx.) G.L. Nesom	North America	Moderate	Herb
14	Asteraceae	<i>Verbesina encelioides</i> (Cav.) Benth. & Hook. fil. ex A. Gray	Mediterranean	High	Herb
15	Euphorbiaceae	<i>Ricinus communis</i> L.	Africa	High	Shrub
16	Fabaceae	<i>Acacia cyanophylla</i> Lindely	Australia	High	Tree
17	Fabaceae	<i>Leucaena leucocephala</i> (Lam.) Wit.	Tropical America	High	Tree
18	Fabaceae	<i>Parkinsonia aculeata</i> L.	Tropical America	High	Tree
19	Heliotropiaceae	<i>Heliotropium curassavicum</i> L.	E. S Europe. W. N Africa	Moderate	Herb
20	Meliaceae	<i>Melia azedarach</i> L.	India	Moderate	Tree
21	Onagraceae	<i>Oenothera laciniata</i> Hill.	North America	New	Herb
22	Poaceae		North America	High	Herb
23	Poaceae	<i>Chloris gayana</i> Kunth.	Tropical America	New	Herb
24	Poaceae	<i>Eleusine indica</i> (L.) Gaertner	Tropics & Subtropics	Moderate	Herb
25	Solanaceae	<i>Nicotiana glauca</i> R.C. Graham.	Brazil	High	Shrub
26	Solanaceae	<i>Solanum elaeagnifolium</i> Cav.	North America	High	Herb
27	Solanaceae	<i>Solanum rostratum</i> Dunel.	Neotropics & S.W-USA	New	Herb
28	Verbinaceae	<i>Lantana camara</i> L.	Tropical America	Moderate	Shrub
29	Zygophyllaceae	<i>Tribulus terrestris</i> L.	Tropical America	Moderate	Herb

Cenchrus ciliaris Cav.

Table 2. Categorizing of invasive species according to their importance and Source.

No	Family	Name	Importance	Source
1	Aizoaceae	<i>Tetragonia tetragonoides</i>	Noxious	[20]
2	Amaranthaceae	<i>Amaranthus blithoides</i>	Noxious	[17]
3	Amaranthaceae	<i>Amaranthus retroflexus</i>	Noxious	[20]
4	Amaranthaceae	<i>Beta vulgaris</i>	Food	[20]
5	Amaranthaceae	<i>Chenopodium album</i>	Noxious	[20]
6	Amaranthaceae	<i>Chenopodium murale</i>	Noxious	[20]
7	Apiaceae	<i>Anethum graveolens</i>	Food	[20]
8	Asteraceae	<i>Artemisia vulgaris</i>	Noxious	[18]
9	Asteraceae	<i>Bidens pilosa</i>	Noxious	[20]
10	Asteraceae	<i>Erigeron bonariensis</i>	Noxious	[20]
11	Asteraceae	<i>Erigeron canadensis</i>	Noxious	[20]
12	Asteraceae	<i>Sonchus oleraceus</i>	Noxious	[20]
13	Asteraceae	<i>Symphyotrichum subulatum</i>	Noxious	Newly reported
14	Asteraceae	<i>Verbesina encelioides</i>	Ornamental	[19]
15	Euphorbiaceae	<i>Ricinus communis</i>	Ornamental	[20]
16	Fabaceae	<i>Acacia cyanophylla</i>	Ornamental	[20]
17	Fabaceae	<i>Leucaena leucocephala</i>	Ornamental	[22]
18	Fabaceae	<i>Parkinsonia aculeata</i>	Ornamental	[20]
19	Heliotropiaceae	<i>Heliotropium curassavicum</i>	Noxious	[20]
20	Meliaceae	<i>Melia azedarach</i>	Ornamental	[20]
21	Onagraceae	<i>Oenothera laciniata</i>	Noxious	[15]
22	Poaceae	<i>Cenchrus spinifex</i>	Noxious	[20]
23	Poaceae	<i>Chloris gayana</i>	Fodder	[14]
24	Poaceae	<i>Eleusine indica</i>	Fodder	[20]
25	Solanaceae	<i>Nicotiana glauca</i>	Ornamental	[20]
26	Solanaceae	<i>Solanum elaeagnifolium</i>	Noxious	[23]
27	Solanaceae	<i>Solanum rostratum</i>	Noxious	[16]
28	Verbinaceae	<i>Lantana camara</i>	Ornamental	[20]
29	Zygophyllaceae	<i>Tribulus terrestris</i>	Noxious	[20]

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