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Flora and vegetation study on Hairy Beggarticks (*Bidens pilosa* L.) plant in Egypt

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Abstract

Bidens pilosa L. is an Asteraceae plant that originated from South America and can be found in the most countries of tropical and subtropical regions. The present study aimed to identify the flora and vegetation groups associated to the noxious species, *B. pilosa* to show its effect of the native flora. A 231 stands distributed in 5 governorates located at Nile Delta were used to identify the associated flora and vegetation groups with *B. pilosa* populations. Floristic analysis showed 113 species associated with *Bidens pilosa* L. It was found that family Poaceae had the highest number of associated species with *B. pilosa* (25 species), also Therophytes were the dominant life form represented by 78 species (69.03% of the total species) and the annuals were recorded 70% of the total species. A 39 species representing 34.5% of the total species have environmentally service as segetals. A 68 species = 60.2% of the total recorded species have economic goods as medicinal plants. The application of TWINSPAN on the cover estimates of 113 associated species recorded in the 231 sampled stands of *B. pilosa*, lead to the recognition of 13 vegetation groups. These groups showed a reasonable segregation along the habitats DECORANA. The vegetation groups are named according to first and second dominant species associated with *B. pilosa*. The presence of *B. pilosa* 100% in all vegetation groups, while cover varied from one group to another. Increase in the cover of *B. pilosa* weed reduced the number of associated species. So, *Bidens pilosa* plant effects on the native weed flora in the Nile Delta region. Therefore, *B. pilosa* weed must be controlled to conserve the native flora.

Key words: *Bidens pilosa* L., Floristic Analysis, Environmental services, Economic goods, TWINSPAN, Vegetation groups, Diversity.
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1. Introduction

Diversity is important for the survival of all ecosystems. However, most scientific discussions and policies regarding biodiversity conservation in agricultural landscapes are led by ecologists and nature conservationists [1] and are therefore usually focused on increasing species richness and conserving flagship species and habitats. Biodiversity is given importance not only for its nature conservation services, but because it provides production and environmental services, thus contributing to the development of more sustainable production methods [2]. It follows that biodiversity becomes an entity that has to be managed to support sustainable agriculture (Biodiversity for Agriculture) [3].

The intensive use of agroecosystem during the last decades to provide products for human consumption and processing toward monocultures, using introduced seeds, chemical fertilizer, and pesticides, greatly reduced the biodiversity [4] and has negative environmental impacts as water pollution or nitrogen excess [5,6]. Particularly, heavy agricultural dependence on synthetic chemical pesticides for crop protection against pests caused biodiversity loss [7].

Noxious weeds are non-native plants that were introduced to country through human actions. Because they aggressively grow and have no natural enemies in the new area, therefore, these species can be destroying the wildlife habitat, compete the crops and it is difficult to control [3].

Alien or non-native species are becoming serious threat to the environment and economic locally and globally. Invasive alien species negatively effects on biological diversity, agricultural production, and human health. Invasive plant species in everywhere, damage crops, industries, the environment and public health. Scientists, academics, leaders of industry and land managers are realizing that invasive species are severe environmental threats of the 21st century [8].

In addition, invasive species is recognized as one of the leading threats to biodiversity and imposes tremendous costs on agriculture, forestry, fisheries, wetlands, roadsides, natural areas, and other human enterprises, including human health. Invasive species take a heavy economic toll with costs estimated to be $137 billion every year in the United States [9]. In 1994, the impacts of invasive plants in the United States were estimated at $13 billion per year [10].

Invasion of native plant populations by non-native species have become a major environmental problem [11]. Unlike chemical pollutants that degrade over time and allow the ecosystem to recover, the biological invasions are widely spreaded, causing great problems. Serious effects of invasive non-native species include displacement or replacement of native plants, disturbance in nutrients cycles, and changes in pattern of plant successions [12].

Generally, these non-native species can possess a risk to the biodiversity when they naturalize and penetrate agroecosystems and conservation areas. Globally, invasions by non-native species are responsible for the most losses of biological diversity than the other factors except the habitat losses by human activities. Non-native invasive species threat two-thirds of all endangered species. Some experts considered that the non-native species are the second threat to the biodiversity, after habitat destruction [12]. Also it can be considered the native species are invasive when they spread into artificial habitats such as farms or gardens.

Bidens pilosa L. (Asteraceae) is originated from South America and can be found in almost all countries from tropical and subtropical regions [13, 14]. There are 230 to 240 known *Bidens* species. Among them, *Bidens pilosa* [15, 16]. *B. pilosa* has several varieties such as *B. pilosa* var. radiata, var. minor, var. pilosa and var. bisetosa. Alongside examination of morphological traits, authentication of *B. pilosa* can be aided by chemotaxonomy and molecular characterization [17].

Bidens pilosa plant is often a noxious weed of cultivation in Egypt and some countries [18]. According to the International Union for Conservation of Nature (IUCN) *B. pilosa* is a new invasive plant in Egypt and the surrounded countries. It has the ability to invade diverse habitats, including roadsides, crops, pastures, gardens, disturbed areas, fallow lands and urban open space [19]. *B. pilosa* is a problematic plant species for many reasons throughout its range. It is reported as a troublesome weed to at least 30 crops in over 40 countries because of its high potential to reduce the crop yields [20]. It has a fast growth rate, strong seed production capacity, forming dense stands as well as producing allelopathy compounds in addition to be a victor host for many plant parasites. For these reasons, presence of *B. pilosa* within the farm plants and crops is strong indicator for germination suppression, aggressive competition then significant low production and loss of crop yields.

Thick stands of *B. pilosa* impede access to roads, trails and recreational areas; moreover, its burrs are a nuisance to people, as well as, sheep and other fleece producing livestock [21].

The objectives of this work are to study the effect of alien invasive species *B. pilosa* on the natural weed flora in the agroecosystems through studying floristic composition of *B. pilosa* populations and identifying the common communities associated with it. This study is significant in

showing the effect non-native weeds on the native flora consequently of the agroecosystem to take the wright decision for the weed management.

2. Materials and methods

2.1. Study area

Two hundred and thirty one stands were surveyed for studying the phytosociology of *Bidens pilosa* populations located at four governorates of Egypt (Qalyubiya, Al-Sharkya, Al-Dacahlya, Cairo and Giza) were selected to study plant vegetation associated with *Bidens pilosa* (Fig. 1).

Fig. 1. Study sites *(Google Earth map, 2018)*.

2.2. Floristic analysis

A list of associated species was done for each sampled stand. *Bidens pilosa* habitats were observed throughout the studied season. Visual estimation of the total cover and the cover of each species (%) was assessed using Réléve method [22]. Identification and nomenclature were according to [23,24,25,26,27,18,28,29]. Voucher specimens were deposited in botany Department Herbarium, Faculty of Science, Benha University and in botany Department Herbarium, Faculty of Women's for Arts, Science and Education, Ain Shams University.

Life forms of the recorded species associated with *Bidens pilosa* were identified following Raunkiaer scheme [30] as follows: Ch: chamaephytes, H: hemicryptophytes, GH: geophytes-helophytes,and Th: therophytes. The actual and relative numbers of species belonging to each life form (biological spectrum) in each crop were calculated. The national and global geographical distribution of the recorded species associated with *Bidens pilosa* were gathered from [23,31,32,33,26,27,18,34].

The global distribution (i.e. floristic regions) is coded as follows: ME: Mediterranean, COSM: Cosmopolitan, SA-SR: Saharo-Arabian, Trop: Tropical, S-Z: Sudano-Zambezian, MA: Malysian, ER-SR: Euro-Siberian, IR-TR: Irano-Turanian, GC: Guineo-Congolese, IN: Indian, PAL: Palaeotropical, PAN: Pantropical, Temp: Temperate and NEO: Neotropical.

The Egyptian phytogeographical regions of the recorded species were identified following [23] and are coded as follows: Nd: Nile Delta, Nv: Nile Valley, Nf: Nile Faiyum, O: Oases of the Libyan desert, Mma: Western Mediterranean coast, Mp: Eastern Mediterranean coast, Da: Arabian desert, Di: Isthmic desert, Dl: Libyan desert, R: Red Sea coast, GE: Gebel Elba and surrounding mountains and S: Sinai proper. The abundance categories of these species in the different phytogeographical regions of Egypt were also indicated. This will help in assessing the rarity forms of these species. The abundance categories are: cc: very common = 4, c: common = 3, r: rare = 2, rr: very rare = 1. For example, the maximum abundance is the presence of a very common species in the 12 geographical regions: 12 x 4 = 48 (100%). Species that have relative abundance from 60– 100% are very common, while 30-60% is common, 10-30% is rare and up to 10% are very rare.

2.3. Multivariate analysis

The Two-way indicator species analysis (TWINSPAN), as a classification technique, and Detrended Correspondence Analysis (DCA), as an ordination technique, were applied to the matrix of cover estimates of 113 species in 231 stands in *Bidens pilosa* sites. TWINSPAN is a two-way classification FORTRAN program that constructs a key to the sample classification by identifying one to several species that are particularly diagnostic of each division in the classification. The most significant new feature is that the program first constructs a classification of samples, and then uses this classification to obtain a classification of species according to their ecological preferences [35,36,37]. DCA is a FORTRAN program for detrended correspondence analysis and reciprocal averaging. It was applied as a mean of axis construction to achieve a two-dimensional ordination of species and stands [38,39].

2.4. Diversity indices

Some diversity indices were calculated for the vegetation groups as derived from the multivariate analysis. Species richness (alpha-diversity) for each vegetation group was calculated as the average number of species per stands. Species turnover (beta-diversity) was calculated as a ratio between the total number of species recorded in a certain vegetation group and its alpha diversity [40]. Relative evenness or equitability (Shannon-Wiener index) of the species cover was expressed as $\hat{H} = -\Sigma^s P_i (\log P_i)$, where S is the total number of species and P_i is the relative cover of the species. The relative concentration of dominance is the second group of heterogeneity indices and is expressed by Simpson's index: $D= 1/C$ {$C = \Sigma^s (P_i)^2$}, where S is the total number of species and P_i is the relative cover of species [41,42].

3- Results

3.1. Floristic Analysis

The recorded species associated with *Bidens pilosa* L. with their families, life forms and floristic categories are presented in Appendix (1). One hundred and thirteen species belongs to 89 genera and 35 families were recorded associated with *B. pilosa*. The dominant families was Poaceae represented by (25 species); followed by Asteraceae (13 species); Brassicaceae and Fabaceae (7 species); Euphorbiaceae (6 species); Convolvulaceae (5 species) and Chenopodiaceae, Malvaceae and Solanaceae (4 species). In addition, four families were represented by three species, while three families included 2 species, and 19 families were represented by only one species (Fig. 2).

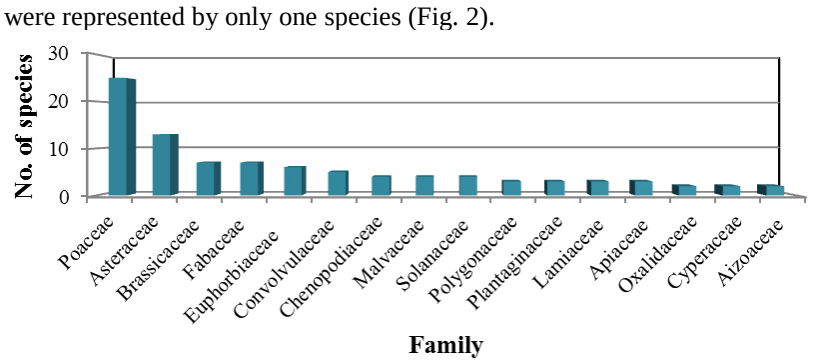

Fig. 2. Number of plant species belonging to the different families associated with *Bidens pilosa*.

Eighty species, representing (70% of the total species), were recorded as annuals; such as *Trianthema portulacastrum*, *Coriandrum sativum* and *Amaranthus hybridus*, while 33 species (30%) were perennials such as *Arum palaestinum*, *Zaleya pentandra* and *Cynanchum acutum* (Appendix 1). Moreover, 78 species represented by69.03%of the total species were terrestrial weeds such as *Amaranthus hypridus*, *Anagallis arvensis* and *Avena fatua*, while25 species (22.12%) were natural plants; of them *Sesbania sesban*, *Conyza aegyptiaca* and *Lamium amplexicaule*, eight species (7.1%) were plants escaped from cultivation such as *Zea mays* and *Helianthus annus*. Two species (1.8%) were aquatic plants, which are *Veronica anagallis-aquatica* and *Phragmites australis* (Fig. 3).

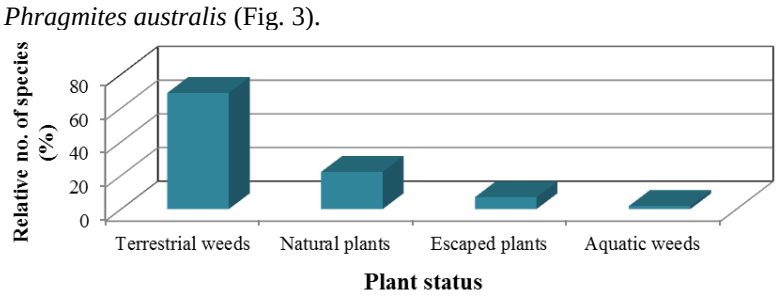

Fig. 3. Status of the recorded species associated to *Bidens pilosa*.

The chorological analysis of the recorded species associated with *B. pilosa* indicated the predominance of pluri-regional elements represented by 51 species (45.13% of the total species), followed by cosmopolitans represented by 27 species (23.9%). Mono-regional taxa represented by 16 species (14.2%) and bi-regional taxa represented by 14 species

(12.4%). There are five species representing (4.42%) of the total species were recorded as only cultivated plants (Fig. 4).

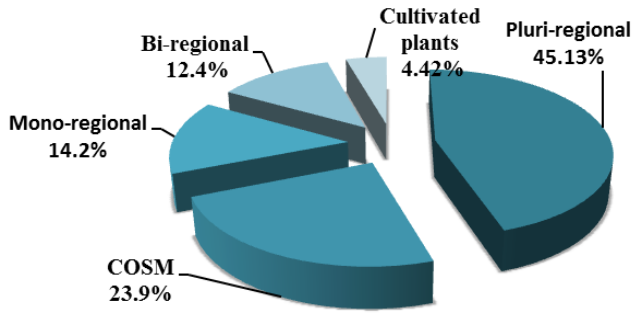

Fig. 4. Global phytogeographical distribution of the recorded associated species.

The national phytogeographical distribution of the recorded species associated with *B. pilosa* was found that 13 species had a wide geographical distribution all over Egypt (i.e. occur in the all 12 geographical regions) of them *Echinochloa colona*, *Cynodon dactylon* and *Cyperus rotundus*. In addition, 10 species were distributed in 11 regions (*Imperata cylindrica*, *Anagallis arvensis* and *Chenopodium murale*). Moreover, *Chenopodium ficifolium* was restricted to the Nile delta region, while *Amaranthus hybridus* and *Amaranthus lividus* were exclusively belonged to Nile delta region, Nile valley and Sinai regions, respectively (Fig. 5).

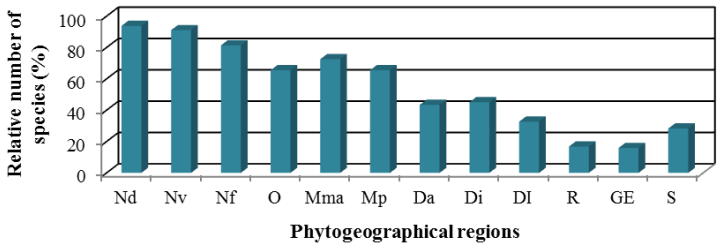

Fig. 5. The different phytogeographical regions of the recorded species associated with *Bidens pilosa.*

The highest number of species (93.8% of the total species) was belonged to the Nile Delta region, while the lowest (15.9%) was related to Gebel Elba (Fig. 6). Moreover, according to the abundance categories of the recorded species associated with *B. pilosa*, it was found that 47.1% of the total species were common, while 36.2% were very common, 12.5% were rare and 4.2% were very rare (Fig. 7)

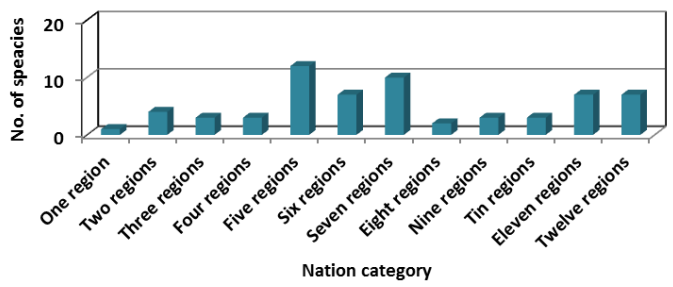

Fig. 6. Nation geographical categories of the associated species with *Bidens pilosa*.

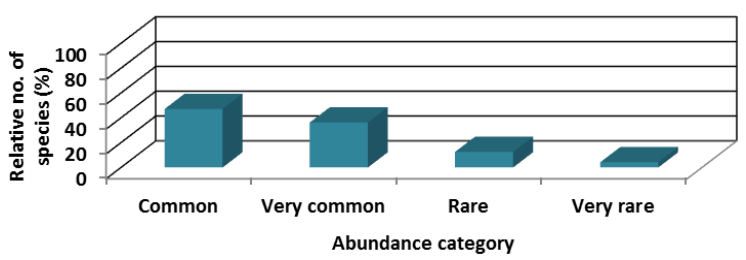

Fig. 7. Abundance categories of the recorded species associated with *Bidens pilosa* in the different phytogeographical regions.

There are 111 species have environmental and economic importance from the total 113 species. Fifty five species, representing 48.8% of the total species have both environmental services and economic goods (Fig. 8). In addition, 16 species (14.3%) had only environmental services, while 39 species (34.6%) exclusively had economic goods. The importance of two species is not detected (*Percicaria singalensis* Brouss. ex. Wild. and *Seda alba* L.).

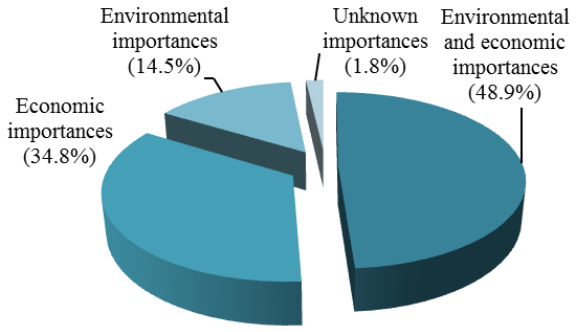

Fig. 8. Environmental services and Economic goods of the recorded species associated with *Bidens pilosa*.

The potential and actual environmental services of the recorded species were classified into 11 major categories: segetals, ruderals, sand controllers (i.e. sand binder, hummock formers and wind breaks), bank retainers, shaders, parasites, poisonous plants, invaders, weed controllers, nitrogen fixers and water purifiers. The environmental services of the recorded species could be arranged discerningly as follows (Fig. 9): segetals (39 species representing 34.5% of the total species), followed by ruderals (15 species =13.3%), poisonous plants (nine species = 8.0%), other uses (eight species = 7.1%), sand controllers (six species = 5.3%), weed controllers (five species = 4.4%), water invaders (three species = 2.7%), bank retainers (two species =1.8%), shaders (two species =1.8%), nitrogen fixers (two species = 1.8%), and water purifiers (one species = 0.9%). Moreover, 54 species, representing (47.8%of the total species) of the environmentally important species have only one importance, 13 species (11.5%) have two importance, and four species (3.6%) have three importance (Fig. 10). Of 113 species, 42 species (37.1%) their environmental importance are unknown.

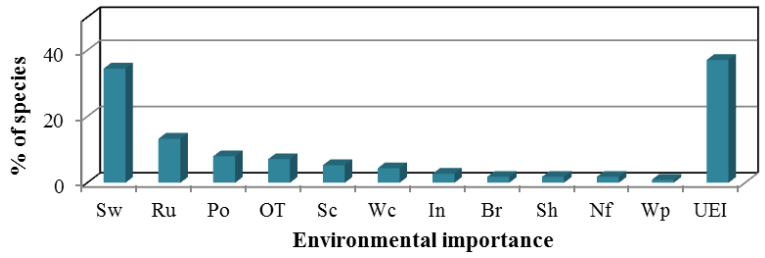

Fig. 9. Environmental services of the recorded species in the different habitats of *Bidens pilosa*. Sw: segetals, Ru: ruderals, Sc: sand controllers, Br: bank retainers, Sh: shaders, Po: posionous plants, In: invaders, Wc: weed controllers, Nf: nitrogen fixers, Wp: water purifiers, OT: other uses and UEI: unknown environmental importance.

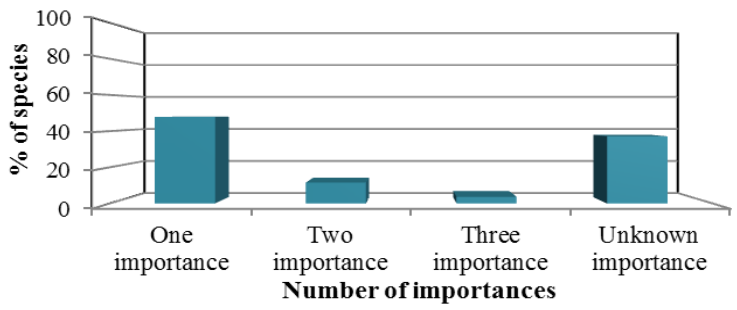

Fig. 10. Percentage of associated species in relation to the no. of environmental services.

The potential and actual economic goods of the recorded species were assessed in the different habitats of *B. pilosa L.* The economic goods are classified into six major categories: grazing, medicinal, human food, timber, fuel, and other uses (e.g. making mats, baskets, chairs, ornamentals, fibers, fodders, beach beds, and oils and dye extractions). The economic goods of the recorded species could be arranged discerningly as follows (Fig. 11): medicinal (68 species = 61.1% of the total recorded species), human food (43 species = 38.1%), grazing (40 species = 35.4%), other uses (9 species = 8%), fuel (5 species = 4.4%), and timber (1 species = 0.9%). Moreover, 43species (37.2 %) of the economically important species have only one good, 38 species (33.6%) have two goods, 13 species (11.5%) have three goods and two species (1.8%) have five goods (Fig. 12).

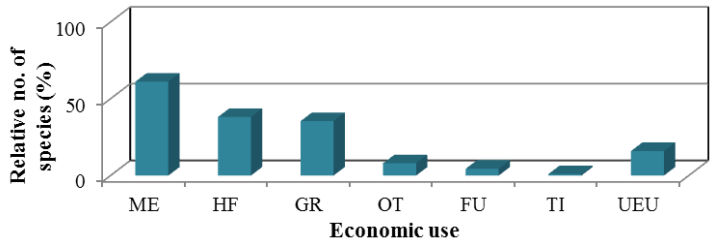

Fig. 11. Economic goods of the recorded species in the different habitats of *B. pilosa*. GR: grazing, ME: medicinal, HF: human food, OT: other uses, FU: fuel, TI: Timber use and UEU: unknown economic use.

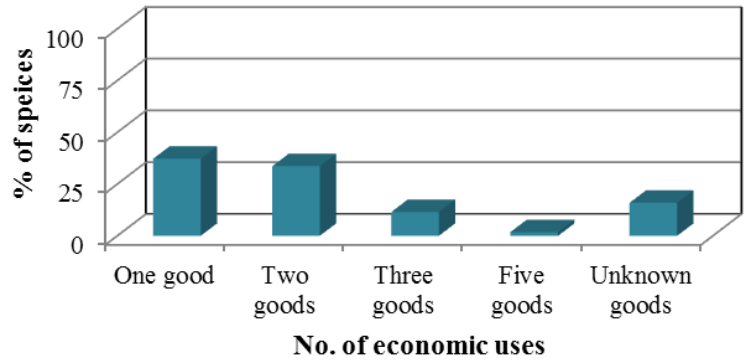

Fig. 12. Relative number of species in relation to the no. of economic goods.

3.2. Multivariate analysis of vegetation

The application of TWINSPAN on the cover estimates of 113 associated species to *Bidens pilosa* in 231 sampled stands lead to recognition of 13 vegetation groups (Table 1 and Fig. 13). The vegetation groups are named according to first and second dominant species associated with *B. pilosa* (the species that have the highest presence percentage and/or the highest relative cover). The presence of *B. pilosa* 100% in all vegetation groups, while cover varied from one group to another. The description of these vegetation groups was as follows:

Commelina benghalensis -Cyperus rotundus (VG1): It included one stand and 7 species. In this group, *C. benghalensis* represented by 45% cover and 100% presence, while *C. rotundus* was represented by 1% cover, and 100% presence. The associated species include *Galinsoga parviflora*, *Euphobia peplus*, *Ipomoea hederacea* and *setaria glauca*.

Withania semenifera - Oxalis corniculata (VG2): It included 2 stands and 15 species. *W. semenifera* was represented by 2% cover and 100% presence, while *O. corniculata* was represented by 1% cover and 50% presence. The associated species include *Ricinus communis*, *Euphorbia indica, Solanum lycopersicum* and *Melilotus indica.*

Table 1. First and 2nd dominant species in vegetation groups, with *Bidens pilosa*

V.G.	No. of stands	1st dominant Species	C%	P%	2nd. dominant Species	C%	P%
VG1	1	*C. benghalensis*	45.0	100	*C. rotundus*	1.0	100
VG2	2	*W. semenifera*	2.0	100	*O. corniculata*	1.0	50.0
VG3	4	*E. peplus*	17.5	100	*C. dactylon*	1.4	100
VG4	7	*C. dactylon*	51.0	100	*E. peplus*	1.6	100
VG5	6	*C. dactylon*	16.3	100	*P. nodiflora*	15	33.3
VG6	8	*P. minor*	4.8	100	*C. arvensis*	2.7	100
VG7	13	*B. catharticus*	12.6	92.3	*P. minor*	7.7	76.9
VG8	77	*S. pallida*	3.8	81.8	*S. oleraceous*	3.3	90.9
VG9	70	*C. dactylon*	5.8	84.3	*D. sanguinalis*	2.3	20.0
VG10	9	*T. aestivum*	7.6	88.9	*E. helioscopia*	6.6	100
VG11	7	*O. corniculata*	9.9	100	*E. spinosa*	5.6	85.7
VG12	14	*G. parviflora*	5.9	100	*C. dactylon*	2.0	64.3
VG13	13	*E. colona*	9.4	30.8	*C. dactylon*	8.3	84.6

Euphobia peplus - Cynodon dactylon (VG3): It included 4 stands and 8 species. In this group *E. peplus*was represented by 17.5% cover and 100% presence, while *C. dactylon* was represented by 1.4% cover and 100% presence. The associated species include *Soncuhs oleraceous, Avena fatuta*, *Euphorbia indica* and *Imperata cylindrica.*

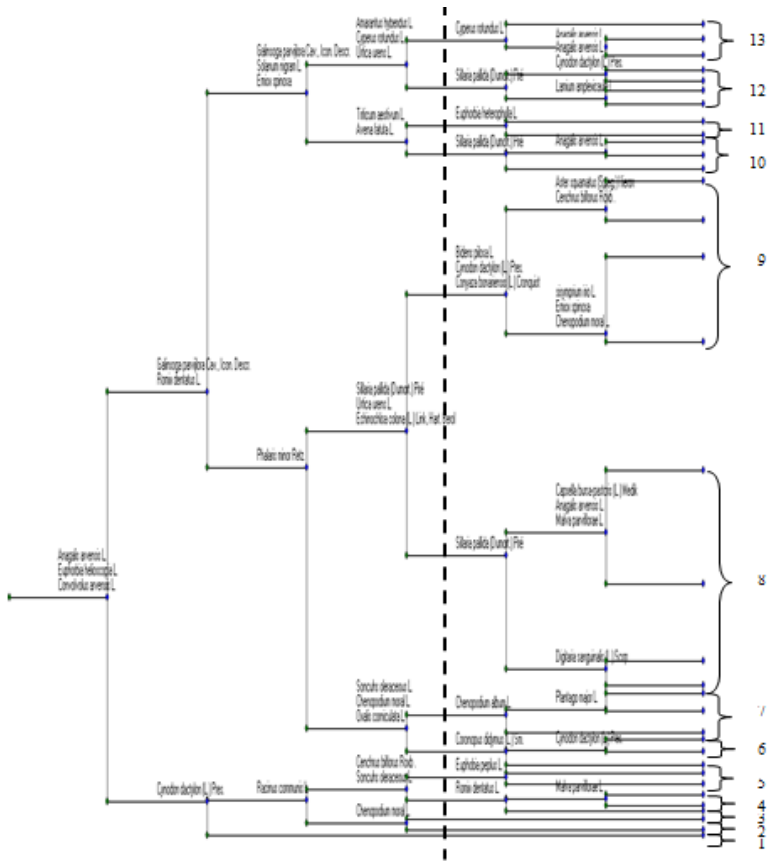

Fig. 13. The dendrogram resulting from the application of TWINSPAN on the 231 sampled stands.
VG1: *Commelina benghalensis- Cyperus rotundus*, VG2: *Withania semenifera- Oxalis corniculata*, VG3: *Euphobia peplus- Cynodon dactylon*,VG4: *Cynodon dactylon- Euphorbia peplus*,VG5: *Cynodon dactylon- Phyla nodiflora*,VG6: *Phalaris minor- Convolvolus arvensis*,VG7: *Bromus catharticus- Phalaris minor*,VG8: *Stellaria pallida- Soncuhs oleraceous*,VG9: *Cynodon dactylon- Digitaria sanguinalis*, VG10: *Triticum aestivum- Euphorbia helioscopia*,VG11: *Oxalis corniculata- Emisx spinosa*,VG12: *Galinsoga parviflora- Cynodon dactylon* and VG 13: *Echinochloa colona - Cynodon dactylon.*

Cynodon dactylon - Euphorbia peplus (VG4): It included 7 stands and 42 species. *C. dactylon*was represented by 51% cover and 100% presence, while *E. peplus* was represented by 1.6% cover and 100% presence. *Romix dentatus, Oxalis corniculata, Phragmites australis* and *Malva parviflorae* are the common associated species.

Cynodon dactylon - Phyla nodiflora (VG5): It comprised 6 stands and 16 species. *C. dactylon*was represented by 16.3% cover and 100% presence, while *P. nodiflora* was represented by 15% cover and 33.3% presence. The associated species include *Bromus catharticus, Panicum ripins, Solanum nigrum* and *Percicaria salicifolium*.

Phalaris minor - Convolvolus arvensis (VG6): This group comprised 8 stands and 22 species. *P. minor*was represented by 4.8 % cover, while *C. arvensis* was represented by 2.7 %.The two species are represented by 100 % presence. The associated species include *Trifolium alexandrnium, sisymprium irio*, *Bromus catharticus* and *Beta volgaris*.

Bromus catharticus - Phalaris minor (VG7): It included 13 stands and 40 species. The cover and presence of *B. catharticus* was 12.6 and 92.3%, while those of *P. minor* were 7.7% and 76.9%, respectively. *Aster squamatus*, *Melilotus indica, Apium graveolens* and*Brassica nigra* are the common associated species.

Stellaria pallida - Soncuhs oleraceous (VG8): This group included 77 stands and 80 species. It was found that *S. pallida*had 3.8 % cover and 81.8% presence, while *S. oleraceous* had 3.3% cover and 90.9% presence. The associated species comprise *Anagalis arvensis*, *Lamium amplexicaule, Cynanchum acutum* and *Romix dentatus.*

Cynodon dactylon - Digitaria sanguinalis (VG9): This group included 70 stands and 94 species. *C. dactylon* had 5.8 % cover and 84.3% presence, while *D. sanguinalis* had 2.3% cover and 20.0% presence. The common associated species are *Malvastrurn coromandelianum*, *Triticum aestivum, Conyaza bonariensis* and *Echinochloa colona.*

Triticum aestivum - Euphorbia helioscopia (VG10): nine stand and 38 species represented this group. *T. aestivum* had 7.6 % cover and 88.9% presence, while *E. helioscopia* had 6.6% cover and 100%

presence.The common associated species are *Emix spinosa*, *Coronopus didymus*, *Cichorium indiva* and *Seda alba.*

Oxalis corniculata - *Emix spinosa* (VG11): This group included 7 stands and 27 species. It was found that, *O. corniculata*had 9.9% cover and 100% presence, while *E. spinosa* had 5.6% cover and 85.7% presence. The common associated species comprise *Cynanchum acutum*, *Trianthema portulacastrum*, *Lamium amplexicaule* and *Euphorbia helioscopia.*

Galinsoga parviflora - *Cynodon dactylon* (VG12): This group included 14 stands and 37 species with *G. parviflora*had 5.9 % cover and 100 % presence. However, *C.dactylon* had 2% cover and 64.3% presence. The common associated species are *Anagalis arvensis*, *Stellaria pallida*, *Capsella bursa-pastoris* and *Cynanchum acutum*.

Echinochloa colona - *Cynodon dactylon* (VG13):It comprised 13 stands and 37 species. *E. colona*had 9.4 % cover and 30.8 % presence, while *C.dactylon* 8.3% cover and 84.6% presence. The associated species comprise *Euphorbia heterophylla*, *Setaria viridis*, *Cichorium indiva* and *Digitaria sanguinalis*.

3.3. Diversity indices of the plant communities

The total number of species recorded in the 13 vegetation groups (Table 2), identified according to TWINSPAN classification technique, ranged between 7species in *C. benghalensi – C. rotundus g*roup (VG 1)whitch had the lowest species turnover (1.0), and 94 species in *C. dactylon – D. sanguinalis* group (VG 9), which had the highest (5.2). The highest value of Shannon index was 2.7 in *S. pallid – S. oleraceous* group (VG 8). It was fond that *B. catharticus – P. minor*group (VG 7) had the highest species richness (19.3 species stand^{-1}), while *C. dactylon – P. nodiflora* group (VG 5) had the lowest (5.5 species stand^{-1}). The lowest Shannon index and Simpson index were 0.4 and 1.2, respectively in *C. dactylon – E. peplus*group (VG 4). Moreover, the highest value of Simpson index (105.0) was recorded in *W. semenifera – O. corniculata* group (VG 2).

Table 2. Diversity indices of the 13 vegetation groups produced from TWINSPAN. VG1: *C. benghalensis – C. rotundus,* VG2: *W. semenifera – O. corniculata,* VG3: *E. peplus – C. dactylon,*VG4: *C. dactylon – E. peplus,* VG5: *C. dactylon – P. nodiflora,*VG6: *P. minor – C. arvensis,*VG7: *B. catharticus – P. minor,* VG8: *S. pallida – S. oleraceous,* VG9: *C. dactylon – D. sanguinalis,* VG10: *T. aestivum – E. helioscopia,* VG11: *O. corniculata – E. spinosa,* VG12: *G. parviflora – C. dactylon* and VG13: *E. colona – C. dactylon*

Vegetation group	Diversity index				
	No. of species	Species richness	Species turnover	Shannon Indix	Simpson index
VG 1	7	7.0	1.0	0.6	1.3
VG 2	15	12.5	1.2	2.6	105.0
VG 3	8	6.0	1.3	1.0	1.8
VG 4	42	13.6	3.1	0.4	1.2
VG 5	16	5.5	2.9	0.9	2.3
VG 6	22	13.3	1.7	2.4	15.0
VG 7	40	19.3	2.1	2.4	9.0
VG 8	80	18.6	4.3	2.7	22.6
VG 9	94	18.0	5.2	2.6	14.8
VG 10	38	18.1	2.1	2.2	8.0
VG 11	27	13.1	2.1	2.0	6.3
VG 12	37	16.6	2.2	1.9	4.1
VG 13	37	13.8	2.7	2.3	9.9

5- DISCUSSION

The floristic study of *Bidens pilosa* population and their distribution achieved its presence in 11 different habitats, which are: canals & ditches, wastelands, citrus orchards, guava orchards, apricots orchards, pear orchards, Mango orchards, crops, public gardens, plantation sand banana orchards. This result coincided with the studies of [27,43,44]. In addition, *B. pilosa* occupies tropical and subtropical habitats, it introduced to many countries covering wide ranges of environmental conditions [45,46]. *Bidens pilosa* was recorded as one of the associated weed to *Opuntia ficus-indica* orchards in Qalyubiya [47]. The wide geographical distribution of *B. pilosa* may be attributed to its ability to compete with and displace many other annuals, in addition to It often becomes dominant after the eradication of perennial grasses, and displays strong allelopathic effects on a number of plant species [48,49].

The large number of genera compared to that of the species (about 2.1 species per genus) is a striking feature in Egyptian flora [50]. It is a comparable figure to that of the Nile Delta (1.9 species/genus) [34, 47,51]. But according to [52] it is very low figure compared to the global average (13.6 species/genus). The present study indicated that the flora associated with *B. pilosa* goes below the average level of the Egyptian flora, where the number of species per genus was 1.3, which is similar figure to 1.6 recorded for the Egyptian Northern lakes [53]. This means that the flora associated with *B. pilosa* as well as Nile Delta and the northern lakes are relatively more richer than that of the Egyptian flora, as the region that has a certain number of species, each of which belongs to a different genus, is relatively more diverse than a region with the same number of species but belongs to a few number of genera [54].

One hundred and thirteen species belongs to 89 genera and 35 families were recorded associated with *B. pilosa*. The dominant families were Poaceae; followed by Asteraceae; Brassicaceae and Fabaceae; Euphorbiaceae and Convolvulaceae. These families constitute the bulk of the Nile Delta flora, in Dakahlia-Damietta coastal region [55], the wastelands the Zagazig governorate [56], Kafr El Sheikh Province [57], on *M. parviflora* communities in the Nile Delta region [44], in Qalyubiya, Minofia, and Beheira Governorates [51] and in Great Cairo, Middle Delta, western desert, eastern desert and Mediterranean region[58].

Annual species (80 species) were highly represented in the present study, which may be assigning to their short life cycle that enables them to resist the instability of the agro-ecosystem. In addition, they are generally characterized by high distribution of resources to the reproductive organs and the production of flowers early in their life-span to ensure some seed production even in a year when the growing season is abbreviate [59]. On the other side, most perennial species are not adapted to successful establishment in arable crops [60].

The life form spectra provide information, which may help in evaluating the response of vegetation to the variations in the environmental factors [61]. The Mediterranean climate was specified as a “therophyte climate”, because of the high percentage (> 50% of the total species) of therophytes in many Mediterranean floras [62]. This study indicated that the therophytes are the dominant life form over the others. The dominance of therophytes over the other life forms referring to a response to the hot-dry climate, topographic variation and biotic influence [63,44]. According to [61,47,51], therophytes the main life form in weed studies and most of them are specially for the cultivated lands which subjected to agricultural activities to prevent weeds existence especially the perennials. The species diversity variations among the different habitat types may be attributed to differences in soil characteristics, substrate discontinuities and the allelopathic effects of one or more invasive species depending on their relative dominance through other associated species [64], in addition to habitat characteristics and the type of agriculture activities [47,58].

The global phytogeographical distribution of the recorded species associated with *B. pilosa* were defined according to [58,65,30,23,33,26,27,18,34]. The chorological analysis of the recorded species indicated the predominance of pluri-regional elements, followed by cosmopolitans, mono-regional taxa, bi-regional taxa andcultivated plants. The dominance of interregional species (bi-, tri- and pluri-regional) over mono-regional ones to the presence of inter-zonal habitats, such as anthropogenic or hydro- and halo-philous sites [50]. Moreover, the dominance of the delta sector elements in the Mediterranean, which corresponded with this study [55]. The presence of phytogeographical elements other than the delta sector, in the present study, is believed to be a reflection of intense climatic changes and the degradation of the delta sector ecosystem which facilitated the invasion of some species from the adjacent regions [55,66].

Weeds are unwanted plants, they should all be regarded as being of potential commercial value and have a significant such as food, medicine, agriculture, ornamentals, pollution control and others [67]. About 111 species (98.23%) of total species associated with *B. pilosa* have environmental services or economic goods. Segetal weeds had the highest contribution as the main land used in Nile valley is the agricultural lands [34,58]. The ruderals also contribute high percentage because of the intensive and extensive human activities (e.g. roadsides, abandoned fields, railways and terraces of watercourses) that create a variety of wide urban habitats where the offensive weeds are the most adapted to such type of disturbance [68,53]. Poisonous plants are the

species which have a chemical compounds that may adversely affect on animals and humans [61]. Some species are especially useful in medicine and pharmacology, such as *Euophorbia* species, *Convolvulus arvensis*, *Ranunculus margenata* [69] and *Malva parviflora* [58].

The economic goods of the associated species to *B. pilosa* populations could be arranged descendingly as follows: medicinal, human food, grazing, other uses, fuel, and timber. There are some examples of selective uses of different plant organs at different seasons. About 68 species are of popular medicinal uses; for example, *Phragmites australis* rhizomes are affect as stomachic, antiemetic, antipyretic, acute arthritis, jaundice, pulmonary abscesses and diuretic [70]. The aerial part of *Capsella bursa-pastoris* acts as a treatment to all kinds of bleeding (from nose bleeding to blood in urine) [71], also it treat diarrhea and used in Chinese traditional medicine for dysentery and eye problems. It is thought that *Capsella bursa-pastoris* has anti-inflammatory activities and used as a fever reducer. The decoction of *Pluchea dioscoridis* leaves are used for infantine ailments and treat the rheumatic pains [72]. *Mentha longifolia* leaves are used against flu, laryngitis and many types of colic. *Ricinus communis* and *Sesbania sesban*are used in several uses in the traditional medicine. Moreover, fruits, flowers, shoot, roots and rhizomes of 43 species are eaten by the inhabitants in the study area. Young leaves and seeds of *B. pilosa* are cooked as vegetable dish [73], also the leaves and young shoots of *M. parviflora* (Khubbayza) and *Rumex dentatus* (Hommeid) are eaten raw or cooked. While the fresh leaves and stems of *Beta vulgaris* (Salq) are cooked as a stew or as a soup mixed with lentil. Fresh young *Portulaca oleracea* (Rigla) shoots and leaves are eaten raw, as a salad and cooked as a vegetable dish [74]. The underground parts of *Phragmites australis* (Hagna) are sometimes eaten [70,53]. The Fresh leaves of *Cichorium endivia* (Cichoria or serres) are eaten raw or as a salad, also oil of *Helianthus annus* seeds used in cooking and *Soncuhs oleraceous* (Goadad) leaves, flowers and young roots are eaten raw, as a salad or cooked. *Solanum lycopersicum* (Tamatem) fruits are eaten raw and as a salad or cooked in a vegetable dishes.

Ordination techniques used by Phytosociologists to simplify distribution patterns along the gradients of environmental variables [75,76]. The classification of vegetation associated with *B. pilosa* using an application of TWINSPAN, resulted in identifies 13 vegetation groups varied between natural and weed communities. *Cynodon dactylon* - *Digitaria sanguinalis* vegetation group is a common community associated with *B. pilosa* consists from 70 stands and associated with 94 species. This classification may indicate the significant effect of habitat type; management practices in the agro-ecosystem, seasonality and soil characteristics, these factors influence weed community *composition* [77,78,79,47,80,58]. The vegetation groups, resulted from TWINSPAN classification are clearly distinguished by the first two DCA axes. These results are in agreement with results of [81,79,47,58], contributed the plant community composition to season, soil characteristics, management practices and plant density.

High species richness may be related to this environmental micro-heterogeneity that promotes diversity [82]. The variations in species richness, diversity and evenness through the different community types may be attributed to differences in substrate discontinuities, soil characteristics and the allelopathic effects of one or more invasive species depending on their relative dominance among other associated species [64,83,47,51,58]. Moreover, the difference in field administration practices may also be a factor that explains differences in species richness [84,85,79].

5. Conclusion

In the present study 113 species were recorded associated to Bidens pilosa populations. The most common family of the recorded families was Poaceae (Gramineae) which had the highest number of associated species (25 species). The environmental services (segetals) had the highest number of associated species (39 species representing 34.5% of the total species). The economic goods medicine had the highest number of associated species (68 species = 60.2% of the total recorded species). *B. pilosa* has a wide distribution in more of 12 habitats, but Orange (citrus) orchards habitats representing in (70 stands from 231 sampled stands) are contain the largest distribution of *B. pilosa* in Egypt. Canals and ditches habitat had the highest number of associated species (80 species representing 70.8% of the total recorded species). The application of TWINSPAN on the cover estimates of 113 associated species with *B. pilosa* lead to the recognition of 13 vegetation groups. *Sillaria pallid* - *Soncuhs oleraceous* group (VG 8) that included the highest number of stands (77 stands) and 80 species, had the most associated species with *B. pilosa*. . Increase in the cover of *B. pilosa* weed reduced the number of associated species. So, *Bidens pilosa* plant effects on the native weed flora in the Nile Delta region. Therefore, *B. pilosa* weed must be controlled to conserve the native flora.

Appendix (1). Floristic characteristics of the recorded species associated with *Bidens pilosa* L. ME: Mediterranean, COSM: Cosmopolitan, SA-AR: Saharo-Arabian, Trop.: Tropical, S-Z: Sudano -Zambezian, ER-SR: Euro-Siberian, IR-TR: Irano-Turanian, PAL: Palaeotropical, and PAN: Pantropical, Ch: Chamaephytes, H: Hemicryptophytes, GH: Geophytes-helophytes, G: Geophytes, Ph: phanerophytes and Th: Therophytes

Species	**Family**	**Arabic name**	**Habit (Duration)**	**Life form**	**Floristic category**	**Nation distribution**
Trianthema portulacastrum L.	Aizoaceae	تريانثيما	Annual	Th	Trop.+ Sub.Trop.	GE
Zaleya pentandra (L.) C. Jeffrey	Aizoaceae	زالية	Perennial	Ch	Trop+ S-Z+SA-AR	N. De. R. GE. S
Amaranthus hypridus L.	Amaranthaceae	رعاف	Annual	Th	COSM	N, O, M, S
Amaranthus lividus L.	Amaryllidaceae	أمارنطون	Annual	Th	ME+IR-TR	N, M, S
Ammi majus L.	Apiaceae	خلة - سدا	Annual	Th	ME+IR-TR	N, O, M, S
Apium graveolens L.	Apiaceae	كرفس	Annual	Th	Cultivated	M, De, S
Coriandrum sativum L.	Apiaceae	كزبرة	Annual	Th	Cult+ ME+IR-TR+ER-SR	N, O, M, S
Arum palaestinum	Araceae (arum)	لوف فلسطيني	Perennial	G	ME+SA-AR+S-Z	M, D, S
Cynanchum acutum L.	Asclepiadaceae	عليق - مرخ	Perennial	Ch	ME+IR-TR	N, O, M
Aster squamatus (Spreg.) Hieron	Asteraceae	..	Biennial	Th	ME+SA-AR+S-Z	N, M, O, D, S
Bidens pilosa L.	Asteraceae	حُسيكة	Annual or Perennial	Th	PAN	N, M, De, S
Cichorium endivia L. subsp pumilum Jacq.	Asteraceae	سريس	Annual	Th	ME+IR-TR	N, O, M

Appendix (1) continue

Species	Family	Arabic name	Habit (Duration)	Life form	Floristic category	Nation distribution
Conyza aegyptiaca (L.) Dryand. In Ait.	Asteraceae	كونيزة	Annual	Th	S-Z+ Trop+ IR-TR+SA-AR	N, O
Conyza bonariensis (L.) Cronquist	Asteraceae	خوع- نفلا	Annual	Th	NEO	N, O, M, D, S
Eclipta Prostrata (L.)L., Mant	Asteraceae	منكسفة	Annual	Th	Trop+ COSM	N, O, M
Galinsoga parviflora Cav., Icon. Descr.	Asteraceae	..	Annual	Th	COSM	N
Helianthus annus L.	Asteraceae	عباد الشمس	Perennial	Ch	Cultivated	Cult
Launaea nudicaulis (L.) Hook.	Asteraceae	حوا	Perennial	H	SA-AR+IR-TR+S-Z	N, O, M, D, R, GE, S
Pluchea dioscorides (L.) Desf.	Asteraceae	برنوف	Perennial	Ph	SA-AR+S-Z	N, M, De, S
Senecio glaucus L.	Asteraceae	الشيخة الرمادية	Annual	Th	ME+SA-AR+IR-TR	M, D, S
Sonchus oleraceus L.	Asteraceae	جعضيض	Annual	Th	COSM	N, O, M, D, R, S
Xanthium strumarium L.	Asteraceae	الشبيط	Annual	Th	PAN	N, O, M, S
Heliotropium supinum L.	Boraginaceae	رقيب الشمس المنبطح	Annual	Th	COSM	N, M, O, D, S
Species	Family	Arabic name	Habit (Duration)	Life form	Floristic category	Nation distribution
Brassica nigra (L.) Koch	Brassicaceae	خردل اسود	Annual	Th	COSM	N, O, M, Da,
Brassica rapa L.	Brassicaceae		Annual, Biennial	Th	Cultivated	N, O, M
Capsella bursa-pastoris (L.) Medik	Brassicaceae	كيس الراعى	Annual	Th	COSM	N
Coronopus didymus (L.) Sm.	Brassicaceae	..	Annual or Biennial	Th	COSM	N
Coronopus niIoticus (Delile) Spreng .	Brassicaceae	حارة	Annual	Th	S-Z	N, O, De
Rorippa palustris (L.) Besser	Brassicaceae	..	Annual or Perennial	Th	COSM	N,M
Sisymbrium irio L.	Brassicaceae	سمارة رثة	Annual	Th	ME+IR-TR+ER-SR	N, M, De , R,GE, S
Cannabis sativa L.	Cannabaceae	القنب	Annual	Th	Trop+Cult+Sup.Trop	N, M, O, D, S
Stellaria pallida (Dumort.) Murb.	Caryophyllaceae	حشيشة القزاز	Annual	Th	ME+ER-SR	N, O, M, S
Beta vulgaris L.	Chenopodiaceae	سلق	Annual	Th	ME+ER-SR+IR-TR	N, O, M, De, S
Chenopodium album L.	Chenopodiaceae	سرمق ابيض - زربيح ابيض	Annual	Th	COSM	N, O, M, D, S
Chenopodium ficifolium Sm. Fl. Brit.	Chenopodiaceae	..	Annual	Th	COSM	N. D
Chenopodium murale L.	Chenopodiaceae	لسان الثور	Annual	Th	COSM	N, O, M, D, R, GE, S
Commelina benghalensis L.	Commelinaceae	وعلان بنغالي	Perennial	Ch	ME+IR-TR+S-Z+SA-AR+Trop	N
Convolvulus arvensis L.	Convolvulaceae	عليق بري	Perennial	H	Trop	N, O, M, D, S
Ipomoea cairica (L.) Sweet, Hort	Convolvulaceae	الديداء - الأثمان	Perennial	H	ME+Trop+S-Z+IR-TR+Cultivated	N, M, D
Ipomoea carnea Jacq., Enum.	Convolvulaceae	عليق كبير- إيبوميا لحمية	Perennial	H	ME+IR-TR+Trop+Cultivated	N
Ipomoea hederacea Jacq.	Convolvulaceae	إيبوميا عشقية الورق	Perennial	H	ME+Trop+S-Z+IR-TR	N
Ipomoea purpurea (L.) Roth	Convolvulaceae	الأثمان الأرجواني	Perennial	H	ME+Trop+S-Z+IR-TR	N

Appendix (1) continue

Species	Family	Arabic name	Habit (Duration)	Life form	Floristic category	Nation distribution
Cyperus alopecuroides Rottb	Cyperaceae	سعد ثعلبي	Perennial	GH	ME+Trop+S-Z+IR-TR	N. M. De
Cyperus rotundus L.	Cyperaceae	سعد مستدير	Perennial	GH	ME+IR-TR+Trop	N, O, M, D, R, GE, S
Euphorbia heterophylla L.	Euphorbiaceae	فربيون - حلبلوب ارضي	Annual	Th	PAN	N, O, M
Euphorbia helioscopia L.	Euphorbiaceae	سعدة	Annual	Th	ER-SR+ME+IR-TR+S-Z	N, M
Euphorbia peplus L.	Euphorbiaceae	ودينه – فرفح	Annual	Th	ME+ER-SR+IR-TR	N, O, M, D, S
Euphorbia prostrata Aiton, Hort. Kew.,	Euphorbiaceae	لبين	Annual	Th	Trop	N, M, S
Euphorbia indica Lam., Encycl.	Euphorbiaceae	..	Annual	Th	SA-AR+IR-TR+S-Z	N
Ricinus communis L.	Euphorbiaceae	خروع	Perennial	Ph	PAN	De, GE
Medicago polymorpha L.	Fabaceae	نفل	Annual	Th	ME+COSM+Cultivated	N. O. M. D. S
Melilotus indicus (L.) All.	Fabaceae	حندقوق هندي	Annual	Th	ME+IR-TR+SA-SI	N, O, M, D, S
Sesbania sesban (L.) Merr.	Fabaceae	سيسبان	Perennial	Ph	COSM	N. M. O. S
Trifolium alexandrnium L.	Fabaceae	برسيم	Annual	Th	ME	N. O. M. D, S
Trifolium resupinatum Boiss	Fabaceae	جريده	Annual	Th	IR-TR+ER-SR+ME	N. O. M. D
Trigonilla hamosa L.	Fabaceae	حلبة متفرعة	Annual	Th	ME+SA-AR+IR-TR+Cultivated	N. O. M. S
Vicia sativa subsp. Sativa L.	Fabaceae	جلبان	Annual	Th	ME+ER-SR+IR-TR+Cultivated	N. M
Funaria sp.	Funariaceae	فيوناريا	Annual	Th	COSM	N, M, O, D, S
Lamium amplexicaule L.	Lamiaceae	فم السمكة	Annual	Th	ME+ER-SR+IR-TR+S-Z	N, O , M , S·
Mentha longifolia (L.) Hudson	Lamiaceae	نعناع	Annual	Th	ME+ER-SR+IR-TR+S-Z	N, O, S
Mentha pulegium L.	Lamiaceae	نعناع أوروبي - النَّعْنَاع البَرِّيّ	Annual	Th	ME+ER-SR+IR-TR+SA-AR	N, O
Hibiscus trionum L.	Malvaceae	خطمي	Annual	Th	Cultivated+ME+IR-TR+S-Z+Trop	N, O, M, S
Malva parviflora L.	Malvaceae	خبيزة	Annual	Th	ME+IR-TR	N, O, M, D, R, GE, S
Malvastrurn coromandelianurn (L.) Garcke	Malvaceae	..	Annual	Th	Trop+Cultivated	N
Sida alba l.	Malvaceae	سيدا بيضاء	Annual or Perennial	Th	Caltivated+Trop+Sub.Trop	N, O, M
Ludwigia stolonifera (Guill &Perr.) P. H. Raven	Onagraceae	حبق البحر	Perennial	Ch	ME+IR-TR+S-Z	N, O, M. S
Oxalis anthelmintica A Rich_.	Oxalidaceae	حميضة	Perennial	H	Trop+S-Z+ME	GE
Oxalis corniculata L.	Oxalidaceae	حميضة قرينية	Perennial	H	COSM	N, O, M, De
Plantago major L.	Plantaginaceae	لسان الحمل	Perennial	H	COSM	N, O, M, S
Veronica anagallis-aquatica L.	Plantaginaceae	ظِرْبَاب	Perennial	GH	COSM	N, O
Veronica polita Fr., Nov. Fl. Suec	Plantaginaceae	زهرة الحواشي اللامعة	Annual	Th	COSM	N, O, M
Agrostis stolonifera L.	Poaceae	أغروستيس رئدي	Perennial	Ch	ER-SR+ME+IR-TR+S-Z	S
Arundo donax L.	Poaceae	غاب	Perennial	G	ME+IR-TR+SA-AR	N. O. M. D. S
Avena fatua L.	Poaceae	شوفان	Annual	Th	COSM	N, O, M, De
Brachiaria eruciformis (Srn.) Griseb.	Poaceae	نسيله	Annual	Th	ME+IR-TR+S-Z	N, O. S
Bromus catharticus Vahl.	Poaceae	..	Annual	Th	ME+ER-SR+IR-TR +MA	N, O, M, De

Appendix (1) continue

Species	Family	Arabic name	Habit (Duration)	Life form	Floristic category	Nation distribution
Cenchrus biflorus Roxb .	Poaceae	..	Annual	Th	SA-AR+S-Z+IR-TR	N, D. S
Cynodon dactylon (L.) Pers.	Poaceae	نجيل بلدي	Perennial	G	COSM	N, O, M, D, R, GE, S
Dactyloctenium aegyptium (L.) P. Beauv.	Poaceae	النجم	Annual	Th	Cultivated+Trop.+COSM	N. O. M. D. S
Digitaria sanguinalis (L.) Scop.	Poaceae	ابوركبة	Annual	Th	PAL	N, O, M, De, S
Echinochloa colona (L.) Link	Poaceae	ابو ركبه - ذنيبه	Annual	Th	ME+IR-TR+Trop	N, O, M, D, R, GE, S
Echinochloa stagnina (Retz.) P. Beauv., Ess. Agrostogr.	Poaceae	..	Annual	Th	Trop+IR-TR+S-Z	N. O. M. De
Imperata cylindrica (L.) Raeusch.	Poaceae	حلفا - حلف - ديس	Perennial	GH	ME+SA-AR+IR-TR	N, O, M, D, R, S
Lolium temulentum L.	Poaceae	زوان مسكر	Annual	Th	ME+ER-SR+IR-TR+S-Z	N. O. M. Dw. S
Panicum repens L.	Poaceae	الثمام المنتفخ - الثمام الزاحف	Perennial	G	PAN	N, O, M, De
Paspalidium geminatum (Forssk.) Stapf	Poaceae	نسيله - أبو بيض	Perennial	GH	Trop	N, O, M, De
Phalaris minor Retz.	Poaceae	ذيل القط	Annual	Th	ME+IR-TR	N, O, M, De, S
Phragmites australis (Cav.)Trin.ex Steud	Poaceae	بوص	Perennial	GH	COSM	N, O, M, D, R, S
Poa annua L.	Poaceae	سبل أبو الحسين	Annual	Th	ME+ER-SR+IR-TR	N. O. M. S
Polypogon monspeliesis (L.) Desf.	Poaceae	ذيل القط	Annual	Th	COSM	N. O. M. D. R. S
Setaria glauca (L.) P. Beauv	Poaceae	ذيل الثعلب الازرق	Annual	Th	S-Z+ Trop.	N, O, De, GE
Setaria verticillata (L.) Beauv.	Poaceae	ذيل الثعلب	Annual	Th	COSM	N, O, M, D, R, GE, S
Setaria viridis (L.) Beauv	Poaceae	الاخضر ذيل الثعلب	Annual	Th	PAL	N, O, De, S
Triticum aestivum L.	Poaceae	قمح	Annual	Th	Cultivated	N, Cult
Vossia cuspidata (Roxb.) Griff.	Poaceae	..	Perennial	GH	Trop	N
Zea mays L	Poaceae	ذره	Annual	Th	PAL	N
Emex spinosa (L.) Campd	Polygalaceae	ضرس العجوز - حنزاب	Annual	Th	ME + SA-SI	N, O, M, D, S
Persicaria salicifolia (Brouss. ex Willd.) Assenov	Polygonaceae	أبو عين حمرة	Perennial	GH	COSM	N. M
Persicaria senegalensis (Meisn.) Sojak.	Polygonaceae	..	Annual	Th	Trop.+ S-Z+SA-AR+ME	N. M
Rumex dentatus (L.) subsp. Mesopotamicus	Polygonaceae	حميض	Annual	Th	ME+ER-SR+IR-TR+SA-AR	N. O. M. S
Portulaca oleracea subsp. oleracea L.	Portulacaceae	رجله	Annual	Th	COSM	N, O, M, D, S
AnagaIiis arvcnsis L.	Primulaceae	زغلنت - عين القط	Annual	Th	COSM	N, O, M, D, R, GE, S
Adiantum capillus-veneris L.	Pteridaceae	كزبرة البئر	Perennial	H	Trop.+ S-Z+IR-TR+ER-SR+ME	N, M, O, D, R, GE, S
Ranunculus margenata L.	Ranunculaceae	زغلنتة	Annual	Th	ME+ER-SR+IR-TR	N,O
Riccia sp.	Ricciaceae	ريشيا	Annual	Th	COSM	N, M, O, D, R, GE, S
Rubus sanctus Sehreb. Icon. Dcscr.	Rosaceae	عُلَّيق مقدس	Annual	H	ME+ER-SR+IR-TR	N. M. S

Appendix (1) continue

Species	Family	Arabic name	Habit (Duration)	Life form	Floristic category	Nation distribution
Physalis angulata L.	Solanaceae	..	Annual	Th	Cultivated+ Trop.+ S-Z+SA-AR+ME	N
Solanum lycopersicum L.	Solanaceae	طماطم	Annual	Th	Cultivated	Cult
Solanum nigrum L.	Solanaceae	عنب الديب	Annual	Ch	ME+ER-SR+IR-TR	N, O, M, D, S
Withania somnifera (L.) Dunal.	Solanaceae	عبعب منوم	Perennial	Ch	ME+ER-SR+IR-TR+S-Z	N, O, M, GE
Corchorus olitorius L.	Tiliaceae	ملوخيه	Annual	Th	PAN	N, O, M, S
Urtica urens L.	Urticaceae	حريق	Annual	Th	ME+ER-SR	N, O, M, De
Phyla nodiflora L.	Verbenaceae	ليبيا	Perennial	H	ME+IR-TR+ Trop.	N, O, M, D, S

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