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(RESEARCH ARTICLE)

Weed flora of selected farms in Al-Wadi Al-Shargi in Ain Zara District Southwest of Tripoli- Libya

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Abstract

The present study was designed to explore the species diversity and floristic analysis of the weed flora of selected farms in the Al-Wadi Al-Shargi in Ain Zara district southwest of Tripoli- Libya. A total of 85 different plant taxa have been collected and recorded from the study area representing 29 families of which 27 families and 67 species are belonging to dicotyledons, 2 families, and 18 species belonging to monocotyledons. The results of this study show that the dominance of the family Poaceae with 17 species followed by the family Asteraceae with 16 species, then the family Fabaceae and Brassicaeae with 8 species each. The rest families were represented by three species or less. The result has also shown the dominance of the genus *Sisymbrium* with three species. Lifeform spectrum analysis has shown the absolute dominance of therophytes with 80 species. Simpson's Diversity index showed that the weed flora of the studied farms was highly diversified.

Keywords: Weed flora; Crop fields; Life form; Simpson index; Al-Wadi Al-Shargi

1. Introduction

Weed can be described as either an unacceptable plant that grows where it is not required or which grows out of its natural position [1]. Weeds have many harmful effects to field crops than many insects, bacterial and fungal diseases, they compete with the crops for water, nutrients, and light, and they exhibit allelopathy, competition, and parasitism [2; 3]. This competition increases in the wet, hot, and humid monsoon season (July), and the ability of weeds to compete successfully with crops for light, water, and nutrients depend on several interrelated factors. These include the timing of weed emergence to crop emergence, the growth form of the weeds, and the density of the weeds present in the crop. The different environmental conditions determine the specific weed spectrum, composition, and population of each region [4]. The reduction in yield due to weed crop competition mainly depends on weed species and their densities as well as crop species. As the distribution and infestation intensity of each weed is different, so the extent of crop yield reduction will mainly depend on the number and kind of weeds found in the field [5; 6].

The number and species structure of weeds depends e.g., on soil quality and properties, i.e., granulometric composition, fertility, pH, and water air relationships in soil [7; 8; 9]. The factors that have the greatest influence on weed infestation include agrotechnical weed control procedures, such as crop rotation, cultivation, selection of species and cultivars, sowing time, sowing quantity, row spacing, soil mulching [10]. Weed biodiversity also has a number of biological functions in and around fields. Moreover, it plays a significant role in the nutrient cycle and uses, as well as in maintaining the balance of crops attacked by diseases and pests [11]. However, weed infestation in fields of grain is a serious problem in plant production. The quantitative relations between weed species can change at different grain growth stages and over the years. This demonstrates the adaptability of weeds to agrotechnical [12]. Weeds compete

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with other plants for nutrients, water, and light, and in consequence cause high crop losses [13]. They assimilate much more water and nutrients than crops. Therefore, they can be particularly competitive in case of elements deficiency in the soil. Another factor affecting crop loss is the collection of weed seeds together with crops. It has a significant influence on lowering the quality of agricultural products [14].

The present research was undertaken to record the diversity of weed species in selected adjacent farms in Al-Wadi Al-Shargi in Ain Zara district southwest of Tripoli- Libya.

2. Methodology

Diversity of weed flora in three selected farms of Al-Wadi Al-Shargi in Ain Zara district southwest of Tripoli- Libya was carried out in two consecutive growing seasons in the period between October 2019 and July 2021. The collected plant specimens were brought to the herbarium and treated by the usual herbarium procedures including pressing, poisoning, mounting, labeling, and identifying. The identification of the specimens was confirmed by the author with the help of the following [15; 16; 17] and also by matching herbarium specimens at the National Herbarium, Department of Botany, Faculty of Sciences, University of Tripoli. Eventually, the specimens were deposited in the National Herbarium, Department of Botany, Faculty of Sciences, and University of Tripoli, Libya for future reference.

3. Results and discussion

3.1. Floristic

A total of 85 weed species were recorded and identified in this survey belong to 29 families, among which 2 families belong to monocotyledons with 18 species and 27 families belong to dicotyledons with 67 species (Table 1). Floristic analysis has shown the dominance of the family Poaceae with 17 species followed by the family Asteraceae with 16 species, then the families Fabaceae and Brassicaceae with 8 species each, other families were less dominant which represented by three species or less. The dominant genera recorded in this study were *Sisymbrium* which is represented by three species, followed by the genera *Bromus, Amaranthus, Lophohloa, Hypochoesis, Chenopodium, Euphorbia, Medicago, Trifolium, and Rumex* which represented by two species each, the rest genera represented by only one species each.

3.2. Lifeform analysis

The biological spectrum analysis according to [18] which was modified by [19] has shown the absolute dominance of the therophytes with 80 species, where only three geophyte species were recorded and one hemicryptophyte (Table 1). This biological spectrum is a result of environmental conditions, but also it is a result of the instability of the weed synusia due to strong human impact, which is characteristic of agro-ecosystems [20; 21].

It is clear that the Therophytes are dominant due to the long dry periods during the year in Libya, and appears that the preferable strategies of plants in the temperate climate in Libya are annual and perennial life forms [22]. Affiliation of some life form is a certain connection with the time of flowering and fruiting. Thus, in the study area, therophytes are predominant, these are annual plants that bloom in spring, Their flowering period is long enough that they can, in the absence of agricultural measures, be undisturbed to complete their life cycle and form seeds and fruits[21].

Table 1 A checklist of collected and identified weeds

Moncots			
No	**Family**	**Species**	**Life form**
1	Cyperaceae	*Cyperus rotundus* L.	Geo
2	Poaceae	*Avellinia michelii* (Savi.) Parl	Th
3		*Avena sterilis* L.	Th
4		*Bromus diandrus* Roth.	Th
5		*Bromus rigidus* Roth.	Th
6		*Cenchrus incertus* M.A.Curtis	Th
7		*Cyrodon dactylon* (L.)Pers.	Geo

8		*Cutandia memphetica* (Sprengel.)Pich.	Th
9		*Eleusine indica* (L.) Graerth	Th
10		*Hordeum murinum* L.	Th
11		*Lophochloa cristata* (L.)Hyi.	Th
12		*Lophochloa salzamnii* (Boiss.)H.Scholz.	Th
13		*Lolium rigidum* Gaud.	Th
14		*Piptatherum miliaceum* (L.)Coss	Geo
15		*Phalaris minor* Retz.	Th
16		*Poa annua* L.	Th
17		*Setaria adhaerens* (Forsk.)Chiov.	Th
18		*Vulpia membranacea* (L.)Dumort.	Th
Dicots			
19	Aizoaceae	*Mesembryanthemum crystallinum* L.	Th
20	Amaranthaceae	*Amaranthus hybridus* L.	Th
21		*Amaranthus retroflexus* L.	Th
22	Apiaceae	*Anethum graveolens* L.	Th
23		*Daucus capillifolius* L.	Th
24	Asteraceae	*Amberboa libyca* (Viv.)Alavi.	Th
25		*Anthemis secundiramea* Bir	Th
26		*Bidens pilosa* L.	Th
27		*Carduus argentatus* L.	Th
28		*Centaurea dimorpha* Viv.	Th
29		*Conyza bonariens* (L.)Cronq.	Th
30		*Cichorium pumilum* Jack.	Th
31		*Chrysanthemum coronarium* L.	Th
32		*Echinops spinosissimum* DC.	Th
33		*Hypochoeris achyrophprus* L.	Th
34		*Hypochoeris glabra* L.	Th
35		*Launaea residifolia* (L.).O.Kuntze.	Th
36		*Onopordum arenarium* (Desf.) Pomel.	Th
37		*Reichardia tingitana* (L.) Roth.	Th
38		*Senecio gallicus* Chiax vin.	Th
39		*Sonchus oleraceus* L.	Th
40	Brassicaceae	*Brassica tournefortii* Goun.	Th
41		*Diplotaxis murale* L.	Th
42		*Eruca sativa* Mill.	Th
44		*Hussonia pinnata* (Viv.)Jafri.	Th
45		*Lobularia libyca* (Viv.) Meisner.	Th
46		*Sisymbrium irrio* L.	Th
47		*Sisymbrium officinale* (L.) Scop.	Th
48		*Sisymhrium orientale* L.	Th
49	Caryophyllaceae	*Silene colorata* Poiert.	Th

50		*Silene gallica* L.	Th
51		*Stellaria media* (L.) Vill.	Th
52	Chenopodiaceae	*Chenopodium album* L.	Th
53		*Chenopodium murale* L.	Th
54	Convolvulaeae	*Convolvulus arvensis* L.	Geo
55	Cuscutaceae	*Cuscuta campestris* Yunchr.	Th
56	Euphorbiaceae	*Euphorbia peplus* L.	Th
57		*Euphorbia terracina* L.	H
58	Fabaceae	*Medicago polymorpha* L.	Th
59		*Medicago tornata* (L.) MilL.	Th
60		*Melilotus sulcalus* Disc.	Th
61		*Onobrychis sp.*	Th
62		*Ononis reclinata* L.	Th
63		*Trifolium stellalum* L.	Th
64		*Trifolium tomentosum* L.	Th
65		*Vicia villosa* Roth.	Th
66	Fumariaceae	*Fumaria judaica* Boiss.	Th
67	Geraniaceae	*Erodium laciniatum* (Car.) Willd.	Th
68		*Geranium molle* L.	Th
69	Hypecoaceae	*Hypocoum geslini* Cosset.	Th
70	Illcebraceae	*Paronychia arabica* (L.) DC.	Th
71	Lamiaceae	*Lamium amplexuale* L.	Th
72	Malvaceae	*Malva parviflora* L.	Th
73	Onagraceae	*Oenothera laciniata* Mill.	Th
74	Papaveraceae	*Papaver rhoeas* L.	Th
75	Plantaginaceae	*Plantago lagopus* L.	Th
76	Polygenaceae	*Emex spinosus* (L.) Camp.	Th
77		*Rumex pucephalaphorus* L.	Th
78		*Rumex vesicarius* L.	Th
79	Portulaceae	*Portulaca oleracea* L.	Th
80	Primulaceae	*Anagalis arvensis* L.	Th
81	Scropholariaceae	*Linaria tenius* (Viv.) Sperg.	Th
82		*Veronica pilota* Fries.	Th
83	Solanaceae	*Solanum nigrum* L.	Th
84	Urticaceae	*Urtica urens* L.	Th
85	Zygophyllaceae	*Tribulus terrestris* L.	Th

3.3. Simpson's index

One of the most important indices which are used for the evaluation of ecosystems at different scales is species diversity [23]. Typical biodiversity measurement focuses on the species level and local diversity can be studied with various indices [24] such as Simpson's index or species richness which are commonly used to assess different trends in plant diversity. Diversity values of Simpson's index are a range between 0 and 1; when the value is closer to 1 it is more diverse and when it is closer to 0 it is less diverse [25]. In this study, Simpson's diversity index calculates a diversity score for the recorded weed species; it is based on both the number of different species of each genus and the number of individuals present for each of those species.

The formula for calculating Simpson's index is:

$$D = 1 - \frac{\sum n_i(n_i - 1)}{N(N-1)}$$

Where N = the total number of all species recorded in this survey.

ni = the numbers of species of each genus.

∑ ni (ni-1) = 272+ 2 + 2+ 240+ 56 + 6 + 2 + 2 + 56 + 2 + 6 + 2 = 648

N (N-1) = 85(85-1) = 7140

Simpson's Diversity Index (D) = 1- (648/7140) = 1- 0.024 = 0.9076

Depending on the value obtained from calculated Simpson's diversity index the weed flora of the studied farms is highly diverse.

The top-ranking weed species *Cyperus rotundus*, *Chrysanthemum choroarium Bromus diandrus, B. rigidus, Avea sterilis, Cyodon dactylon, Lobularia libyca, Amaranthus hybridus* were the most aggressive and difficult weeds to control in different surveyed areas, the produced high number of seeds for the next cropping seasons. The result is that these weeds come up in larger numbers in the subsequent seasons, as more seeds will have been added to those already in the seed bank. If more seed production is coupled with weed seed dormancy then the problem is worsened. High frequency of these weeds showed that they are a serious problem in all agricultural fields, and also can suppress the associated species through the release of allelochemicals from decomposing biomass and root exudates. Other aggressive weeds such as *Cenchrus incertus Emex spinosus*, *Bidens pilosa* and *Medicago polymorpha* which produce spiny seeds in large numbers which may intermix with crop seeds and become problematic and hard to remove and control, and also can adhere to farms cloths and then may affect human health.

4. Conclusion

Due to importance of field weeds in their harmful effect on crop plants, this study was conducted to determine the dominant weeds in the fields under study for the purpose of developing a crop management plan to reduce the risks of these weeds through their irradiation or at least prevent their spread.

Compliance with ethical standards

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Disclosure of conflict of interest

All authors hereby declare no conflicting interest

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