Floristic and Vegetation Study on the Main Weed Communities Associated with Wheat (*Triticum aestivum* L.) Crop

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Abstract

The present study aims at studying the floristic features and community types of the main weed species associated with wheat crop in Menofia Province, Egypt. Sixty stands (each 10 × 10 m) were randomly selected in five wheat farms for monthly determining the cover of weed species along the growing season of wheat. Twenty nine species belonging to 28 genera and 17 families were recorded associated with wheat crop. The most dominant families were Poaceae, Brassicaceae and Fabaceae. Annual weeds were represented by 26 species, while perennials were 3 species. Therophytes were the dominant life form (26 species), while geophytes-helophytes, chamaephytes and hemicryptophytes were represented by on species (*Cyperus rotundus*, *Solanum nigrum* and *Convolvulus arvensis*, respectively). The application of TWINSPAN on the cover estimates of 29 associated species recorded in the 60 sampled stands in wheat, led to the recognition of 8 vegetation groups: **A**: *Convolvulus arvensis,* **B**: *Malva parviflora,* **C**: *Polypogon monspliensis***,** **D**: *Capsella pursa-pastoris,* **E**: *Euphorbia peplus,* **F**: *Chenopodium murale,* **G**: *Sonchus oleraceous,* and **H**: *Beta vulgaris. M. parviflora* group had the highest values of species richness and relative concentration of dominance, while *C. murale* group had the lowest values of species richness, relative evenness and relative concentration of dominance. Moreover, the highest value of relative evenness was recorded in *M. parviflora* and *C. pursa-pastoris* group. The present study is the keystone for further investigation on the weed function and weed management practices.

Key words: Wheat, assemblage, weeds, floristic, community types.

1. Introduction

Agriculture can be conceived as the management of terrestrial ecosystems to divert their productive capacity to serve human needs **(Millennium Ecosystem Assessment, 2005).** As such, agro-ecosystems provide benefits for humankind, i.e. “ecosystem services”, mostly in the form of primary production such as food, feed, timbers, fibers and other natural

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products (**Petit et al., 2011**). Plant based food has played an important role in human nutrition, being a very important source of antioxidants, vitamins and minerals (**Kulkarni et al., 2007)**.

A major objective of most weed community ecology studies has been to identify patterns of species composition and distribution and to interpret these patterns in relation to known or presumed gradients in the environment (**Fried, 2008**). Quantitative analysis, especially quantitative classification methods and ordination techniques, has been widely used to indicate the ecological relationships between vegetation and the environment (**Zhang and Zhang, 2000**). Moreover, floristic studies are not only important to know the variety of plants present in an area, but also socio-economically significant. They provide shelter, food, medicine and everything for the human being and other species of that area.

Weeds are plants which grow where they are not wanted. They differ from other plants in being more aggressive, having peculiar characteristics that make them more competitive (**Gomaa, 2012**). Weeds act as drivers of changes of ecosystem function, nutrients cycling, food webs, plant community structure, habitat availability for animals and fire regimes (**Ghersa et al., 1996**). They are considered one of the main factors limiting agricultural production systems (**Petit et al., 2011; Radicetti et al., 2013**). Yield losses due to weeds are a major cause of low yields in direct-seeded cereals systems and there is considerable scope to improve weed management (**Johnson et al., 2004**). Raising seedlings in a seed bed gives the cereal crop a competitive advantage over weeds and this has long been one of the main components of weed management in traditional cropping systems (**Bastiaans et al., 2000**).

Weeds are an integral component of agro-ecosystems and play an important role in diversifying of the land. Evidence from field experiments shows that weeds can be used to increase species diversity of an ecosystem, reduce pest density, and maintain soil fertility (**Chen et al. 2004**). One of the main problems that agricultural production faces is weeds that interfere with crop growth and production. These weeds compete with plant species for water, light, nutrients and space (**Al-Johani et al. 2012)**. **Fried (2009)** reported that arable weed species play an important role in supporting biological diversity, in particular as food resources of primary importance for birds and insects inhabiting farmlands. Moreover, weed communities are affected by many factors as farm management practices, crop type, season and soil characteristics. Many factors involved in the formation of the weed community make it difficult to evaluate the relative importance of each individual factor (**Shehata and Galal, 2015**).

In farming systems, weeds are one of the major threats to crop production; however the risk of weeds is not only reducing the main crop yields, but also decreasing the commercial quality and the feeding palatability of main crops (**Uchino et al., 2012**). In addition, they increase the soil seed bank of weeds (**Buhler, 1999**), which may cause severe weed infestation in subsequent crop production (**Uchino et al., 2009**). Moreover, planting method is an important yield-contributing factor. Whereas, row spacing in planting method is very important for crop plants and it is determined by the growth habit of the crop and agro-climatic conditions (**Devi et al., 1990**). The present study aims at studying the floristic features and community types of the main weed species associated with wheat crop in Menofia Province, Egypt. This study is the keystone for further investigation on the weed function and weed management practices.

2. Materials and Methods

2.1 Floristic analysis

The weed flora associated with wheat crop was surveyed during the growth season (January – April, 2104). Sixty stands (10 × 10 m), randomly selected in five wheat farms, and were observed monthly throughout the growing season. A list of weed species was made for each sampled stand. A visual estimate of the total cover and the cover of each weed species (%) was assessed using Réléve method (**Muller-Dombois and Ellenberg, 1974**). Identification and nomenclature of weed species were according to **Täckholm (1974), El-Hadidi and Fayed (1994/1995)** and **Boulos (2009)**. Voucher specimens were deposited in Faculty of Women, Botany Department Herbarium and Helwan Faculty of Science (HCH) Herbarium.

Life forms of the recorded species were identified following the Raunkiaer scheme (**Raunkiaer, 1937**) as follows: Ch: chamaephytes, H: hemicryptophytes, GH: geophytes-helophytes, and Th: therophytes. The absolute and relative numbers of species belonging to each life form (biological spectrum) were calculated. In addition, the global geographical distribution of the recorded weed species was gathered from **Täckholm (1974)**, **Zohary (1966, 1972), Wickens (1977**), and **Ahmed (2003**). The global distribution (i.e. floristic regions) is coded as follows: 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.

2.2 Vegetation analysis

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 29 weed species in 60 stands in wheat crop (**Hill 1979a, b**). Species richness (alpha-diversity) for each vegetation group was calculated as the average number of species per stand. 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 (**Whittaker, 1972**). Relative evenness or equitability (Shannon-Wiener index) of the importance value of species was expressed as: $\hat{H} = -\Sigma^{s}$ Pi (log Pi), where S is the total number of species and Pi is the relative importance value (i.e. relative cover) of the species. The relative concentration of dominance is the second group of heterogeniety indices and is expressed by Simpson's index: $D=1/C\{C=\Sigma^{s} (Pi)^{2}\}$, where S is the total number of species and Pi is the relative importance value (relative cover) of species. More details about these indices are available in **Pielou (1975)** and **Magurran (1988).**

3. Results and Discussion

3.1.1 Floristic analysis

The recorded species associated with wheat crop with their families, life forms and floristic categories are presented in **Table 1**. Twenty nine species belonging to 28 genera and 17 families were recorded associated with wheat crop. The most dominant families were Poaceae, Brassicaceae, Fabaceae (4 species for each), Chenopodiaceae (3 species), and Asteraceae (2 species), however the other families were represented by only one species (**Fig. 1**).

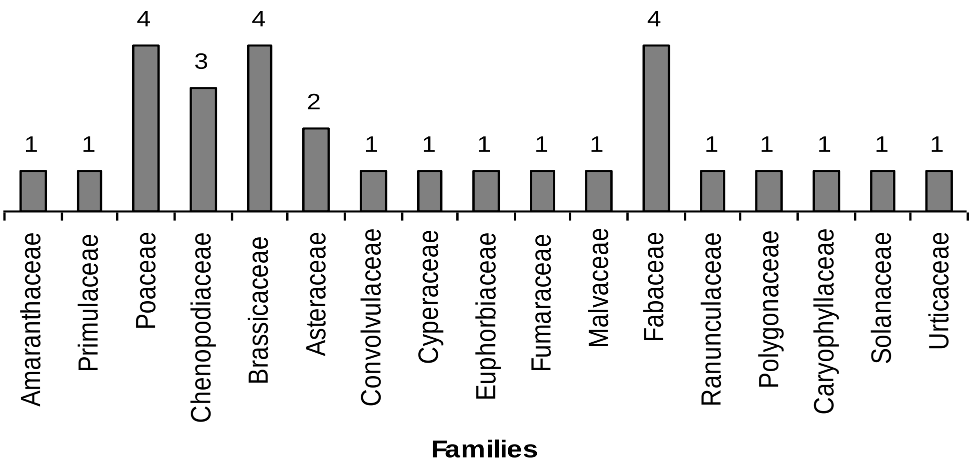

Fig 1: Number of weed species belonging to the different families associated with wheat crop.

3.1.2 Habit of species

The majority of weed species (26 species), associated with wheat crop, were annuals (e.g. *A. hybridus*, *A. arvensis*, *A. fatua*, *B. vulgaris*, *C. bursa-pastoris*, and *C.* muraleSetariaviridis), while perennial weeds were represented by three species (**Table 1**). The common annuals recorded in wheat farms were (*Convolvulus arvensis*, *Cyperus rotundus* and *Solanum nigrum*).

3.1.3 Life forms

The life form spectrum of the recorded species associated with wheat indicated the presence of four life forms: hemicryptophytes, geophytes-helophtes, chamaephytes and therophytes (**Fig. 2**). It was found that, therophytes were the dominant life form represented by 26 species associated with wheat, while geophytes-helophytes, chamaephytes and hemicryptophytes were represented by on species (*C. rotundus*, *S. nigrum* and *C. arvensis*, respectively).

Table 1. Floristic properties of the recorded species associated with wheat crop

Species	Family	Arabic Name	Habit	Life form	Floristic category
Amaranthus hybridus L.	Amaranthaceae	رعاف	Annual	Th	COSM
Anagallis arvensis L.	Primulaceae	عين القط	Annual	Th	ME+ER-SR+IR-TR
Avena fatua L.	Poaceae	زمير	Annual	Th	COSM
Beta vulgaris L.	Chenopodiaceae	سلق	Annual	Th	ME+ER-SR+IR-TR
Brassica tournefortii Gouan	Brassicaceae	شرطام	Annual	Th	ME+SA-AR+IR-TR
Capsella bursa-pastoris (L.) Medik.	Brassicaceae	كيس الراعى	Annual	Th	COSM
Chenopodium ficifolium Sm.	Chenopodiaceae	منتنه	Annual	Th	COSM
Chenopodium murale L.	Chenopodiaceae	لسان الثور	Annual	Th	COSM
Cichorium endivia L.	Asteraceae	شيكوريا	Annual	Th	ME+IR-TR
Convolvulus arvensis L.	Convolvulaceae	عليق	Perennial	H	Trop
Coronopus niloticus (Delile) Spreng.	Brassicaceae	حاره	Annual	Th	S-Z+EGYPT
Cyperus rotundus L.	Cyperaceae	سعد	Perennial	GH	ME+IR-TR+Trop
Euophorbia peplis L.	Euphorbiaceae	لبينة	Annual	Th	ME+ER-SR+IR-TR
Fumaria gaillardotii Boiss.	Fumaraceae	زيته	Annual	Th	ME+ER-SR+IR-TR
Hordeum vulgare L.	Poaceae	شعير	Annual	Th	ME+IR-TR
Malva parviflora L.	Malvaceae	خبيزة	Annual	Th	ME+IR-TR
Medicago polymorpha L.	Fabaceae	نفل	Annual	Th	COSM
Phaseolus vulgaris L.	Fabaceae	فاصوليا	Annual	Th	Cultivated
*Pisum sativum*L.	Fabaceae	بسلة	Annual	Th	Cultivated
Poa annua L.	Poaceae	سبل أبو الحسين	Annual	Th	ME+ER-SR+IR-TR
Polypogon monspeliensis (L.) Desf.	Poaceae	ديل القط	Annual	Th	COSM
Ranunculus sceleratus L.	Ranunculaceae	زغلنتة	Annual	Th	ME+ER-SR+IR-TR
Raphanus sativus L.	Brassicaceae	فجل	Annual	Th	Cultivated
Rumex dentatus L.	Polygonaceae	حميض	Annual	Th	ME+ER-SR+IR-TR
Silene rubella L.	Caryophyllaceae	أبو النجف	Annual	Th	ME
Solanum nigrum L.	Solanaceae	عنب الديب	Perennial	Ch	ME+ER-SR+IR-TR
Soncuhs oleraceous L.	Asteraceae	جعضيض	Annual	Th	COSM
Trifolium alexandrinum L.	Fabaceae	برسيم	Annual	Th	ME
Urtica urens L.	Urticaceae	حريق	Annual	Th	ME+ER-SR

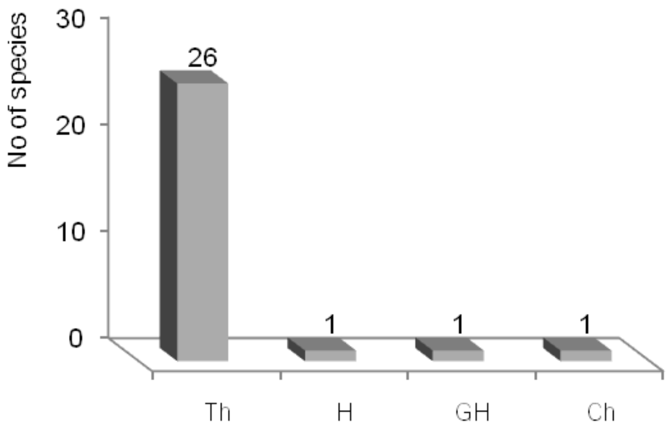

Fig. 2. Life form spectra of the recorded associated species in each of the wheat crop.Th: therophytes. H: hemicryptophytes, GH: geophyte – helophytes and Ch: chamaephytes.

3.1.4 Chorological analysis

The spectrum of the global distribution of the recorded species associated with wheat crop indicated that pluri-regional taxa were the dominant elements in wheat farms; represented by 10 species, followed by cosmopolitans (8 species), bi-regionals (5 species) and monoregional elements, which were represented by three species **(Fig. 3**).

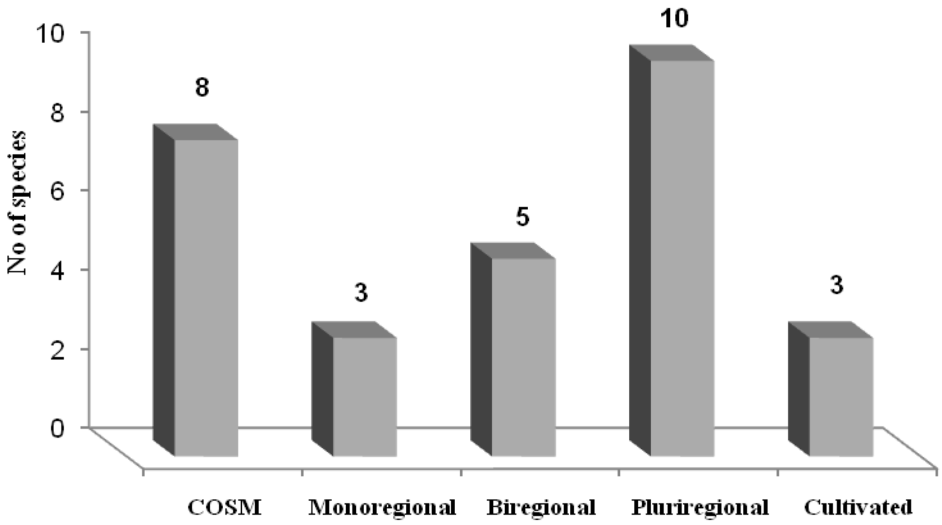

Fig 3. Floristic category of the recorded species associated with wheat crop.

3.1.5 Vegetation Analysis

The application of TWINSPAN on the cover estimates of 29 associated species recorded in the 60 sampled stands of wheat, led to the recognition of 8 vegetation groups (**Fig. 4**). These groups showed a reasonable segregation along the ordination plane axes 1 and 2 of

DECORANA (**Fig. 5**). The vegetation groups are named after the first dominant species (the species that have the highest presence percentage and / or the highest cover) associated with *T. aestivum*. The presence of wheat was 100% in all vegetation groups, while cover varied from one group to another. The description of these vegetation groups was indicated in **Table (2)** as follows:

Convolvulus arvensis **(VG A):** It includes two stands and 16 species. In this group *Triticum aestivum* was represented by 77.5% cover, while *C. arvensis* was represented by 3.0% cover and 100% presence. The associated species include *A. arvensis*, *Sonchusoleraceous*, *B. vulgaris*, *C. murale* and *Polypogon monspliensis*.

Malva parviflora **(VG B):** It includes six stands and 21 species. *T. aestivum* was represented by 71.7% cover, while *M. parviflora* was represented by 2.3% cover and 100% presence. The common associated species include *P. monspliensis*, *C. murale*, *M. polymorpha*, *C. pursa-pastoris* and *Rumex dentatus*.

Polypogon monspliensis **(VG C):** It includes six stands and 19 species. In this group *T. aestivum* was represented by 76.7% cover, while *P. monspliensis* was represented by 1.1% cover and 100% presence**.** The associated species include *Poaannua, Raphanus sativus*, *R. dentatus*, *C. arvensis* and *S. oleraceous*.

Capsellapursa-pastoris **(VG D):** It includes 23 stands and 23 species. In this group, *T. aestivum* was represented by 72.4% cover, while *C. pursa-pastoris* was represented by 0.8% cover and 87.5% presence. *A. fatua*, *P. monspliensis*, *P. annua*, *C. arvensis* and *M. polymorpha* are the common associated species.

Euphorbia peplus **(VG E):** It comprises 6 stands and 17 species. *T. aestivum* was represented by 75.8% cover, while *E. peplus* was represented by 2.2% cover and 100% presence. The associated species include *Pisum sativum, C. murale, C. niloticus, B. vulgaris* and *Silrene rubella*.

Chenopodium murale **(VG F):** This group comprises 5 stands and 15 species. In this group, *T. aestivum* was represented by 63.0% cover, while*C. murale* was represented by 7.0% cover and 60.0% presence**.** The associated species include *C. pursa-pastoris*, *C. endivia*, C. *arvensis*, *E. peplus* and *B. vulgaris*.

Sonchus oleraceous **(VG G):** It includes 9 stands and 19 species. In this group, *T. aestivum* was represented by 67.8% cover, while *S. oleraceous* was represented by 0.9% cover and 100% presence. *C. murale, C. pursa-pastoris, M. parviflora, C. niloticus* and *B. vulgaris* are the common associated species.

Beta vulgaris **(VG H):** This group includes 3 stands and 15 species. It was found that, *T. aestivum* had 70.0% cover, while *B. vulgaris* had 0.7% cover and 100% presence. The associated species comprise *M. parviflora*, *C. pursa-pastoris*, *U. urens*, *R. sativus* and *C. rotundus*.

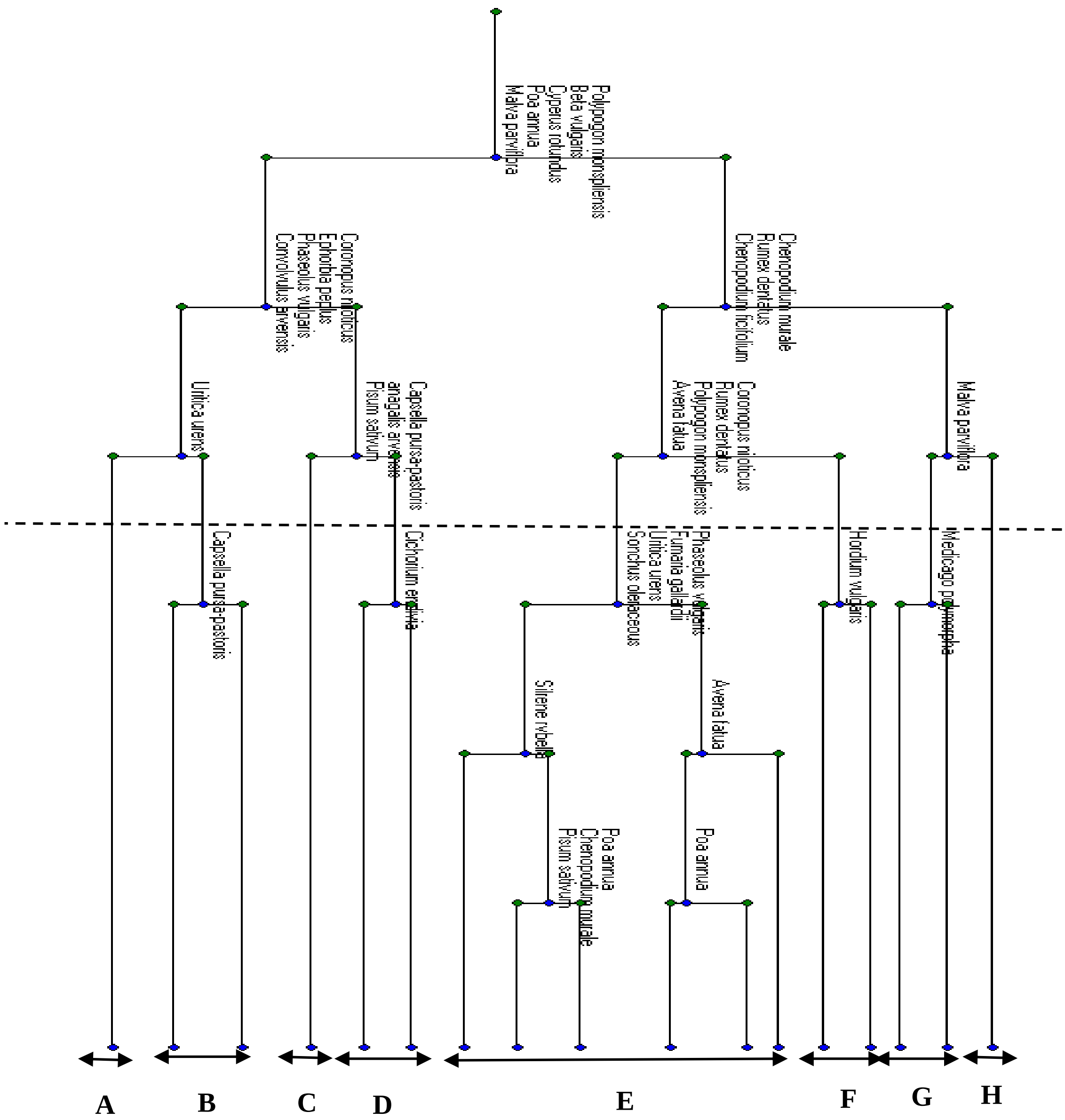

Fig. 4. The dendrogram resulting from the application of TWINSPAN on the 60 sampled stands. The names of these groups are: **A**: *Convolvulus arvensis*, **B**: *Malva parviflora*, **C**: *Polypogon monspliensis*, **D**: *Capsella pursa-pastoris*,**E**: *Euphorbia peplus*,**F**: *Chenopodium murale*, **G**: *Sonchus oleraceous*, and **H**: *Beta vulgaris.*

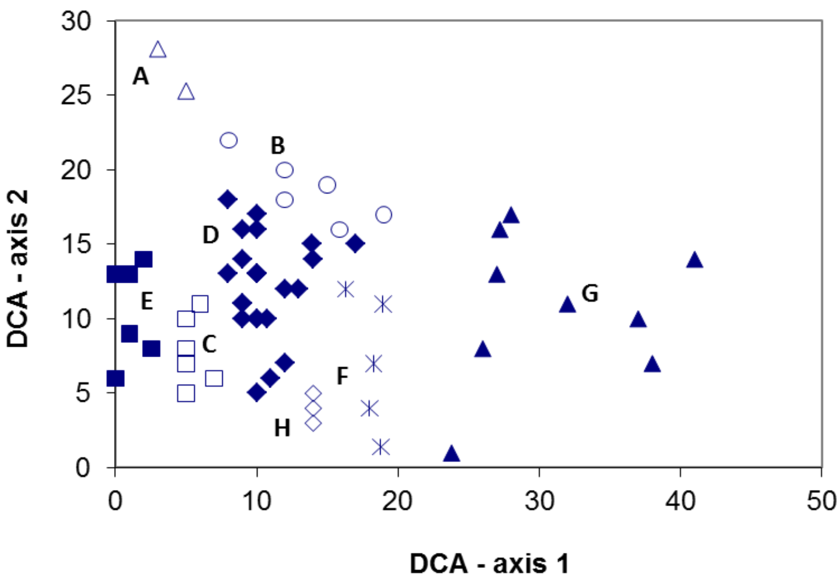

Fig. 5. DCA ordination of the 8 vegetation groups identified after the application of TWINSPAN on the 60 sampled stands. The names of these groups are: **A**: *Convolvulus arvensis*, **B**: *Malva parviflora*, **C**: *Polypogon monspliensis***, D**: *Capsella pursa-pastoris*,**E**: *Euphorbia peplus*, **F**: *Chenopodium murale*,**G**: *Sonchus oleraceous*, and **H**: *Beta vulgaris.*

3.1.6 Diversity of the plant communities

The total number of species recorded in the 8 vegetation groups, identified according to TWINSPAN classification technique, varied from 15 species in *C. murale* and *B. vulgaris* groups (VG F and H) to 23 species in *C. pursa-pastoris* group (VG D) (**Table. 3**). *M. parviflora* group (VG B) had the highest values of species richness (14.3 species/stand) and relative concentration of dominance (17.4), while VG F had the lowest values of species richness (7.6 species/stand), relative evenness (2.5) and relative concentration of dominance (11.4). Moreover, the highest value of relative evenness (2.9) was recorded in VG B and D, while the highest species turnover (2.2) was recorded in VG D (**Table. 3**).

3.2 Discussion

Many grassy and broadleaf weeds are associated with wheat crop, the occurrence of which may depend upon many factors such as location, soil fertility, management etc. (**Shah, 2013**). The weeds of the cultivated lands of Egypt are mainly short-lived (annuals and biennials) herbs. The main difference in weed composition is between winter and summer crops (**Galal, 2001**). In the present study, twenty nine weed were recorded as the common associated species of wheat. However, **Galal (2001)** recorded 35 species associated with wheat crop in Giza area, while **Shaltout and El Fahar (1991)** recorded 69 species in the Nile Delta.

Table 2. Average cover (C) and presence (P) of the recorded species associated with wheat in the eight vegetation groups resulted from TWINSPAN

Species	Vegetation group															
	A		B		C		D		E		F		G		H	
	C	P	C	P	C	P	C	P	C	P	C	P	C	P	C	P
Triticum aestivum	77.5	100.0	71.7	100.0	76.7	100.0	72.4	100.0	75.8	100.0	63.0	100.0	67.8	100.0	70.0	100.0
Pisum sativum					0.5	16.7	0.5	30.4	1.6	100.0	0.5	20.0	0.8	77.8		
Medicago polymorpha			1.4	66.7			0.8	8.7					1.0	33.3		
Sonchus oleraceous	0.5	100.0	0.8	83.3	0.7	50.0	0.6	60.9	0.6	66.7	0.5	20.0	0.9	100.0	0.5	33.3
Beta vulgaris	0.5	50.0	1.3	50.0			0.5	4.3	1.1	66.7	0.8	40.0	1.2	66.7	0.7	100.0
Chenopodium murale	0.5	100.0	2.0	100.0			0.6	39.1	1.6	66.7	7.0	60.0	4.5	66.7	0.5	100.0
Phaseolus vulgaris			0.5	33.3	0.5	50.0	0.5	65.2					0.5	33.3	0.5	100.0
Malva parviflora			2.3	100.0	0.5	66.7	0.5	82.6					2.3	33.3	0.5	33.3
Coronopus niloticus	0.5	50.0	0.6	83.3			0.7	52.2	1.3	66.7	0.5	20.0	1.4	77.8	0.5	100.0
Capsella pursa-pastoris	0.5	50.0	1.4	83.3	0.5	50.0	0.8	87.0	0.7	100.0	4.0	80.0	2.6	44.4	1.3	100.0
Fumaria gallardii					0.5	16.7	0.5	47.8	0.5	16.7	0.5	20.0			0.5	66.7
Raphanus sativus					1.0	16.7	0.5	4.3	0.5	16.7	0.5	40.0	0.8	66.7	0.8	66.7
Cichorium endivia					0.5	16.7	0.5	13.0	0.5	33.3	1.5	40.0				
Convolvulus arvensis	3.0	100.0	0.8	83.3	0.8	50.0	0.8	43.5	0.7	83.3	1.3	80.0				
Uritica urens			0.5	16.7			0.5	30.4	0.5	16.7	0.5	40.0			0.8	100.0
Euphorbia peplus			0.7	50.0	0.5	50.0	0.5	82.6	2.2	100.0	1.2	60.0	1.0	33.3		
Anagalis arvensis	1.3	100.0	0.5	16.7	0.5	16.7	0.7	26.1	1.1	66.7			0.5	11.1		
Rumex dentatus	0.5	100.0	1.3	100.0	0.8	66.7							0.5	22.2		
Cyperus rotundus			0.8	33.3	0.6	100.0	0.7	47.8							0.5	33.3
Poa annua	0.5	50.0	1.1	66.7	1.8	50.0	0.8	73.9	0.5	16.7			0.5	11.1		
Silrene rvbella	0.5	50.0					0.5	13.0	1.2	50.0						
Avena fatua	0.5	50.0	0.8	66.7	0.5	100.0	1.8	8.7								
Solanum nigrum	0.5	50.0					0.5	4.3	0.5	16.7						
Ranunculus sceleratus			0.5	16.7									0.5	22.2		
Chenopodium ficifolium	0.5	50.0	0.7	83.3									0.5	11.1	0.5	33.3
Amaranthus hybridus	0.5	50.0	0.5	16.7	0.5	16.7							0.5	11.1	0.5	66.7
Polypogon monspliensis	0.5	50.0	2.0	83.3	1.1	100.0	1.1	21.7								
Hordium vulgaris					0.5	33.3										
Brassica turnifortii											0.5	20.0				
Trifolium alexandrinum											0.5	20.0	0.8	44.4	0.5	33.3

Table 3. Diversity indices of the 8 vegetation groups produced from TWINSPAN. Maximum and minimum values are underlined

Diversity index	Vegetation group							
	A	B	C	D	E	F	G	H
Number of species	16.0	21.0	19.0	23.0	17.0	15.0	19.0	15.0
Species richness	12.0	14.3	10.7	10.5	10.8	7.6	9.7	11.7
Species turnover	1.3	1.5	1.8	2.2	1.6	2.0	2.0	1.3
Relative evenness	2.7	2.9	1.8	2.9	2.7	2.5	2.7	2.6
Relative concentration of dominance	14.4	17.4	14.2	15.4	13.2	11.4	13.7	12.9

In the present study, *A. arvensis, A. fatua, C. arvensis, P. annua* and *P. monspliensis* were the common associated species in wheat crop. This result coincided with those of **Galal (2001)** in Giza, and **Shaltout and El Fahar (1991)** and **Abouziena et al. (2008)** in Nile Delta. **Moustafa (1996)** stated that the lowest number of species associated with wheat may be attributed to human impact on agriculture and its different process in addition to climatic variation.

Worldwide, **Begum et al. (2003)** reported 73 weed species in wheat crop in Bangladesh, among them, *Chenopodium album, D. sanguinalis* and *C. dactylon* had higher relative abundance values as were recorded in the present study. Similarly, **Aslam et al. (1989)** stated that *Phalaris minor* and *C. album* were the major problematic weeds of wheat in Pakistan. In addition, **Hobbs (1990), Dwivedi et al. (1996)** and **Mishra (2014)** reported that, *A. fatua, C. dactylon* and *A. arvensis* are the major weeds of wheat in India. Moreover, **Nanda and Patro (1996)** recorded 20 weed species associated with wheat crop at Orissa, India.

Poaceae included the most dominant plants associated with wheat crop, followed by Cruciferae and Fabaceae, Chenopodiaceae and Asteraceae. These families constitute the bulk of the flora of the study area in accordance with **Al-Sodany (1992)** in various habitats in north Nile Delta, **Speringuel et al. (1991)** in the Nile Valley (Upper Egypt), and **Khedr et al. (1998)** in the north western part of Nile Delta.

Life form spectra provide information that may help in assessing the response of vegetation to variations in environmental factors (**Galal, 2005)**. Therophytes were the dominant life form among the life forms of the recorded species associated with wheat, followed by geophytes-helophytes, chamaephytes and hemicryptophytes. According to **Galal (2001)**, therophytes are the main life forms and most of them are weed species characteristic to the cultivated lands, coinciding with **Hassib (1951)** on the Egyptian flora. **Heneidy and Bidak (2001)** pointed out that the dominance of therophytes over the other life forms seems to be a response to the hot-dry climate, topographic variation and biotic influence. In the present study, 26 species, recorded in wheat crop, were annuals. **Gomaa (2012)** attributed the high contribution of annuals to their short life cycle that enables them to resist the instability of the agro-ecosystem. Annuals are generally characterized by high allocation 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 cut short (**Sans and Masalles, 1995)**. However, **Marshall (1989)** demonstrated that most perennial species are not adapted to successful establishment in arable crops.

The spectrum of the global distribution of the recorded species associated with wheat crop indicated that pluri-regional taxa were the dominant elements in wheat, followed by cosmopolitans, bi-regionals and monoregional elements. According to **Mashaly (1987**), 50% of the species in the Deltaic sector are Mediterranean taxa, 32% are pluri-regionals and 8% are Saharo-Sindian elements. Most of the recorded species were Mediterranean taxa; however presence of phytogeographical elements other than Mediterranean, is believed to be a reflection of intense climatic changes and/or the degradation of the Mediterranean ecosystem which facilitated the invasion of some elements from the adjacent regions (**Mashaly, 1987; Madi et al., 2002).**

In Egypt, phytosociological studies on weeds along the Nile valley are still limited. In fact, most of the studies that carried out on weed communities are mostly floristic (**Galal, 2001**). Phytosociologists used ordination techniques to simplify distribution patterns along the gradients of environmental variables (**Spink, 1992**). The classification of vegetation associated with wheat crop using TWINSPAN analysis, led to identify 8 vegetation groups. *C. arvensis* is a common community associated with wheat. This classification may indicate the significant effects of crop sowing type, management practices and monthly variation on the weed community composition and structure. The effect of crop may be indirect. For example, fertilization regimes, soil management practices, application of herbicides and weed management may vary depending on the crop type, and these factors influence weed community composition (**Gomaa, 2012).**

The vegetation groups, resulted from TWINSPAN classification, are clearly distinguished by the first two DCA axes. Thus, the DCA analysis also strengthens the importance of crop and season for the formation of weed community. These results agreed with those of **El-Demerdash et al. (1997), Andreasen and Skovgaard (2009), Pinke et al. (2010)** and **Gomaa (2012)**, who pointed out that season, soil characteristics, management practices and crop type, contribute to the composition of weed community.

One of the dominant weed communities associated with wheat crop was *C. murale*, which was reported by **Shaltout and El-Halawany (1992)** and **Gomaa (2012)** to dominate some weed communities of date palm orchards in eastern Saudi Arabia. In addition, it also dominated weed communities of winter crops in Egypt (**Hegazy et al., 2004).** Moreover, *C. arvensis* community, dominated wheat crop, was recorded by **Shaltout and El-Halawany (1992)** as dominant weeds in eastern Saudi Arabia. It was listed as a co-dominant species in the date palm orchards of Central Saudi Arabia (**Gazer, 2011**). These two species were listed by **Chaudhary et al. (1981)** among weeds that cause severe infestation in agricultural areas in the central southern and eastern Arabian Peninsula.

Crop type had the most significant influence on species composition although it had a low impact on species richness (**Fried et al., 2008**). *M. parviflora* and *A. hybridus* groups in wheat had the highest values of species richness and diversity. The high species richness may be related to this environmental micro-heterogeneity that promotes diversity (**Palmer and Maurer, 1997**). The variations in species richness, diversity and evenness among the different community 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 among other associated species (**Shehata and Galal, 2015**). Moreover, the difference in field management practices may also be a factor that explains differences in weed species richness (**Gomaa, 2012**). Although weeds are unwanted plants, increased their diversity may have other indirect beneficial effects on agro-ecosystems. For example, increased vegetation diversity can lead to suppression of pests via 'top-down' enhancement of natural enemy populations or by resource concentration and other 'bottom-up' effects acting directly on pests (**Shehata and Galal, 2015**).

It was clear that species richness in wheat was lower than that recorded in orchards by **Gomaa (2012**). The low species richness of the study crop compared with orchards may be attributed to the fact that the land of field crops is generally plowed each season before the sowing of crops, a practice that reduces the richness of weeds compared to the orchards that are rarely plowed (**Gomaa, 2012**). The present study showed that at this local scale, weed species richness and diversity were enhanced when the local surroundings of the focal field are more heterogeneous. Here, this heterogeneity is not so much linked to the diversity of land use types, but mostly relates to the grain of the landscape, i.e. the number of parcels surrounding the focal field. This partly fits expectations from the mosaic concept, where species number should increase with habitat heterogeneity (**Gaba et al., 2010**).

4. Conclusion

Twenty nine species belonging to 28 genera and 17 families were recorded associated with wheat crop. This considered low figure than that recorded in the previous studies, where as the present study was carried on small scale. Its community types were recorded as common associated plants in wheat. The present study is the keystone for further investigation on the weed function and weed management practices.

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الملخص باللغة العربية

دراسة الغطاء النباتى لمجتمعات الحشائش الرئيسية المصاحبة لمحصول القمح

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تهدف الدراسة الحالية الى التعرف على الفلورا والغطاء النباتي لمحصول القمح والحشائش المصاحبة له فى محافظة المنوفية ، مصر. ولتحقيق هذا الهدف تم اختيار 60 موقع كل منهم (10×10 م) فى خمس حقول خلال موسم الزراعة. تم تسجيل 29 نوع تنتمى الى 28 جنسا و 17 فصيلة مصاحبة لمحصول القمح وكانت العائلة السائدة هى العائلة النجيلية تليها العائلة الصليبية ثم العائلة الفراشية. تمثل النباتات الحولية 26 نوع والنباتات المعمرة 3 أنواع . تعتبر النباتات الحولية هى النباتات الشائعة فى اشكال الحياة بينما النباتات المختبئة وشبه المختبئة ممثلة بنوع واحد لكل منهم وهذه الأنواع هى السعد وعنب الديب والعليق. وبتطبيق التحليل الدليلى ثنائى الاتجاه تم تسجيل 8 مجتمعات نباتية وهى مجتمع العليق، مجتمع الخبازى ، مجتمع ديل القط ، مجتمع كيس الراعى ،مجتمع اللبين ، مجتمع الزربيح ، مجتمع الجعضيض ، مجتمع السلق. يتسم مجتمع الخبازى بأعلى species richness ، relative concentration of dominance، بينما يتسم مجتمع الزربيح بأقل species richness ، relative evenness ، relative concentration of dominance. علاوة على ذلك يتسم مجتمعى الخبازى وكيس الراعى بأعلى relative evenness .