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Diversity, utility and communities of weed in wheat of Nowshera, Pakistan

[Diversidad, utilidad y comunidades de hierbas en trigo de Nowshera, Pakistan]

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Abstract: Weeds are disregarded for their competitive nature and difficulties during harvesting and threshing. Categorizing them by economic use classes enables effective management. Weed ecological studies in wheat crop fields were conducted to evaluate the floristic diversity, ecological characteristics, community structures and economic uses of weeds in District Nowshera, Pakistan. Different wheat crop fields were surveyed for the collection and identification of plant species growing as weed. Total 50 plant species from 47 genera and 20 families were recorded in the study area. Asteraceae had the highest number of species (10), followed by Poaceae (9). Therophytes were more with 42 species, followed by geophytes and Hemicryptophytes each with 3 species. Most species had mesophyllous leaf size (15), while nanophyllous (12) and microphyllous (11). Simple leaves were more common (28) than dissected leaves (22). Nonspiny species were (44) while only 6 had spines. Maximum plant species were fodder (35) and medicinal (10). In the study, four distinct weed communities were identified using quadrate method i.e. Cynodon-Anagallis-Melilotus, Arenaria-Anagallis-Cannabis, Cynodon-Parthenium-Coronopus and Rumex-Arenaria-Oxalis. These findings provide a valuable starting point for future in-depth investigations on the entire flora and vegetation of Nowshera, Pakistan.

Keywords: Wheat; Weed; Diversity; Ecology; Nowshera-Pakistan

Resumen: Las hierbas se descartan por su naturaleza competitiva y las dificultades para su cosecha y trilla. Categorizarlas por su uso económico usa clases y permite una gestión efectiva. Los estudios ecológicos de las hierbas en los campos de trigo se han conducido para evaluar la diversidad de flora, las características ecológicas, las estructuras de comunidades, y los usos económicos de las hierbas en el distrito de Nowshera, Pakistan. Distintos campos de trigo fueron muestreados para recolección e identificación de especies vegetales que crecen como hierbas. Un total de 50 especies de plantas de 50 géneros y 20 familias se registraron en esta área de estudio. El mayor número de especies pertenecía al género Asteraceae had the highest (10), seguido por Poaceae (9). Therophitos fueron la mayoría, con 42 especies, seguidos por las geófitas y Hemicriptofitas cada una con 3 especies. La mayoría de las especies tenía un tamaño de hoja mesófilo (15), mientras que los nanófilos registraron 12 y micrófilos 11. Las especies de hojas simples fueron más comunes (28) que las hojas diseccionadas (22). Las especies sin espinas predominaron (44) mientras que solo 6 tenían espinas. La mayoría de las especies fueron eran forraje (35) y medicinales 10. En el estudio, cuatro familias distintas fueron identificadas usando el método cuadrado, esto es, Cynodon-Anagallis-Melilotus, Arenaria-Anagallis-Cannabis, Cynodon-Parthenium-Coronopus y Rumex-Arenaria-Oxalis. Estos hallazgos permiten un valioso punto de inicio para futuras investigaciones en profundidad sobre la flora y vegetación de Nowshera, Pakistan.

Palabras clave: Trigo; Hierba; Diversidad; Ecología; Nowshera-Pakistan

INTRODUCTION

Historically Nowshera was a town, cantonment and tehsil of Peshawar. It became a district in 1988 and is located along the banks of the Kabul River on the main Grand Trunk Road towards the east of Peshawar city. It is bordered on the north by Mardan, northeast Swabi, northwest Charsadda, east Attock and south by Kohat district. (Figure No. 1). The geographical location of the area is 34°055 N Latitude and 71°58′29E Longitude. The total area is 1748 Km^2 and agricultural land occupies 52540 hectares. The cold month start from November to February and the hottest months prevail from June to August. Ecologically the area falls under a subtropical zone with characteristic flora and vegetation types. Kabul River and tube well are the main sources of irrigation in the area. The major cultivated crops in the area include wheat, maize, sugarcane, vegetables and fodder. Wheat is grown as one of the major cereal crops throughout Pakistan. Wheat as a crop has multiple uses and is susceptible to weed infestation. Many ecological studies on weeds in wheat crops are carried out in many other districts such as Chitral (Hussain *et al.*, 2004; Shah *et al*., 2014), Dir (Shah *et al*., 2004), Swat (Akhtar & Hussain, 2007), Swabi (Sher *et al*., 2011), Mardan (Marwat *et al*., 2006), Peshawar (Hussain *et al*., 2012; Bajwa *et al*., 2017), Malakand (Iqbal *et al*., 2017), Narwana, India (Duggal, 2017) and Dir Lower (Muntaha *et al*., 2018). Sharma and Rayamajhi (2022) described different aspects of weed management in maize crops. Weeds are among the major issues responsible for a reduction in yield and profit in any crop production system. Herbicides are the easiest and quickest solution of weeds. However, their frequent use exerts negative consequences on the environment and human health and results in the evolution of herbicide-resistant weed species (Naeem *et al*., 2022). The greatest approach to learn about the habiat, areas, vegetation structure, habit and various relationship between plants in an ecosystem is by the study of plant communities (Khan *et al*., 2016).

The present study provides the first documented report on weed infestation in District Nowshera. This valuable information serves as a foundation for future investigations into the overall floristic diversity of the region.

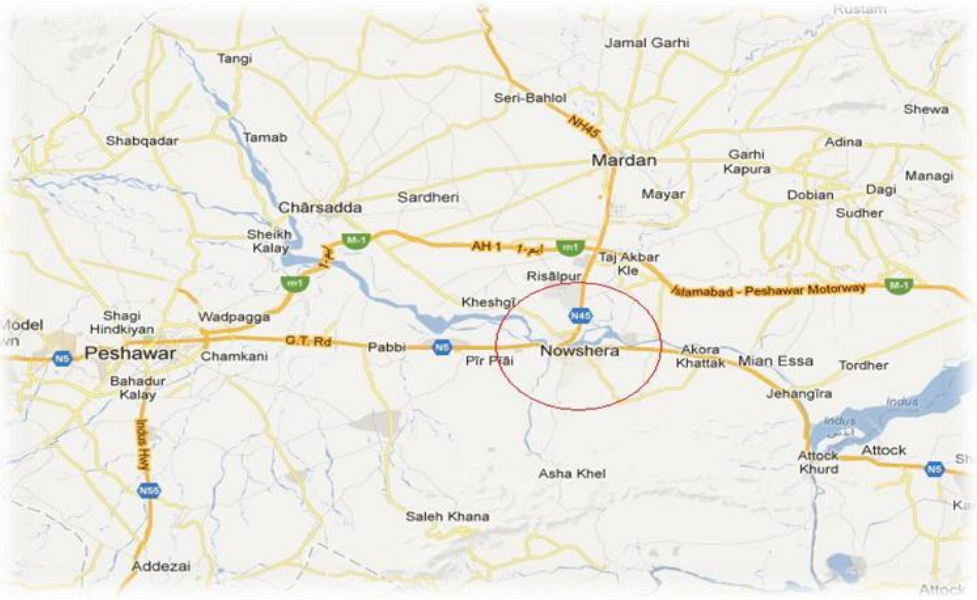

Figure No. 1
Map of Nowshera District, Khyber Pakhtunkhwa Province, Pakistan

MATERIALS AND METHODS

The study was conducted through a field survey carried out at Nowshera-Pakistan during March-April 2017, with the aim of collecting, identifying and ecologically describing the weed flora in wheat crop fields (Figure No. 1 and Figure No. 2). Weed species

were identified utilizing available literature and references such as the Flora of Pakistan. The life-form and leaf-size classes of the plant species were assigned based on the classification systems developed by Raunkiaer (1934) and Hussain (1989). Phenologically plant species were categorized as pre-reproductive/vegetative stage, reproductive/flowering, fruiting stage and post-reproductive/dying stage. Observations were made regarding leaf shapes and the presence of spines during field survey.

Weeds were further categorized into economic use classes based on interviews with farmers and personal observations. To establish weed communities, the Quadrat method (quantitative ecological techniques) was employed. The sampling was carried out at different localities in the study area. 4 sites were selected and each site consists of 10 stands. Quadrates having sizes of 1×1 m^2 was used for phytosociological sampling. For all quadrates phytosociological attributes *i.e.,* density, cover, frequency, relative density, relative cover, relative frequency and importance values (IVs) were recorded. Density and cover of the species were calculated using mid values and relative values of the density, cover and frequency were added to get the importance values. Communities were established and the associated species was noted. It was named based on the highest importance values (IVs) of the three leading species such as *Avena-Anagallis-Cannabis* (31 spp.), *Cynodon-Parthenium-Coronopus* (37 spp.) *and Rumex-Arenaria-Oxalis* (28 spp.).

Importance values (IVs)

RD+ RC+ RF = IVs

Relative density, RD = Density of particular species ÷ Total densities of all species× 100

Relative cover, RC = Cover of a particular species ÷ Total cover of all species × 100

Relative frequency, RF = Frequency of a particular species ÷ Frequency of all species ×100

The experimental data were analyzed using SAS (Statistical Analysis System) software version 9.2. Mean phenotypic values were compared with Student's t-test at 5%, 1%, and 0.1% levels of probability.

RESULTS AND DISCUSSION

Weed evaluation in the wheat crop fields revealed that there were 50 plant species distributed into 47 genera and 21 families. The prominent family remained Asteraceae with 10 species followed by Poaceae possessed 9 plant species. Brassicaceae, Chenopodiaceae, Papilionaceae and Polygonaceae had 3 species each. Apiaceae, Euphorbiaceae, Plantaginaceae, Solanaceae and Verbenaceae are represented by 2 species. The remaining 9 families contained 1 species each. Therophytes were more (42 specis, 84%) followed by Geophytes and Hemicryptophytes each with three species (6%) while two species (4%) were Chamaephytes.15 plant species (30%) had Mesophyllous leaves succeeded by Nanophyllous (12 species, 24%), Microphyllous (11 species, 22%), Macrophyllous (7 species ,14%), Leptophyllous (3 species, 6%) and 2 species (4%) had Megaphyllous leaves. Simple leaf weed were more (28 species, 56%) while 22 plants (44%) had Dissected leaf structures. Maximum individuals (44 specis, 88%) were equipped with no spines and the remaining (6 species, 12%) had spines. Most plants occurred in the reproductive stage (37 species, 74%), then post-reproductive (7 species, 14%) and vegetative (6 species, 12%) stages. The categorization of weeds into economic use classes indicated that weed plants were mostly used as fodder (35 species, 70%), medicinal (10 species, 20%), vegetable (3 species, 6%), oil yielding and thatching purpose 1 species each (2%) (Table No. 1 & Table No. 2). It is necessary that before eradicating weeds the economically important weed plants must be used as fodder, food and medicines. Four weed communities were established which consisted of *Cynodon-Anagallis-Melilotus* (29 spp.), *Avena-Anagallis-Cannabis* (31 spp.), *Cynodon-Parthenium-Coronopus* (37 spp.) and *Rumex-Arenaria-Oxalis* (28 spp.) (Table No. 3, Table No. 4, Table No. 5 & Table No. 6).

Environmental conditions, edaphic factors, aspects, ecological zonation and herbivory modify the morphological features of species. Annual therophyte plants are more common in fertile loamy and humid soil. Plants reduce their leaf sizes to avoid harsh environmental conditions in alpine and

terrestrial ecosystems. Day length and season of the year effect phenology of plant species. Plants avoid herbivory by releasing aromatic volatile phytochemicals and growth of spines on their bodies. The results agreed with the work of many researchers who presented similar trend in species composition. Categorization of weed into various economic use classes and hand pulling of weed at early S1 vegetative phenological stage are suggested.

Growth of weeds reduces crop yield greatly. It can be affected by moisture, temperature, pH of soil, macronutrients and micronutrients availability in soil. Although weeds are beneficial for crops also by recycling nutrients to the soil and avoiding harmful insects for crops by providing habitat to them.

Figure No. 2
Graphical representation of ecological features of weed in District Nowshera, Pakistan

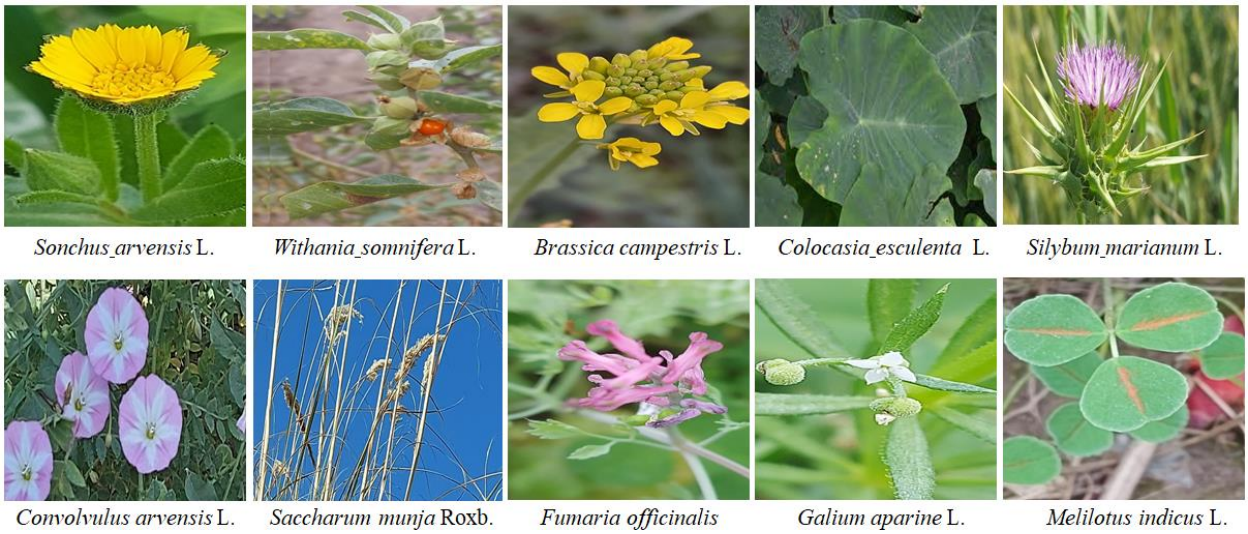

Figure No. 3
Phenotype of selected plant species

Table No. 1

Floristic diversity, biological spectra and economic uses of weed in District Nowshera

No.	Plant species	Life forms	leaf sizes	Leaf shape	Phenological stages	Spiny nature	Economic uses
	Angiosperms						
A	**Monocots**						
1	**Araceae**						
i.	*Colocasia esculenta* (L.) Schott.	G	Meg	S	Rep	NSp	Veg
2	**Cyperaceae**						
i.	*Cyperus rotundus* L.	G	Mic	S	Rep	NSp	Fod
3	**Poaceae**						
i.	*Alopecurus myosuroides* Huds.	H	Mic	S	Rep	NSp	Fod
i.	*Avena fatua* L.	Th	Mes	S	Post R	NSp	Fod
ii.	*Bromus catharticus* Vahl.	Th	Mes	S	Rep	NSp	Fod
iii.	*Cynodon dactylon* (L.) Pers.	H	Mic	S	Rep	NSp	Fod
iv.	*Hordeum murinum* L.	Th	Mes	S	Rep	NSp	Fod
v.	*Lolium temulentum* L.	Th	Mes	S	Rep	NSp	Fod
vi.	*Phalaris minor* Retz.	Th	Mic	S	Rep	NSp	Fod
vii.	*Poa annua* L.	Th	Mic	S	Rep	NSp	Fod
viii.	*Saccharum munja* Roxb.	H	Meg	S	Veg	NSp	That
B	**Dicots**						
4	**Apiaceae**						
i.	*Scandix pectin veneris* L.	Th	Mic	D	Rep	NSp	Fod
ii.	*Torilis arvensis* (Huds.) Link.	Th	Mic	D	Rep	NSp	Fod
5	**Asteraceae**						
	Cichorium intybus L.	Th	Mac	D	Rep	NSp	Med
i.	*Circium arvense* (L.) Scop.	Th	Mac	D	Rep	Sp	Fod
ii.	*Conyza bonariensis* (L.) Cronquist.	Th	Mes	S	Veg	NSp	Fod
iii.	*Eclipta alba* (L.) Hassk.	Th	Mic	S	Rep	NSp	Fod
iv.	*Lactuca serriola* L.	Th	Mac	D	Veg	Sp	Fod
v.	*Parthenium hysterophorus* L.	Th	Mes	D	Rep	NSp	Fod
vi.	*Silybum marianum* L.	Th	Mac	D	Post R	Sp	Med
vii.	*Sonchus arvensis* L.	Th	Mes	D	Post R	NSp	Fod
viii.	*Taraxacumofficinale* Webber.	G	Mac	D	Post R	NSp	Med
ix.	*Xanthium strumarium* L.	Th	Mac	D	Veg	Sp	Fod
6	**Brassicaceae**						
	Brassica campestris L.	Th	Mes	D	Post R	NSp	Veg O
i.	*Capsella bursa pastoris* (L.) Medik.	Th	Mic	D	Post R	NSp	Fod
ii.	*Coronopus didymus* (L.) Sm.	Th	N	D	Rep	NSp	Fod
7	**Cannabinaceae**						
i.	*Cannabis sativa* L.	Th	Mes	D	Rep	NSp	Med
8	**Caryophyllaceae**						
i.	*Arenaria serphyllifolia* L.	Th	N	S	Post R	NSp	Fod
9	**Chenopodiaceae**						
i.	*Chenopodium album* L.	Th	Mic	D	Rep	NSp	Veg
ii.	*Chenopodium ambrosioides* L.	Th	Mes	D	Rep	NSp	Med

iii.	*Suaeda fruticosa* Forssk. Ex Gmelin.	Ch	N	S	Veg	NSp	Fod
10	**Convolvulaceae**						
i.	*Convolvulus arvensis* L.	Th	Mes	D	Rep	NSp	Fod
11	**Euphorbiaceae**						
i.	*Euphorbia granulata*Forssk.	Th	L	S	Rep	NSp	Fod
ii.	*Euphorbia helioscopia* L.	Th	N	S	Post R	NSp	Med
12	**Fumariaceae**						
i.	*Fumaria officinalis* (Hausskn) Pugsley.	Th	N	D	Rep	NSp	Med
13	**Oxalidaceae**						
i.	*Oxalis corniculata* L.	Th	L	D	Rep	NSp	Med
14	**Papilionaceae**						
i.	*Medicago polymorpha* L.	Th	N	S	Rep	NSp	Fod
ii.	*Melilotus indicus* (L.) All.	Th	N	S	Rep	NSp	Fod
iii.	*Trifolium resupinatum* L.	Th	N	S	Rep	NSp	Fod
15	**Plantaginaceae**						
i.	*Veronica anagallis-aquatica* L.	Th	Mes	S	Rep	NSp	Fod
ii.	*Veronica persica* Poir.	Th	N	D	Rep	NSp	Fod
16	**Polygonaceae**						
i.	*Emex spinosa* (L.) Campd.	Th	Mic	S	Rep	Sp	Fod
ii.	*Polygonum plebeium* R.Br.	Th	L	S	Rep	NSp	Fod
iii.	*Rumex crispus* L.	Th	Mac	S	Rep	NSp	Veg
17	**Primulaceae**						
i.	*Anagallis arvensis* L.	Th	N	S	Rep	NSp	Fod
18	**Rubiaceae**						
i.	*Galium aparine* L.	Th	N	S	Rep	Sp	Fod
19	**Solanaceae**						
i.	*Solanum nigrum* L.	Th	Mes	D	Rep	NSp	Med
ii.	*Withania somnifera* (L.) Dunal.	Ch	Mes	S	Veg	NSp	Med
20	**Verbenaceae**						
i.	*Phyla nodiflora* (L.) Greene.	Th	N	S	Rep	NSp	Fod
ii.	*Verbena officinalis* L.	Th	Mes	D	Rep	NSp	Fod

Keys: Life-forms: G. *Geophytes*; Th. *Therophytes*; H. *Hemicryptophytes*; Ch. *Chamaephytes.*
Leaf-sizes: N. *Nanophylls*; Mic. *Microphylls*; Mes. *Mesophylls*; Mac. *Macrophyll*; L. *Leptophyll*; Meg. *Megaphylls.*
Leaf-shape: D. *Dissected*; S. *Simple.*
Phenological stages: Rep. *Reproductive stage*; Post R. *Post reproductive stage*; Veg. *Vegetative stage.*
Spiny nature: Sp. *Spiny*; NSp *Non-spiny.*
Economic uses: Fod. *Fodder*; Med. *Medicinal*; Veg. *Vegetable*; Veg O. *Vegetable oil*; That. *Thatching*

Table No. 2

Summary of ecological characteristics of weed in District Nowshera, Pakistan

S.No.	Parameters	No. species	Percentage
1	**Life form classes**		
i	Therophytes	42	84
ii	Geophytes	3	6
iii	Hemicryptophytes	3	6
iv	Chamaephytes	2	4
Total		**50**	**100**

2	**Leaf size classes**		
i	Mesophyll	15	30
ii	Nanophyll	12	24
iii	Microphyll	11	22
iv	Macrophyll	7	14
v	Leptophyll	3	6
vi	Megaphyll	2	4
Total		**50**	**100**
3	**Leaf shape**		
i	Simple	28	56
ii	Dissected	22	44
Total		**50**	**100**
4	**Phenological stages**		
i	Reproductive	37	74
ii	Post reproductive	7	14
iii	Vegetative	6	12
Total		**50**	**100**
5	**Spiny nature**		
i	Non-spiny	44	88
ii	Spiny	6	12
Total		**50**	**100**
6	**Economic uses**		
i	Fodder	35	70
ii	Medicinal	10	20
iii	Vegetable	3	6
iv	Vegetable oil	1	2
v	Thatching	1	2
Total		**50**	**100**

Table No. 3
Phytosociological attributes of *Cynodon-Anagallis-Melilotus* community

No	Plant species	Density	Cover	Frequency	RD	RC	RF	IV
1	*Cynodon dactylon*	20.5	25.5	80	24.40	18.68	9.30	52.38*
2	*Melilotus indicus*	7.0	9.5	60	8.33	6.95	6.97	22.25***
3	*Cannabis sativa*	3.5	8.5	70	4.16	6.22	8.13	18.51
4	*Anagallis arvensis*	6.5	7.5	90	7.73	5.49	10.46	23.68**
5	*Coronopus didymus*	5.5	8.5	50	6.54	6.22	5.81	18.57
6	*Sonchus arvensis*	3.0	6.0	60	3.57	4.39	6.97	14.93
7	*Phalaris minor*	5.5	6.5	50	6.54	4.76	5.81	17.11
8	*Fumaria officinalis*	0.5	1.5	10	0.59	1.09	1.16	2.84
9	*Chenopodium album*	2.5	3.5	30	2.97	2.56	3.48	9.01
10	*Cyperus rotundus*	5.0	7.0	40	5.95	5.12	4.65	15.72
11	*Convolvulus arvensis*	0.5	1.5	10	0.59	1.09	1.16	2.84
12	*Solanum nigrum*	2.0	6.0	40	2.38	4.39	4.65	11.42
13	*Xanthium strumarium*	1.0	3.0	20	1.19	2.19	2.32	5.7
14	*Conyza banariensis*	1.0	2.0	20	1.19	1.46	2.32	4.97
15	*Persicaria maculosa*	1.0	3.0	20	1.19	2.19	2.32	5.7

16	*Oxalis corniculata*	1.0	2.0	20	1.19	1.46	2.32	4.97
17	*Phyla nodiflora*	1.5	2.5	10	1.78	1.83	1.16	4.77
18	*Veronica anagallis-aquatica*	5.0	7.0	20	5.95	5.12	2.32	13.39
19	*Chenopodium ambrosioides*	0.5	1.5	10	0.59	1.09	1.16	2.84
20	*Ranunculus muricatus*	0.5	1.5	10	0.59	1.09	1.16	2.84
21	*Rumex crispus*	0.5	3.0	10	0.59	2.19	1.16	3.94
22	*Emex spinosus*	1.0	2.0	10	1.19	1.46	1.16	3.81
23	*Euphorbia helioscopia*	2.5	5.5	30	2.97	4.02	3.48	10.47
24	*Avena fatua*	1.0	1.5	20	1.19	1.09	2.32	5.7
25	*Cichorium intybus*	0.5	1.5	10	0.59	1.09	1.16	2.84
26	*Partheniumhysterophorus*	1.5	2.5	30	1.78	1.83	3.48	7.09
27	*Mentha arvensis*	1.5	2.5	10	1.78	1.83	1.16	4.77
28	*Eclipta alba*	1.5	2.5	10	1.78	1.83	1.16	4.77
29	*Medicago polymorpha*	0.5	1.5	10	0.59	1.09	1.16	2.84
	Total	84	136.5	860	99.88	99.82	99.87	300.67

RD = Relative Density; RC = Relative Cover; RF = Relative Frequency; IV = Importance Value.
*** = *p*<0.01, ** = *p*<0.001, *** = *p*<0.0001**

Table No. 4
Phytosociological attributes of *Avena-Anagallis-Cannabis* community

No.	Plant species	Density	Cover	Frequency	RD	RC	RF	IV
1	*Polypogon monspeliensis*	0.5	1.5	10	1.49	2.47	1.81	5.77
2	*Oxalis corniculate*	1.0	2.0	20	2.98	3.30	3.63	9.91
3	*Veronica anagallis-aquatica*	1.5	2.5	30	4.47	4.13	5.45	14.05
4	*Anagallis arvensis*	5.0	5.0	60	14.92	8.26	10.90	34.08**
5	*Veronica persica*	1.0	2.0	20	2.98	3.30	3.63	9.91
6	*Avena fatua*	4.0	7.0	60	11.94	11.57	10.90	34.41*
7	*Parthenium hysterophorus*	0.5	1.5	10	1.49	2.47	1.81	5.77
8	*Conyza bonariensis*	0.5	1.5	10	1.49	2.47	1.81	5.77
9	*Coronopus didymus*	0.5	1.5	10	1.49	2.47	1.81	5.77
10	*Mentha arvensis*	1.5	2.5	10	4.47	4.13	1.81	10.41
11	*Cannabis sativa*	2.0	3.0	20	5.97	4.95	3.63	14.55***
12	*Rumex crispus*	1.5	2.5	30	4.47	4.13	5.45	14.05
13	*Cynodon dactylon*	1.5	2.5	30	4.47	4.13	5.45	14.05
14	*Brasssica campestris*	0.5	2.5	10	1.49	4.13	1.81	7.43
15	*Trifolium resupinatum*	1.5	2.5	30	4.47	4.13	5.45	14.05
16	*Silybum marianum*	0.5	1.5	10	1.49	2.47	1.81	5.77
17	*Convolvulus arvensis*	0.5	1.5	10	1.49	2.47	1.81	5.77
18	*Euphorbia helioscopia*	0.5	1.5	10	1.49	2.47	1.81	5.77
19	*Bromus catharticus*	0.5	0.5	10	1.49	0.82	1.81	4.12
20	*Sonchus arvensis*	1.0	2.0	20	2.98	3.30	3.63	9.91
21	*Medicago polymorpha*	1.0	1.0	20	2.98	1.65	3.63	8.26
22	*Phalaris minor*	0.5	0.5	10	1.49	0.82	1.81	4.12
23	*Galium aparine*	1.0	1.0	20	2.98	1.65	3.63	8.26
24	*Verbena officinalis*	0.5	0.5	10	1.49	0.82	1.81	4.12
25	*Torilis arvensis*	1.5	2.5	10	4.47	4.13	1.81	10.41
26	*Taraxacum officinale*	0.5	1.5	10	1.49	2.47	1.81	5.77
27	*Ranunculus muricatus*	0.5	0.5	10	1.49	0.82	1.81	4.12

28	*Lactuca serriola*	0.5	1.5	10	1.49	2.47	1.81	5.77
29	*Cyperus rotundus*	0.5	0.5	10	1.49	0.82	1.81	4.12
30	*Cichorium intybus*	0.5	2.5	10	1.49	4.13	1.81	7.43
31	*Fumaria officinalis*	0.5	1.5	10	1.49	2.47	1.81	5.77
	Total	33.5	60.5	550	99.88	99.82	99.77	299.47

RD = Relative Density; RC = Relative Cover; RF = Relative Frequency; IV = Importance Value.
*** = p<0.01, ** = p<0.001, *** = p<0.0001**

Table No. 5
Phytosociological Attributes of *Cynodon-Parthenium-Coronopus* community

No.	Plant Species	Density	Cover	Frequency	Density	RC	RF	IV
1	*Emex spinosus*	1.5	2.5	10	2.4	2.48	1.31	6.19
2	*Cannabis sativa*	1.5	2.5	30	2.4	2.48	3.79	8.67
3	*Rumex longifolius*	2.5	5.5	50	4.0	5.47	6.32	15.79
4	*Parthenium hysterophorus*	4.0	5.0	60	6.4	4.97	7.59	18.96**
5	*Coronopus didymus*	4.0	5.0	60	6.4	4.97	7.59	18.96***
6	*Cyperus rotundus*	3.0	4.0	20	4.8	3.98	2.53	11.31
7	*Phalaris minor*	2.5	2.5	50	4.0	2.48	6.32	12.8
8	*Euphorbia granulate*	1.0	2.0	20	1.6	1.99	2.53	6.12
9	*Oxalis corniculata*	2.0	3.0	40	3.2	2.98	5.06	11.24
10	*Veronica anagalis-aquatica*	1.5	2.5	10	2.4	2.48	1.31	6.19
11	*Convolvulus arvensis*	2.0	4.0	40	3.2	3.98	5.06	12.24
12	*Persicaria maculosa*	4.5	5.5	30	7.2	5.47	3.79	16.46
13	*Anagalis arvensis*	1.0	1.0	20	1.6	0.99	2.53	5.12
14	*Xanthium strumarium*	1.5	2.5	10	2.4	2.48	1.31	6.19
15	*Colocasia esculanta*	0.5	1.5	10	0.8	1.49	1.31	3.6
16	*Polypogon monspelensis*	2.5	3.5	30	4.0	3.48	3.79	11.27
17	*Cynodon dactylon*	8.0	11.0	60	12.8	10.94	7.59	31.33*
18	*Silybum marianum*	0.5	0.5	10	0.8	0.49	1.31	2.6
19	*Medicago polymorpha*	2.5	3.5	30	4.0	3.48	3.79	11.27
20	*Avena falua*	3.5	4.5	30	5.6	4.47	3.79	13.86
21	*Typha angustata*	0.5	2.5	10	0.8	2.48	1.31	4.59
22	*Tamaxixaphylla*	0.5	3.5	10	0.8	3.48	1.31	5.59
23	*Phyla nudiflora*	0.5	1.5	10	0.8	1.49	1.31	3.6
24	*Saccharum munja*	1.5	2.5	10	2.4	2.48	1.31	6.19
25	*Suaeda fruticosa*	0.5	1.5	10	0.8	1.49	1.31	3.6
26	*Chenopodium ambrosioides*	1.5	2.5	10	2.4	2.48	1.31	6.19
27	*Chenopodium album*	0.5	1.5	10	0.8	1.49	1.31	3.6
28	*Arenaria serphyllifolia*	0.5	0.5	10	0.8	0.49	1.31	2.6
29	*Polygonum plebium*	0.5	0.5	10	0.8	0.49	1.31	2.6
30	*Cichorium intybus*	0.5	1.5	10	0.8	1.49	1.31	3.6
31	*Cirsium arvense*	0.5	1.5	10	0.8	1.49	1.31	3.6
32	*Melilotus indicus*	0.5	1.5	10	0.8	1.49	1.31	3.6
33	*Withania somnifera*	0.5	1.5	10	0.8	1.49	1.31	3.6
34	*Galium aparine*	0.5	0.5	10	0.8	0.49	1.31	2.6
35	*Mentha arvensis*	2.5	3.5	10	4.0	3.48	1.31	11.27
36	*Eclipta alba*	0.5	1.5	10	0.8	1.49	1.31	3.6
37	*Euphorbia helioscopia*	0.5	0.5	10	0.8	0.49	1.31	2.6
	Total	62.5	100.5	790	100	99.34	100.89	300.6

RC = Relative Cover; RF = Relative Frequency; IV = Importance Value.
*** = $p < 0.01$, ** = $p < 0.001$, *** = $p < 0.0001$**

Table No. 6
Phytosociological Attributes of *Rumex-Arenaria-Oxalis* community

No.	Plant species	Density	Cover	Frequency	RD	RC	RF	IV
1	*Emex spinosus*	4.5	4.5	70	8.25	5.0	8.53	8.25
2	*Cannabis sativa*	2.5	3.5	50	4.58	3.88	6.09	14.55
3	*Melilotus indicus*	2.5	7.5	50	4.58	8.33	6.09	19.00
4	*Oxalis corniculata*	3.5	6.5	70	6.42	7.22	8.53	22.17***
5	*Anagalis arvensis*	1.0	1.0	2.0	1.83	1.11	2.43	5.37
6	*Ranunculus muricatus*	1.5	2.5	30	2.75	2.77	3.65	9.17
7	*Rumexlongifolius*	5.5	9.5	70	10.09	10.55	8.53	29.17*
8	*Sonchus arvensis*	3.0	6.0	40	5.50	6.66	4.87	17.03
9	*Phalaris minor*	3.0	4.0	40	5.50	4.44	4.87	14.81
10	*Arenaria serphyllifolia*	5.5	7.0	60	10.09	7.77	7.31	25.17**
11	*Setaria glauea*	1.5	2.5	30	2.75	2.77	3.65	9.17
12	*Conyza bonariensis*	0.5	1.5	10	0.91	1.66	1.21	3.78
13	*Cepsella bursa-pastoris*	0.5	1.5	10	0.91	1.66	1.21	3.78
14	*Convolvulus arvensis*	2.5	5.5	50	4.58	6.11	6.09	16.78
15	*Fumaria indica*	1.5	3.5	30	2.75	3.88	3.65	10.28
16	*Euphorbia helioscopia*	0.5	1.5	10	0.91	1.66	1.21	3.78
17	*Poaannua*	1.5	1.5	10	2.75	1.66	1.21	5.62
18	*Coronopus didymus*	2.5	2.5	30	4.58	2.77	3.65	11
19	*Silybummarianum*	1.0	3.0	20	1.83	1.33	2.43	7.59
20	*Torilis arvensis*	0.5	0.5	10	0.91	0.55	1.21	2.67
21	*Medicago polymorpha*	2.5	4.5	30	4.58	5.0	3.65	13.23
22	*Galium aparine*	0.5	0.5	10	0.91	0.55	1.21	2.67
23	*Parthenium hysterophorus*	0.5	0.5	10	0.91	0.55	1.21	2.67
24	*Cynodon dactylon*	2.0	3.0	20	3.66	3.33	2.43	9.42
25	*Trifolium resupinatum*	0.5	0.5	10	0.91	0.55	1.21	2.67
26	*Cichorium intybus*	1.5	2.5	10	2.75	2.77	1.21	6.73
27	*Avena fatua*	0.5	0.5	10	0.91	0.55	1.21	2.67
28	*Chenopodium album*	1.5	2.5	10	2.75	2.77	1.21	6.73
	Total	54.5	90	820	99.85	99.85	99.76	299.46

RD = Relative Density; RC = Relative Cover; RF = Relative Frequency; IV = Importance Value.
*** = $p < 0.01$, ** = $p < 0.001$, *** = $p < 0.0001$**

CONCLUSION

Diverse distribution of weed flora was present in wheat fields showing that weed exhibit competition with wheat crops. The findings of present research will provide helpful tools for identifying different types of weed species and their relative abundance for the scientists to manage the problems going on with cereal crops and also for their ecological management.

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