

COMPOSITION OF WEED SPECTRUM IN WHEAT FIELDS OF DISTRICT MUZAFFAR-GARH PUNJAB PAKI STAN

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ABSTRACT

Weed flora was explored in wheat fields of District Muzaffar-Garh (Pakistan) during 2016-17. Studies were accomplished in eight different locations of the district using quadrat method. Weed spectrum varied spatially in most of these towns. The flora comprised 3 monocot and 7 dicot families. Thirteen dicot weed species belonging to 7 families and seven monocot species from three monocot families were identified in the study area. Family Fabaceae from the dicots and Poaceae among the monocots emerged as the largest families each comprising of five weed species. The next dominant family was Chenopodiaceae having 2 species while rest of the families were represented by a single species each. IVCI exhibited that at Kochak Baloch Cyprus-Spergula-Cheopodium community prevailed, while at Chak 54 L a different community Medicago-Melilotus-Rumex has been the predominant. At Fateh Pur site witnessed the superiority of Chenopodium-Lathyrus-Cyperus community, whereas at Saggray Wala Anagallis-Sonchus-Cynodon dominated. Pattal Munda and Rang Pur had overwhelming stands of Chenopodium, Melilotus Rumex community. While Chowk Sarwar Shaheed and Abbasi Chowk were infested with Avena-Poa-Rumex and Angallis-Rumex-Chenopodium communities, respectively. IVCI identified four most important weeds in the Distict Muzaffar Garh, Punjab Pakistan in descending order in wheat fields are Rumex dentatus (64), Chenopodium album (59.5), Anagallis arvensis (58.4) and Melilotus alba (48.6). In order to harvest the optimum yield of wheat proper management of these and other weeds is recommended.

Keywords: Anagallis, Chenopodium, Importance value, Importance Value Constancy Index (IVCI), Rumex, Triticum aestivum.

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INTRODUCTION

Weeds stand as unwanted plants from human point of view which deprive us from achieving full utilization of land and water resources. The seeds of weeds usually germinate earlier than the crop seeds. Their seedlings have capability to grow faster than those of crops to establish in prevailing conditions. Weeds possess high degree of adjustability changing soil features and environmental conditions. Weeds produce enormous quantity of seeds for next generation and have efficient seed dispersal mechanism. Each and every field has abundant quantity of weed seeds present in it which on getting proper moisture and nutritional conditions germinate to compete with the crops raised in such fields. In addition to sharing all necessities of life they exert allelopathic effects on crops. So weed infestation remains one of the main reasons for low wheat yield not only in Pakistan but all over the world.

The need for the control of weeds had been felt long ago and numerous strategies are in practice to achieve this purpose. However; a number of difficulties are faced to control weeds at every place which always stand across in developing any satisfactory solution for the problem. One of these problems and a prominent restriction is that weed flora is continuously changing due to climate change at global level. Furthermore the seeds of exotic plants introduced in an area may get established as a part of flora of that region (Maillet and Lopes-Garcia, 2000). *Parthenium hysterophorus* L. is presently dominating weed flora in various regions of Pakistan, but it did not exist a few years ago (Khalid, 2000). *Achyrenthes aspera* L. is also another weed of this category infesting various crops and also exerting allelopathic effects to enhance its competitive capabilities with field crops (Srivastav et al., 2011). Therefore, there is a need to conduct regular surveys of field crops to study weed flora for developing

effective weed control schemes in any area. Muzaffar-Garh is an important wheat (*Triticum aestivum* L.) growing area located in the Southern Punjab (Pakistan). Its climate is slightly harsh, having very severe summer and cold winter seasons. The fields are partly canal-irrigated and partly barren sand dunes; hence soil depicts much variation in texture. The present study was carried out to enlist weed flora infesting wheat fields in this district.

MATERIALS AND METHODS

Eight sites namely Kochak Baloch, Chak 54-L, Fateh Pur, Saggray Wala, Pattal Munda, Rang Pur, Chowk Sarwar Shaheed and Abbasi Chowk were selected in district Muzaffar-Garh, Punjab Province Pakistan to study the diversity of weed flora in wheat fields. The Physio-chemical properties of soils in the respective sites are provided in Table-1. At Kochak Baloch Site the soil was slightly saline in texture (Table-1). Surveys were performed during 2016-17 wheat crop season. Quadrat method was used to record the data regarding weed spectrum. At each selected site wheat fields were surveyed on all the four sides of town or village. The dimension of quadrat used was 1m². Ten Quadrats were used at each site and subsequently means were computed for each location. The numbers of all weed species were counted in each quadrat area and data were recorded. The soil samples were collected from surveyed wheat field's up to nine inches depth to cover area occupied by roots. The weed species were subjected to Taxonomic classification. Ecological analysis was performed to determine frequency, relative frequency, density and relative density of each weed species. Soil samples were analysed for pH value, EC, Saturation percentage, Sodium and Potassium concentrations (AOAC, 1984). Weeds spectrum was also interpreted using soil parameters. Calculations for various parameters were computed as suggested by Hussain et al. (2004), Hassan et al. (2006) and Hassan et al. (2010) according to the following formulae:

$$\text{Absolute Density } m^{-2} = \frac{\text{weed } m^{-2} \text{ in 10 quadrates}}{10}$$

$$\text{Relative density \%} = \frac{M_{o i s}}{M_{o t s}} \times 100$$

$$\text{Frequency \%} = \frac{N_{i w h i n s o}}{T_{n o q}} \times 100$$

$$\text{Relative frequency \%} = \frac{F_{v o a s s}}{T_f} \times 100$$

$$\text{Importance value} = \frac{R_d + R_f}{2}$$

Importance Value Constancy Index (IVCI) = Average Importance Value (AIV) x Constancy Class

Table -1. Physio-chemical properties of soils from wheat fields of various target sites in district Muzaffar-Garh.

| Site | pH | Na (ppm) | K (ppm) | Saturation % | Texture | E.C (dSm ⁻¹) |
|----------------------|------|----------|---------|--------------|-----------------|--------------------------|
| Kochak Baloch | 7.04 | 525 | 42 | 57.99 | Saline | 116 |
| Chak 54L | 7.62 | 340 | 39 | 32.25 | Sandy loam | 46.7 |
| Fateh Pur | 7.06 | 254 | 33 | 28.22 | Loam | 56.5 |
| Saggray Wala | 7.20 | 725 | 361 | 53.00 | Slightly saline | 07.79 |
| Rang Pur | 6.92 | 347 | 38 | 48.39 | Loam | 75.3 |
| Pattal Munda | 9.52 | 878 | 33 | 40.31 | Sandy loam | 171.0 |
| Chowk Sarwar Shaheed | 7.23 | 530 | 45 | 44.67 | Sandy loam | 100.1 |
| Abbasi Chowk | 8.05 | 654 | 70 | 46.48 | Sandy loam | 190.8 |

RESULTS AND DISCUSSION

Density m⁻²

The perusal of data in Table-2 exhibits that 19 weed species were identified in wheat fields across 8 locations of District Muzaffar Garh, Pakistan. Fateh Pur (64.0) and Saggray Wala (61.6) were evaluated as the most weed infested sites while Pattal Munda (45.8) was the least infested site. The mean number of weeds across 8 locations was 55.3 m⁻². *Anagallis arvensis* L. (9.8), *Chenopodium album* L. (9.4) and *Poa annua* L. (6.4) were dominant weeds in the wheat fields of District Muzaffar

Garh (Table-2). *Vicia sativa* (L.)S.F.Gray.Nat. (0.1), *Euphorbia helioscopia* L. (0.1), *Convolvulus arvensis* L (0.1), *Trigonella carniculata* L. (0.3) and *Desmostachya bipinnata* (L.) Stapf. (0.4) emerging as the minor weeds in the study area were meagerly represented either at one or two sites of the study area (Table-2). The weed density and diversity depends on soil texture, soil structure, soil reaction, soil fertility, moisture content, crop rotation and cultural practices. Hence, a variability in number and diversity was recorded at different

locations owing to the variability in these factors.

Relative Density (%)

The Relative Density (%) of different weed species widely varied across the different locations of the study area. There existed one or two dominant species across each location which mainly constituted the cumulative Relative density of each location (Table-3). The highest relative density of the weed across all 8 locations was achieved for *Anagallis arvensis* L. to the extent of 64% at Saggray Wala which was followed by 49.8 and 46.2% occupied by *Chenopodium album* L. at Fateh Pur and *Anagallis arvensis* L. at Abbasi Chowk (Table-3). The Mean relative density across all locations studied evidenced the while the third position was clinched by *Rumex dentatus* L. (11.6%) [Table-3].

Frequency and Relative Frequency %

The data in Table-4 exhibit *Anagallis arvensis* L., *Rumex dentatus* L. and *Chenopodium album* L. as the most frequent weeds infesting wheat fields Muzaffar-Garh district. Whereas the moderately frequent species included *Asphodelus tenuifolius* Cav., *Cynodon dactylon* (L.) Pers., *Cyperus rotundus* L. and *Melilotus alba* L.. Mean Frequency % across the 8 locations shows that the highest frequency was achieved by *Chenopodium album* (43.8%), *Rumex dentatus* (42.5%) *Anagallis arvensis* (35%) and *Melilotus alba* (30%), respectively (Table-4). Whereas the least frequent weeds in this study included *Trigonella corniculata* L., *Vicia sativa* (L.)S.F.Gray.Nat., *Euphorbia helioscopia* L., *Desmostachya bipinnata* (L.)Stapf. and *Convolvulus arvensis* L. (Table-4). A variability in the Relative Frequency (%) was depicted at various locations investigated in this study (Table-5). *Cyperus rotundus* L. shared the highest Relative Frequency (25.8%) at Kochak Baloch. It was however, non-existent at any other location of the study area. Similarly *Asphodelus tenuifolius* Cav. emerged as the important weed at Chak 54 L and Chowk Sarwar Shaeed having a Relative Frequency of 22.6 and 21.9%, respectively. However, the weed species

like *Anagallis arvensis* L., *Chenopodium album* L., *Melilotus alba* L. and *Rumex dentatus* L. were frequently represented across the studied locations (Table-5). Pertaining to the Mean Relative Frequency (%) across the locations revealed the dominant share by the aforementioned 4 species (Table-5).

Importance Value and Importance Value Constancy Index

An array of 20 weed species infesting the target area has been arranged in the descending order IVCI (Table-6). Regarding the weed communities different locations varied due to soil properties and the tillage variability and cropping pattern etc. At Kochak Baloch Cyprus-Spergula-*Chenopodium* community prevailed, While at Chak 54 L a different community *Medicago-Melilotus-Rumex* has been the predominant. At Fateh Pur site witnessed the superiority of *Chenopodium-Lathyrus-Cyperus* community, whereas at Saggray Wala *Anagallis-Sonchus-Cynodon* dominated (Table-6). Patal Munda and Rang Pur had overwhelming stands of *Chenopodium*, *Melilotus Rumex*. While Chowk Sarwar Shaheed and Abbasi Chowk were infested with *Avena-Poa-Rumex* and *Anagallis-Rumex-Chenopodium* communities, respectively (Table-6). The Average Importance Value (AIV) exhibits *Anagallis-Rumex-Chenopodium* as the dominant community in the Muzaffar Garh District of Punjab, Pakistan.

The Importance Value Constancy Index (IVCI) shows 10 most important weeds in the District Muzaffar Garh, Punjab Pakistan in descending order *R. dentatus* (64), *C. album* (59.5), which was closely followed by *A. arvensis* (58.4). The next weed dominant in the array is *M. alba* (48.6) followed by *C. rotundus* (19.2) and *C. dactylon* (18.8). The remaining weeds securing the dominance status in IVCI are *M. denticulata*, *A. fatua*, *P. annua* and *A. tenuifolius* having the values of IVCI score of 15, 13.2, 11.6 and 11.2, respectively (Table-6). Hassan et al. (2010) showed

the average Importance value and ranking in descending order enumerated as *Astragalus* sp., *Medicago denticulata* Willd., *Fumaria indica* L. and *Asphodelus tenuifolius* L. as the most important weeds of gram in the sandy and sandy loam soils of the District Lakki Marwat, Pakistan. Earlier studies of Hassan et al. (2006) report similar findings from their studies in Karak district, Pakistan. Jakhar et al (2005) raised wheat crop in different types of soil and reported that in saline soil *Spergula flaccida* has been the dominant weed in wheat.

The data indicated that 20 weed species (13 dicots, 7 monocots) were infesting wheat fields of district Muzaffar-Garh. A large number of factors are responsible for the density and diversity of weeds infesting an area. Soil physical and chemical properties viz., texture, structure, pH, EC, available moisture, and cropping pattern play an important role for the infestation of weed species at a given location.

The data in Table-6 reveals that Family Fabaceae from dicots and Poaceae from the monocots group comprised of the largest number of five species each. Fabaceae included *M. alba*, *M. denticulata*, *L. aphaca*, *T. corniculata* and *V. sativa*. Whereas among the other dicots *C. album* and *C. murale* belonged to Chenopodiaceae, *A. arvensis* from Primulaceae. *S. flaccida*; is a member of Caryophyllaceae and *E. helioscopia* from Euphorbiaceae. Another dicot *C. arvensis* belongs to Family Convolvulaceae, *S.*

asper and *R. dentatus* are the members of Asteraceae and Polygonaceae, respectively. Whereas the five Poaceous weeds comprised of *C. dactylon*, *A. fatua*, *P. annua*, *P. minor* and *D. bipinnata*. Whereas the other monocots in the target area are *C. rotundus* representing Cyperaceae and *A. tenuifolius* from Asphodelaceae. Similar diverse floral composition has also been communicated by previous workers showing the dominance of the dicots (Hussain et al., 2004). Our studies are also in a partial agreement with Marwat et al. (2013) who in a similar study in wheat crop in Dera Ismail Khan district reported 32 weeds belonging to two monocot and thirteen dicot families. However, some research workers evaluated that monocots dominated in number than dicots in their findings (Nazar et al., 2008; Hussain et al., 2010).

CONCLUSIONS

A Survey to identify weed flora was conducted in wheat fields of district Muzaffar-Garh during 2016-2017. Twenty weed species belonging to ten angiosperm families were recorded in this area. Family Fabaceae and Poaceae with five species each are the largest families with 5 species each. Average Importance value indicated *Chenopodium album* L. as the most abundant and dominant species closely followed by *Anagallis arvensis* L., *Rumex dentatus* L. and *Asphodelus tenuifolius* Cav.

Table-2. Density (m^{-2}) of various weed species in wheat across eight locations of district Muzaffar-Garh.

| Weed Species | Kocak Baloch | Chak 54L | Fateh Pur | Saggray Wala | Pattal Munda | Rang Pur | Chowk Sarwar Shahed | Abbasi Chowk | Mean |
|--|-----------------|-------------|--------------|-----------------|-----------------|-------------|---------------------------|-----------------|------|
| <i>Anagallis arvensis</i> L. | 0.0 | 5.4 | 3.0 | 39.4 | 3.6 | 0.3 | 0.0 | 26.7 | 9.8 |
| <i>Asphodelus tenuifolius</i> Cav. | 0.0 | 13.8 | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | 0.0 | 3.0 |
| <i>Avena fatua</i> L. | 0.0 | 1.4 | 0.0 | 0.0 | 0.4 | 0.0 | 18.0 | 1.5 | 2.7 |
| <i>Chenopodium album</i> L. | 5.6 | 0.0 | 26.6 | 3.6 | 22.8 | 10.8 | 0.4 | 5.3 | 9.4 |
| <i>Chenopodium murale</i> L. | 0.0 | 0.0 | 0.0 | 1.4 | 0.0 | 0.9 | 1.0 | 15.8 | 2.4 |
| <i>Convolvulus arvensis</i> L. | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.1 |
| <i>Cynodon dactylon</i> (L.)Pers. | 5.2 | 0.0 | 2.4 | 1.4 | 0.0 | 3.0 | 0.4 | 0.0 | 1.6 |
| <i>Cyperus rotundus</i> L. | 16.4 | 0.0 | 5.0 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 | 2.8 |
| <i>Desmostachya bipinnata</i> (L.) Stapf. | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 |
| <i>Euphorbia helioscopia</i> L. | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| <i>Lathyrus aphaca</i> L. | 0.0 | 0.0 | 9.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 |
| <i>Medicago denticulata</i> L. | 3.2 | 10.4 | 6.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.3 | 2.6 |
| <i>Melilotus alba</i> L. | 4.0 | 4.6 | 4.0 | 2.0 | 10.6 | 13.2 | 2.4 | 0.6 | 5.2 |
| <i>Phalaris minor</i> Retz. | 0.0 | 4.0 | 1.0 | 0.0 | 0.4 | 3.3 | 0.0 | 0.0 | 1.1 |
| <i>Poa annua</i> L. | 0.0 | 9.8 | 0.0 | 0.0 | 0.0 | 0.0 | 14.0 | 6.1 | 3.7 |
| <i>Rumex dentatus</i> L. | 2.0 | 3.8 | 7.0 | 1.4 | 7.4 | 18.3 | 9.6 | 1.5 | 6.4 |
| <i>Spergula flaccida</i> L. | 9.2 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.2 |
| <i>Sonchus asper</i> (L.)Hill. | 0.0 | 0.0 | 0.0 | 10.6 | 0.0 | 0.0 | 0.0 | 0.0 | 1.3 |
| <i>Trigonella corniculata</i> L. | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 |
| <i>Vicia sativa</i> (L.)S.F.Gray.Nat. | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.1 |
| Total | 51.0 | 53.6 | 64.0 | 61.6 | 45.8 | 50.7 | 56.6 | 57.8 | 55.3 |

Table-3. Relative Density (%) of various weed species in wheat across eight locations of district Muzaffar-Garh.

| Weed Species | Kocak Baloch | Chak 54L | Fateh Pur | Saggray Wala | Pattal Munda | Rang Pur | Chowk Sarwar Shahed | Abbasi Chowk | Mean |
|--|-----------------|-------------|--------------|-----------------|-----------------|-------------|---------------------------|-----------------|------|
| <i>Anagallis arvensis</i> L. | 0.0 | 10.1 | 4.7 | 64.0 | 7.9 | 0.6 | 0.0 | 46.2 | 17.7 |
| <i>Asphodelus tenuifolius</i> Cav. | 0.0 | 25.7 | 0.0 | 0.0 | 0.0 | 0.0 | 17.7 | 0.0 | 5.4 |
| <i>Avena fatua</i> L. | 0.0 | 2.6 | 0.0 | 0.0 | 0.9 | 0.0 | 31.8 | 2.6 | 4.9 |
| <i>Chenopodium album</i> L. | 11.0 | 0.0 | 41.6 | 5.8 | 49.8 | 21.3 | 0.7 | 9.2 | 17.2 |
| <i>Chenopodium murale</i> L. | 0.0 | 0.0 | 0.0 | 2.3 | 0.0 | 1.8 | 1.8 | 27.3 | 4.3 |
| <i>Convolvulus arvensis</i> L. | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 0.0 | 0.2 |
| <i>Cynodon dactylon</i> (L.)Pers. | 10.2 | 0.0 | 3.8 | 2.3 | 0.0 | 5.9 | 0.7 | 0.0 | 2.9 |
| <i>Cyperus rotundus</i> L. | 32.2 | 0.0 | 7.8 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 | 5.1 |
| <i>Desmostachya bipinnata</i> (L.)Stapf | 5.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 |
| <i>Euphorbia helioscopia</i> L. | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| <i>Lathyrus aphaca</i> L. | 0.0 | 0.0 | 14.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 |
| <i>Medicago denticulata</i> L. | 6.3 | 19.4 | 9.4 | 0.0 | 0.0 | 0.0 | 1.1 | 0.5 | 4.7 |
| <i>Melilotus alba</i> L. | 7.8 | 8.6 | 6.3 | 3.2 | 23.1 | 26.0 | 4.2 | 0.6 | 9.4 |
| <i>Phalaris minor</i> Retz. | 0.0 | 7.5 | 1.6 | 0.0 | 0.9 | 6.5 | 0.0 | 0.0 | 2.2 |
| <i>Poa annua</i> L. | 0.0 | 18.3 | 0.0 | 0.0 | 0.0 | 0.0 | 24.7 | 10.6 | 6.7 |
| <i>Rumex dentatus</i> L. | 3.9 | 7.1 | 10.9 | 2.3 | 16.2 | 36.1 | 17.0 | 2.6 | 11.6 |
| <i>Spergula flaccida</i> L. | 16.9 | 0.0 | 0.0 | 1.6 | 0.0 | 0.0 | 0.0 | 0.0 | 2.2 |
| <i>Sonchus asper</i> (L.)Hill. | 0.0 | 0.0 | 0.0 | 17.2 | 0.0 | 0.0 | 0.0 | 0.0 | 2.4 |
| <i>Trigonella corniculata</i> L. | 5.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 |
| <i>Vicia sativa</i> (L.)S.F.Gray.Nat. | 0.0 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.2 |
| Total | 51.0 | 53.6 | 64.0 | 61.6 | 45.8 | 50.7 | 56.6 | 57.8 | 55.3 |

Table-4. Frequency (%) Of various weed species across eight locations of district Muzaffar-Garh.

| Weed Species | Kocak Baloch | Chak 54L | Fateh P ur | Saggra Y Wala | Pattal Munda | Rang Pur | Chowk Sarwar Shahae | Chowk Chowk | Abbasi Chowk | Mean Frequency % |
|--------------------------------------|-----------------|-------------|---------------|------------------|-----------------|-------------|---------------------------|----------------|-----------------|------------------------|
| Anagallis arvensis L. | 0.0 | 10.0 | 40.0 | 100.0 | 20.0 | 10.0 | 0.0 | 100.0 | 35.0 | |
| Asphodelus tenuifolius Cav. | 0.0 | 70.0 | 0.0 | 0.0 | 0.0 | 0.0 | 70.0 | 0.0 | 17.5 | |
| Avena fatua L. | 0.0 | 10 | 0.0 | 0.0 | 20.0 | 0.0 | 80.0 | 10.0 | 11.2 | |
| Chenopodium album L. | 70.0 | 0.0 | 80.0 | 30.0 | 10.0 | 80.0 | 20.0 | 60.0 | 43.8 | |
| Chenopodium murale L. | 0.0 | 0.0 | 0.0 | 40.0 | 0.0 | 20.0 | 10.0 | 80 | 18.9 | |
| Convolvulus arvensis L. | 0.0 | 0.0 | 0.0 | 0.0 | 20.0 | 0.0 | 0.0 | 0.0 | 2.5 | |
| Cynodon dactylon (L.)Pers. | 50.0 | 0.0 | 10.0 | 30.0 | 0.0 | 70.0 | 10.0 | 0.0 | 20.0 | |
| Cyperus rotundus L. | 80.0 | 0.0 | 30.0 | 0.0 | 0.0 | 20.0 | 0.0 | 0.0 | 10.0 | |
| Desmostachya bipinnata (L.)Stapf. | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 | |
| Euphorbia helioscopia L. | 0.0 | 0.0 | 0.0 | 20.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 | |
| Lathyrus aphaca L. | 0.0 | 0.0 | 60.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 7.5 | |
| Medicago denticulata L. | 30.0 | 60.0 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | 16.3 | |
| Melilotus alba L. | 0.0 | 50.0 | 40.0 | 10.0 | 70.0 | 60.0 | 10.0 | 20.0 | 30.0 | |
| Phalaris minor Retz. | 0.0 | 20.0 | 30.0 | 0.0 | 10.0 | 30.0 | 0.0 | 0.0 | 10.0 | |
| Poa annua L. | 0.0 | 30.0 | 0.0 | 0.0 | 0.0 | 0.0 | 50.0 | 40.0 | 15.0 | |
| Rumex dentatus L. | 10.0 | 50.0 | 40.0 | 20.0 | 10.0 | 90.0 | 60.0 | 60.0 | 42.5 | |
| Spergula flaccida L. | 50.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.3 | |
| Sonchus asper (L.)Hill. | 0.0 | 0.0 | 0.0 | 80.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | |
| Trigonella corniculata L. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Vicia sativa (L.)S.F.Gray.Nat. | 0.0 | 10.0 | 0.0 | 0.0 | 0.0 | 0.0 | 10.0 | 0.0 | 2.5 | |
| Total | 310 | 310 | 360 | 330 | 160 | 380 | 320 | 390 | - | |

Table-5. Relatively frequency (%) Of various weed species across eight locations of district Muzaffar-Garh.

| Weed Species | Kocak Baloch | Chak 54L | Fateh Pur | Saggra Y Wala | Pattal Munda | Rang Pur | Chowk Sarwar Shahae | Abbasi Chowk | Mean Relative Frequency |
|--|-----------------|-------------|--------------|------------------|-----------------|-------------|---------------------------|-----------------|-------------------------------|
| <i>Anagallis arvensis</i> L. | 0.0 | 3.2 | 11.1 | 30.3 | 12.5 | 2.8 | 0.0 | 26.3 | 11.5 |
| <i>Asphodelus tenuifolius</i> Cav. | 0.0 | 22.6 | 0.0 | 0.0 | 0.0 | 0.0 | 21.9 | 0.0 | 5.8 |
| <i>Avena fatua</i> L. | 0.0 | 3.2 | 0.0 | 0.0 | 12.5 | 0.0 | 25.0 | 2.6 | 3.8 |
| <i>Chenopodium album</i> L. | 14.1 | 0.0 | 22.2 | 9.1 | 6.3 | 22.2 | 6.3 | 15.8 | 14.4 |
| <i>Chenopodium murale</i> L. | 0.0 | 0.0 | 0.0 | 12.1 | 0.0 | 5.3 | 3.1 | 21.1 | 6.2 |
| <i>Convolvulus arvensis</i> L. | 0.0 | 0.0 | 0.0 | 0.0 | 12.5 | 0.0 | 0.0 | 0.0 | 0.8 |
| <i>Cynodon dactylon</i> (L.)Pers. | 16.1 | 0.0 | 2.8 | 9.1 | 0.0 | 19.4 | 3.1 | 0.0 | 6.5 |
| <i>Cyperus rotundus</i> L. | 25.8 | 0.0 | 30.0 | 0.0 | 0.0 | 5.6 | 0.0 | 0.0 | 3.2 |
| <i>Desmostachya bipinnata</i> (L.) Stapf. | 6.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 |
| <i>Euphorbia helioscopia</i> L. | 0.0 | 0.0 | 0.0 | 6.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 |
| <i>Lathyrus aphaca</i> L. | 0.0 | 0.0 | 16.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 |
| <i>Medicago denticulata</i> L. | 9.7 | 17.9 | 8.3 | 0.0 | 0.0 | 0.0 | 0.0 | 2.6 | 5.3 |
| <i>Melilotus alba</i> L. | 0.0 | 16.1 | 17.4 | 4.0 | 43.8 | 16.7 | 3.1 | 5.3 | 9.9 |
| <i>Phalaris minor</i> Retz. | 0.0 | 6.5 | 8.3 | 0.0 | 6.3 | 7.9 | 0.0 | 0.0 | 3.3 |
| <i>Poa annua</i> L. | 0.0 | 9.7 | 0.0 | 0.0 | 0.0 | 0.0 | 15.6 | 10.5 | 4.9 |
| <i>Rumex dentatus</i> L. | 3.2 | 16.1 | 11.1 | 6.1 | 6.3 | 23.7 | 18.8 | 15.8 | 14.0 |
| <i>Spergula flaccida</i> L. | 16.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 |
| <i>Sonchus asper</i> (L.)Hill. | 0.0 | 0.0 | 0.0 | 24.2 | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 |
| <i>Trigonella corniculata</i> L. | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| <i>Vicia sativa</i> (L.)S.F.Gray.Nat. | 0.0 | 3.2 | 0.0 | 0.0 | 0.0 | 0.0 | 3.1 | 0.0 | 0.8 |

Table-6. Importance value of various weed species across eight locations of district Muzaffar-Garh.

| Weed Species | Kocak Baloch | Chak 54L | Fateh Pur | Saggray Wala | Pattal Munda | Rang Pur | Chowk Sarwar Shaheed | Chowk Abbasi Chowkt | AIV | Constancy Class | IVCI |
|-------------------------------|--------------|-----------|-----------|--------------|--------------|-----------|----------------------|---------------------|-----------|-----------------|------|
| <i>Rumex dentatus</i> | 3.6 | 11.6 c | 11.0 | 4.2 | 11.3 c | 29.9 b | 17.9c | 18.4 c | 12.8 b | 5 | 64.0 |
| <i>Chenopodium album</i> | 12.2 c | 0.0 | 43.0 a | 9.1 | 24.9 b | 46.7 a | 3.5 | 12.5 | 11.9 c | 5 | 59.5 |
| <i>Anagallis arvensis</i> | 0.0 | 6.7 | 10.3 | 47.2 a | 10.2 | 1.7 | 0.0 | 36.3 a | 14.6 a | 4 | 58.4 |
| <i>Melilotus alba</i> | 3.9 | 12.4 b | 11.9 | 3.6 | 33.5 a | 21.4 c | 3.7 | 3.0 | 9.7 | 5 | 48.6 |
| <i>Cyperus rotundus</i> | 29.0 †a | 0.0 | 18.9 c | 0.0 | 0.0 | 3.3 | 0.0 | 0.0 | 6.4 | 3 | 19.2 |
| <i>Cynodon dactylon</i> | 13.2 | 0.0 | 4.7 | 16.2 c | 0.0 | 10.2 | 1.9 | 0.0 | 4.7 | 4 | 18.8 |
| <i>Medicago denticulata</i> | 8.0 | 18.7 a | 13.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.6 | 5.0 | 3 | 15.0 |
| <i>Avena fatua</i> | 0.0 | 2.9 | 0.0 | 0.0 | 6.7 | 0.0 | 28.4a | 2.6 | 4.4 | 3 | 13.2 |
| <i>Poa annua</i> | 0.0 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 20.2b | 17.6 | 5.8 | 2 | 11.6 |
| <i>Asphodelus tenuifolius</i> | 0.0 | 24.2 | 0.0 | 0.0 | 0.0 | 0.0 | 19.8 | 0.0 | 5.6 | 2 | 11.2 |
| <i>Phalaris minor</i> | 0.0 | 11.8 | 5.0 | 0.0 | 3.6 | 7.2 | 0.0 | 0.0 | 2.8 | 3 | 8.4 |
| <i>Chenopodium murale</i> | 0.0 | 0.0 | 0.0 | 7.2 | 0.0 | 3.6 | 3.5 | 24.2 b | 1.7 | 3 | 5.1 |
| <i>Sonchus asper</i> | 0.0 | 0.0 | 0.0 | 20.7 b | 0.0 | 0.0 | 0.0 | 0.0 | 2.9 | 1 | 2.9 |
| <i>Lathyrus aphaca</i> | 0.0 | 0.0 | 23.8 b | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.3 | 1 | 2.3 |
| <i>Spergula flaccida</i> L. | 16.5 b | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1 | 1 | 2.1 |
| <i>Vicia sativa</i> | 0.0 | 2.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.8 | 0.0 | 0.5 | 3 | 1.5 |
| <i>Desmostachya bipinnata</i> | 6.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 1 | 0.8 |
| <i>Convolvulus arvensis</i> | 0.0 | 0.0 | 0.0 | 0.0 | 6.6 | 0.0 | 0.0 | 0.0 | 0.8 | 1 | 0.8 |
| <i>Euphorbia helioscopia</i> | 0.0 | 0.0 | 0.0 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 1 | 0.4 |
| <i>Trigonella corniculata</i> | 2.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 1 | 0.3 |

†a,b,c denote the First, Second and Third ranking species in Importance Value and Average Importance Value.

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