

DIVERSITY OF WEED SPECIES IN WHEAT FIELDS OF DISTRICT MORADABAD REGION UP

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Abstract

*Wheat production has a substantial obstacle in the form of weeds, which have an impact on crop development, productivity, and the overall capacity of agriculture to remain sustainable. The purpose of this research is to identify and describe the dominant weed flora as well as their relative abundance. The variety of weed species that are found in wheat fields in the District Moradabad area of Uttar Pradesh is the primary focus of this investigation. In the course of the Rabi season, field surveys were carried out at a number of different wheat agricultural locations. In order to estimate the frequency, density, and significance value index (IVI) of each species, data were obtained using quadrat sampling and then analysed. As a consequence of the findings, a wide variety of broadleaf and grassy weeds were discovered, with some species, including *Phalaris minor*, *Chenopodium album*, *Avena fatua*, and *Melilotus indica*, being found to be the most widespread. Seasonal shifts, the composition of the soil, and agricultural techniques were discovered to have an impact on the distribution patterns of weeds. As a result of these results, a scientific foundation has been established for the development of site-specific and integrated weed control techniques with the goal of increasing wheat production across the area. Through the provision of baseline information on the variety of weeds in one of the most important wheat-producing regions in Uttar Pradesh, this study makes a contribution to the implementation of sustainable agricultural methods.*

Keywords: Weed diversity, wheat fields, Moradabad district, Uttar Pradesh, *Phalaris minor*, *Chenopodium album*, IVI, integrated weed management, Rabi season, sustainable agriculture.

INTRODUCTION

Because of its great nutritional content, its usefulness as a staple diet for vegetarians, and its enormous area of production, wheat (*Triticum aestivum* L.) is considered to be one of the most significant cereals. Over 23.00 million hectares of land in India are dedicated to its cultivation, and the country's annual output is 46.89 million tonnes. With a total output of 4.2 million tonnes, it is cultivated on 3.7 million hectares of land in the state of Madhya Pradesh. When compared to the national average of 2032 kg/ha, the average yield of the state is 1,183 kg/ha, which is much lower than the national average. It is one of the primary causes for this poor yield because there is an infestation of weeds.[1]

Unwanted plants that grow spontaneously and often in a prolific manner and persistently interfere with agricultural activities, raise the cost of labour, and decrease crop development and yields. Weeds are plants that are cultivated without permission. These organisms arise concurrently with the crop and develop

inside the environment of the crop. There is a significant increase in the severity of weed issues in intensive farming, which involves substantial inputs, especially in settings where irrigation is present. Weeds compete with wheat crops for resources such as nutrients, vacant water space, and sun radiation, resulting in a decrease in crop growth and production. There are a number of variables that contribute to the poor yield of wheat, one of the most prominent of which is crop weed competition. The percentage of losses that were attributed to weeds varied from 10 to 20 percent (Phillips et al., 1993) to 34.8% (Godel, 1993). The type of the weed, the interaction between the weed and the crop, and the site conditions all have a role in determining the yield losses in wheat in India. It ranged from 30-40% in Haryana (Katyal et al., 1980; Rastogi et al., 1984), 20-25% in Himachal Pradesh (Moodgal & Singh, 1984), 47% in Uttar Pradesh (Sunita Tiwari et al., 1993), 47% in Maharashtra (Satao et al., 1993), 20% in Gujarat (Barewadia et al., 1993), and 20-26% in Madhya Pradesh (Kurchania et al., 1993) in mixed weed flora. Additionally, it ranged from 8 to 53% in Phalaris minor wheat ecosystems (Tiwari and Bisen, 1985). This information was gathered from various sources in North India.

Hand weeding is one of the classic ways of weed management; nonetheless, it is considered to be laborious, time-consuming, less economically viable, and even impractical in situations when the weather and soil conditions are not good. In addition, serious losses in crop development and production are caused by the absence of labourers at the key period of crop weed competition. Prior to the implementation of any management measures, weeds have adequately entrenched themselves and caused a significant amount of stress to the crop. Not only does hand weeding cause the soil crust to be disturbed and weed seeds to be dispersed, but it also causes harm to the surface feeding roots and raises the danger of drying of the soil, as well as the possibility of regenerating and sprouting weeds that have been left out.[2]

Chemical weed control is more successful, less expensive, and often requires less time than conventional approaches. This is because chemical weed treatment is able to overcome the challenges that are encountered with traditional methods. There is a tremendous amount of potential for herbicides to effectively manage weeds in wheat.

Herbicides, or more colloquially, weed killers, are a vast diversity of chemicals that have been developed in response to the demand for a simple and rapid way to eradicate weeds. A wide range of substances that have been shown to destroy plants also have the potential to harm mammalian tissues. These pesticides are widely used nowadays to ensure sufficient crop yields. These pesticides work well on other plants these days. Currently, it is widely used for sufficient agricultural output.

Date of sowing, planting geometry, and the use of herbicides are cultural and chemical measures that are of interest for suppressing weed development. These methods will be examined separately in various wheat producing locations. In order to get optimal production outcomes, it is preferable to promote just these aspects of effective management, whether by chemical or cultural techniques.[3]

Herbicide efficacy is context-dependent and influenced by agroclimatic factors. In order to effectively control weeds like *Chenopodium album* L., *Galinsoga parviflora*, *Ageratum conyzoides*, *Vicia hirsuta*, *Melilotus alba*, *Anagallis arvensis*, *Amaranthus viridis*, and others in wheat crops grown on the Satpura plateau, it is crucial to gather precise and accurate information about their suitability, selectivity, and application timing. As a consequence of developments in weed science, new high-yielding cultivars and associated agro-technology have been progressively replacing 2,4-D, a pesticide widely employed in

wheat-growing regions for the efficient control of alien weed flora. The herbicides pendimethalin (pre-emergence) and oxyfluorfen (post-emergence) have a wide range of actions, preventing the growth of grassy and broad-leaved weeds in wheat. Studies conducted by Bisen and Tiwari (1980) and Sharma et al. (1987) have shown their efficacy in managing both grassy and non-grassy weeds in wheat crops.[4]

The selective control of broad-leaved weeds in wheat was also shown to be effective with fluroxypyr and clopyralid applied after the plants had emerged. They might stand in for 2,4-D, which has negative impacts on ear development. Although it did not effectively control grassy weeds, fluroxypyr was found to be effective against several other species, including *Convolvulus arvensis sativa*, *Rumex dentatus*, *Argemone Mexicana*, *Anagallis arvensis*, *Trifolium*, *Melilotus* spp., *Chenopodium album flagiferum*, *Portulaca oleracea*, and *Ageratum conyzoides* (Tiwari et al., 1988). Yields comparable to those of the clean plots were achieved by applying isoproturon emergence at a rate of 0.75 to 1.00 kg/ha, pendimethalin as pre-emergence at a rate of 1.0 to 1.5 kg/ha (Yadav et al., 1984), or a post-emergence rate of 1.5 kg/ha of isoproturon plus 2,4-D (Malik et al., 1988).

Worldwide, weeds include 30,000 distinct species, with around 18,000 of those species being responsible for significant harm in various forms. There are 31 weed species in wheat grown under irrigation in the North M.P. regions of Rewa and Satna (Paradkar et al., 1992), 32 in the Western Madhya Pradesh districts of Khandwa and Khargon (Paradkar et al., 1989), and 50 in the Central Madhya Pradesh region's deep black soil (Paradkar 1993). Before recommending a management method for a specific area, it is crucial to identify the weeds in the field. Weed taxonomy is a scientific field. It is necessary to study weeds thoroughly in order to learn about their phenological behaviours, seed patterns, modes of propagation, polymorphism, and other characteristics.[5]

OBJECTIVES:

1. Wheat field weed assessment.
2. The ecological characteristics of several weed species.

MATERIAL AND METHOD

Study Area

In the district of Moradabad, Uttar Pradesh, wheat crop fields were inspected in a number of different places, including Bilari, Thakurdwara, Kundarki, Bahjoi, Moradabad city, Chandausi, and Sambhal.[6]

Collection

The study's objective was to examine the weed variety, and it was conducted from November 2017 to April 2018. We used established protocols while collecting weed species. Factors such as species needs and availability dictated the species collection. While harvesting the tiny plants, their whole root systems, stems, leaves, flowers, and fruits were collected. Since it was impractical to pluck the whole plant from such massive bushes, a twig including the stem, leaves, flowers, and fruits was instead plucked.[7]

Herbarium Preparation

After the plant specimens were collected, they were compressed using a herbarium press. Three or five layers of printed paper were used to layer the plant-derived components. The paper sheets were changed at regular intervals for eight days. Once the plant specimens had been appropriately dried and pressed, they were prepared for herbarium processing by mounting them on herbarium sheets. To protect the sheets against insects and fungus, they were treated with a solution of 1% mercuric chloride. The herbarium was further protected against pest infestation by means of naphthalene balls.

Identification

Nair (1978), Meenakshi and Sharma (1985), Sidhu and Bir (1991), Rawat et al. (2013), and Kaur et al. (2017) were among the available literature sources used to identify the plant species that were collected. Government Degree College in Moradabad, Uttar Pradesh, is home to a Department of Botany and Environmental Science, where specimens of the discovered plant species were transferred to the Herbarium.[8]

RESULTS AND DISCUSSION

The survey found 51 different forms of weeds in wheat crop fields throughout District Moradabad, Uttar Pradesh. There are a total of 48 genera and 22 families that include these weeds. Out of the 51 species, 42 belonged to the dicot family (Ranunculaceae, Papaveraceae, Fumariaceae, Brassicaceae, Caryophyllaceae, Malvaceae, Geraniaceae, Fabaceae, Asteraceae, Primulaceae, Asclepidaceae, Convolvulaceae, Solanaceae, Scrophulariaceae, Lamiaceae, Chenopodiaceae, Amaranthaceae, Polygonaceae, Euphorbiaceae, and Cannabaceae, and 09 belonged to the monocot family (Cyperaceae and Poaceae). The families Poaceae and Asteraceae had the most species in the study area (8 each), followed by the Fabaceae with 5 each, the Caryophyllaceae with 3 each, and the Polygonaceae with 2 each, as well as the families Amaranthaceae, Convolvulaceae, Solanaceae, Malvaceae, Chenopodiaceae, and Brassicaceae. [9]

The following families were represented by a single species: Cyperaceae, Geraniaceae, Primulaceae, Asclepidaceae, Convolvulaceae, Scrophulariaceae, Lamiaceae, Euphorbiaceae, Cannabaceae, and Papaveraceae (Table 1).

Genus Convolvulus, Veronica and Rumex were represented by 2 species each, whereas Ranunculus, Argemone, Fumaria, Sisymbrium, Cronopus, Stellaria, Spergula, Silene, Malva, Malvastrum, Oxalis, Medicago, Lathyrus, Vicia, Melilotus, Trifolium, Ageratum, Gnaphalium, Parthenium, Artemisia, Cirsium, Sonchus, Conyza, Launaea, Anagallis, Calotropis, Solanum, Nicotiana, Salvia, Chenopodium, Chenopodiastrium, Achyranthes, Alternanthera, Polygonum, Euphorbia, Cannabis, Cyperus, Poa, Cyanodon, Lolium, Avena, Dichanthium, Polypogon, Cenchrus and Phalaris were represented by only 1 species each.

Wheat weed flora has been studied in numerous ways by researchers from different professions. These studies evaluated the amount of weed infestation in wheat crops and the variety of weed species, according to Salonen et al. (2001). Among the wheat varieties produced in Turkey's agricultural districts of Enez (Edirne), Kirec and Yarci (1999) identified 93 distinct weed species. Dhole et al. (2013) investigated 30 weed species from 26 genera and 15 families in the Rabi wheat crop in the Marathwada district. The weed flora in barley (*Hordeum vulgare* L.) and wheat (*Triticum aestivum* L.) fields was studied by Alhasi et al. (2017) in Libya's Al-Marj Plain. Among the wheat crop regions studied by Kumar and Duggal (2017) in the Narwana region of Haryana were 54 weed species, belonging to 50 genera and 22 families.[10]

The three most common pests in every region in District Moradabad were identified as *Fumaria indica*, *Rumex dentatus*, and *Phalaris minor*. Species such as *Cronopus didymus* were not the only ones to dominate; *Chenopodium album* and *Spergula arvensis* were also prominent. The Rabi season saw the highest concentration of irrigated soil species, *Phalaris minor*, in this region.

All places where wheat crops were grown have *Phalaris minor*, the most frequent pest. Dense populations of this pest may significantly lower wheat grain yields. One weed species' spread was drastically different from another's. The only species documented in water canals are *Anagallis arvensis* and *Veronica anagallis-aquatica*. Weeds such as *Argemone mexicana*, *Ageratum conyzoides*, *Solanum nigrum*, and *Nicotiana plumbinifolia* were found on the bunds of the wheat fields. There were a lot of *Chenopodium murale* and *Chenopodium album* in the harvest, along with *Cronopus didymus*. [11]

Some of the weeds in the study area have ethnobotanical importance because they were used for a wide range of purposes by the indigenous peoples who lived there, including food, medicine, and fodder. *Melilotus indicus* has several medicinal benefits and may assist with a variety of skin problems. The culinary world is one area where *Chenopodium album* finds use. Common foods used as animal feed include *Cyanodon dactylon*, *Lolium temulentum*, and *Avena sativa*. For a wide range of ailments, the natives also turn to *Melilotus indicus*, *Calotropis procera*, and *Rumex dentatus*.

Table.1 Name of family with number of genera and species identified from study area

S. No.	Family	Genera	Species
1	Ranunculaceae	01	01
2	Papaveraceae	01	01
3	Fumariaceae	01	01
4	Brassicaceae	02	02
5	Caryophyllaceae	03	03
6	Malvaceae	02	02
7	Geraniaceae	01	01
8	Fabaceae	05	05
9	Asteraceae	08	08
10	Primulaceae	01	01
11	Asclepidaceae	01	01
12	Convolvulaceae	01	02

13	Solanaceae	02	02
14	Scrophulariaceae	01	02
15	Lamiaceae	01	01
16	Chenopodiaceae	02	02
17	Amaranthaceae	02	02
18	Polygonaceae	02	03
19	Euphorbiaceae	01	01
20	Cannabaceae	01	01
21	Cyperaceae	01	01
22	Poaceae	08	08
Total		48	51

Table.2 Taxonomic position, life form, and habit of weeds identified from study area

S. No.	Botanical Name	Family	Local Name	Life Form	Habit	Image	Voucher number
1.	Ranunculus sceleratus L.	Ranunculaceae	Crowfoot	Annual	Herb	1a	WU-132
2.	Argemone maxicana L.	Papaveraceae	Satyanashi	Annual	Herb	1b	WU-133
3.	Fumaria indica Pugsl.	Fumariaceae	Gajar ghas	Annual	Herb	1c	WU-134
4.	Sisymbrium irio L.	Brassicaceae	Khubkala	Annual	Herb	1d	WU-135
5.	Cronopus didymum L		Jungli Hallon	Annual	Herb	1e	WU-136
6.	Stellaria media (L.) Vill.	Caryophyllaceae	Phul booti	Annual	Herb	1f	WU-137

7.	<i>Spergula arvensis</i> L.		Kalri booti	Annual	Herb	1g	WU-138
8.	<i>Silene conoidea</i> L.		Takla	Annual	Herb	1h	WU-139
9.	<i>Malva parviflora</i> L.	Malvaceae	Mallow	Annual	Herb	1i	WU-140
10.	<i>Malvastrum coromandelianum</i> (Linn) Garcke		Kharenti	Annual	Herb	1j	WU-141
11.	<i>Oxalis corniculata</i> Linn.	Geraniaceae	Khatti booti	Perennial	Herb	1k	WU-142
12.	<i>Medicago polymorpha</i> L.	Fabaceae	Maina	Annual	Herb	1l	WU-143
13.	<i>Lathyrus aphaca</i> L.		Jangli matter	Annual	Herb	1m	WU-144
14.	<i>Vicia sativa</i> L.		Bakla	Annual	Herb	1n	WU-145
15.	<i>Melilotus indicus</i> L		Senji	Annual	Herb	1o	WU-146
16.	<i>Trifolium fragiferum</i> L		Jangli barseem	Annual	Herb	1p	WU-147
17.	<i>Ageratum conyzoides</i> L.	Asteraceae	Neelam	Annual	Herb	1q	WU-148
18.	<i>Gnaphalium polycephalum</i> L		-	Annual	Herb	1r	WU-149
19.	<i>Parthenium hysterophorus</i> L.		Congress grass	Perennial	Herb to shrub	1s	WU-150

20.	Artemisia scoparia Waldst & Kit		Gazer booti	Perennial	Herb to shrub	1t	WU-151
21.	Cirsium arvense (L.) Scop		Leh	Annual	Herb to shrub	1u	WU-152
22.	Sonchus arvensis L.		-	Annual	Herb	1v	WU-153
23.	Conyza bonariensis (L.) Cronquist		-	Annual	Herb	1w	WU-154
24.	Launaea nudicaulis Hook. f.		Hundwaya	Perennial	Herb	1x	WU-155
25.	Anagallis arvensis L.	Primulaceae	Billi booti	Annual	Herb	1y	WU-156
26.	Calotropis procera (Willd) R.Br.	Asclepidaceae	Ak	Perennial	Shrub	2a	WU-157
27.	Convolvulus arvensis L.	Convolvulaceae	Hirankhuri	Annual	Herb	2b	WU-158
28.	Convolvulus pluricaulis Choisy		Shunkhpushi	Annual	Herb	2c	WU-159
29.	Solanum nigrum L.	Solanaceae	Makoi	Perennial	Herb to Shrub	2d	WU-160

30.	Nicotiana plumbaginifolia Viv.		Jungli tambacco	Annual	Herb	2e	WU-161
31.	Veronica anagallis-aquatica L.	Scrophulariaceae	-	Annual	Herb	2f	WU-162
32.	Veronica agrestis L.		-	Annual	Herb	2g	WU-163
33.	Salvia plebeia R. Br.	Lamiaceae	-	Annual	Herb	2h	WU-164
34.	Chenopodium album L.	Chenopodiaceae	Bathu	Annual	Herb	2i	WU-165
35.	Chenopodiastrium murale L.		Khartua	Annual	Herb	2j	WU-166
36.	Achyranthes aspera L.	Amaranthaceae	Puthkanda	Annual	Herb	2k	WU-167
37.	Alternanthera philoxeroides Griseb		-	Annual	Herb	2l	WU-168
38.	Polygonum plebeium R. Br.	Polygonaceae	Gulabi booti	Annual	Herb	2m	WU-169
39.	Rumex dentatus L.		Jungli palak	Annual	Herb	2n	WU-170
40.	Rumex spinosus L.		Kandiali	Annual	Herb	2o	WU-171
41.	Euphorbia helioscopia L.	Euphorbiaceae	Kour Gandhal	Annual	Herb	2p	WU-172
42.	Cannabis sativa L.	Cannabinaceae	Bhung	Perennial	Herb to shrub	2q	WU-173

43.	Cyperus rotundus L	Cyperaceae	Murk	Perennial	Herb	2r	WU-174
							

Image 1. Weed plants of wheat crop fields in District Moradabad, Uttar Pradesh, India:

a- *Ranunculus sceleratus* | b- *Argemone mexicana* | c- *Fumaria indica* | d- *Sisymbrium irio* | e- *Cronopus didymum* | f- *Stellaria media* | g- *Spergula arvensis* | h- *Silene conoidea* | i- *Malva parviflora* | j- *Malvastrum coromandelianum* | k- *Oxalis corniculata* | l- *Medicago polymorpha* | m- *Lathyrus aphaca* | n- *Vicia sativa* | o- *Melilotus indicus* | p- *Trifolium fragiferum* | q- *Ageratum conyzoides* | r- *Gnaphalium polycephalum* | s- *Parthenium hysterophorus* | t- *Artemisia scoparia* |

u- *Cirsium arvense* | v- *Sonchus arvensis* | w- *Conyza bonariensis* | x- *Launaea nudicaulis* | y- *Anagallis arvensis*.



Image 2. Weed plants of wheat crop fields in District Moradabad, Uttar Pradesh, India:

a- *Calotropis procera* | b- *Convolvulus arvensis* | c- *Convolvulus pluricaulis* | d- *Solanum nigrum* | e- *Nicotiana plumbaginifolia* | f- *Veronica anagallis-aquatica* | g- *Veronica agrestis* | h- *Salvia plebeia* | i- *Chenopodium album* | j- *Chenopodium murale* | k- *Achyranthes aspera* | l- *Alternanthera philoxeroides* | m- *Polygonum plebeium* | n- *Rumex dentatus* | o- *Rumex spinosus* |

p- *Euphorbia helioscopia* | q- *Cannabis sativa* | r- *Cyperus rotundus* | s- *Poa annua* | t- *Cyanodon dactylon* | u- *Lolium temulentum* | v- *Avena sativa* | w- *Dichanthium annulatum* | x- *Polypogon monspeliensis* | y- *Cenchrus ciliaris* | z- *Phalaris minor*.

All of the weeds that were found in wheat crop fields were investigated and identified by the current research, which was the very first effort ever made from the study region.[12] The current study offers a comprehensive analysis of the overall weed variety that may be found in the wheat crop fields located in the district of Moradabad in Uttar Pradesh. The data that were acquired from this investigation made it abundantly evident that the variety of weeds was both great and substantial throughout the whole study. The farmers and agriculturists in the study region will be able to identify the weeds with the assistance of this research, which will then assist in the formulation of appropriate strategies for the control and sustainable management of the weeds.[13]

CONCLUSION

This research in Uttar Pradesh's District Moradabad examines weed species diversity in wheat crop fields in great detail. This area is home to a diverse and abundant weed flora, as shown by the documentation of 51 weed species representing 48 genera and 22 families. Out of all the species that were examined, *Phalaris minor* was found to be the most common, followed by *Rumex dentatus*, *Fumaria indica*, and *Chenopodium album*. The abundance of members from the Poaceae and Asteraceae families in wheat agro-ecosystems is indicative of their remarkable flexibility and capacity to compete.

Some weed species were found to be more common in irrigated fields, bunds, and canal borders, according to the research. They serve as both weeds and valuable plants for local populations, as shown by the existence of ethnobotanically significant species including *Melilotus indicus*, *Chenopodium album*, and *Cyanodon dactylon*. Wheat production is at risk due to the prevalence of competitive weeds such as *Phalaris minor*, which calls for prompt management actions.

The development of efficient and location-specific integrated weed management (IWM) plans relies heavily on this baseline record of weed variety. Sustainable and environmentally friendly weed management strategies are supported by the research, which helps farmers and agricultural planners identify key weed species. Improved agro-ecosystem health, lower crop losses, and higher wheat yields are all outcomes of this information's long-term impact on District Moradabad.

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