



# Weed Of Rabi Crops In District Bhiwani, Haryana- Challenges And Management Practices In Botanical Perspective.

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## Abstract:

Weeds are unwanted plants that grow along with the agricultural crops and compete for nutrients, water, sunlight, and space. They reduce crop yield and quality, impose high economic cost to the farmers and may also promote infestation of variety of insects and diseases in the crops. Weeds also interfere with the harvesting process and become part of harvested produce.

Weeds are the major biological constraints affecting productivity of all the crops. Rabi crops are crops grown during the winter season generally in the month of October to December. Wheat and mustard are the main Rabi crops in District Bhiwani, Haryana. These crops are the economic backbone of this region and have cultural significances. The climate of this region is semi-arid with sandy soils, scanty rainfall, and intensive cultivation practices of the region promote the growth of diverse weed flora in wheat, mustard, gram, and barley fields. Weeds compete with the crop plants for soil nutrients, water, sunlight and affect biological structure of the soil. Major weeds of rabi crops in district Bhiwani includes *Phalaris minor* (Little Seed Canary Grass), *Avena fatua* (Wild Oat), *Chenopodium album* (Bathua), *Parthenium hysterophorus* etc. This paper examines the common weeds associated with Rabi crops in District Bhiwani, their botanical characteristics, ecological challenges, problems faced by farmers, and the integrated weed management strategies practiced by the farmers. Integrated Weed Management (IWM), involving mechanical, biological, and chemical methods, has emerged as effective strategies for weed control. However, chemical weedicides has posed severe environmental problems and economic burdens on the farmers. The study also highlights the importance of sustainable and eco-friendly weed management practices used by the farmers of this region.

**Keywords:** Rabi crops, weeds, weedicides, integrated weed management, Rabi Crops, infestation

## Introduction:

Weeds are unwanted plants that grow along with the agricultural crops and compete for nutrients, water, sunlight, and space. They reduce crop yield and quality, impose high economic cost to the farmers and may also promote infestation of variety of insects and diseases in the crops. Weeds also interfere with the harvesting process and become part of harvested produce. Agriculture forms the backbone of the economy in District Bhiwani, Haryana. The district is characterized by semi-arid climatic conditions with sandy to loamy soils and limited rainfall and poor underground water quality. Major rabi crops cultivated in the region include wheat (*Triticum aestivum*), mustard (*Brassica juncea*), gram (*Cicer arietinum*), barley (*Hordeum vulgare*), and berseem (*Trifolium alexandrinum*). However, weed infestation remains one of the most serious challenges affecting crop yields. Weeds compete with the cultivated crops for essential resources. Weeds significantly reduce yield and increase production costs. The floristic diversity of Bhiwani district supports a wide variety of weed species because it lies on ecological transition between semi-desert region of Rajasthan and irrigated plains of Haryana.

## Agro climatic conditions of District Bhiwani

Bhiwani District lies in the southwestern part of Haryana. The district has Alluvial plains in the north semi-desert and sandy terrain in the south and southwest. Some areas of district bhiwani are associated with Aravalli Range in Tosham and Loharu blocks. The region is characterized by very low annual rainfall, high temperature variations, sandy soils with little humus, saline underground water and frequently drought conditions. In these prevailing conditions growth of drought-resistant and highly adaptive weed species is promoted. Wind storms are common which favor soil erosions and is prone to spreading of deserts from adjoining regions of Rajasthan.

## Objectives of the Present Study

1. To identify the weeds of rabi crops in district Bhiwani (HR)
2. To analyze the crop losses caused by these weeds.
3. To find out the ways how reduce competition between weeds and crop plants for nutrients, space, water, and sunlight.
4. To understand the life cycle of weeds for their effective management.
5. To find out any economic benefit from these weeds.
6. To maintain a sustainable and Eco-friendly agriculture practice.

## Main Rabi Crops of District Bhiwani

The important Rabi crops grown in District Bhiwani are Wheat(*Triticum aestivum*), Mustard(*Brassica juncea*), Gram (*Cicer arietinum*), Barley (*Hordeum vulgare*) and Bersem (*Trifolium alexandrinum*).

**Wheat:** Wheat is the major Rabi staple crops grown in District Bhiwani. It is usually sown October to December and harvested in the months of March–April. The seeds are consumed in various forms. Its flour is used in making chapattis, dough for bread and coarse granules as Dalia. The fodder is used to feed animals. Wheat requires plenty of water and soils with less water percolation. Some regions are dominated by sandy soils where other crops like mustard and Gram are grown.

**Mustard:** Mustard is one of the main Rabi crops grown in district Bhiwani of Haryana. The semi-arid climate and sandy-loam soil of Bhiwani are suitable for mustard cultivation. Mustard can be grown in the regions with poor rainfalls. Major mustard-growing areas of district Bhiwani are Tosham, Loharu, Siwani, and nearby rural regions adjoining Charkhi Dadri district

**Gram:** Bhiwani district is a leading district in Haryana for cultivation of gram crop, especially in areas like Siwani and Tosham blocks of the district. Soil type and climate of Bhiwani is well suited for gram cultivation. It is mainly grown as a rabi crop (winter season) grown in the months of October–November and is harvested in March–April. Sandy loam to loamy soils with good drainage is suitable for gram cultivation. The crop require less irrigation and enrich the soil with nitrogen due to root nodules.

**Barley:** Barley crop is also widely grown in parts of Bhiwani and nearby dry regions of Haryana because it performs well under low rainfall and limited irrigation conditions. It is a Rabi crop sown late during October to November

**Berseem:** Berseem (Egyptian Clover) is a popular green fodder crop in Bhiwani and other parts of Haryana because it gives high-quality nutritious fodder during winter.

### Major Weeds of Rabi Crops in District Bhiwani

The main weeds commonly found in wheat fields in northern India, including Haryana, specifically district Bhiwani are grouped into two categories. These are:

#### 1. Grassy weeds 2. Broadleaf weeds.

##### 1. Grassy Weeds:

The grassy weeds are the weeds that looks like grasses. These are mostly weeds that belongs to Monocots.

a) *Phalaris minor* (Little Seed Canary Grass). This weed is most problematic as it hides the wheat plants in early stages of growth. It compete with wheat plant for nutrients as both belongs to same group. It severely affect the yield.

b) *Avena fatua* (Wild Oat): Wild oat is also a grassy weed of family Poaceae.

c) *Poa annua* (Annual Bluegrass): is a cool-season grassy weed belonging to the family Poaceae. It is widely distributed in temperate and subtropical regions and is a common weed in wheat fields of

district bhiwani. It competes strongly with crops for nutrients and water and germinates early and very rapidly.

## 2. Broad Leaf Weeds:

These weeds are Dicotyledonous plants growing unwontedly in the wheat crops. Broad leaves weeds have very high nutrient uptake capacity, compete strongly with crops during early growth period especially for water and reduce crop productivity drastically. These mainly include:

- a) *Chenopodium album* (Bathua): bathua is a very common weed of this category. It is very fast growing and compete aggressively for nutrients and water. This weed is also for great economic and ethno botanic value for this area. It is highly nutritious and good source of dietary minerals especially iron. It is consumed by local people in various forms.
- b) *Rumex dentatus* (Jangli Palak): It commonly grows in wheat as well as mustard. It is considered one of the important competitive weeds in irrigated and fertile fields of wheat and mustard.
- c) *Melilotus indica*: It is a weed of family Fabaceae. It commonly grow among wheat and gram plants and severly affect the crop yield.
- d) *Fumaria parviflora*: It is a broadleaf weed found in wheat crops across Haryana. It is very delicate and highly branched weed with small pinkish flowers. It compete with wheat for minerals, water and sunlight. It reduce growth of wheat especially in early stages of growth and suppresses the growth of seedlings.
- e) *Cirsium arvense* (Canada Thistle): This weed belongs to family Asteraceae. It is a perennial weed. It is a spiny plant with deep roots. Leaves are lobed with sharp prickles on margins. It bear purple to pink flower heads. It is very difficult to control this weed as can regenerate with the underground creeping roots.
- f) *Parthenium hysterophorus*: It grow dominantly in district bhiwani in crops as well as outside the crops. It is an invasive species and flourish well. It is commonly called congress grass or Gajjar ghas by the local people. It strongly compete with wheat and many other crops for nutrients, water, and sunlight. This weed is known to cause skin allergies and itching, dermatitis. Pollen can trigger asthma and respiratory problems.

### Why these weeds flourish well

Weeds grow unwanted among the cultivated crops. High efficiency of the growth is due to

1. The weeds grow fast due to certain adaptations which make them more successful and competitive than the crop.
2. Majority of weeds produce small seeds in excess which ensure their rapid spread over large area.
3. Seed Dormancy: Weed seeds can remain viable in soil for several years. Seeds develop ability to survive in adverse conditions by some biochemical and physiological adaptations.

4. Some weeds release allelopathic substance that inhibit the crop growth.
5. Weeds are able to tolerate drought, high salinity and poor soil conditions common in Bhiwani.
6. Resemblance of weeds the crop plants: Some weeds resemble crop plants at early stages. so it become difficult to eradicate them mechanically in early stages.

## Review of Literature

Singh, Kaur, and Rani (2014) reported that the dominant weed flora of rabi crops in Haryana consisted of grassy weeds such as *Phalaris minor* and *Avena ludoviciana* along with broad-leaved weeds including *Chenopodium album* and *Rumex dentatus*, which significantly affect wheat productivity.

Kumar et al. (2015) reported that post-emergence herbicides effectively reduced weed density and improved productivity in chickpea–mustard intercropping systems, indicating the importance of chemical weed management in rabi crops under north Indian conditions.

Sangwan et al. (2019) reported that sequential application of pendimethalin followed by suitable post-emergence herbicides significantly reduced populations of *Phalaris minor*, *Rumex dentatus*, and other major weeds while improving grain yield and economic returns in dual-purpose wheat under Haryana conditions.

Hu et al. (2021) reviewed deep learning approaches for in-crop weed identification and highlighted that CNN-based models combined with transfer learning significantly improve weed recognition accuracy under complex field conditions, which is highly relevant for precision weed management in wheat-based systems of Haryana.

Walia et al. (2023) reported that sprinkler irrigation systems improved wheat performance in Southern Haryana, including Bhiwani district, highlighting the importance of irrigation management as a key factor influencing crop productivity and indirectly affecting weed competition dynamics.

Sunil et al. (2023) emphasized that integrated weed management combining chemical and non-chemical methods is essential for sustainable control of *Phalaris minor* and associated weed flora in wheat-based cropping systems of Haryana.

Sachan et al. (2024) reported that integrated weed control practices combined with optimized fertilizer management significantly improved wheat yield and reduced weed competition under field conditions in northern India, which is relevant to wheat-based systems of Haryana including Bhiwani district.

## Challenges due to Weeds in Major Crops

### 1. Reduction of Crop Yield/Productivity

Weeds compete with the crop plants for water, minerals, sunlight and space. As a result, the productivity is reduced highly from 20-50 percent depending upon the number and type of weed.

### 2. Development of Herbicide Resistance

Continuous use of similar herbicides has resulted in resistant populations of *Phalaris minor* in wheat fields.

**3. Increased Cost of Cultivation:** Additional labor and chemical inputs increase production expenses.

**4. Soil Moisture Depletion:** In semi-arid regions like Bhiwani, weeds consume valuable soil moisture and compete with crop plants.

**5. Pest and Disease Shelter:** Weeds act as alternate hosts for insects and pathogens. They can survive in the fields for many generations.

## Weed Management Practices

### 1. Cultural Methods

**a) Crop Rotation:** Rotating wheat with mustard, gram, or legumes interrupts weed life cycles. It is the practice of growing different crops in a planned sequence on the same field to break life cycles of weeds, reduce weed populations, and prevent dominance of specific weed species in the cultivated area. It is main component of IWM. Same field conditions favour weed growth. Crop rotation disturb the life cycle of weeds by changing the microclimate of the soil.

**b) Timely Sowing:** Early sowing helps crops establish before weeds emerge. Thus the crop exert dominance over the weeds to absorb the nutrients and water.

**c) Use of Clean Seeds:** Clean seed use refers to planting crop seeds that are free from unwanted weed seeds, free from fungal propagules and properly certified. It will prevent introduction of new weed species and prevent increase in soil seed load.

**d) Proper Fertilizer Application:** This method refers to the planned use of fertilizers in correct dose, time and method of application so that the crop gains a competitive advantage over weeds plants. As a result the weed growth is suppressed.

### 2. Mechanical Methods

1. Hand weeding: It is a mechanical method of weed control in which weeds are removed manually from the field using hands or simple tools. It is one of the oldest and most effective direct methods of weed management. No specific technique is used. This method should be practiced before the flowering time of the weeds.

2. Hoeing: In this method weeds are removed and the soil is loosened using a tool called a hoe. It helps in cutting weeds from the root zone and improving soil conditions for crop growth. Hoeing is most effective when the weeds are in seedling stage, soil is with sufficient moisture and the crops are strong enough to withstand soil disturbance.

**3. Inter-cultivation:** Inter-cultivation is a mechanical weed control method in which the soil between crop rows is tilled during the crop growth period using tools to remove weeds and improve soil conditions. It is practiced in row-planted crop. It involves cutting and uprooting weeds in the between crop rows and disturbing weed root systems causing their growth inhibition.

**4. Mechanical Weeder Machines:** These are the machines that cut or uproot the weeds. These machines are fast and least disturb the crops.

**3. Integrated Weed Management (IWM) Practices:** Integrated Weed Management combines multiple methods for sustainable weed control. Integrated Weed Management (IWM) is a systematic approach in which two or more weed control methods are combined together to manage weeds effectively, economically, and in a sustainable manner. It aims to keep weed population below economic threshold level (ETL) rather than complete eradication from the fields. Keeping the weed load below a specific level is very important. Various components of IWM are Crop rotation, Mechanical weeding, Mulching, Herbicide rotation, Biological control, Improved irrigation practices etc. IWM reduces dependence on chemicals and improves long-term soil health. Research emphasizes that no single method alone is sufficient for permanent weed control.

### **Ethno botanical and Ecological Importance of Weeds**

Weeds cause severe harmful effects on the crops. However, some weeds are of great economic, medicinal and ecological value. For example *Chenopodium* (*Bathua*) is most commonly used weed in the area of district Bhiwani. It is used in various preparations. It is considered highly nutritious and rich source of Iron. It is also a source of income to poor people. *Argemone* is considered as a toxic weed, it is also a traditional medicinal plant used in some skin infections, wound healing, pain relief etc. *Parthenium hysterophorus* (*Congress grass*) causes asthma.

### **Future Weed Management Perspectives and Suggestions:**

**Future Weed Management Perspectives and Suggestions** in District Bhiwani should focus on weed management practices with minimum use of chemical weedicides. It should involve herbicide resistance monitoring, precision agriculture techniques, remote sensing and drone-based weed detection, biological weed control and imparting knowledge about life cycle of weeds to the farmers.

### **Conclusion**

Weeds are a major threat to Rabi crop production in District Bhiwani, Haryana. The semi-arid, dry environment and changing agricultural practices favored the growth of diverse weed flora during last three decades. Important weeds such as *Phalaris minor*, *Chenopodium album*, *Rumex dentatus*,

*Melilotus indica*, *Avena fatua* and *Parthenium hysterophorus* significantly reduce crop productivity in the rabi crops of District Bhiwani. Effective weed management requires an integrated approach combining cultural, mechanical, chemical, and biological methods. Not a single method is sufficient to control the weeds. It depends on the climate, type of crop, irrigation practices, time of sowing etc. Sustainable and scientifically planned weed management practices are essential for ensuring food security, soil health, and agricultural sustainability in the study area. Control of weeds not only increase the productivity but also improve the economic status of people.

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