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Review Article

Weed Management in Wheat (Triticum aestivum L.): A Review

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Article Information:
Received: 18 February 2026 | Revised: 20 March 2026 | Accepted: 17 April 2026 | Published: May 22, 2026

Cite this article:
Dhirendra Pratap Singh, Abhishek Govind Rao (2026). Weed Management in Wheat (Triticum aestivum L.): A Review *Public Health Open Journal*. 11(1):462–465. https://doi.org/10.17140/PHOJ.11.01.462

Abstract
Wheat (Triticum aestivum L.) is one of the most important cereal crops globally and a major contributor to food security. However, weed infestation is a serious constraint in wheat production, causing significant yield and economic losses. Weeds compete with crop plants for nutrients, moisture, light, and space, leading to reduced productivity. Yield losses due to weeds in wheat may reach up to 24% or more depending on weed density and environmental conditions . This review focuses on major weed flora, crop–weed competition, critical periods of weed control, and various weed management strategies including cultural, mechanical, chemical, and integrated approaches. Emphasis is placed on sustainable weed management practices to enhance wheat productivity and environmental safety. Weeds are among the most persistent biotic constraints in wheat production, causing yield losses of 20–40% if unmanaged. Conventional reliance on herbicides has led to resistance in major weed species such as Phalaris minor, necessitating integrated approaches. This review synthesizes cultural, mechanical, chemical, and biological methods, emphasizing Integrated Weed Management (IWM) as a sustainable pathway. Challenges such as herbicide resistance, environmental concerns, and climate variability are discussed, with future directions highlighting precision agriculture, climate-smart practices, and ecological sustainability.

Keywords: *Wheat, weeds, herbicides, integrated weed management, crop competition*

1. Introduction

Wheat is a staple food crop cultivated across diverse agro-climatic regions. Weed infestation is one of the major biotic stresses limiting wheat yield. Weeds reduce crop productivity by competing for essential resources and interfering with crop growth. The diversity of weed flora varies depending on soil type, irrigation practices, cropping systems, and climatic conditions .The increasing reliance on herbicides has led to issues such as herbicide resistance, environmental pollution, and shifts in weed flora. Therefore, sustainable weed management strategies are essential for long-term productivity. Weeds are unwanted plants which provide hard time to any particular crop in which it occurs. Its svariety and distribution differs from crop to crop. Such vegetation is found abundant in cultivated fields of great financial and biological significance (Jabeen Ahmed, 2009). These unwanted plants grow along with agricultural plants and cause gradual and important loss in crop yield because they can compete with crop plants for want of available nutrients, space, water contents, sunlight etc (Dangwal et al., 2010). Weed occurrence is the major problem in wheat crop which can reduce wheat production by 25-30% in (Nayyar et al., 1994).Weed utilizes soil nutrients and competes for space and sunlight with crop, thus reduce crop yield and subsequently market value (Pervaiz and Quazi, 1992). Besides measureable effects on yield, weeds also affect the quality of crop due to presence of their seeds and fragments. The magnitude of crop yield loss is determined by the persistence of weeds, their density, type and also by the practices used for crop management. The chief weeds of wheat are Wild oat, Avenafatua, Lamb's quarters, Chenopodium album, Canary grass, Phalaris minor, Wild medic, (Medicago polymorpha), Blue pimpernel, Anagallisarvensisc, Field bind weed, Convolvulus arvensis, Rumex dentatus, Seniberadidym, Broad leaf dock, (Swine cress) and Fumariaindica (fumatory), Melilotus alba L. (sweet clover), (Shamsi and Ahmad, 1984). There are nearly 30,000 weeds species in the world, out of these 50 to 200 mostly cause considerable damage to the major food crops (Mahmood and Niaz, 1992). It is expected that is loss in wheat production is about from 20% to 40% is due to weeds (Ahmad and Sheikh, 2003). The wheat grower enhanced wheat crop qualities by using new variety, increase biodiversity and keep away wheat crop from adverse effects of pest and climatic condition.(Walburger et al., 1999).

The weed density of dominated species (30.4 m-2) was recorded for Phalaris minor (G.sokay) followed by Cannabis sativa (28.4 m-2). While, the lowest weed density was calculated for Chenopodium album (4.3 m-2) in the wheat fields. The infestation of weeds depends on the frequent rainfall i.e. when rainfall is higher the infestation of the species will be more. The farmers did not used the proper weed management practices to control weeds in their fields. In earlier studies Muhammad et al. (2009) also found 34 broad leaf, sedges and grassy weed species in maize crop that resulted in maize yield reduction. Relative weed density (%) The results on relative weed density of a particular species are shown in Table 2. The relative weed density of dominated species (16.8%) was recorded for Phalaris minor (G.sokay) followed by Cannabis sativa (15.6%). While, the lowest relative weed density was calculated for Chenopodium album (2.4%) in the wheat fields. The infestation of weeds depends on the frequent rainfall i.e. when rainfall is higher the infestation of the species will be more. The peoples are not aware about integrated management practices that's why weed infestation in wheat crop is more critic and needs proper management techniques. In earlier studies Muhammad et al. (2009) also found 34 broad leaf, sedges and grassy weed species in maize crop that resulted in maize yield reduction. Weed frequency (%) The weed frequency of weeds is the best way of indication for the prevalence of weed species in the studied area. The results on weed frequency (%) of a particular species are shown in Table 2. On the basis of the data provided the highest frequency was computed for Cannabis sativa (88%) followed by Stellaria media and Phalaris minor (G.sokay) (84% respectively); while, the lowest (60%) fequency was recorded for Chenopodium album. The remaining weeds included in the Table-2 were of minor phytosociological status and relatively unimportant as far as wheat production in the target area is concerned. The highest weed frequency in wheat fields might be due to lack of weed management in the target area that's why, weeds reproduce more and are frequently occurring in wheat crop. Saeed et al. (2010) also reported the frequent occurrence of different weeds in their experiments. In a similar study, Khan et al. (2012) also narrated the highest weed frequency for broad leaved weeds as compared to grassy weeds. The major weed were reported to infest wheat crop in the northern Pakistan were Cannabis sativa Hussain et al. (2007). Relative weed frequency (%) The relative weed frequency of weeds is the best way of indication for the prevalence of weed species in the studied area. The results on relative weed frequency (%) of a particular species are shown in Table 2. On the basis of the data provided the highest relative frequency was computed for Cannabis sativa (8.7%) followed by Stellaria media and Phalaris minor (G.sokay) (8.3% respectively); while, the lowest (5.9%) relative fequency was recorded for Chenopodium album. The remaining weeds included in the Table-2 were of minor phytosociological status and relatively unimportant as far as wheat production in the target area is concerned. The highest weed frequency in wheat fields might be due to lack of weed management in the target area that's why, weeds reproduce more and are frequently occurring in wheat crop. Saeed et al. (2010) also reported the frequent occurrence of different weed species in their experiments. In a similar study, Khan et al. (2012) also narrated the highest weed frequency for broad leaved weeds as compared to grassy weeds. Hussain et al. (2007) reported that the major weed in the northern Pakistan were Cannabis sativa. Kazi et al. (2007) reported that the relative density and frequency of Chenopodium album were 13.53% and 30% respectively. While Heliotropium europacum showed less frequency (3.33%) and density (0.52). Qureshi et al. (2009) determined that Cannabis sativa and Ranunculus muricatus were the most common and dominant weed species with an average rate of 72% and 84% respectively in wheat crop in District Toba Tak Singh. Muhammad et al. (2009) recorded that the Cynodon dactylon and Convolvulus arvensis were most common weed species in wheat, maize and potato crops. Subedi (2013) studied tha the major weed species on the basis of frequency and density were Vicia hirsutum, Chenopodium album, Oxalis 916 Journal of Pharmacognosy and Phytochemistry corniculata, Anagalis arvensis and Poa annua while Chenopodium album, Polypogon fudax, Solanum nigrum, Gnaphalium affine Anagalis arvensis and Polygonum plebijum in wheat population. Whereas, Khobragade and Sathawane (2014) studied that Chenopodium album, Parthenium heterosphorus, Melilotus indica, Phaselous aconitifolius, Tridax procumbence, Alternanthera spinosus, Anagalis arvensi, Rumex dentatus, Cyprus rotunds, Portulaca oleracea and Euphorbia thymifolia were reported to be the common weed species in wheat crop. Khan et al. (2012) found seven weeds in wheat crop which were Cirsium arvense, Convolvulus arvensis, Conyza bonariensis, Cynodon dactylon, Cyperus rotundus, Parthenium hysterophorus, and Sonchus aspera. Importance value index The importance value index is important for understanding the status of a given weed specie in a weeds community. The data in Table-3 exhibits the highest importance value index (25.1%) was recorded for Phalaris minor (G.sokay) followed by Cannabis sativa (24.3%), while the lowest importance value index (8.4%) for Chenopodium album and the second lowest by Avena fatua (9.0%). The highest importance value index of the above weed species is due to their high valve of relative weed density and relative weed frequency and are ought most important to be managed properly on time. The weeds should be control before threshold level, so that could not decrease wheat productivity. These results are supported by those of Saeed et al. (2010) who observed the highest importance value index for kharif weeds in their investigations. Waheed et al. (2009) concluded that weed species such as Cannabis sativa, Polypogon fugax, Melilotus indica, Cirsium arvense, Chenopodium album and Cynodon dactylon were also uniformly observed with IVI ranging from 6.70-44.45%. Fresh biomass (g plant-1) Data regarding fresh weed biomass of of different weeds during the survey indicated that fresh biomass varied among different weeds speices (Table 3). The data further revealed that maximum fresh biomass was recorded from Cannabis sativa (142.6 g plant-1) followed Vicia sativa and Medicago minima (128.3 and 128.2 g plant-1) respectively. While, the lowest fresh biomass was noted from Euphorbia helioscopia and Medicago truncatula (20.3 and 17.2 g plant-1) respectively. The more fresh biomass of the weeds might be due to the avialibility of sufficient water, nutrients and no weed management techniques. That's why weeds grow vigoursley and produce more biomass. The used of proper weed management technique caused maximum reduction in the germination and biomass of horse purslane (Khan et al., 2012). The lowest weed biomass in treated fields negatively affected the weed growth and biomass (Patel et al., 2006). Dry biomass (g plant-1) Data regarding dry weed biomass of of different weeds during the survey indicated that dry biomass varied among different weeds speices (Table 3). The data further revealed that maximum dry biomass was recorded from Cannabis sativa (59.1 g plant-1) followed Vicia sativa and Medicago minima (44.1 and 37.9 g plant-1) respectively. While, the lowest dry biomass was noted from Euphorbia helioscopia and Medicago truncatula (20.3 and 17.2 g plant-1) respectively. The more dry biomass of the weeds might be due to the availability of sufficient water, nutrients and no weed management techniques. That's why weeds grow vigourasliy and produce more biomass. The used of proper weed management technique caused maximum reduction in the germination and biomass of horse purslane (Khan et al., 2012). The lowest weed biomass in treated fields negatively affected the weed growth and biomass (Patel et al., 2006).

2. Conclusion

Weed infestation is a major constraint in wheat production, significantly affecting yield and quality. Integrated weed management is the most effective approach for sustainable weed control. Future research

Table 1. Major Weed Flora in Wheat

Category	Weed	Scientific Name
Grassy	Little seed canary grass	Phalaris minor
Grassy	Wild oat	Avena ludoviciana
Broadleaf	Bathua	Chenopodium album
Broadleaf	Senji	Melilotus indica
Broadleaf	Scarlet pimpernel	Anagallis arvensis

Table 2. Herbicides for Weed Control in Wheat

Weed Type	Herbicide	Dose	Remarks
Grassy	Clodinafop	60 g/ha	Post-emergence
Grassy	Pinoxaden	50 g/ha	Effective for Phalaris
Broadleaf	2,4-D	500 g/ha	Apply at 30-35 DAS
Broadleaf	Metsulfuron	4 g/ha	Controls many BLW
Mixed	Sulfosulfuron+Metsulfuron	32 g/ha	Broad spectrum

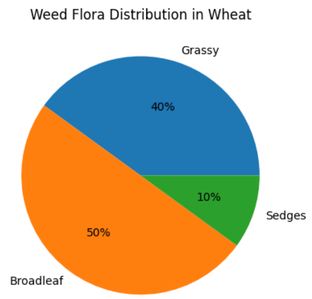

Figure 1. Weed Flora Distribution

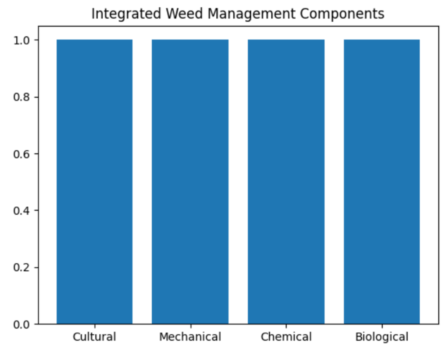

Figure 2. Integrated Weed Management Components

should focus on combining traditional practices with modern technologies to enhance efficiency and sustainability. Effective weed management in wheat requires integration of multiple strategies. While herbicides remain dominant, IWM offers the most sustainable path, balancing productivity with environmental safety. For Indian wheat systems, combining timely sowing, crop rotation, residue management, and judicious herbicide use is essential to ensure long-term yield stability and food security. Weed management in wheat is context-dependent, influenced by agro-climatic conditions, resource availability, and farmer practices. While herbicides remain dominant due to cost-effectiveness, over-reliance has accelerated resistance. Mechanical and cultural methods, though eco-friendly, are less effective alone. Biological control is promising but requires further research and adoption. Integrated approaches balance productivity with sustainability, aligning with climate-smart agriculture. Emerging technologies such as precision agriculture, AI-driven weed detection, and herbicide rotation strategies offer future solutions. Policy support for IWM adoption, farmer training, and investment in biocontrol research are critical for long-term resilience. Weed management in wheat requires a holistic approach. Integrated Weed Management (IWM) is the most sustainable pathway, combining cultural, mechanical, chemical, and biological methods. For Indian wheat systems, strategies such as timely sowing, crop rotation, residue management, and judicious herbicide use are essential. Future directions should emphasize precision technologies, climate-smart practices, and ecological sustainability to ensure yield stability and food security.

References

1. Chauhan, B. S., Mahajan, G., Sardana, V., Timsina, J., & Jat, M. L. (2012). Productivity and sustainability of the rice–wheat cropping system in the Indo-Gangetic Plains of the Indian subcontinent: Issues and challenges. *Field Crops Research*, *143*, 1–3.
2. Malik, R. K., & Singh, S. (1995). Littleseed canarygrass (*Phalaris minor*) resistance to isoproturon in India. *Weed Technology*, *9*(3), 419–425.
3. Singh, V. P., Kumar, A., & Yadav, R. (2016). Integrated weed management in wheat: A review. *Indian Journal of Weed Science*, *48*(3), 233–242.
4. Chauhan, B. S. (2020). Grand challenges in weed management. *Frontiers in Agronomy*, *2*, 3.