



## A Holistic Approach to Integrated Weed Management in Wheat Crops to Increase Productivity

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### Introduction:

Wheat is the second-most important staple food in India, behind rice, and has great worldwide significance. The country's estimated output of wheat for the agricultural year 2022–2023 is 112.18 million tonnes, up 4.44 million tonnes from the production realized in 2021–2022, according to the Second Advance Estimates. The introduction of high-yielding, short-stature cultivars as well as increasing use of fertilizers, irrigation, and herbicides are responsible for this amazing development. However, the high fertilizer and water requirements of these high-yielding dwarf types, along with their low competitiveness, have facilitated increased weed infestations. Approximately one-third of the losses caused by pests of all kinds are caused by weeds. Effective weed management becomes essential in realizing the genetic yield potential of wheat. In addition to lowering agricultural yields, weeds make harvesting more difficult. Therefore, employing effective weed control techniques is necessary to guarantee food security and maintain food

grain output to meet the needs of a continuously expanding population. A methodical strategy that includes all methods of weed control is known as integrated weed management (IWM). Herbicide usage and other treatments are strategically combined in order to discourage the development of weeds while keeping their use to a minimum and reducing it to levels that are both environmentally and economically viable. IWM prioritizes supporting healthy crop development while causing the least amount of damage to agro-ecosystems and encouraging organic pest management techniques. This strategy evaluates the possible cost-effectiveness of all locally applicable control strategies and tactics. A crucial aspect of IWM is that it allows for freedom in its use rather than adhering to strict requirements.

### Cultural Customs:

- **Crop rotation:** Weed life cycles are disrupted and weed pressure is decreased by rotating wheat with non-host crops.

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- **Row spacing and seeding rates:** resistance can be avoided by alternating different types of herbicides. should be adjusted to provide wheat a competitive advantage against weeds. When to Plant: Early planting gives wheat the advantage against weeds that are just developing.
- **Timing of Planting:** Early planting gives wheat the advantage against weeds that are just developing.

### Physical Techniques

- **Mechanical Cultivation:** Weeds are physically removed from the field by using tillage or plowing. Mechanical cultivation reduces the effectiveness of weed management over other conventional approaches by necessitating repeated operations.
- **Mulching:** The use of organic mulch prevents the growth of weeds and maintains soil moisture. Wheat straw, new or old hay, freshly cut forage or cover crops, chipped brush, wood shavings, tree leaves, cotton gin waste, rice or buckwheat hulls, and other agricultural leftovers are examples of organic mulch materials.

### Chemical Procedures:

**Herbicides:** Herbicides continue to be a crucial part of IWM when used carefully and in concert with other strategies. Herbicide

resistance can be avoided by alternating different types of herbicides.

- **Pendimethalin:** This herbicide is used for pre-planting or pre-emergence weed control in wheat. Trade names include Prowl and Stomp.
- **2,4-D:** This herbicide is used to control broadleaf weeds in wheat fields. Trade names include Salvo and Weedone.
- **Metsulfuron-methyl:** Effective against a wide range of broadleaf weeds in wheat crops. Trade names include Ally and Escort.
- **Dicamba:** Dicamba-based herbicides are used for controlling broadleaf weeds in wheat. Trade names include Banvel and Clarity.
- **Atrazine:** While primarily used in corn, atrazine is sometimes used in combination with other herbicides for weed control in wheat. Trade names include AAtrex and Bicep II Magnum.
- **Isoxaflutole:** Often used in combination with other herbicides for grass and broadleaf weed control in wheat. Trade names include Balance Flexx and Corvus.

Please be aware that the trade names and availability of herbicides may change over time and vary according on area. For the most recent and area-specific information on using

herbicides in wheat crops, farmers should always speak with their regional agricultural extension agencies or herbicide manufacturers. When applying herbicides, it's also essential to adhere to suggested application rates and safety measures.

### Biological Control:

- **Beneficial Organisms:** Introducing natural weed antagonists like insects or pathogens can effectively reduce weed populations.
- **Cover Crops:** Cultivating cover crops that outcompete weeds or produce allelopathic compounds serves as a potent biological control measure.

### The advantages of integrated weed control in wheat crops:

1. **Sustainable Agriculture:** IWM promotes sustainable agriculture practices by reducing the environmental impact of weed management, reducing the usage of herbicides, and maintaining soil health.
2. **Herbicide Resistance Management:** Using a variety of IWM management techniques helps prevent the establishment of weed strains that are resistant to herbicides.
3. **Yield Augmentation:** Increased yields are the outcome of well implemented IWM methods, which make wheat

crops healthier and have less weed interference.

4. **Cost effectiveness:** Over time, IWM can lower production costs associated with herbicide treatments.

### Difficulties and considerations:

IWM has promise, but its implementation requires careful planning and supervision. When creating an IWM strategy, farmers must take into account local species of weeds crop kinds, climatic variables, and available resources. A change in mindset in agricultural operations may also be necessary for IWM adoption, which might be difficult for certain farmers.

### Conclusion:

As a complex strategy to address the persistent problem of weeds in wheat fields, integrated weed management arises. Farmers may maximize wheat output while minimizing the harmful effects of weeds on crop health by using a variety of cultural, physical, chemical, and biological management approaches. IWM is a crucial weapon in the toolbox of forward-thinking wheat farmers who work toward a fruitful and environmentally conscientious future in an era when resilient and sustainable agriculture takes precedence.