

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

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ABSTRACT

Weed infestation is one among the most important biotic constraints in wheat production. Wheat is infested with diverse style of weed flora, because it is grown under diverse agro atmospheric condition, different cropping sequence, and tillage and irrigation regimes. For controlling weeds in wheat, growers mostly depend on herbicides because of cost and time effectiveness. For control of diverse weed flora in wheat combination of herbicides or as sequential, if not compatible are required. However, sole dependence on herbicides is additionally not desirable because it contributes to shift towards difficult-to-control weeds and therefore the rapid evolution of herbicide resistance, which may be a threat for sustainable wheat production. For efficient weed management, the non-chemical weed management tactics should be adopted in conjunction chemically (like herbicide mixture and rotation, optimum spray time, dose and methods). a number of the non-chemical agronomic strategies like tillage, sowing time, sowing methods, competitive crop cultivars, higher crop density, closer spacing, irrigation, fertilization and crop rotation is adjusted and adopted in such a fashion that they supply the competitive edge to the crop over weeds. Integration of information of weed biology and non-chemical methods of weed control with chemical methods will help in increasing the lifetime of existing herbicides and make the weed management cost-effective and efficient.

Keywords: *Weed, Infestation, Management, Herbicides.*

INTRODUCTION

Wheat belongs to the monocot family. The term wheat is generally wont to check with the cultivated species of the monocot genus. Among many wheat plants, only three species are commercially important. These are bread wheat (*Triticum aestivum* L.), wheat (*Triticum turgidum* L.) and emmer wheat (*Triticum compactum*). But, now day cultivation is

restricted almost entirely to the tetraploid hard wheat (*Triticum turgidum* L.) and hexaploid bread wheat (*Triticum aestivum* L.). From the 2 of them, hexaploid bread wheat is that the most grown throughout the planet. This includes the overwhelming majority of sorts, which show great diversity in agro-ecological adaptation and utilization (Gooding & Davies, 1997).

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Wheat is a vital grain food component and could be a vital commodity among cereal crops (Baghestani et al., 2007). Globally, it is the most important food grain and ranks second in total production as a cereal crop behind maize; the third being rice. It is reported that per 100 g of wheat grain contains 326-335 calories, 11.57-14.0 g water, 9.4-14.0 g protein, 1.2-2.5 g fat, 69.1-75.4 g total carbohydrate, 1.8-2.3 fiber, 1.7 g ash, 36-46 mg calcium, 354-400 mg phosphorus, 3.0-4.3 mg iron, 370-435 mg potassium, 0.43-0.66 mg thiamine, 0.11-0.12 mg riboflavin and 4.3-5.3 mg niacin (Harker et al., 2005). Wheat is one of the most important cereal crops and is extensively grown, produced and consumed (Rafi et al, 2019). Wheat is one of the most important cereal crops and is extensively grown, produced and consumed in the world (Leser, 2013). A 17% world's cropped area is under wheat cultivation which together adds 35% of the staple food and 20% of the calories (Chhokar et al., 2006).

1. Effects of Weeds on Wheat Production

Weeds are notorious yield reducers that are, in many situations, economically more important than insects, fungi or other pest organisms (Savary et al., 2000). The key factors in crop yield reduction were identified with weed-crop emergence, competition duration, weed lifecycle and growth habit, density of weeds and crop plants, crop species and cultivars. Weeds are good competitors with crop plants because of their growth habits. Weeds grow quicker and taller than crop plants, produce a foliar canopy that shades the crop plants and have greater root elongation and branching which result in a root system that absorbs more nutrients and water from the soil at the expense of the crop plant. Wheat is one the most important crop which is seriously affected with weeds and so that yield will be reduced at a great extent.

2. Weed Control Methods

Despite Weeds are difficult to manage than any other pests because they are stationary and competition usually does not result from just one species, weed control is an important management practice for wheat production

that should be carried out to ensure optimum grain yield. The objective of weed control is to create unfavorable conditions to weeds while maintaining conditions conducive for plant growth. On the other hand, weed control is to reduce weed populations to levels that do not affect the yield, quality or harvesting of the current or sequential crops.

2.1 Cultural Methods

Crop rotation, crop selection, variety selection, adjusting planting date, plant population and spacing, plus fertilizer rate and method of application and are all cultural practices that affect weed management. Crop rotation is one among the foremost important factors in an integrated weed management program. Different crop also allow rotation of herbicides having a special mode of action. There are several crops that may be rotated with wheat within the winter season like potato, onion, winter maize, mustard and sunflower. Other rotations include rice-potato-sunflower, rice-mustard-sugarcane and rice-potato-onion has been found best alternate (Singh, 2007).

2.2 Mechanical and Manual Weeding

Removal of weeds by various means of tools and implements, hand weeding and pulling comes under mechanical and physical practices of weed control, respectively. Mechanical weeding done twice at 15 and 30 days stage was found most effective in reducing weed dry matter accumulation in wheat (Sharma et al., 2011). Pandey et al. (2007) revealed that hand weeding significantly reduced the intensity of perennial grasses and sedges in wheat. Radhey Shyam et al. (2009) noted that hand weeding twice at 35 and 55 days after sowing was most effective to minimize the weed density and their dry weight under all the wheat establishment methods.

2.3 Chemical Control

Weed management in wheat is not accomplished by using agronomical and cultural practices exclusively. Herbicides continue to be the most powerful and reliable way to control weeds in wheat. Herbicide mixtures may also be one of the options for management or delay of cross resistance

development (Dhawan et al., 2009). Alternate herbicides with different mode of action also help in delaying the cross resistance. Brar and Walia (2009) reported that mesosulfuron+iodosulfuron, sulfosulfuron and clodinafop fb 2, 4-D were quite effective against Phalaris minor and broad leaf weeds. Malik et al. (2010) reported that chlorsulfuron 30 g/ha, triasulfuron 40 g/ha and metsulfuron 4g/ha reduced the density and dry weight of total weed to the extent of 85- 89 % and produced grain yield of wheat statistically similar to weed free check.

3. Integrated Weed Management

Integrated weed management for crops is a concept that combines weed control principles, practices, materials, and strategies to maintain plant health by minimizing damage from weeds. It is very clear that herbicide alone will not be the solution for weed problem in wheat. Therefore, perfect sowing techniques that allow integration of mechanical methods with herbicides or cultural methods require urgent attention. Weed intensity and dry matter of weeds at harvest were significantly lower in weed free followed by pendimethalin pre emergence @ 1.0 kg/ha + hand weeding and was maximum in weedy check (Patil & Dhonde, 2009). Integration of isoproturon @ 0.75 kg/ha + 2,4-D @0.5 kg/ha with one inter culture at 30 DAS was the best treatment in terms of reducing weed population and dry weight at different stage of crop growth (Rathi et al., 2008). Singh et al. (2013) noticed that post emergence application of metsulfuron (6 g ha⁻¹) and 2, 4-D (500g ha⁻¹) at 30-35 days after sowing in wheat recorded higher weed killing efficiency (38.1 %), weed control efficiency (78.3 %), lower weed index (23.5 %) and reduced their dry matter accumulation by 67.4 % as compared to farmer's practice.

SUMMARY

Weed infestation is one the most biotic constraints in wheat production and productivity. Wheat is infested by different weed flora comprising grasses and broad leaved weeds. For weed control most the wheat producer farmers depends on herbicides

because of cost and time effectiveness compared to manual weeding. However continuous use of the identical herbicide or herbicide of the identical mode and mechanism of action leading to the buildup of resistance and tolerant weed variety. Integration of herbicides with hand weeding attributed to efficient and prolonged weed control. Herbicide supplemented with hand weeding for the control lately emerging weeds. An integrated approach, where herbicide plays a pivotal role is that the only way ahead for effective weed management. Use of weed free seed, use of well rotten farm yard manure, method of sowing, seed rate, sowing time, varietal selection, amount of fertilizer application, proper herbicide selection, proper dose, time and method of herbicide application, herbicide rotation and mixture, use of adjuvant, mechanical weeding and crop rotation are the key constituents of integrated weed management.

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