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Effect of conservation tillage and weed management practices on weeds dyanamics in wheat (*Triticum aestivum* L.)

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Abstract
An experiment on "Effect of conservation tillage and weed management practices on weed dyanamics in wheat (*Triticum aestivum* L.)" was conducted at the shradhay Bhagwati Singh Agriculture Research farm, Hazipur, Chandra Bhanu Gupt Krishi Mahavidyalaya, BKT, Lucnkow (U.P.) during Rabi Season of 2022-23 The experiment was laid out in split plot design (SPD) with conversation tillage and four weed control practice. Results revealed that among tillage practices crop received zero tillage + residue and in weed management practices Sulfosulfuron 75% WP @ 24 g A.I/ha found significantly better weed dynamics for wheat productivity.

Keywords: Conservation tillage, weed management, crop weeds, weeds dyanamics

Introduction
The presence of weeds within the crop may adversely affect production in a number of ways. Weeds compete with crop species for water, nutrients and light and ultimately reduce crop yield. Weeds are unwanted plant species growing in the domesticated crops. The competition of weeds for nutrients may results in such obvious responses as dwarfing in plant size, nutrient starved conditions, wilting and actual dying out of plants. Weeds are notorious yield reducers that are, in many situations, economically more important than insects, fungi or other pest organisms. Weeds not only reduce the crop yield, but also deteriorate the quality of the produce thereby, reducing its market value. Weeds reduce yield by affecting the sunlight reaching the plants. In some more serious cases it may lead to complete failure of crop. Therefore, the eradication of weeds from the crop fields is essential for obtaining maximum returns.

Indo-Gangetic or northern plains of India are mostly comprised of wheat rice cropping system. The major weeds prevalent in wheat fields are dicot and monocot, grown in Rabi season viz. Bathua (*Chenopodium album*), Gazari (*Fumaria parviflora*), Katili (*Cersium arvensis*), Krishnneel (*Anagallis arvensis*), Akari (*Vicia hirsuta*), Sengi (*Melilotus alva/ Meliotus indica*), Chatari matari (*Lathyrus aphaca*), Satyanashi (*Argemone maxicana*) etc. Likewise, monocot weeds viz., Gehusa/ Gullidanda / Gehun ka mama (*Phalaris minor*), wild oats (*Avena fatua*), Piazi (*Asphodelus tenuifolius*) etc. that impose serious problems in wheat fields. In addition to these, doob (*Cynodon dactylon*) is a major perennial weed.

The most noxious weed in wheat field is *Phalaris minor* Retz. (Littleseed canary grass). Surveys of wheat crops in the states of Punjab and Haryana established *P. minor* as the most dominant weed of wheat in northwest India. It is very difficult for the farmers to identify due to their resemblance with the wheat plants in early stages of growth. Its morphological similarity and competitive fast growth with wheat are important problem. Untreated weed infestation can result in dramatic reduction in wheat yield by 57%, therefore farmers are being forced to harvest immature crops. Complete failure of crop can occur in extreme cases. Traditional methods of weed control such as crop rotation, manual hoeing or tractor drawn cultivator and costly labour have made the use of herbicides popular among Indian farmers.

Keeping the importance of these circumstances in view, it is necessary to select the suiTable chemicals capable of controlling effectively and economically all the type of weeds present in wheat crop.

There are many kinds of chemicals (herbicides) which are used for controlling the weeds. The herbicides are most effective in controlling annual as well as perennial weeds. However, it is essential to select an appropriate kind of chemical and to use it at a specified rate; otherwise, they may damage the crop. The eradication of weeds through chemicals is considered suiTable for more area during short period of time. Herbicide is a chemical used to kill or inhibit the growth of weeds and other unwanted plant pests. Herbicide activity can be either selective or nonselective. Selective herbicides are used to kill weeds without significant damage to desirable plants. Nonselective herbicides kill or injure all plants present if applied at an adequate rate. A number of weed species that were once susceptible to and easily managed by certain herbicides have developed resistance with time. These weeds are no longer controlled by applications of previously effective herbicides. As a result, the repeated use of a specific type of herbicide on the same land has developed resistance in some type of weeds to these chemicals. Their application can therefore result in visible crop injuries i.e., leaf chlorosis, necrosis, plant deformations, decolorization, leaves withering, growth retardation. The intensity and duration of the crop-weed competition determines the magnitude of crop yield losses (Swanton *et al*., 2015) [10]. Uncontrolled growth of weeds on an average caused about 48 per cent reduction in grain yield of wheat when compared with weed free condition (Singh *et al*., 2012) [9]. Herbicides play an important role for weed control in closely spaced crops like wheat and barley, where manual or mechanical weeding is difficult (Yaduraju and Das, 2002) [11]. Among different weed management practices, chemical weed control preferred because of less labour involvement and no mechanical damage to the crop that happens during manual weeding (Marwat *et al*., 2008) [6]. These necessitate evolving a strategy to screen out more herbicides to control the weed flora economically in the wheat fields on large scale. In India, herbicide shares only about 8 per cent of total pesticide consumption in country and we use an average of only about 35-gram herbicides ha^{-1} annum^{-1} (Gupta, 2007) [1].

Methodology:

The experiment was carried out during Rabi 2022-23 at Shradhay Bhagwati Singh Agriculture Research Farm, Hajipur, Chandra Bhanu Gupta Krishi Mahavidyalaya, BKT, and Lucknow (U.P.). The field was well leveled having good soil condition. In order to determine the physico-chemical characteristics of experimental plot a soil sample was collected from different places at random with the help of soil augar to a depth of 0-15 cm prior to application of fertilizers. The soil sample representing the whole field was taken and analyzed in laboratory for physico-chemical properties. The experiment was laid out in split plot design (SPD) with conversation tillage and four weed control practice with combination of 12 treatment and replicated three times. The treatments were allotted randomly to various main plots and sub plots.

Results and Discussion

Weed growth

The data on total weed density were recorded at 30, 60, and 90 DAS were analyzed statistically and presented in Table 1.

An examination of data clearly indicate that showed that continuous emergence of weeds in all tillage and weed management practices. Crop sown in zero tillage + residue (T_3) recorded lowest no. of weeds (6.72. 6.89, 7.27 /m^2) at respective stage, which was followed by zero tillage (T_2). The highest density of weed was observed (12.65, 14.49 and 15.56/m^2) with conventional tillage (T_1). The higher density of weeds under conventional tillage was found due to prepared soil exposed the seed bank and geminated in higher numbers. Thus, higher population of weed under conventional tillage (T_1). However, the weed seeds under zero tillage + residue (T_3) or zero tillage (T_2) did not exposed the weed seed bank and not germinate due to compactions of soil resulted lower density of weeds.

Table 1: Effect of conservation tillage and weed management practices on Density of total weeds (No. m2) at various growth stage of wheat

Treatments	Total weeds density (No. m^2)		
	30 DAS	60 DAS	90 DAS
Tillage Practices			
Conventional tillage (CT)	12.65	14.49	15.56
Zero tillage (ZT)	7.79	8.50	9.19
Zero tillage + residue (ZTR)	6.72	6.89	7.27
SEm+	0.12	0.1	0.15
CD (P=0.05)	0.33	0.27	0.41
Weed management			
Weedy check	15.72	17.50	19.75
Metsulfuron 20% WP @ 20g a.i./ha (PoE)	8.50	9.76	9.88
2,4-D @ 38@EC@0.8kg a.i./ha (PoE)	9.38	10.78	10.89
Sulfosulfuron 75% WP @ 24 g a.i./ha	6.80	7.15	7.37
SEm+	0.11	0.09	0.14
CD (P=0.05)	031	0.28	0.40

Weed management affected the density of weeds statistically at all stages of crop growth. crop sprayed with post emergence herbicide like sulfosulfuron @ 25 g a.i./ha recorded the lower weed density/m^2 which was followed by metsulfuron @ 60 g/ha and 2,4-D @ 0.75 kg/ha. The lower density of weed under herbicide spray was mainly because of efficient control of weeds by sulfosulfuron followed by met sulfuron. As the experimental field was badly infested by grassy weeds which were efficiently controlled by sulfosulfuron or metsulfuron herbicides. However, 2, 4-D recorded higher density of weeds due to dominance of grassy weeds, became 2, 4-D controlled only broad leaved weeds.

The highest density of weeds was recorded with weedy check at all stages of crop growth owing to continuous emergence of weeds.

Weed dry weight (g/m^2)

The data on weed dry weight was recorded on 30, 60 and 90 Days after sowing were subjected to statistical analysis and are presented in Table 2.

An examination of the data presented in Table 2 revealed that the dry weight of weeds was increased with crop age and reached to maximum at 90 DAS in all treatments.

Tillage practices had significant effect on dry weight of weeds at all three stages. Crop sown in zero tillage + residue (T_3) observed the lowest dry weight of weeds (6.72, 9.73 and 24.70 g/m^2) in respective stage of data recording which was followed by zero tillage (T_2). The highest dry weight of weeds of recorded in conventional tillage (T_1) i.e. 9.90, 17.31 and 39.5 g/m^2 in respective stage.

The lowest dry weight of weeds under zero tillage + residue (T_3) or zero tillage was mainly due to the facts that under both tillage practices the seed bank was not exposed of due to untilled condition and hence, germination of weed seed was not take placed resulted lower density and dry weight of weeds.

Contrary to this, the seeds of weed were fully exposed off by repeated plouging during field preparations resulted higher germination of weeds and caused contributed to higher dry weight of weed under conventional tillage (T_1) treatment.

Table 2: Dry weight of weed (g/m^2) as affected by tillage practices and weed management at different stages.

Treatments	Dry weight of weed (q/ha)		
	30 DAS	60 DAS	90 DAS
Tillage Practices			
Conventional tillage (CT)	9.90	17.31	39.5
Zero tillage (ZT)	7.64	11.01	32.5
Zero tillage + residue (ZTR)	6.72	9.73	24.7
SEm±	0.21	0.41	0.8
CD (P=0.05)	0.84	1.3	2.9
Weed management			
Weedy check	8.60	21.3	54.7
Metsulfuron 20% WP @ 20g a.i./ha (PoE)	8.10	5.90	6.55
2,4-D @ 38@EC@0.8kg a.i./ha (PoE)	8.30	7.10	8.90
Sulfosulfuron 75% WP @ 24 g a.i./ha	8.00	5.10	6.15
SEm±	0.24	0.31	0.51
CD (P=0.05)	0.92	0.92	1.54

Turning to the effect of weed management practices on weed dry weight revealed that post emergence spray of Sulfosulfuron @ 25 G.I./ha recorded significantly the lowest dry weight of weeds (8.00, 5.10 and 6.15 g/m^2) in respective stages which was followed by metsulfuro @ 60 g a.i./ha (8.10, 5.90 and 6.55 g/m^2). Among, herbicide, post emergence spray of 2, 4-D @ 0.75 kg/ha observed the higher amount of weed dry weight (8.30, 7.10 and 8.9/m^2) respective stage. Weedy check recorded significantly the highest dry weight of weeds (8.60, 21.3, 54.7 g/m^2) in respective stage. The lowest weed dry weight under sulfosulfuron applied treatment was mainly due to effective control of broad leaved weeds along with grassy weeds resulted in efficient control and hena, lowest dry matter of weeds was affianced. Kholchar and Nepali, 2010 [2], Kaur *et al.*, 2017 [12], Mishra *et al.* (2021) [7]; Mishra *et al.* (2023) [8]; resported superiority of sulfosulfuron over other herbicide.

Conclusion

Conventional tillage (CT) find significant higher than other tillage practices under total weeds density (No. m^2) and Dry weight of weed (q/ha). Weedy check found significantly more suitable than other herbicides treatments under total weeds density (No. m^2) and Dry weight of weed (q/ha).

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