

Effect of Tillage and Weed Control Methods on Weeds and Wheat (*Triticum aestivum*) in Vertisols

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Wheat is the major winter season cereal crop grown in an area of about 27 million hectares in India under diverse agro-ecological conditions. It is rotated with rice (10.5 m ha^{-1}) in the Indo-Gangetic Plains (IGP). However, rice-wheat cropping system has become more fragile and system productivity is showing the sign of fatigue (Hobbs and Morris, 1996). In recent years, major emphasis in this system has been on resource conservation technologies to reduce the cost of production, energy consumption, soil degradation and environmental pollution and to increase the profit margin of the farmers. Zero tillage and bed planting have been widely adopted by the farmers in more than one million hectares area of IGP. The incentive for a change from conventional tillage to zero-tillage has come from three directions : improved profitability, productivity and sustainability of rice-wheat cropping system.

FIRBS (furrow irrigated raised bed-planting system) saves on fertilizer, seed and water and reduces weed incidence and crop lodging (Chauhan *et al.*, 2001).

Field studies were carried out at the National Research Centre for Weed Science, Jabalpur, India during winter season of 2001-02 to know the effect of different tillage practices on weeds and wheat yield. The soil was clay loam (Typic Chromusterts), low in available nitrogen (240 kg ha^{-1}), medium in available phosphorus ($42 \text{ kg P}_2\text{O}_5 \text{ ha}^{-1}$), and high in available potassium ($314 \text{ kg K}_2\text{O ha}^{-1}$), with organic carbon 0.56% and pH 6.6. Treatments comprised combinations of three tillage practices (zero tillage-ZT, conventional tillage-CT and furrow irrigated raised bed-planting system-FIRBS) in main plots and three weed control measures (weedy check, isoproturon at 1.0 kg ha^{-1} and isoproturon fb 1 hand weeding at 30 days after sowing-DAS) in sub-plots

Table 1. Effect of tillage and weed control methods on weeds at 90 DAS and grain yield of wheat

Treatment	Weed density (No. m^{-2})*				Weed dry weight* (g m^{-2})	Grain yield (kg ha^{-1})
	<i>C. album</i>	<i>P. minima</i>	Others	Total		
Tillage						
ZT	5.4 (29)	1.7 (2)	1.9 (3)	6.1 (37)	3.6 (12.5)	4761
CT	6.2 (38)	2.8 (7)	1.5 (2)	7.0 (49)	6.1 (36.7)	4275
FIRBS	7.4 (54)	3.1 (9)	1.6 (2)	8.8 (77)	6.8 (45.7)	3792
LSD (P=0.05)	NS	1.2	NS	NS	2.2	231
Weed control						
Weedy	10.1 (102)	3.3 (10)	2.0 (4)	11.6 (134)	7.6 (57.3)	4139
Isoproturon 1.0 kg	2.1 (4)	1.3 (1)	1.7 (2)	2.9 (8)	3.5 (11.8)	4425
HW at 30 DAS	6.8 (46)	3.0 (9)	1.3 (1)	7.5 (56)	5.3 (27.6)	4264
LSD (P=0.05)	2.7	0.9	0.7	1.8	1.8	223

*Data subjected to square root transformation ($x+0.5$). Values in parentheses are original.

NS-Not Significant.

were replicated four times in a split-plot design. ZT comprised planting directly with zero-till seed drill, CT consisted of disc ploughing once+cultivator twice+rotavator and planting and FIRBS consisted of planting directly on well prepared land as in case of CT with bed planter. Wheat (cv. WH 147) was sown on November 15, 2002. The crop was raised under irrigated condition with 120 kg N, 60 kg P₂O₅ and 60 kg K₂O ha⁻¹. Isoproturon was applied 25 DAS as post-emergence. Weed population and weed dry matter were recorded at 90 DAS.

The field was infested mainly with *Chenopodium album* (88.6%) and *Physalis minima* (8.5%). ZT reduced population of both the weed species as compared to CT and FIRBS but the difference was significant only in case of *P. minima*. Maximum population of both the weeds was obtained in FIRBS. ZT significantly reduced the total weed dry weight as compared to CT and FIRBS, which were at par with each other (Table 1). Isoproturon at 1.0 kg ha⁻¹ significantly reduced the population of both the weed species and total weed dry weight and was superior to hand weeding. The highest grain yield of wheat (4761 kg ha⁻¹) was

recorded from ZT followed by CT (4275 kg ha⁻¹) and FIRBS (3792 kg ha⁻¹). The lowest grain yield in FIRBS might be due to poor raised-bed formation and collapse of beds after flood irrigation due to heavy soil and higher infestation of weeds. Chauhan *et al.* (1999) also reported that FIRB system was not suitable for black cotton soils. Isoproturon resulted in the highest grain yield (4425 kg ha⁻¹) which was at par with hand weeding (4264 kg ha⁻¹) but significantly superior to weedy check (4139 kg ha⁻¹). The interaction effects between tillage and weed control methods were non-significant.

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