Short communication

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Production potential of soybean-wheat cropping system through weed management

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The benefits of tillage are multifaceted as it loosens soil, enhance release of nutrients from soil for plant growth, kill weeds and regulates the circulation of water and air through soil which lead to an enhanced nutrient uptake and better yield of crops. Weeds creating competition for nutrients, space, water *etc*. reduce the crop yield and deteriorate the quality of produce hence, reduce the market value of the turnout (Arif *et al*. 2006). The response of weed flora to different weed control methods also vary depending upon field situation. Tillage affects the weeds by uprooting, dismembering and burying them deep enough to prevent emergence by changing soil environment and so inhibiting weeds germination and establishment, thereby creating favorable soil environment for plant growth (Sawanton *et al*. 2000). Soybean is a miracle crop which is mainly grown for oil and is a good source of protein, used in cattle feeds. Weed infestation in soybean results in a loss of yields to the extent of 30-80 per cent (Yaduraju *et al*. 2002). Hence, an experiment was conducted to identify ideal method of weed management in soybean-wheat cropping system.

Field experiment was conducted at Weed Research Center Farm of M.A.U, Parbhani during *Kharif* and *Rabi* season of 2007, 2008 and 2009. The experiment was laid out in split plot design with three replications. The main plot consisted of tillage treatments including - zero tillage (ZT) - ZT, ZT - conventional tillage (CT), CT - ZT , minimum tillage (MT) - MT and CT - CT and sub-plots included weed control treatments, *viz.* two hand weedings, alachlor 2 kg/ha pre-emergence treatment (PE) in soybean/pendimethalin 1 kg/ha PE in wheat and weedy check in rotation. The gross plot size and net plot size was 10.0 x 2.7 m and 9.0 x 1.8 m, respectively. Soybean crop in *Kharif* was sown during first fortnight of July and wheat crop in *Rabi* was sown during last week of November. Recommended dose of fertilizers and plant protection schedule were followed for respective crops. The data were statistically analyzed using ANOVA and means were separated using LSD test at 5% level of probability.

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Effect on weeds in soybean

Lowest dry weight of grassy weeds was found in CT-CT tillage system during 2008, 2009, which was at par with MT-MT tillage and significantly superior over rest of the treatments in soybean (Table 1). Whereas during 2007 lowest biomass of grassy weeds was found in MT-MT tillage system, which was at par with CT-CT tillage. Lowest biomass of broad-leaved weeds at 60 DAS was recorded in CT-CT tillage system during 2007, 2008 and 2009 (2.89, 2.84 and 15.67 respectively), which was at par with MT-MT tillage (3.57, 3.20, 17.03, respectively).

Significant differences due to weed control treatments were recorded in weed biomass. The lowest biomass of grassy weeds was recorded in 2 hand weedings during 2007, 2008 and 2009 which was at par with alachlor 2.0 kg/ha PE. The lowest biomass of broad leaved weeds was recorded in 2 hand weedings during 2007, 2008 and 2009 (2.22, 3.09, 11.85 respectively), which was at par with alachlor 2.0 kg/ha PE and significantly superior over weedy check.

Effect on grain yield of soybean

Biomass of grassy weeds in MT- MT tillage system was found lowest during 2008 (2.80 g/m^2). During 2009, the lowest biomass of grassy weeds was recorded in CT-CT which was at par with MT-MT tillage system in wheat (Table 1).

The biomass of broad-leaved weed was found lowest in MT- MT tillage system and was at par with CT-CT and ZT-CT system during all the years of experimentation.

The lowest biomass of grassy and broad-leaved weeds was recorded in 2 hand weedings and was at par with alachlor 2.0 kg/ha PE and significantly superior over weedy check during 2007, 2008 and 2009.

During the year 2007, 2008 and 2009, grain yield loss due to unchecked weeds was 41, 36 and 41%, respectively. During 2007 and 2008, highest grain yield of soybean (3.08 and 2.92 t/ha) recorded in CT-CT treatment was at par with ZT-CT and MT-MT tillage system and found significantly superior over rest of the treatments (Table 2). Whereas, during 2009, the

Table 1. Dry weed weight as influenced by different treatments in soybean and wheat at 40 days after sowing

Treatment	Biomass of weeds in soybean (g/m^2)						Biomass of weeds in wheat (g/m^2)					
	Broad-leaved weeds			Grassy weeds			Broad-leaved weeds			Grassy weeds		
	2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Main plot (Tillage)*												
ZT-ZT	4.99	5.78	23.00	6.56	6.00	23.90	8.67	7.90	27.74	5.54	4.63	28.34
ZT-CT	4.08	4.90	18.72	5.63	4.98	19.40	7.07	5.84	22.20	3.96	4.40	23.12
CT-ZT	4.27	4.55	18.28	5.30	3.10	12.25	7.50	6.80	26.35	5.18	4.98	27.42
MT-MT	3.53	3.20	17.03	5.02	2.89	08.00	5.66	3.88	17.33	3.30	2.80	20.84
CT-CT	2.89	2.84	15.67	5.16	2.69	5.30	6.21	2.94	15.73	3.92	4.50	19.23
LSD (P=0.05)	1.72	0.45	4.68	NS	1.80	5.57	0.85	2.04	2.18	NS	0.80	4.22
Sub-plot (weed control methods)**												
Two hand weedings	2.22	3.09	11.85	1.42	2.10	7.58	5.15	4.00	14.28	3.85	3.66	18.04
Alachlor 2 kg/ha PE in soybean and pendimethalin 1 kg/ha PE in wheat	2.62	3.80	13.11	3.33	2.80	9.55	6.78	4.73	15.75	3.94	3.87	20.45
Weedy check	5.43	5.86	30.66	9.05	6.89	24.19	9.15	7.68	35.58	5.35	5.27	32.88
LSD (P=0.05)	0.67	0.53	3.12	1.18	1.11	2.62	0.65	1.30	1.68	0.95	0.57	3.68

*ZT = Zero tillage; CT = Conventional tillage; MT = Minimum tillage; ** PE = pre emergence treatment

Table 2. Soybean and wheat grain yield as influenced by different treatments

Treatment	Grain yield of soybean (kg/ha)			Grain yield of wheat (kg/ha)		
	2007	2008	2009	2007	2008	2009
Main plot (Tillage)*						
ZT-ZT	1.82	1.63	1.43	2.73	2.51	1.92
ZT-CT	2.09	1.97	1.61	2.99	2.75	2.31
CT-ZT	2.90	2.74	2.11	2.98	2.61	2.08
MT-MT	2.78	2.50	2.27	3.35	3.48	2.74
CT-CT	3.08	2.92	2.53	3.09	3.23	2.83
LSD (P=0.05)	0.41	0.21	0.43	0.30	0.29	0.33
Sub-plot (weed control methods)**						
Two hand weedings	2.88	2.74	2.34	3.32	3.02	3.19
Alachlor 2 kg/ha PE in soybean and pendimethalin 1 kg/ha PE in wheat	2.87	2.57	2.23	3.22	2.97	3.10
Weedy check	1.85	1.75	1.39	2.59	2.77	2.22
LSD (P=0.05)	0.29	0.23	0.14	0.31	0.23	0.39

*ZT = Zero tillage; CT = Conventional tillage; MT = Minimum tillage; ** PE = pre emergence treatment

highest grain yield of soybean (2.53 t/ha) was recorded by CT-CT tillage system which was found at par with MT-MT tillage system and significantly superior over rest of the treatments.

During 2007, 2008 and 2009, highest grain yield values were recorded under two hand weedings treatment which was at par with alachlor 2 kg/ha PE and was significantly superior over weedy check. Effect on weeds in wheat

Effect on grain yield of wheat

During the year 2007 and 2008, the maximum grain yield of wheat (Table 2) was recorded in MT-MT (3.35 and 3.48 t/ha, respectively) followed by CT-CT tillage system. Whereas during 2009, highest grain yield (2.83 t/ha) of wheat was recorded in CT- CT treatment which was at par with MT- MT tillage system (2.74 t/ha).

Two hand weedings treatment resulted in highest grain yield and straw yield, which was found at par with pendimethalin 1 kg/ha PE and significantly superior over weedy check during 2007, 2008 and 2009.

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