

Short Communication

Effect of tillage practices on wheat productivity, water use efficiency and economics under limited water supply condition

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Rice wheat is dominated cropping system in India and is grown in 10.4 million hectare in India with 74% of the total food grain production of the country. Sowing of wheat after rice crop required more tillage for fine seedbed preparation. The energy input, time and cost of seedbed preparation for wheat in paddy soil is high. Also with greater intensity of tillage, the repeated movement of traffic on soil causes mechanical compaction and deterioration of soil structure. Several yield reducing and yield limiting factors including delayed planting of wheat shortage of energy, labour and other input resistance of *Phalaris minor* weed to isoproturon and crop residue burning have contributed to stagnating or declining productivity and sustainability of the system. Hence an on farm trial was laid out to study the tillage practices on growth, yield, WUE weed intensity and economics of wheat in rice- wheat cropping system under limited water

supply condition.

An on farm trial was conducted under RCT project at Majhganva village of Gorakhpur during *rabi* 2004-05 and 2005-06. The experiment was laid out in randomized block design with 5 treatments, replicated 5 times. The treatments included T₁- Zero tillage sown with control traffic machine+ 2 irrigation, T₂- Reduced tillage sown with CT machine+ 2 irrigation, T₃- conventional tillage sown with CT machine+ 2 irrigation, T₄- Conventional tillage sown by broad casting+ 2 irrigation T₅- Conventional tillage sown by broad casting+ 4 irrigation. The experimental field was low land loam in texture with pH 7.5. The soil was low in organic carbon (0.31 %) and available nitrogen (215Kglha), Phosphorus (8.8 Kg/ha) and medium in potassium (194 Kg/ha). Fertilizer cum seed drill especially designed for Zero tillage condition using control traffic principle adopted from border method.

Table 1 : Effect of tillage practices on wheat productivity and economics.

Treatments	Effective tillers (m ²)	No. of grains/ear	Test wt. (g)	Grain yield (q/ ha)	Net return (Rs/ ha)	B:C ratio	Water applied (/ha/cm)	W.U.E.	Population of phalaris minor (/m ²)at 30 DAS
T ₁ - Zero till + 2 irrigation (sown with CTM)	365	43.2	37.5	39.5	13616	2.05	22.67	174.2	5.84
T ₂ - Zero till + 2 irrigation (sown with CTM)	356	42.6	35.2	37.8	11652	1.85	26.51	142.6	6.6
T ₃ -Conventional tillage+ 2 irrigation (sown with CTM)	344	40.5	35.5	36.1	9888	1.69	29.42	122.7	8.3
T ₄ - Conventional tillage + 2 irrigation (sown with CTM)	327	35.4	32.3	30.3	5095	1.33	30.55	99.2	8.5
T ₅ - Conventional tillage + 4 irrigation (sown with CTM)	338	36.0	33.9	34.7	5103	1.28	53.45	64.9	8.7
CD at 5%	11.5	2.1	1.6	2.4	-	-	4.2	14.1	0.9

CT= Control traffic machine. Data was transformed X + 0.5, original values are under parenthesis

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Fertilizers were applied @ 120 Kg N 60 Kg P_2O_5 and 60 Kg K_2O /ha.

Wheat sown with Zero tillage + 2 irrigation (T_1) on a par with reduced tillage + 2 irrigation (T_2) recorded significantly higher grain yield over other tillage practices owing to higher number of effective tillers, more number of grains/ ear and test weight. This might be due to 8 days advanced sowing, placement of fertilizer by machine and less weed population compared to conventional tillage. These findings are in accordance with those of Tripathi and Chauhan (2001), Reduced tillage + 2 irrigation (T_2) and conventional tillage sown with CT machine + 2 irrigation on a par with each other and produced significantly superior yield attributes and grain yield than conventional tillage sown by broad casting + 2 irrigation (T_4) and conventional tillage sown by broad casting + 4 irrigation. Later treatment (T_5) gave significantly higher grain yield than conventional tillage sown by broad casting + 2 irrigations.

Synonymous to grain yield zero tillage wheat (T_1) recorded highest net return (Rs.13616/ha) and benefit: cost ratio (2.05) which was Rs. 1964,3728 , 8521 and 8513 the higher net return than reduced tillage (T_2), conventional tillage sown with CT (T_3), conventional tillage sown by broad casting + 2 irrigation (T_4) and conventional tillage +4 irrigation (T_5) respectively. These finding confirms the results of Singh and Pandey (2004).

Conventional tillage sown by broad casting + 4

irrigation (T_5) noticed higher net return over conventional tillage sown by broad casting + 2 irrigation (T_4) while benefit cost ratio was higher in later treatment. Highest water use efficiency (174.23 Kg/ha-cm) was recorded with zero till wheat which was significantly superior over rest of tillage practices combined with method of sowing and irrigation. Lowest population of *Phalaris minor* was also recorded with zero till wheat followed by reduced tillage which were significantly lower than rest of the treatments. Similar population of *Phalaris minor* was noticed in conventional sowing of wheat whether it is sown by control traffic or broad casting method applied 2 or 4 irrigation.

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