

Response of Varieties and Zero-Tillage Device on Grain Yield of Wheat in Rice-Wheat Cropping System in the Indo-Gangetic Plain Zone of UP

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Abstract

An on farm trial conducted at farmer's field during 2004-2005 and 2005-2006 in the Indo-Gangetic plain zone of Mirzapur district showed that sowing of wheat variety HUW 510 by zero till ferti seed drill brought about significantly higher seed yield (47.61 q/ha) as compared to varieties HUM 468, HD 2285 and UP 2338 which yielded about 44.93, 37.83 and 35.75 q/ha respectively. When the zero till device was used in combination with herbicides isoproturan and 2,4-D the population of weeds like *Phalaris minor*, *Chenopodium album*, *Lathyrus aphaca*, *Melilotus alba* and *Launia pinnatifida* was drastically reduced by 56 and 48% during 2004-2005 and 2005-2006 respectively as compared to the traditional practice which had a weed population of 65/m² (dry weight 10.66 q/m²).

Key words : Response of varieties, Zero-tillage device, Grain yield, Wheat.

Mirzapur is agriculturally and socially one of the most backward district of UP. The average yield of most of the crops in the district is below the average national and state level yield due to diversified agricultural problems like use of old varieties, poor soil fertility due to excessive soil erosion, poor fertilizer and plant protection measures. The district is divided into two agro-climatic zones viz. The Indo-Gangetic plain zone and Vindhayn zone. The Karhat village, where the on farm trial was conducted, falls under Indo-Gangetic plain zone. In this zone 45% of area is covered under irrigation and the farmers mainly adopt rice-wheat cropping system. Irrigation is done through canal, tubewells, minor irrigation structures like water harvesting bunds, ponds. A socio-economic survey was performed through participatory rural appraisal tool to study the socio-economic conditions of the farmers and their specific problems related to cultivation. The survey revealed that the main reason for low productivity in the area was adoption of low potential rice varieties like tall mahsuree and BPT 5204 which are disease sensitive but have greater market value. Some farmers grow high yielding variety like Swarna but do not manage it properly. The other causes of low yield of BPT 5204 variety were infestation of blight at jointing stage, lower plant population (25—

36 hills/m²) and transplantation of 30–35 days older seedlings. During *rabi* season farmers, in general grow late sown wheat variety, HUW 234 in these areas which is a very old variety and do not yield much compared to some potential varieties developed for the area. Some of the major problems of low yield of wheat in this area were delayed sowing of wheat crop, problems of weeds, and imbalance use of nutrient such as 60-80 kg/ha of diammonium phosphate at transplanting/sowing followed by one or two split applications of urea (40 kg/ha) in both the crops. The delay in wheat sowing was mainly because of late harvest of preceding paddy crop. It was realised that the conditions of the area are ideal for use of zero till drill which can help escape the late sowing of wheat and some of the other problems like excessive incidence of *Phalaris minor* and water scarcity problem to some extent. After diagnosing the problem of the area a field of a farmer from village Karhat was selected. The survey resulted a weed population of 65 weeds / m² (10.66 q/m² dry weight) in wheat crop (Table 1) before sowing of wheat crop by zero-till drill. *Cynodon dactylon*, *Phalaris minor*, *Melilotus alba*, *Lathyrus aphaca* and *Chenopodium album* were the major weeds of wheat crops. In the local term motha, senwai, makhana, chirchiri, dadmari, patharchatta,

Table 1. Identification of weeds and their number before commencement of the on farm trial (traditional). Average no. of weeds 65/m² and dry weight of weeds 10.66 g/m². No. of doob grass (*Cynodon dactylon*) was calculated on the basis of three nodes length.

Farmer No. /Year	Practice	Type of weeds	No. of weeds/ m ²	Average weeds/ m ²
1 (2004-2005)	Traditional	<i>Phalaris minor</i>	19	65
		<i>Chenopodium album</i>	11	
		<i>Lathyrus aphaca</i>	07	
		<i>Melilotus alba</i>	07	
		<i>Cynodon dactylon</i>	21	
		<i>Phalasis</i>	18	
		<i>Chenopodium album</i>	10	
Same farmer (2005-2006)	Traditional	<i>Lathyrus aphaca</i>	07	62
		<i>Melilotus alba</i>	07	
		<i>Cynodom dactylon</i>	20	

doob and kans were the *kharif* weeds whereas jangali menhandee, genhusa, mataree, vanmethi, bathuwa, bangobhee, chaulai, hirankuhree and banpyazee were the *rabi* weeds. To overcome the problems the problems of late sowing of wheat crop, zero tillage ferti-seed drill was introduced in the area for advancing the sowing by 7—12 days. The cost of cultivation was also substantially reduced due to the use of the machine. Five wheat varieties i.e. HUW 234, HUW 468, HUW 510, HD 2285 and UP 2338 were taken for the on-farm trial.

Methods

Late sown five wheat varieties i. e. HUW 234, HUW 468, HUW 510, HD 2285 and UP 2338 were selected for the trial. The soil of the field was clay loam where all these varieties were directly sown after harvest of rice crop; 100 kg diammonium phosphate (DAP) was applied at the time of sowing after which two split doses of urea were broadcasted at tillering and jointing stages of the crop. Three irrigations were given at tillering, jointing and milking stages of wheat crop. Sowing was done on 3 December 2004 and 5 December 2005 in randomized block design with four replications by zero-till drill. Isoproturan and 2,4-D

weedicides were used at 21 days after sowing in both the years; 120 kg/ha of seed was applied at the time of sowing. The crop was harvested on 12 April 2005 and 15 April 2006 and the yields was recorded after threshing.

Results and Discussion

Growth Parameter

Sowing of wheat variety HUW 510 with zero tillage device brought about higher number of tillers per plant (2.26 tillers/plant) as compared to other varieties (Table 2). The number of leaves per plant was observed to be 7 and 14.91 leaves per plant at 25 and 65 days after sowing. With regard to dry weight per plant it was found to be 1.72 g/plant by HUW 510 variety at 65 after sowing.

The root, tiller emergence and leaf area were better in the variety HUW 510 followed by HUW 468 and UP 2338 in both the years of the trial.

Dry weight per plant was also higher in HUW 510 and HUW 468. The varieties HD 2285 and UP 2338 showed less dry weight at 25 and 65 days after sowing.

Type and Number of Weeds

Several demonstrations were conducted at farmers field for popularising the zero-tillage sowing during 2004-2005 and 2005-2006 (Tables 1 and 2). During 2004-2005 an average 65 weed m² (dry weight 10.66 g/m²) were recorded in traditional practice before commencement of the on-farm trial. After introduction of zero till drill along with one spraying of isoproturon and 2,4-D in combination the total number of weeds decreased by 56% in the first year. During the second year of seeding by zero-tillage device, the total number of weeds reduction enhanced upto 71%. The high reduction of weeds in the second year as compared to the first year could probably be attributed to the more number of weeds buried in the deeper soil layers. It is reported that zero-tillage seeding device decreases the total number of weeds as compared to frequent ploughed field (1).

Grain Yield

Sowing of HUW 510 wheat varieties with zero-

Table 2. Impact of zero-tillage ferti seed drill and weedicide (isoproturon and 2, 4-d) on the number and type of weeds at farmers field in the Karhat villae of Jamalpur block of Mirzapur district. Isoproturan and 2, 4-D spraying were applied at 30 days after sowing.

Farmers No./ Year	Type of weeds	No. of weeds/m ²	Per cent reduction in weeds population compared to tradinational practice
1 (2004-2005)	<i>Phalaris minor</i>	10	45
	<i>Chenopodium album</i>	04	
	<i>Lathyrus aphaca</i>	09	
	<i>Melilotus alba</i>	03	
	<i>Cynodon dactylon</i>	11	
Same farmer (2005-2006)	<i>Phalaris minor</i>	6	71
	<i>Chenopodium album</i>	—	
	<i>Lathyrus aphaca</i>	7	
	<i>Melilotus alba</i>	—	
	<i>Cynodon dactylon</i>	5	

tillage seeding device brought significantly higher grain yield in both the years of the trial. The yields were 48.72 and 46.50 q/ha during 2004-2005 and 2005-2006, respectively. The average yield was 47.61 q/ha (Table 2). HUW 468 brought about 44.93 q/ha of grain yield which was significant at 5 % level of significance but at par with HUW 510 at 1% level of significance. It has also been reported that sowing of wheat with zero-tillage seeding device brought about 0.2 to 1.16 q/ha higher seed yield of wheat crop as compared to traditional sowing (2).

References

1. Anonymous. 2001. Biotechnology : Global update 2001. Conservation tillage helps farmers cut costs. Confed. Indian Indust & Dep. Biotech., Min. Sci. & Tech. Govt. India 3 : 1—4.
2. Singh B. R., A. K. Katiyar. Sukhdev and A. Kumar. 2000. Use of zero tillage ferti-seed-drill for direct sowing of wheat crop under rice wheat cropping system, Indian fmg. 50 : 25—27.