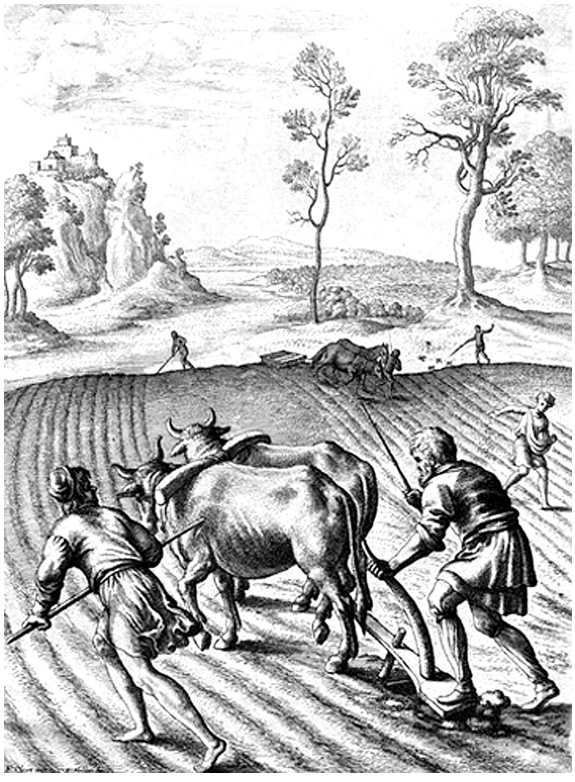
ISSN : 1812-5379 (Print)
ISSN : 1812-5417 (Online)
http://ansijournals.com/ja

JOURNAL OF AGRONOMY



ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Agronomy 2 (2): 109-112, 2003
ISSN 1680-8207

First Irrigation and Nitrogen Application in Zero-Tillage Wheat

Imtiaz Hussain, M. Aslam, S.K. Tanveer, M. Sohail and N.S. Kissana
Wheat Programme, National Agricultural Research Center, Islamabad, Pakistan

Abstract: Direct drilling of wheat in to rice stubbles through zero tillage drill has eliminated the time for land preparation and improved crop stand establishment. In rice-wheat area, the adoption of zero-tillage is growing with the passage of time. The study was performed in Kala Shaha Kaku and Muridkay during 1998-99 to determine the optimum time for first irrigation and nitrogen application in zero tillage wheat in rice-wheat area of Punjab. In the first trial, the treatments included first irrigation at sowing, at emergence, two weeks after emergence and four weeks after emergence. In the second trial, treatments included all nitrogen dressed at sowing, half nitrogen dressed at sowing and half at first irrigation and all nitrogen broadcasted at first irrigation and all nitrogen broadcasted at sowing. The results indicated that emergence, tillering, grain and biological yield was significantly higher when the first irrigation was applied 2 to 4 weeks after emergence. Timing of nitrogen application did not significantly affect the heads per m^2, grain yield and biological yield of zero tillage wheat. However, the split application of urea at planting and at first irrigation could improve zero tillage wheat production.

Key words: Zero-tillage, first irrigation, nitrogen, yield

Introduction

The rice-wheat zone of Punjab covers 1.1 million hectare in the district of Sialkot, Gujranwala, Sheikhupura, Lahore, Kasur, and Gujrat. In this area, 72% of wheat is grown in rotation with rice and wheat yield are low in comparison with those of the other cropping systems in Punjab (Hamid ***et al.***, 1987).

In the rice-wheat ecology, poor wheat yield were attributed to late planting because of late maturing rice cultivars and time required for land preparation. The other reasons of lower wheat yield include the broadcasting of wheat and improper crop management. The conventional wheat planting system in rice-wheat did not ensure timely planting of wheat, which reduces crop establishment and yield. Direct drilling of wheat directly in to rice stubble through zero tillage drill eliminated the time for land preparation and improved crop stand establishment (Byerlee, 1984). Timely planting of wheat after rice resulted in 10 percent higher wheat grain yield in rice-wheat area of the Punjab (Aslam ***et al.***, 1993).

In rice-wheat cropping system, most of the wheat is planted in wad water (residual moisture) and first post planting irrigation is applied with average interval of 27 to 30 days after planting (Byerlee ***et al.*** 1984; Aslam ***et al.***, 1989). In zero tillage planted wheat, the seed is planted in

residual soil moisture. Lack of land preparation operation results in more moisture conservation, therefore, the timing of first post planting irrigation is an important issue. In adoption of zero tillage, there was low response of surface fertilizer application, which also need special attention. This study was, therefore, undertaken to determine the optimum time for first irrigation and nitrogen application in zero tillage wheat in rice-wheat area of Punjab.

Materials and Methods

These experiments were performed on farmer's fields in Kala Shaha Kaku and Muridkay during 1998-99. In this area of the Punjab, the dominant cropping system is rice-wheat. In the study, no land preparation was done and wheat was planted with zero-tillage drill after rice harvesting. Seed rate, amount of fertilizer and other agronomic practices were performed as per recommendations. In the first trial, the treatments included first irrigation at sowing, at emergence, two weeks after emergence and four weeks after emergence. In the second trial, treatments included all nitrogen dressed at sowing, half nitrogen dressed at sowing and half at first irrigation, all nitrogen broadcasted at first irrigation, all nitrogen broadcasted at sowing. In both trials, the treatments were replicated three times.

The wheat emergence was recorded from one square meter area of each plot randomly. However, heads per m^2, grain yield and biological yield were recorded from 4m X 1m area sample. Data were analyzed with the MSTAT statistical package using RCBD (Randomized Complete Block Design) and means were compared (Steel and Torrie, 1980).

Results and Discussions

Significant differences in wheat emergence, heads per m^2, grain and biological yield of wheat due to timing of first irrigation application were observed (Table 1). First irrigation application at sowing resulted in poor emergence of zero-till wheat. However, wheat emergence was significantly higher when the first irrigation was applied 2 to 4 weeks after emergence (Table 1). Irrigation at sowing resulted in crust formation, which ultimately hindered the emergence of wheat seedlings. It also showed the advantage of wheat sowing in optimum moisture condition.

Timely and better emergence of wheat contributed toward better crop growth and production. The application of irrigation at the time of sowing also resulted in lower number of heads per m^2, grain and biological yield as compared to other treatments. Significantly higher number of heads, grain and biological yield was observed when the first irrigation was applied 2-4 weeks after emergence (Table 1).

The results of this study showed that the best time for first irrigation application in zero-tillage wheat would be between two to four weeks after emergence. The wheat sown in rice stubbles has enough moisture for crop emergence. In this situation, application of irrigation after sowing would not only curtail the emergence, but also reduce the wheat grain yield. When the first irrigation was applied during second to fourth week after emergence in zero tillage wheat, residual moisture from previous rice crop was used efficiently and better yields were obtained.

Table 1: Effect of first irrigation timing on zero-tillage wheat

Treatments	Emergence No / m^2	Heads per m^2	Grain Yield (Kg ha^{-1})	Biological yield (Kg ha^{-1})
At sowing	121	184	3188b	8375
At emergence	142	222	3708ab	9520
2 weeks after emergence	143	224	4103a	10207
4 weeks after emergence	163	238	3875a	9375

Table 2: Effect of timing of nitrogen application in zero-tillage wheat

Treatments	Emergence No / m^2	Heads/m^2	Grain Yield (Kg ha^{-1})	Biological yield (Kg ha^{-1})
All N dressed at sowing	138b	183a	3230a	8332a
½ N dressed at sowing and ½ at 1st irrigation	169a	185a	3250a	8000a
All N broadcast at 1st irrigation	172a	192a	3188a	8355a
All N broadcast at sowing	145b	183a	3105a	8145a

In the fertilizer study, application of all nitrogen at sowing significantly reduced the wheat emergence (Table 2). However the timing and method of nitrogen application did not significantly affect the heads per m^2, grain yield and biological yield of zero tillage wheat (Table 2).

The application of all nitrogen at planting reduces germination because of its burning effect due to seed and fertilizer contact in soil. On the other hand, splitting nitrogen dose in to two or delaying its application can help in achieving better wheat emergence in zero tillage wheat. As the sources of nitrogen include urea, the application of half nitrogen at sowing and other half at first irrigation would not only minimize nitrogen losses but would also improve the grain yield. The study supported the view that nitrogen can be conveniently broadcasted at the first irrigation without any loss to grain yield (Majid ***et al.***, 1987).

The results of this study concluded that the best time for the first irrigation application in zero-tillage wheat would be between two to four weeks after emergence. The application of irrigation at the second to fourth week after emergence would result in efficient utilization of residual moisture from previous rice crop.

While applying nitrogen in zero-tillage wheat, following points should be kept in mind.

- If source of nitrogen is urea then very little should be applied at sowing, other may be split for application at the first and second irrigation.
- To avoid burning effect, nitrogen fertilizer other than urea should be used at planting.

References

Aslam, M., A. Majid, N.I. Hashmi and P.R. Hobbs, 1993. Improved wheat yield in the rice-wheat cropping system of the Punjab through zero tillage. Pak. J. Agric. Res., 14: 8-11.

Aslam, M., A. Majid, P.R. Hobbs, N.I. Hashmi and D. Byerlee, 1989. Wheat in the rice-wheat cropping system of the Punjab: A synthesis of on-farm research results 1984-1988. PARC/CIMMYT. Pakistan Agricultural Research Council (PARC), Islamabad, Pakistan, pp: 89-3.

Byerlee, D., A.D. Sheikh, M. Aslam and P.R. Hobbs, 1984. Wheat in the rice based farming systems of the Punjab: Implications for research and extension. National Agricultural Research Center, Islamabad, Pakistan.

Hamid, N.T., Pinckney, A. Valdes and S. Gnaegy, 1987. The wheat economy of Pakistan: Setting and prospects, Islamabad. Government of Pakistan. International Food Policy Research and Ministry of Food and Agriculture.

Majid, A., M. Aslam, N.I. Hashmi and P.R. Hobbs, 1987. "Potential use of minimum tillage in wheat after rice." In Wheat Production Constraints in Tropical Environments, Ed. A.R. Klatt, Mexico, D.F., pp: 71-77.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and procedures of statistics. 2nd Ed., McGraw-Hill Book Co. Inc., New York, USA.