International Journal of Agricultural Sciences ISSN: 2167-0447 Vol. 5 (3), pp. 533-535, May, 2015. Available online at www.internationalscholarsjournals.org

Full Length Research Paper

A study on the response of varied sowing dates on the yield and yield components of direct seeded fine rice *(Oryza sativa L.)*

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Accepted 17 April, 2015

The research was conducted to study the response of yield and yield components of direct seeded fine rice (*Oryza sativa* L.) to different sowing dates during 2008 at Agronomic Research Area, University of Agriculture Faisalabad. Experiment was laid out in a randomized complete block design with three replications having net plot size of 4 x 3 m. Experiment comprised of six different sowing dates that is 31st May, 10th June, 20th June, 30th June, 10th July and 20th July. Experiment was sown in 20 cm apart rows with single row hand drill using seed rate of 75 kgha^{-1}. Nitrogen and phosphorous were applied at the rate of 120 and 60 kgha^{-1} respectively. Urea and diammonium phosphate (DAP) were used as sources of nitrogen and phosphorus respectively. Full dose of the phosphorous and half dose of the nitrogen were applied at sowing while the remaining half dose of nitrogen was applied in two equal splits, at 20-30 days and 45-55 days after sowing (DAS). Yield components like tillers per meter square, number of kernel per panicle and 1000-kernel showed significant response to different sowing dates. The crop sown on 20th June (D_3) produced the maximum number of productive tillers per meter square (328.7), kernel per panicle (94.47). 1000-kernel weight (18.82 g) and paddy yield (4468 kgha^{-1}). The result showed that the direct seeding of super basmati on 20th June gave the best results in term of entire yield and yield components.

Key words: Direct seeding, fine rice, sowing dates, yield and yield components.

INTRODUCTION

Rice (*Oryza sativa* L.) is a major food of the world and more than half of the population subsists on it. It is the main livelihood of rural population living in subtropical and tropical Asia and hundreds of millions people living in Africa and Latin America. It contains a number of energy rich compounds such as carbohydrates, fat, protein and reasonable amount of iron, calcium, thiamine, riboflavin and niacin (Juliano, 1993). In Pakistan next to wheat, rice is the second important food crop. Pakistan is 12th largest rice producing country. The area and production under rice is 2,515,000 ha and 5,563,000 tones respectively and the average yield is 2211 Kgha^{-1} (GOP, 2008). The common method of rice cultivation in Punjab is transplanting the nursery which is very laborious and time consuming job. The high cost of farm labor invariably delays transplanting and often leads to the use of aged seedling. To overcome these problems, the method of direct seeding is evolved. Direct seeding is an attractive and sustainable alternative to traditional transplanting of rice.

Direct seeding offers such advantages as faster and easier planting, reduced labor, earlier crop maturity by 7–10 days, more efficient water use and higher tolerance of water deficit, less methane emission and often higher profit in areas with an assured water supply. The sowing date for direct seeding of rice plays vital role in improving its growth and increasing the yield. The sowing time of the rice crop is important for three major reasons. Firstly, it ensures that vegetative growth occurs during a period of satisfactory temperatures and high levels of solar radiation. Secondly, the optimum sowing time for each cultivar ensures the cold sensitive stage occurs when the minimum night temperatures are historically the warmest (late January to early February). Thirdly, sowing on time guarantees that

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Table 1. Effect of different sowing dates on yield and yield components of direct seeded fine rice.

Sowing dates	Productive tillers per meter square	Kernel per panicle	1000-kernel weight	Grain yield ($kgha^{-1}$)
31st May	301.0 c	84.6 c	16.5 c	3562 c
10th June	317.0 b	90.2 b	17.4 b	3964 b
20th June	328.7 a	94.4 a	18.8 a	4468 a
30th June	287.0 d	79.2 d	15.2 d	2852 d
10th July	270.0 e	73.2 e	14.4 e	1908 e
20th July	256.3 f	67.2 f	13.4 f	1347 f
LSD value	3.404	1.85	0.28	94.65
CV (%)	0.64%	1.25%	0.99%	1.72%

grain filling occurs when milder autumn temperatures are more likely, hence good grain quality is achieved (Farrell et al., 2003). The delayed sowing result in the poor emergence and reduced heading panicle per meter square and spikelets per panicle and ultimately yield is affected (Hayat et al., 2003) .The present study was therefore conducted to determine the effect of different sowing dates on the yield and yield components of direct seeded fine rice.

MATERIALS AND METHODS

Experiment was laid out in a randomized complete block design with three replications. Net plot size was of 4 x 3 m. Experiment was comprised of six different sowing dates that is 31st May, 10th June, 20th June, 30th June, 10th July and 20th July. Crop was sown with a single row hand drill using a seed rate of 75 $kgha^{-1}$ in 20 cm apart rows. Nitrogen and phosphorus were applied at the rate of 120-60 $kgha^{-1}$ to all the treatments. Urea and diammonium phosphate (DAP) were used as sources for nitrogen and phosphorus. Half of nitrogen along with full dose of phosphorus was applied in two equal splits, at 30 days and 55 DAS. Data on following observations was recorded during the course of study by using standard procedures. The parameters include the number of productive tillers per meter square, number of kernel per panicle, 1000-kernel weight (g), and paddy yield ($kgha^{-1}$) and economic analysis.

RESULTS AND DISCUSSION

Number of productive tillers per meter square

The data regarding the number of productive tillers per meter square is given in Table 1. It is evident from the data that number of productive tillers per meter square was affected significantly by different sowing dates. The crop sown on 20th June (D_3) produced the maximum number of productive tillers per meter square **(**328.7) followed by 10th June (D_2) sowing with 317.0 number of tillers per meter square. The lowest number of productive tillers per meter square **(**256.3) was observed when rice was sown on 20th July (D_6). This showed that total number of productive tillers gradually decreases as the sowing was done before 20th June or delayed after 20th June. This increase in number of productive tillers per meter square at 20th June sowing was attributed due to the favorable environmental conditions which enabled the plant to improve its growth and development as compared to other sowing dates.

These results are similar to that of Pandey and Agarwal, 1991 and they indicated that different sowing dates had significant effect on number of fertile tillers per meter square. These results are also in line with Rakesh and Sharma (2004) who are of the opinion that delay in planting resulted in significant decrease in number of productive tillers per meter square and ultimately the paddy yield.

Number of kernels per panicle

The data regarding the number of kernels per panicle is presented in Table 1. It is evident from the data that number of kernels per panicle was affected significantly by different sowing dates. The crop sown on 20th June (D_3) produced the maximum number of kernels per panicle (94.4) followed by 10th June (D_2) sowing giving 90.2 numbers of kernels per panicle. The lowest number of kernels per panicle (67.2) was observed when rice was sown on 20th July (D_6). This showed that number of kernels per panicle gradually decreases as the sowing was done before 20th June or delayed after 20th June. These results are similar to that of Akram et al. (2007) and Kameswara and Jackson (1997) who reported that number of kernels per panicle were significantly affected as sowing date is delayed. However these results are contrary to that of Habibullah et al. (2007), who reported that sowing date had no significant effect on number of grains per panicle.

1000-Kernel weight (g)

The data regarding the 1000-kernel weight (g) are given in Table 1. It is evident from Table 1 that 1000-kernel weight

Table 2. Economic analysis regarding the effect of different sowing dates on yield and yield components of direct seeded fine rice.

Sowing dates	Gross income (Rs)	Total expenditure (Rs)	Net benefit (Rs)
31st May	96179	45070	51109
10th June	107025	44205	62820
20th June	120623	43341	77282
30th June	77004	42476	34528
10th July	51520	41612	9908
20th July	36369	40747	-4378

(g) was affected significantly by different sowing dates. The crop sown on 20th June (D_3) produced the maximum 1000-kernel weight (g) (18.8) followed by 10th June (D_2) sowing giving 17.4 1000-kernel weight (g)**.** The lowest 1000-kernel weight (g) 13.4 was observed when rice was sown on 20th July (D_6). This showed that 1000-kernel weight gradually decreases as the sowing was done before 20th June or delayed after 20th June. This showed that the environmental conditions like temperature, humidity was most favorable for grain development during 20th June as compared to other sowing date. These results are in line with that of Tari et al*.* (2007) and they reported that effect of sowing date on 1000-kernel weight (g) was significant at 0.01 probability level.

Grain yield (kgha^{-1})

The data regarding the grain yield (kgha^{-1}) are given in Table 1. It is evident from Table 1 that grain yield (kgha^{-1}) was affected significantly by different sowing dates. The crop sown on 20th June (D_3) produced the maximum grain yield (4468 kgha^{-1}) followed by 10th June (D_2) sowing giving 3964 kgha^{-1} grain yield. The lowest grain yield (1347 kgha^{-1}) was observed when rice was sown on 20th July (D_6). This showed that the grain yield gradually decreases as the sowing was done before 20th June or delayed after 20th June. The higher yield in case of sowing on 20th June was attributed to increased cumulative mean value of temperature and sunshine hour due to early sowing, more number of productive tillers, more number of kernels per panicle, and increase 1000-kernal weight.

These results are in line with that of Iqbal et al*.* (2008) who reported that the highest yield (4-5 tha^{-1}) was obtained when the rice crop was sown earlier in the season. Similarly, according to Baloch et al*.* (2006) among planting dates, June 20th planted crop gave highest paddy yield.

Economic analysis

Data pertaining to economic analysis is given in Table 2. A perusal of Table 2 indicated that maximum net income of Rs 77282 was recorded when rice was sown on 20th June. High net income was due to high paddy yield and straw yield as well as due to fewer pest attacks thereby reducing the additional cost of inputs in terms of pesticide application. This was followed by the rice sown at 10th June and 31st May giving net income of Rs 62820 and 51109 respectively.

The minimum net income of Rs 9907 was observed when rice was sown on 10th July. However a loss of Rs 4378 was observed when the rice was sown on 10th July. This showed that the net benefit gradually decreased as sowing was done after 20th June and later on. Seeding rice before the predicted optimum periods would lengthen the time between seeding and emergence; increase production costs from the use of recommended seed treatments, higher seeding rates; a longer period for pest control and possibly result in poor stand establishment (Slaton et al., 2007).

Conclusion

The conclusion drawn from this investigation is that, the sowing dates significantly affects the entire yield and yield components of direct seeded fine rice. The result showed that the direct seeding of super basmati on 20th June gave the best results in term of entire yield and yield components.

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