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EFFECT OF VARIOUS PLANTING TECHNIQUES ON YIELD AND YIELD COMPONENTS OF RICE

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ABSTRACT

To study the effects of planting techniques on performance of rice, multilocational trials were conducted at Pindi Rattan Singh, Kot Nazir and PARC farm Kala Shah Kaku during 2009. Eight planting methods viz; drilling of soaked seed in wattar condition, drilling on beds and furrow, drilling on beds, Planting on beds & furrow, transplanting on beds, line transplanting in a well puddled soil, conventional transplanting and parachute transplanting were tested. The highest plant height (123.70 cm), productive tillers (264.67/m^2), paddy yield (3.90 t/ha) and cost benefit ratio (1.29) were observed in line transplanting method. Minimum paddy yields (3.07 t/ha) were obtained from drilling on beds. The highest profit was obtained from line transplanting so it was the method ensuring maximum benefit to the producer.
Key words: Planting techniques, Rice, Production, cost benefit.

INTRODUCTION

Rice is an important cereal crop after wheat in Pakistan. It fulfills the total local requirements of rice as well as contributes towards foreign exchange earnings. Rice is cultivated on area of 2.9 m.ha; with average yield of 2.3 t/ha (Anonymous 2009). Paddy yields of Pakistan are lower as compared to countries like Australia, USA and Japan where yields are 10269, 62198 and 6997 Kg/ ha respectively (Anonymous 2004). There are different causes of low yields but less plant density and delay plantings are of utmost importance (Mahmood & Walter 1990). Manual method of seedlings transplanting faces problem of labour during planting season. This is the only method being practiced by the farmers of Pakistan. The labour does not care the spacing between plants and resultantly plant population remains lower (Mann & Ashraf, 2001). Alternative methods of rice planting seem the only viable solution of this problem. DSR (Direct seeded rice) technology offers a potential method, being successfully employed in different countries (Adair *et al.*, 1992). In Australia and USA, DSR and bed planting are being used as resource conserving technologies which reduce pollution and improve living of the farming community by increasing profitability (Murugaboopathi *et al.*, 1991; Majid *et al.*, 1996; Sharma, 1996). Rice planting through parachute technology is an alternate method for gaining optimum plant population and obtaining higher yields (Akhtar and Sabar, 2002). In the present dissertation eight rice transplanting methods were tested at various locations in traditional rice growing areas of the Punjab to determine the most productive method of rice production.

MATERIALS AND METHODS

Field experiments were conducted at three locations viz; Pindi Rattan Singh, Kot Nazir and PARC Research farm KSK during 2009 to determine effect of different rice-planting techniques. The experimental design was RCBD (Randomized Complete Block Design) with 3 replications. Super Basmati was planted in plots having size as much as 10x30 m^2. The planting methods tested in the studies are given in table-1.

Table-1. Planting methods tested in rice growing areas of the Punjab

S.#	Treatments
1	Direct seeding on well prepared soil in wattar condition
2	Drilling on beds and furrow
3	Drilling on beds
4	Planting on beds and furrow
5	Transplanting on beds
6	Line transplanting
7	Conventional transplanting
8	Parachute transplanting

Direct seeding of soaked seed was done in the 2nd week of June after seedbed preparation using seed @30 Kg/ha. The sprouted seeds for nursery were sown on the same day. Direct seeding on flat and beds was carried out by zero drill and mechanical bed planter respectively. Seeding in furrows was performed manually by means of single row hand drill. Seed was soaked for five hours for good germination. Transplanting on beds

and furrows was done manually after thirty days of direct seeding. Beds for transplanting were also made with bed planter. Seedlings were transplanted at edges of the moist beds. Plastic trays having cavities were used to raise parachute nursery. These trays were kept on uniform beds and pre germinated seeds were sown in the cavities with two seeds/cavity. Twenty-five days old seedlings of parachute nursery were thrown in puddled field. Thirty days old seedlings were used for other transplanting methods. Line transplanting was done manually at 20 cm x 20 cm spacing. Other recommended practices were carried out to raise crop. Necessary data were collected according to standard procedures and analyzed statistically. The treatment means were compared using LSD at 5% level of significance (Steel *et al*., 1997).

RESULTS AND DISCUSSION

Plants height depicts health and vigor of a crop. It is directly proportional with the development of root system and availability of nutrients to the plants. In present studies, the highest plant heights were recorded in transplanted crop in puddled soil (123.7 cm) whereas the lowest plant height was observed in direct seeded crop. The results are in support with Mann *et al* (2002) and Ramzan & Rehman (2006) who reported similar trends in their field studies. Drilling on beds gave more plant height as compared to direct seeding on flat soil. It may be due to availability of soil moisture through seepage providing good conditions for germination and initial crop growth. Maqsood (1998) also reported higher plant heights in transplanted rice as compared with direct seeding.

Productive tillers (m^{-2}) in line transplanting and conventional planting in puddle soil were higher as compared with the remaining planting methods. The tiller population in direct seeding on flat soil was at par with manually transplanted crop. It may be due to higher seed rates used at seeding time. Awan *et al.,* (2005) discussed and reported similar results in the studies.

The panicle length in transplanted rice was significantly higher as compared to direct seeded crop. It was because of more space, sunlight and nutrients availability in transplanted crop whereas higher weed densities in direct seeded crop hinders the development of panicle length and other yield attributes in direct seeded crop.

Table-2. Effect of different planting techniques on various crop parameters

Treatments	Plant height (cm)	Productive tillers/m^2	Panicle length (cm)	1000grain wt. (g)	Paddy yield (t/ha)
Direct seeding on well prepared soil in wattar condition	115.3 e	263.0 a	22.33 d	21.00	3.53 c
Drilling on beds and furrow	119.3 d	248.7 c	22.00 d	20.00	3.27 d
Drilling on beds	119.7 cd	209.3 e	26.07 c	20.11	3.07 e
Planting on beds and furrow	119.3 d	239.7 d	27.27 b	21.22	3.30 d
Transplanting on beds	121.7 b	211.3 e	28.70 a	20.78	3.53 c
Line Transplanting	123.7 a	264.7 a	28.70 a	21.89	3.90 a
Conventional transplanting	123.0 a	260.7 a	28.80 a	21.89	3.73 b
Parachute transplanting	120.3 c	254.7 b	26.50 c	20.67	3.50 c
LSD at $\alpha = 0.05$	0.97	5.03	0.53	NS	0.10

Thousand grain weight was not significantly affected by various planting methods however it was relatively higher in transplanted crop than direct seeding (Table-2).

Line transplanting ensures the optimum plant population by planting the seedlings at specific distance, therefore, the highest paddy yield (3.90 t/ha) was obtained from line transplanting whereas in conventional transplanting it was relatively low. The yield in drilling on flat soil, transplanting on beds and parachute transplanting was at par but significantly lower than drilling on beds & furrow and planting on beds & furrows. Drilling on beds produced the lowest yields. Low yields may be attributed to low tiller population. The findings are in line with those of Mahajan (1995) who reported that grain yield increased significantly with transplanting over direct seeding.

Maximum cost benefit ratio (CBR) was observed in line transplanting (1.29) followed by conventional transplanting (1.27). The minimum CBR (1.12) was recorded in planting on beds & furrows and parachute transplanting (table-3). The cost benefit ratios in direct seeding methods were almost at par but lower than line and conventional planting in puddle soils and higher than parachute planting method and transplanting of crop on bed & furrows. The findings are in favour of those described by Awan *et al*. (2005).

Table-3. Effect of planting techniques on cost-benefit ratio

Treatments	Paddy Yield (t/ha)	Cost (Rs./ha)	Income (Rs./ha)	Profit (Rs./ha)	Cost benefit ratio
Direct seeding on well prepared soil in wattar condition	3.5	36289	43750	7461	1.21
Drilling on beds and furrow	3.3	33289	41250	7961	1.24
Drilling on beds	3.1	32539	38750	69211	1.19
Planting on beds and furrow	3.3	36927	41250	4323	1.12
Transplanting on beds	3.5	36552	43750	7198	1.20
Line Transplanting	3.9	37852	48750	10898	1.29
Conventional transplanting	3.7	36452	46250	9798	1.27
Parachute transplanting	3.5	39165	43750	4585	1.12

The study revealed that maintaining optimum plant population in transplanting enhanced paddy yields but direct seeding on flat in wattar condition may become an alternate method of rice crop establishment where labour for transplanting is a serious problem.

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