International Journal of Advanced Multidisciplinary Research (IJAMR)
ISSN: 2393-8870
www.ijarm.com
Coden:IJAMHQ(USA)

Research Article

Effect of sowing methods on disease of paddy

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Keywords

Conventional method, directed seeded rice; soaked seed; sowing technique; sprouted seed.

Abstract

The study had been planed to evaluate the effect of four different sowing techniques namely conventional method of sowing (T_1); broadcasting of sprouted seed (T_2); drilling of soaked seed (T_3) and broadcasting of seed in soil prepared without puddling (T_4) on Super basmati were evaluated during 2011 and 2012. One month old paddy nursery was transplanted in T_1 but in all other treatments seed @ 37.50 kg ha^{-1} was applied. Maximum plant height was recorded in T_1 (131.39 cm) and T_2 (131.42 cm) showed non-significant difference with each other but differed significantly ($P \leq 0.05$) from the remaining treatments during 2011. During 2012 maximum plant height in T-1 (133.69 cm) and T-2 (135.68 cm) was recorded. Maximum productive tillers were recorded in T_1 (310 tillers m^{-2}) which differed statistically with all other treatments during 2011. However maximum productive tillers were recorded in T-1 (407.00 tillers m^{-2}) and T-4 (391.3 tillers m^{-2}) which were non-significant to each other but differed statistically with other two treatments during 2012. Increase in 1000 grains weight was recorded in T_1 (21.48 g) and T_2 (21.37 g) respectively over two other treatments during 2011; however, during 2012, only T_2 (23.33 g) showed significant result over all other treatments. Brown leaf spot disease incidence was recorded high in T_4 (22 %) followed by T_3 (16 %); T_2 (13 %) and T_1 (12 %) during 2011; however, maximum disease incidence was recorded in T_4 (25%) followed by T_3 (17%); T_1 (10%) and T2 (8%) during 2012. Average data of yield showed that T_1 (4087 kg ha^{-1}) recorded maximum yield than the remaining treatments. Maximum economic return was recorded from T_2 with cost benefit ratio (1:1.31) followed by T_1 (1:1.29); T_3 (1:1.05) and T_4 (1:0.87) in the study.

Introduction

Rice is one of the most widely consumed food crop in the world. It is grown on an area of 1.98 m ha with annual production of 3.64 m tones and average production in yield was 1842 kg ha^{-1} (Anonymous, 2010). In Pakistan, Punjab and Sindh are rice-producing provinces. These two provinces account for more than 88 percent of total rice production (Abedullah *et al*., 2007). This cereal foodstuff provides nourishment over half of the world's population. In fact, this staple food provides more than one fifth of the calories consumed worldwide by human beings. The rice plant grows upto 1.25 m with an upright stem and long, pointed and flat leaves, having stalk bearing flowers from which the rice grains are produced. The rice plant needs both warmth and moist season for its proper growth. It is a major food supplement; it is commercially cultivated as cash crop in many regions of the world like Pakistan. Rice is very nutritious and contains loads of nutrients to give energy and vitality to our body. Rice is a rich source of carbohydrates; important source of storing energy inside the body. Rice is low in fat, salt, cholesterol and thus helps in keeping the heart healthy. Basmati rice is globally renowned for its unique smell and delicate flavor, highly demanded in the International Market. Rice is the 2nd most important staple food of Pakistani people which is grown in all provinces especially the kaller belt of rice. Transplanting of rice required maximum labor and resulted in maximum cost of production hence; planting was delayed due to labor scarcity. It would be advantageous, if transplanting could be substituted by direct seeding of rice which could result in proper plant population. However, if this method is successful in the environment of Pakistan, it will reduce the labor cost and thus, increases the profit margin of the farmers. Direct seeded rice is an alternate option to cope

with the problems of water and labor scarcity associated with conventional method (Weerakoon *et al*., 2011). Direct seeding of rice is accomplished by methods such as water seeding, wet seeding and dry seeding (Ehsanullah *et al*., 2007; Bouman *et al*., 2007; Farooq *et al*., 2011). The study was, therefore, planned to evaluate the effect of four different sowing techniques with special attention to the disease complex on paddy at Agro-Ecological Zone of Adaptive Research Farm, Gujranwala, Pakistan.

Materials and Methods

The study was conducted at Adaptive Research Farm, Gujranwala to evaluate four different sowing techniques Conventional Method of sowing (T_1); Broadcasting of sprouted seed in well puddled soil (T_2); drilling of soaked seed after land preparation field capacity (FC) or wattar condition (T_3) and broadcasting of seed in well prepared soil without puddling (T_4) with special attention to diseases on fine rice during the 2011-12. In T_1, one month old nursery of paddy was transplanted but on all other treatments seed used @ 37.50 kg ha^{-1}. The experiment was conducted in randomized complete block design with three replications having net plot size 8 × 18 $meter^2$ area. Recommended dose of Phosphorus and Potash was manually broadcasted in the field. In line sowing plant to plant and row to row spacing was maintained at 23 cm in all the sowing techniques. For weed control a recommended post emergence herbicide (Clover & Sunstar) was sprayed on day 30 after sowing in direct seeded plots (T-2; T-3 & T-4) at wattar condition. In conventional method pre-emergence weedicide was applied in the field on day 5 after transplanting with shaker bottle. Zinc Sulphate 21% in crystalline form was broadcasted in each treatment @ 25 kg ha^{-1} on day 25 after transplanting the nursery in T_1. On all other treatments Zinc Sulphate 21% was applied @ 25 kg ha^{-1} on day 50 after sowing and the recommended dose (185 kg ha^{-1}) of Urea was applied in all treatment. Two split doses of cartap hydrochloride 4% G were broadcasted in the field @ 22.5 kg ha^{-1}. In DSR plot irrigation was applied in 7-10 days interval. Fungicide was not applied in any treatment throughout the growing season. Other agronomic and plant protection measures were kept standard and uniform for all treatments to avoid biasness. Data regarding plant height (cm), productive tillers m^{-2}, 1000 grain weight (g), disease incidence (%), paddy yield (kg ha^{-1}) and economic analysis were recorded by counting three samples taken randomly from each repeat during Kharif 2011-12. The method of cost benefit ratio was followed by Kahloon *et al*. (2012). The diseases incidences were recorded by disease rating scale 0-100% (Chaudary *et al*., 2009).

Results and Discussion

Data regarding plant height (Table 1) indicated that T_2 produced the highest plant height (131.42 cm) and T_1 (131.39 cm) followed by T_3 (127.17 cm) and T_4 (125.77 cm) during 2011. During 2012, plant height T_1 (133.69 cm) and T_2 (135.68 cm) were similar with one another but differ from other treatments. Data regarding plant height indicated that broadcasting of sprouted seed in well puddled soil T2 enhanced deep penetration of roots resulting in efficient nutrient uptake and better plant growth. However an other reason is that due to loose soil by puddling facilitated maximum access of nutrients through roots or may be due to the better and healthy root development than other sowing methods. Our results of plant height (cm) are similar to those reported by Maqsood (1998) who stated that transplanting method enhanced plant height and panicle length than direct seeding at field capacity or wattar condition. Productive tillers in T_1 (310.00 tillers m^{-2}) showed highest count as compared to T_2 (289.00 tillers m^{-2}), T_4 (286.3 tillers m^{-2}) and T_3 (287.80 tillers m^{-2}) during 2011. On the other hand T_1 (407.00 tillers m^{-2}) and T_4 (391.30 tillers m^{-2}) showed higher count than T_2 (318.3 tillers m^{-2}) and T_3 (308.7 tillers m^{-2}) during 2012. The results of productive tillers was high in conventional method was the agreement with those of Sharma (1995) and Naklange *et al*. (1996). Weight of 1000 grain was also measured and T_1 showed highest grain weight (21.48 g) than T_2 (21.37 g) followed by T_3 (20.40 g) and T_4 (19.65 g) during 2011. However, during 2012 maximum 1000 grain weight was recorded in T_2 (23.33 g) followed by T_1 & T_3 (21.04 g and 20.46 g). The lowest grain weight was recorded by T_4 (19.76 g) than all other treatments. However the results of 1000 grain weight in conventional method of sowing (T1); broadcasting of sprouted seed (T2) agreed with the findings of of Singh *et al*., (1981) and Jana *et al*., (1981) who reported that weight of 1000-grain was the highest in transplanted rice compared to other methods of sowing including direct seeded rice. These results of yield (kg ha-1) are in the line with those of Thakur, (1993) and Mahajin *et al*., (1995) who reported that grain yield increased significantly with transplanting of sprouted seed over direct seeding rice techniques. Maximum disease incidence was checked in T_4 (22 %) followed by T_3 (16 %), T_2 (13 %) and T_1 (12 %) during 2011. However maximum disease incidence was recorded in T_4 (25%) followed by T_3 (17 %), T_1 (10 %) and T_2 (8 %) respectively in the studied area during 2012.

Table 1: Effect of different sowing techniques on Plant height (cm), Productive Tillers, 1000 grain weight (g) and disease incidence (%) of paddy during 2011-12

Treatments	Plant height (cm)		Productive Tillers m^{-2}		1000 grain wt. (g)		Diseases Incidence (%)	
	2011	2012	2011	2012	2011	2012	2011	2012
(T-1) Conventional Methods of Sowing (transplanting of nursery after puddling)	131.39a	133.69a	310.00a	407.00a	21.48a	21.04b	12a	10a
(T-2) Broadcasting of sprouted seed in well puddled soil	131.42a	135.68a	289.00b	318.3b	21.37a	23.33a	13 b	8 a
(T-3) Drilling of soaked seed after land preparation in wattar condition.	127.17b	125.14b	275.80c	308.7b	20.40b	20.46b	16 c	17 b
(T-4) Broadcasting of seed in well prepared soil without puddling	125.77b	128.56b	286.3b	391.3a	19.65c	19.76c	22 d	25 c

Note: The treatments having same superscript in a column are non-significant

Table 2 displays that T_1 (conventional methods of sowing) showed the highest yield of Super Basmati rice (4087 kg ha^{-1}) compared to T_2 (3880 kg ha^{-1}), T_3 (3606.5 kg ha^{-1}) and T_4 (2960 kg ha^{-1}) in the studied area. Table 2 also shows the highest cost benefit ratio (CBR) (1:1.31) in case of T_2 with net profit (Rs.36950 ha^{-1}) followed by T_1 (Rs.37025 ha^{-1}) with cost benefit ratio (1:1.29) compared to T_3 (Rs 6100 ha^{-1}) with CBR (1:1.05). The data showed no benefit rather loss through CBR (1:0.87) in T_4 with negative value of benefit.

Table 2: Effect of different sowing techniques on the yield (kg ha^{-1}) and cost benefit ratio of Super Basmati during Kharif 2011-12

Treatments	Yield Kg ha^{-1}			Total Cost of Production (Rsha^{-1})	Total Income (Rsha^{-1})	Net Benefit (Rsha^{-1})	C:B:R
	2011	2012	Mean Value				
(T-1) Conventional Methods of Sowing (transplanting of nursery after puddling)	4137a	4037a	4087a	126575	163600	37025	1:1.29
(T-2) broadcasting of sprouted seed in well puddled soil	3890b	3870b	3880b	118250	155200	36950	1:1.31
(T-3) Drilling of soaked seed after land preparation in wattar condition.	3590c	3623c	3606.5c	138300	144400	6100	1:1.05
(T-4) Broadcasting of seed in well prepared soil without puddling	2720d	3200d	2960d	136738	118400	-18338	1:0.87

In calculations the rate of paddy was presumed Rs. 40kg^{-1}

Conclusion

The study revealed that conventional method of sowing (T_1); broadcasting of sprouted seed (T_2); drilling of soaked seed in soil prepared without puddling (T_4) were tested showed that T_1 and T_2 methods of sowing gave maximum cost benefit ratio and net benefit with low disease incidence of brown leaf spot disease of rice was recorded. However the farmers should be avoided for sowing of rice by T_3 and T_4 methods because of maximum disease incidence was recorded.

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