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Effect of Planting Techniques (Direct seeding Vs. Transplanting) on Paddy Yield in Salt-affected Soil

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ABSTRACT

The field experiment was conducted in a salt-affected field (EC = 6.8 dsm^{-1}pH = 8.7, SAR = 45 Silty clay) at Soil Salinity Research Institute, Pindi Bhattian (Pakistan) to determine the best rice planting technique under salt-affected soils. Direct seeding and transplanting techniques were applied using two, three and four seedling $hill^{-1}$. Direct seeding gave the maximum income return under salt-affected soils and had no transplanting cost. Therefore, it proved to be the best planting technique for salt-affected soils related to coarse rice varieties.

Key Words: Planting techniques; Paddy

INTRODUCTION

Rice being one of the richest starchy foods is a principal food crop of about half the world's population (Martin, 1986). In Pakistan, it is the most important Kharif cereal. It occupies a significant position in the agricultural economy of country and is considered as the second staple food. It has emerged as a major export commodity now, contributing about 27% to the total foreign earnings of Pakistan (Anonymous, 1990). Among various factors responsible for boosting rice production, size of nutritional area or plant population is considered to be the key factor. If the spacing is decreased beyond the optimum level, yield is decreased due to mutual shading effect of leaves and greater competition amongst the plants for nutrients and water, which result in inefficient utilization of solar radiation. On the other hand, decrease in number of plants per unit area also results in lower yields. Panikar *et al*. (1978), Venkates and Mahatim (1980) Balasubramaniyan (1985) and Ayub and Sharar (1980) found that spacing had non-significant effect on grain yield. Good crop stand is necessary to ensure higher crop production from normal and under adverse conditions. Establishment to rice seedling is essential in this respect. Rice is highly sensitive to salinity at the beginning i.e., early seedling stage and huge plant mortality is observed under saline field conditions at this stage. Any measure through, which mortality rate could be reduced during this critical phase would be a step forward to improve paddy yield from salt-affected lands. An experiment was, therefore, planned to compare different planting techniques in order to improve crop stand.

MATERIALS AND METHODS

The experiment was conducted in a salt-affected field (EC = 6.8dsm^{-1}, pH = 8.7; SAR = 45; Silty Clay) at Rakh Farm Thatta Khairo Matmal, Soil Salinity Research Institute, Pindi Phattian, employing randomized complete block design with four replications. The treatments were:

1. Two seedlings $hill^{-1}$ (Control)
2. Three seedlings $hill^{-1}$
3. Four seedlings $hill^{-1}$
4. Direct seeding.

In case of seedling transplanting treatments, thirty day old rice seedlings of IR-9 raised on a normal soil were transplanted according to plan at distance 20 x 20 cm, while in the case of direct seeding chilled/sprouted seed (soaked for 24 h in water) was broadcasted on the same date (when seed was sown in soil to raise seedlings for transplanting purpose) in all four plots (2 x 5 m) @ 20 kg ha^{-1} on a puddled salt affected field. All agronomic requirements of crop were met. At maturity, crop was harvested and data on paddy and straw yield were recorded. The data were subjected to analysis of variance and means were separated using least significant difference (LSD) (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

Maximum mean productive tillers (367.5 sq m^{-1}) were obtained through direct seeding (Table I) and it was much higher as compared to rest of the treatments. Ayub and Sharar (1980) have also reported similar results. The minimum mean productive tillers were 317.5 sq m^{-1} in case of two seedlings $hill^{-1}$ (control). Productive tillers increased with increasing the number of seedlings $hill^{-1}$. No big differences among the treatments for panicle length and sterility percentage were found (Table I). However, when four seedlings $hill^{-1}$ were transplanted, sterility percentage was a bit higher. It was concluded that sterility percentage increased with the increase of plant population. So, in salt – affected soil, four seedlings $hill^{-1}$ was recommended for

Table I. Effect of planting techniques on different yield components of rice in salt-affected soils

	(Average of Four Replication)		
Treatments	**No. of Productive Tillers (sq.m^{-1})**	**Panicle Length (cm)**	**Sterility Percentage**
Two Seedlings hill^{-1}	317.5 c	22.9 N.S.	33.2 ab
Three seedlings hill^{-1}	324.3 bc	21.3	30.4 b
Four seedlings hill^{-1}	338.1 b	20.9	34.1 a
Direct Seeding	367.5 a	22.1	33.0 ab

N.S.= Non-significant
Values followed by same letter(s) are statistically similar at P= 0.05

Table II. Effect of planting techniques on paddy and straw yield in salt-affected soils

	(Average of Four Replication)			
Treatments	**Paddy yield (T ha^{-1})**	**Straw yield (T ha^{-1})**	**1000 paddy weight (g)**	**Paddy: Straw Ratio**
Two Seedlings hill^{-1}	2.2 N.S	15.8 ab	12.1 b	0.14 c
Three seedlings hill^{-1}	2.4	15.4 ab	12.3 b	0.16 b
Four seedlings hill^{-1}	2.5	17.5 a	12.7 b	0.14 c
Direct Seeding	2.7	9.5 c	16.1 a	0.28 a

N.S.= Non-significant
Values followed by same letter(s) are statistically similar at P= 0.05

good crop stand.

Data regarding paddy and straw yield and 1000 paddy grain weight as well as paddy: Straw ratio are presented in Table II. Paddy yield increased consistently by increasing the number of seedlings hill^{-1} as well as due to direct seedling of rice. Maximum paddy yield (2.7 t ha^{-1}) was recorded from the direct seeding treatment and minimum paddy was harvested in case of two seedlings hill^{-1}. These differences appear to be substantial.

It was interesting to note that the straw yield was minimum, where rice was planted directly through seed. Maximum rice straw was obtained by rice seedlings plantations due to better establishment/growth of rice plants instead of direct seed sowing. Reason of low straw yield in case of T4 (Direct seedling) may be due to high occurrence of sterility. Paddy (16.1 g) was also recorded from direct seeding and minimum was in case of control. Paddy was heavier in weight in case of T4 (direct seeding); whereas, 1000 paddy grain weight in other treatments was almost the same.

Paddy straw ratio was narrow in case of T4 (direct seedling treatment) as compared to the rest of the treatments included in this study. Amazingly, difference in paddy straw ratio was double to the case of T4 (direct seeding) in comparison to T1 (two seedlings hill^{-1}), T2 (three seedlings hill^{-1}) and T3 (four seedlings hill^{-1}) indicating relatively higher increase in economic yield, when rice was planted directly through seed in a salt-affected field as compared to seedling transplanting techniques.

It was concluded that direct seeding gave the maximum income return under salt-affected soils. So, it is suggested that direct seeding is the best planting technique for puddled salt-affected soils.

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