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EVALUATION OF SEEDLING THROWING METHOD OF RICE PLANTING UNDER LOWLAND CONDITION

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ABSTRACT

Field experiments were conducted during kharif and rabi seasons of 1995-'96 to study the effect of rice planting methods under lowland condition. Seedling throwing method was compared with line and random planting methods. In kharif season the grain yield (6.35 t ha^{-1}) in seedling throwing method was significantly more than that of line and random planting methods (6.15 and 5.71 t ha^{-1} respectively). The grain yield of line planted crop was higher (5.84 t ha^{-1}) in the rabi season, however it was at par with the yield of seedling throwing method (5.61 t ha^{-1}). During both the seasons of study, random planting recorded markedly lower yields (5.22 t ha^{-1} and 5.71 t ha^{-1} in rabi and kharif seasons respectively). Although the line planting method enhanced the yield to 5.84 t ha^{-1} and 6.15 t ha^{-1} during rabi and kharif seasons respectively, the seedling throwing method was more advantageous because of less labour requirement (44.5 per cent of labour saving compared to line planting). The seedling throwing method resulted in higher B:C ratio (2.85 and 3.14 for the rabi and kharif seasons) compared to line planting method (2.79 in rabi and 2.95 in kharif seasons).

KEY WORDS: Planting Methods, Seedling throwing, Line planting, Random planting

Rice (*Oryza sativa L.*) is the principal food crop of Asia for more than 2 billion people. Rice is grown is diverse ecosystems. Rice being a semi-aquatic plant, transplanting method of establishment is more favourable and in general assumed to give more staple grain yield than direct seeding methods (Biswas *et al.*, 1991). Although direct seeding method is cost effective, the grain yield is generally low due to poor and non-synchronised tillering and severe weed infestation. Transplanting method is labour intensive and time consuming. During peak cropping season, the transplanting operation gets delayed, for want of adequate labourers. Such a delay leads to planting of aged seedlings late in the season Rice is transplanted randomly by women who transplant much less number of hills/ unit area resulting in low yields (Gill *et al.*, 1989). The need for a satisfactory alternative to the transplanting of rice, in the context of scarcity, increasing cost of labour and the desire to reduce the drudgery of the women, has been very much felt. In Kerala, Varughese *et al.*, (1993) studied the seedling throwing method of rice planting in the context of scarcity of human labour and higher cost and drudgery involved in transplanting. Lot of research work has been done on the traditional transplanting method, but there is paucity of information about low cost seedling throwing method. Hence, the present study was undertaken to evaluate the suitability and successes of the seedling throwing method of rice planting as against cost intensive transplanting methods.

MATERIALS AND METHODS

The experiments were conducted at the wetland farm of Tamil Nadu Agricultural University, Coimbatore during the rabi season (October 1995 to February 1996) and the kharif season (June to September 1996). The soil texture was clay loam classified as typic Haplustalf, with a pH of 8.0. The soil was low in available N (198.5 kg ha^{-1}), medium in phosphorus (18.6 kg ha^{-1}) and high in potassium (557 kg ha^{-1}).

Rice varieties ADT 38 (medium duration) and ADT 36 (short duration) were raised during rabi and kharif seasons. The field was puddled and uniformly levelled. In the line planting method, 30 day old seedling from a wet nursery were transplanted at a spacing of 20 x 10 cm in the rabi season and 15 x 10 cm in the kharif season with 25 day old seedlings. Random planting was done

using 30 and 25 day old seedlings (in the rabi and kharif seasons respectively) from a wet nursery without adopting any definite plant geometry and density, as done by farmers. For comparing the effect of split application in seedling throwing methods with the line and random planting methods, the average values of split applications (3 and 4 in rabi, 4 and 5 in kharif) were taken. A uniform dose of P_2O_5 and K_2O (each of 50 kg, 38 kg ha^{-1} during rabi and kharif seasons respectively) was applied in the form of super phosphate and muriate of potash as basal for all the methods of planting, while N was applied as urea. Recommended dose of nitrogen was applied in three Splits 50 percent basal, 25 percent each at active tillering (AT) and panicle initiation (PI) for line and random planted crops. For seedling throwing method, N was applied as per treatments, at four splits: 25 percent each at 10 DAST, AT, PI, and flowering (F) and five splits (20 per cent at 10 DAST, AT, PI, F and 10 days after flowering (DAF) F and 10 days after flowering (DAF). Full doses of P_2O_5 and $ZnSO_4$ (25 kg ha^{-1}) were applied at the last puddling and K_2O was applied in equal splits along with N. The experimental design was Factorial randomised block design (FRBD) with there replications. The plot size was 6m X 4M.

RESULTS AND DISCUSSION

Growth characters

The response of individual growth characters varied significantly with planting methods (Table 1). The crop growth parameters viz., plant height, root length, root volume, number of tillers m^{-2} at flowering and dry matter production at maturity stages were found to be much responsive to different rice planting methods. For seedling throwing method of rice planting, the average of twelve treatments was taken for comparison with other methods of planting.

Among the different growth characters studied, differences in plant height at maturity

Table 1. Effect of rice planting methods on labour requirement and growth characters

Growth characters	Rice planting methods									
	Rabi 1995-96					Kharif '96				
	Seedling throwing	Line planting	Random planting	SEd	CD 5%	Seedling throwing	Line planting	Random planting	SEd	CD 5%
Planting labour requirement (woman days ha^{-1})	30	56	46	-	-	31	54	43	-	-
Labour saving (%) over line planting	46.4	-	17.9	-	-	42.6	-	20.4	-	-
Plant height (cm) at maturity	76.7	77	76.8	2.7	NS	79.4	82.1	78.0	1.7	NS
Leaf area index (flowering)	5.53	5.70	5.18	0.12	0.24	5.26	4.95	4.50	0.14	0.28
Root length (cm) at flowering	25.0	22.3	22.5	1.3	2.5	19.9	18.9	18.8	1.2	NS
Root volume (CC) at flowering	16.7	11.4	9.3	1.0	2 1	18.9	17.1	16.0	0.62	1.3
Number of tillers m^{-2} (Flowering)	666	612	585	18 1	35.2	683	642	617	17.0	35 0
Dry matter production (kg ha^{-1}) at maturity	13289	13002	11711	282	580	14389	13508	13272	.273	561

NS - Non Significant

stage was evened-out over the seasons for various planting methods. Increased root activity was evident from the longer roots and larger root volume, with seedling thrown crop at flowering stage over the seasons. Profuse development of lateral roots with seedling thrown crop favoured tiller production at early stages. The tillers with seedling throwing method of planting over line planting was 4.7 percent 6.6 percent more in rabi and kharif seasons respectively (Table 1). The increased tillering might be due to zero depth of planting resulting in better inducement of root growth for anchorage and tiller initiation (Matsushima, 1979).

The leaf area index recorded was comparable in line planting (5.70) and seedling throwing methods (5.53) in wet season. However in dry season seedling throwing method recorded significantly higher LAI values (5.26) compared to that of other planting methods. Development of profuse lateral roots with seedling thrown crop might have favoured better nutrient uptake and tiller production at early stage. Seedling throwing method with better crop growth (tillers m^{-2} and LAI) and root development significantly increased the dry matter production over other establishment methods across the cropping seasons and crop growth stages. The dry matter accumulation was highest in the line planting (rabi) and seedling throwing (kharif) methods of planting compared to random planting (Table 1).

Yield components and yield

Line planting method recorded more panicle m^{-2} (485) compared to seedling throwing (471) in the rabi season, the reverse was true in the kharif season (483 and 459 panicles m^{-2} for seedling throwing and line planting methods respectively (Table 2). Varughese *et al.*, (1993) also recorded higher number of panicles m^{-2} with seedling throwing method compared to transplanting. This increased number of panicles m^{-2} with seedling throwing method might be due to more number of tillers at flowering stage. In rabi season, the unproductive tillers with seedling throwing and line planting were more and on par with each other. During, kharif season also seedling throwing method recorded significantly more unproductive tillers (10.9 per cent) compared to line planting (9.47 per cent) and random planting (9.77 per cent)

Though rice planting methods had no significant influence on the number of filled grains

Table 2. Effect of rice planting methods on yield attributes, yield and economic returns

Yield attributes and yield	Rice planting methods									
	Rabi 1995-96					Kharif '96				
	Seedling throwing	Line planting	Random planting	SEd	CD 5%	Seedling throwing	Line planting	Random planting	SEd	CD 5%
Panicles m^{-2}	471	485	450	5.91	13	483	459	417	6.89	14
Unproductive tillers %	8.0	10.4	9.2	0.36	0.75	10.9	9.47	9.77	0.28	0.56
Filled grains panicle^{-1}	88.2	92.5	90.8	2.3	NS	88.8	86.0	84.1	1.70	3.50
Unfilled grains panicle^{-1} (%)	16.7	12.4	16.1	0.92	1.90	19.0	16.1	15.8	1.0	2.01
Grain yield (kg ha^{-1})	5609	5835	5215	180	371	6345	6148	5705	74	152
Straw yield (kg ha^{-1})	7168	7177	6170	202	416	7934	7651	7155	226	465
Net income (Rs ha^{-1})	19186	19622	16617	-	-	22715	20150	17145	-	-
B:C ratio	2.85	2.79	2.57	-	-	3.14	2.95	2.84	-	-

NS - Non Significant

in wet season, seedling throwing method recorded significantly more number of filled grains per panicle (88.8) and was on par with line planted crop (86.0) in kharif season. Higher spikelet sterility was observed with seedling throwing method (16.7 and 19.0 percent in rabi and kharif seasons respectively) compared to line and random planting methods. Higher spikelet sterility in the seedling throwing method of planting was reported by Esther Shekinah (1996). It is evident from the yield parameters studied that seedling throwing method is superior than random planting method.

Regarding grain yield, seedling throwing method produced grain yield (5.61 t ha^{-1})on par with line planting method (5.84 t ha^{-1}) in the rabi season. However seedling throwing method registered highest grain yield (6.35 t ha^{-1}) compared to that of line planting (6.15 t ha^{-1}) in the dry season (Table 2). The random planting method recorded poor yield of 5.22 t ha^{-1} (rabi) and 5.71 t ha^{-1} (kharif). Kenchiah *et al.* (1996) also recorded the highest grain yield with line planting but the seedling throwing method gave comparable yields with that of line planted crop. This might be due to better growth and yield attributes recorded in seedling throwing method and line planting.

Labour requirements and economics

The seedling throwing method required only 30 and 31 women days ha^{-1} in rabi and kharif respectively, whereas line planting required maximum labour for transplanting viz., 56 (rabi) and 54 (kharif). Random planting also involved higher planting labour (46 and 43 in rabi and kharif respectively). The seedling throwing method of planting being less labour intensive and less drudgerous, required only 55.5 per cent and 68.5 per cent of planting labours used for line and random planting methods respectively over the seasons (Table 1).

Among the different methods of planting, seedling throwing method recorded the highest net income (Rs. 19186 ha^{-1} in rabi and Rs. 22715 ha^{-1} in kharif) and B:C ratio (2.85 and 3.14 during rabi and kharif respectively) compared to other methods of planting (Table 2). Kandasamy et al. (1996) also reported that as a result of yield maintenance and saving in planting labour cost, the B:C ratio was higher with seedling throwing method especially in kharif season. Over both the seasons of study, random planting recorded lowest B:C ratio of 2.57 and 2.84 in rabi and kharif seasons respectively.

Results of the experiments indicated the importance of seedling throwing method of rice planting as against cost and labour intensive transplanting methods. The lower costs of planting by seedling throwing maximised the B:C ratio of 2.85 (rabi) and 3.14 (kharif).

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