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Effect of Planting Pattern on Yield of Rice

P. POTHIRAJ,[1] Y. B. MORACHAN[2] and K. K. SUBBIAH[3]

Six planting patterns and split application of nitrogen were tried with rice varieties Kanchi and Kannagi. Kanchi was found to be superior to Kannagi in which split application of N had least effect on grain yield. Planting 100 hills per m² with one seedling per hill recorded the highest grain yield of 7000 kg/ha followed by 50 hills per m² with two seedlings per hill with 6700 kg/ha. Planting more than two seedlings per hill and adopting wider spacing significantly reduced the grain yield due to over crowding and mutual shading resulting in intra-plant competition.

The early maturing rice varieties are generally shy in tillering. Hence population per unit area is the most important factor among the management practices deciding the grain yield. As such not only the number of seedlings planted in an unit area but also its equitable distribution within the area decide the number of ear bearing tillers. Under wider spacing, mutual shading within the hill occurs because of more number of tillers per hill whereas mutual shading between hills occur in closer spacing. Further, only a few tillers located at the periphery of hill received the full sun light and the outer tillers shade most of the inner tillers. Based on the distribution of seedlings within the unit area, six planting patterns with varied number of hills per m² (25, 50 and 100) and number of seedlings per hill (1, 2, 4 and 8) were tried with the varieties Kanchi and Kannagi to study the effects of different planting patterns on grain yield.

MATERIALS AND METHODS

The experiment was conducted in split plot design with the two varieties and time of application of nitrogen (120 kg/ha as 1) two splits (m_1)—2/3 basal + 1/3 at panicle initiation, 2) three splits (m_2) — $\frac{1}{2}$ basal + $\frac{1}{4}$ tillering + $\frac{1}{4}$ at panicle initiation, and 3) four splits (m_3) — $\frac{1}{4}$ basal + $\frac{1}{4}$ tillering + $\frac{1}{4}$ booting + $\frac{1}{4}$ heading, as main plot treatments. The sub-plot treatments included:

a) **Spacing or number of hills per m²**
   1) 10 x 10 cm (100 hills per m²) S_1
   2) 20 x 10 cm (50 hills per m²) - S_2
   3) 20 x 20 cm (25 hills per m²) - S_3

b) **Plant density**
   1) 100 seedlings per m² - D1
   2) 200 seedlings per m² - D2

The 100 and 200 seedlings per m² were planted with above spacings by varying the number of seedlings per hill from one to eight. Thus, six planting

1 - 3: Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641003

patterns, three each under D1 and D2 were adopted. The crux of the treatments is while the number of seedlings per m² remains constant either at 100 or 200, their pattern of distribution within the unit area differed depending on the number of hills per m² and number of seedlings per hill. The leaf area index was recorded at panicle initiation, flowering and harvest.

RESULTS AND DISCUSSION

Among the two varieties tried Kanchi recorded significantly higher yield than Kannagi (Table I). The yield

TABLE I. Effect of varieties and split application on grain yield (Kg/ha)

Treatment	Two Splits (M1)	Three Splits (M2)	Four Splits (M3)	Mean
Kanchi	5399	5438	5324	5387
Kannagi	5161	5062	5099	5108
C. D. (5%)	N. S.			175.0
Mean	5280	5250	5112	
C. D. (5%)	NS			

NS — Not significant

difference was mainly due to more number of panicles per m² recorded by Kanchi. The different timings of nitrogen application had least effecton grain yield and the yield differences were not statistically significant (Table I).

The yield differences due to spacing, density and their interaction were significant (Table II). Among the three spacings tried, S1 (10 x 10 cm) was significantly superior to S2 and S3, with a grain yield of 5738 kg/ha and S2 and S3 recording 5525 and 4463 kg/ha respectively. This clearly revealed

TABLE II. Effect of density and spacing on grain yield (kg/ha)

Spacing	Density per m²		Mean
	100 (D1)	200 (D2)	
S1 (10 x 10 cm)	7000	4475	5738
S2 (20 x 10 cm)	6700	4350	5525
S3 (20 x 20 cm)	4625	4300	4463
C. D. (5%)	125.0		100.0
Mean	6108	4375	
C. D. (5%)	75.0		

that increasing the spacing beyond 200 sq. cm per hill (20 x 10 cm) was detrimental to grain yield. The higher yield with closer spacing was due to increased number of total tillers and higher percentage of productive to total tillers and number of grains per unit areas This aspect compensated amply the reduction in panicle length and more of chaffiness found associated with closer spacing. Similar high yields with a spacing of 10 x 10 cm were reported by Ahmed and Rao (1966) and Shastry and Freeman (1971). The results of the studies at IRRI, Philippines (Anon., 1968) were also in favour of closer spacing at 10 x 10 cm.

The lower plant density of 100 seedings per m² (D1) gave significantly higher grain yield (6108 kg/ha) than higher density of 200 seedlings per m² (D2) with 4300 kg/ha. Hence planting more than 100 seedlings per m² not only decreased the grain yield but also resulted in wastage of seed material and labour. Hukkeri *et al.* (1968) obtained higher yield with a spacing of 10 x 10 cm and planting single seedling per hill.

The interaction between spacing and density was significant. Both at lower (D1) and higher (D2) density, closer spacing S1 recorded significantly higher yield than wider spacing and the lower plant density (D1) was significantly superior to higher density at all the three spacings. The S1 D1 combination (10 x 10 cm with single seddling per hill) recorded the highest grain yield of 7000 kg/ha among all the treatment combinations followed by S2 D1 (20x10 cm with two seedlings per hill) with 6700 kg/ha. The interaction had clearly brought out the fact that planting 100 seedlings per m^2 is sufficient for obtaining good yield. Increasing the number of seedlings to 200 per by planting four and eight seedlings per hill and adopting a wider spacing (20 x 20 cm) resulted in drastic reduction in grain yield, besides loss of valuable seed material. Hence optimum number of seedlings per m^2 and its equitable distribution within the unit area are the most important factors to ensure higher grain production.

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