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Effect of spacing and genotypes on growth and yield of aerobic rice

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ABSTRACT

An experiment was conducted during *Kharif* 2006 at Agronomy Field Unit, University of Agricultural Sciences, G.K.V.K., Bangalore, to study the effect of spacing and genotypes on growth and yield of aerobic rice. The results revealed that sowing of aerobic rice at a spacing of 45 cm x 20 cm has recorded significantly higher number of leaves per plant (187.3), leaf area per plant (4583 cm^2), number of tillers per plant (41.1), total dry matter production (79.4 g/plant), panicle length (22.1 cm), number of grains per panicle (195.8) and grain yield (57.3 q ha^{-1}) compared to other spacing. Among different genotypes, KRH–2 hybrid recorded significantly higher number of leaves per plant (172.9), leaf area per plant (3338 cm^2), number of tillers per plant (37.4), total dry matter production (83.7 g/plant), panicle length (23.5 cm), number of grains per panicle (207.9) and grain yield (57.6 q ha^{-1}) compared to other genotypes. Interaction between spacing and genotypes was not found significant with respect to growth and yield parameters.

Key words : Spacing, Genotypes, Aerobic rice, Grain and yield

INTRODUCTION

Rice (*Oryza sativa* L.) being the principal food crop to the billions of people around the world and India occupies a pride place among the food crops cultivated in the world. Aerobic rice production system is gaining importance for increased productivity and reduced water usage and is expected to occupy 10 -15 per cent of the total area in India. Higher productivity in any crop can be achieved through a combination of ideal genotypes in a proper environment and by providing suitable agronomic practices. One of the methods for increasing yield is by way of optimizing the plant population per hectare within the reasonable limit to avoid the competition between adjacent plants for light and nutrition. In order to find out the suitable crop geometry and genotype, the plant density studies have been intensified to produce better yield of crop. Greater utilization of radiation is possible when leaf area index attains the peak stage and the land is fully covered by leaves intercepting maximum radiation. Not much information is available on optimum spacing on yield of the cultivars including new genotypes of rice under aerobic method. Further the promising genotypes *viz*., KRH-2, MTU-1001, THANU, MAS-26, MAS-946, have unique characteristics and to exploit these promising genotypes on commercial scale, hence the agronomic investigation on aerobic rice was under taken.

MATERIALS AND METHODS

A field experiment was conducted during *Kharif* season 2006 on red sandy loam soil at Agronomy Field Unit, University of Agricultural Sciences, G.K.V.K., Bengaluru. The soil of the experimental site was red sandy loam having a pH of 6.86 and medium in organic carbon (0.62 %). The initial status of available N, P_2O_5 and K_2O of the experimental site was 246.5, 29.2 and 221.3 kg ha^{-1}, respectively. The experiment was laid out in split plot design with three replications. There were totally 15 treatment combinations comprising of five genotypes *viz*., KRH-2, MTU-1001, THANU, MAS-26 and MAS-946 and three spacing *viz*., 20 cm x 10 cm, 25 cm x 25 cm and 45 cm x 20 cm. Healthy presoaked seeds were sown during July 2006 as per the spacing. Recommended dose of NPK fertilizer (100:50:50 kg/ha) was applied for all the treatments. Nitrogen was applied 50 per cent at the time of sowing and remaining 50 per cent applied as top dressing (30 DAS). NPK are supplied through urea, single super phosphate and murate of potash, respectively. Irrigation was given as and when required depending on upon soil moisture. The growth and yield parameters were recorded at harvest by following standard procedure.

RESULTS AND DISCUSSION

The results are summarized below according to objectives at the study:

Effect of different spacing on growth and yield of aerobic rice:

Aerobic rice sown at a spacing of 45 cm x 10 cm recorded significantly higher growth parameters *viz*., number of leaves per plant (187.3), leaf area per plant (4583 cm^2), number of tillers per hill (41.1) and total dry

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matter production (79.4 g/plant) compared to other spacing. This may be due to higher availability of nutrients, light and moisture to the crop plants leads to vigorous growth, less competition for nutrients, light and moisture between the plants due to less plant population. These results are in conformity with the findings of Raju *et al*. (1989) and Shrirame *et al*. (2000). Lower number of leaves per plant (109.6), leaf area per plant (1557 cm^2), number of tillers per hill (20.6) and total dry matter production (42.6 g/plant) were noticed with the spacing of 20 cm x 10 cm (Table 1). This may be due to high competition for nutrients, moisture and light. These results are in conformity with the findings of Venkateswarlu and Singh (1980) and Makarim *et al.* (2002).

Table 1: Growth parameters of aerobic rice as influenced by different spacing and genotypes

Treatments	Number of leaves plant^{-1}	Leaf area (cm^2)	Number of tillers hill^{-1}	Total dry matter production (g hill^{-1})
Spacing (Main plot)				
20 cm x 10 cm	109.6	1557	20.6	42.6
25 cm x 25 cm	148.1	2804	31.6	65.0
45 cm x 20 cm	187.3	4583	41.1	79.4
S.E. ±	3.17	56.8	0.7	3.7
C.D. (P=0.05)	12.4	179.3	2.8	11.4
Genotypes (Sub plot)				
KRH-2	172.9	3338	37.4	83.7
MTU-1001	155.5	3016	33.1	68.8
THANU	153.45	3006	31.1	64.1
MAS-26	131.99	2781	27.6	49.5
MAS-946-1	127.7	2770	26.1	45.7
S.E. ±	5.6	56.4	0.9	2.2
C.D. (P=0.05)	16.5	163.2	2.8	6.8
Interaction				
S.E. ±	9.8	94.2	1.6	3.9
C.D. (P=0.05)	NS	NS	NS	NS

NS – Non significant

Table 2: Yield and yield parameters of aerobic rice as influenced by different spacing and genotypes

Treatments	Panicle length (cm)	Grains panicle^{-1}	1000 grain weight (g)	Grain yield (q/ha)
Spacing (Main plot)				
20 cm x 10 cm	17.8	161.5	20.1	40.9
25 cm x 25 cm	19.8	178.8	21.2	50.6
45 cm x 20 cm	22.1	195.8	21.6	57.3
S.E. ±	0.4	3.7	0.6	1.2
C.D. (P=0.05)	1.4	14.4	NS	4.8
Genotypes (sub plot)				
KRH-2	23.5	207.8	24.6	57.6
MTU-1001	20.9	185.7	22.1	52.7
THANU	20.1	182.4	21.2	50.2
MAS-26	17.8	160.8	18.9	45.4
MAS-946-1	17.1	156.5	18.0	42.2
S.E. ±	0.6	5.4	0.7	1.50
C.D. (P=0.05)	1.7	15.7	2.1	4.50
Interaction				
S.E. ±	1.0	9.3	1.2	2.6
C.D. (P=0.05)	NS	NS	NS	NS

NS – Non significant

Higher grain yield was recorded at a spacing of 45 cm x 20 cm (57.3 q/ha) which was superior over the spacing 25 cm x 25 cm (50.6 q/ha) and 20 cm x 10 cm (40.9 q/ha). The spacing 45 cm x 20 cm recorded 11.8 per cent and 28.6 per cent more grain yield than that of 25 cm x 25 cm and 20 cm x 10 cm spacing. The measure in higher grain yield with wider spacing might be due to higher yield parameters *viz.*, number of grains per panicle (195.8), panicle length (22.1 cm) and thousand grain weight (21.6 gm) (Table 2). Similar increase in the grain yield with increased plant spacing were also reported by earlier workers like Chandrakar and Chandravanshi (1988) and Makarim *et al.* (2002).

Effect of different genotypes on growth and yield of aerobic rice:

Genotype KRH-2 was recorded significantly higher number of leaves per plant (172.9), leaf area per plant (3338 cm^2), number of tillers per hill (37.4) and total dry matter production (83.7 g/plant) compared to other genotypes. It could be due to higher genetic potentiality. The findings are in accordance with Magat and Apo (2004). Lower number of leaves per plant (127.7), leaf area per plant (2770 cm^2), number of tillers per hill (26.1) and total dry matter production (45.7 g/plant) were recorded significantly by the genotype MAS 946-1 (Table 1).

The genotype KRH-2 recorded significantly higher grain yield (57.6 q ha^{-1}), which was superior over the MTU-1001 (52.7 q ha^{-1}) but was at par with THANU (50.2 q ha^{-1}). Higher grain yield recorded with KRH-2 hybrid might be due to higher yield parameters *viz.*, panicle length (23.5 cm), number of grains per panicle (207.8) and 1000 grain weight (24.6 g). Similar results were also reported by Pradhan *et al*. (2005). The lower grain yield recorded with MAS- 946-1 (42.2 q/ha) (Table 2). This might be due to short statured with protracted tillering and production of non productive tillers.

Interaction between spacing and genotypes were not found significant with respect to growth and yield parameters.

Conclusion:

The field trail revealed that, when aerobic rice was sown with wider spacing (45 cm x 20 cm) performed better than other spacing. Genotype KRH-2 was well suited in aerobic rice cultivation to get higher yield.

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