

COMPARATIVE STUDY OF GROWTH, YIELD ATTRIBUTES AND YIELD OF PADDY VARIETIES AS INFLUENCED BY SEED RATES UNDER DRILLED CONDITION

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ABSTRACT

The present investigation was conducted during *kharif* season of 2018 at Agricultural College farm, College of Agriculture, Nagpur, Maharashtra to optimize the seed rate of paddy varieties under drilled condition. Eight treatments were tested in Factorial randomized block design under three replications. Three factors of the trial were viz., varieties (2), seed rates (2) and spacings (2). Varieties tested were Poornima (V₁) and Indira aerobic-1 (V₂), while seed rates tested were 50 kg ha⁻¹ (SR₁) and 75 kg ha⁻¹ (SR₂) in two different spacings. The growth attributes were found superior in Indira aerobic -1 variety with seed rate of 75 kg ha⁻¹ (SR₂) as compared to Poornima variety. Significantly higher grain yield (4138 kg ha⁻¹) was obtained in Indira aerobic-1 variety which was significantly superior over Poornima variety (3113 kg ha⁻¹). Increased yield in Indira aerobic -1 variety is attributed to improve growth and yield parameters. The results revealed that Indira aerobic-1 variety performed well in seed rate of 75 kg ha⁻¹ under drilled condition and recorded maximum growth, yield attributes and yield.

(Key words: Growth attributes, yield attributes, yield, paddy, varieties, seed rates, drilled condition)

INTRODUCTION

Paddy (*Oryza sativa* L.) is one of the most important and widely cultivated cereal crop in the world. It is the staple food for more than one third of the world's population (Zhao *et al.*, 2011). 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.

At world level rice cultivation areas stretch from China to Australia. Higher productivity in any crop can be achieved through a combination of ideal genotypes in a proper environment and by providing suitable agronomic practices. Among the various cultural practices, selection of suitable rice variety, following the recommended seed rates and spacings are most important for maximizing the yield. The potential for increasing rice production strongly depends on the ability to integrate a better crop management for the different varieties into existing cultivation systems (Mikkelsen *et al.*, 1995) to meet the increasing demands for rice. Selection of adaptable and high yielding genotypes was considered valuable and necessary. Improved high yielding and hybrid varieties contribute one of the major

components of modern rice production technology (Prasad, 2004).

Seed rate significantly determines the plant population, yield components, yield and relative economic output of aerobic rice. Suitable rice variety with optimum seed rate is significantly desirable to utilize available natural resources efficiently to getting maximum yield. Therefore, considering the above harden facts, the present investigation entitled "Comparative study of growth and yield attributes of direct seeded paddy varieties as influenced by seed rates under drilled condition" was carried out.

MATERIALS AND METHODS

The present experiment was conducted at Agriculture College Farm, Nagpur during *kharif* season of 2018-2019. Nagpur is located in Maharashtra state between 21°8' north latitude to 79°4' east longitude having an elevation of 321 m above MSL and has subtropical climate. The soil of the plot was vertisol, and had uniform topography with levelled surface. The experiment was laid in Factorial randomized block design with eight treatments and three

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replications. The factors used were varieties (V_1 - Poornima, V_2 - Indira aerobic -1), seed rates (SR_1 -50 kg ha⁻¹, SR_2 -75 kg ha⁻¹) and spacings (S_1 - 20 cm row spacing, S_2 -30cm row spacing). The treatments used were T_1 ($V_1+S_1+SR_1$), T_2 ($V_1+S_1+SR_2$), T_3 ($V_1+S_2+SR_1$), T_4 ($V_1+S_2+SR_2$), T_5 ($V_2+S_1+SR_1$), T_6 ($V_2+S_1+SR_2$), T_7 ($V_2+S_2+SR_1$), T_8 ($V_2+S_2+SR_2$). The plant height (cm), number of functional leaves plant⁻¹, Dry matter accumulation plant⁻¹ (g), number of tillers plant⁻¹, number of effective tillers plant⁻¹, number of panicles plant⁻¹, length of panicle (cm), number of grains panicle⁻¹, weight of grains panicle⁻¹ (g), test weight (g), grain yield (kg ha⁻¹) were recorded periodically. The observed data were analyzed statistically and the appropriate standard error of mean SE ($m \pm$) and the critical difference (CD) were calculated at 5% level of significance (Panse and Sukhatme, 1954).

RESULTS AND DISCUSSION

Growth attributes

Plant height (cm)

The variety Indira aerobic-1 recorded significantly higher plant height (cm) than Poornima variety. This may be attributed to the strong performance and genetic expression of the variety. The results were in conformity with Durgam *et al.* (2016). They recorded the maximum height of the paddy variety MTU1010 compared to other varieties. The seed rate had significant influence on plant height (cm), maximum plant height (cm) was with seed rate of 75 kg ha⁻¹ than 50 kg ha⁻¹, this might be due to more competition for sun light. Garba *et al.* (2013) and Ameen *et al.* (2014) observed that the seed rate of 75 kg ha⁻¹ produced the taller plants compared to the other seed rates.

Number of functional leaves plant⁻¹

The number of functional leaves plant⁻¹ were influenced by variety and the variety Indira aerobic -1 had more number of functional leaves plant⁻¹ as compared to Poornima variety. Basavaraja *et al.* (2010) and Durgam *et al.* (2016) recorded highest number of functional leaves plant⁻¹ with variety MTU1010. Seed rate of 75 kg ha⁻¹ had produced more number of functional leaves plant⁻¹ than seed rate of 50 kg ha⁻¹. Garba *et al.* (2013) recorded the greater number of functional leaves plant⁻¹ with higher seed rate.

Dry matter accumulation plant⁻¹(g)

More dry matter accumulation plant⁻¹(g) was observed with Indira aerobic-1 paddy variety than Poornima variety. Maximum dry matter accumulation (g) of a genotype compared to other genotypes could be due to higher genetic potentiality. Basavaraja *et al.* (2010) and Shridara *et al.* (2011) recorded the highest amount of dry matter accumulation plant⁻¹ with paddy varieties KRH-2 and BI-43. Seed rate of 75 kg ha⁻¹ had influenced the dry matter accumulation plant⁻¹(g). The results were in accordance with the results of Payman and Singh (2013). They compared the different seed rates and reported that the maximum accumulation of dry matter plant⁻¹ was associated with higher seed rate 60 kg ha⁻¹.

Number of tillers plant⁻¹

Maximum number of tillers plant⁻¹ were in Indira aerobic -1 paddy variety than Poornima variety. Garba *et al.* (2013) and Durgam *et al.* (2016) observed a greater number of tillers plant⁻¹ in paddy varieties MTU1010. More number of tillers plant⁻¹ were produced at 75 kg ha⁻¹ seed rate than 50 kg ha⁻¹. Garba *et al.* (2013) and Ameen *et al.* (2014) noticed the higher number of tillers plant⁻¹ under the influence of higher seed rate of 75 kg ha⁻¹.

Number of effective tillers plant⁻¹

The variety Indira aerobic-1 produced maximum number of effective tillers plant⁻¹ and was significantly superior over Poornima variety. Ameen *et al.* (2014) observed that more number of productive tillers plant⁻¹ in super basmati paddy variety sown under drilled condition. Increase greater number of productive tillers at seeding density of 75 kg ha⁻¹ might also be attributed to optimum plant population due to higher initial seeding density hence, there is more appropriation between the panicles for resource utilization which resulted in a greater number of fertile tillers (Sharma, 1982 and Pedroso and Mariot, 1986). The similar results of the experiment were observed by Ameen *et al.* (2014). The interaction effect of variety and seed rate on growth parameters was found to be non significant.

Yield attributes

Number of panicles plant⁻¹

Total number of panicles plant⁻¹ were significantly influenced and the variety Indira aerobic-1 and was found to be superior over the Poornima variety which might be due to high potential of a genotype to utilise all the resources efficiently. The results of the experiment were similar to the results obtained by Shridara *et al.* (2011) with paddy variety BI-43. The seed rate of 75 kg ha⁻¹ was significantly superior to seed rate of 50 kg ha⁻¹ in recording number of panicles plant⁻¹. The results were in conformity with the results of Ambuj *et al.* (2018), they observed significantly higher number of panicles plant⁻¹ with row spacing of 20 cm.

Length of panicle (cm)

The variety Indira aerobic-1 produced higher length of panicle (cm) than Poornima variety. The length of panicle (cm) is purely a varietal character which is influenced by the genetic makeup and environment. Durgam *et al.* (2016) reported higher length of panicle with paddy variety MTU1010. Seed rate did not have any significant influence on the length of the panicle (cm).

Number of grains panicle⁻¹

The maximum number of grains panicle⁻¹ were observed in Indira aerobic-1 variety and was significantly superior to Poornima variety. Basavaraja *et al.* (2011) and Durgam *et al.* (2016) recorded highest number of grains panicle⁻¹ with paddy varieties MTU1010 and KRH-2. The seed rate of 75 kg ha⁻¹ gave a greater number of grains panicles⁻¹ as compared to 50 kg ha⁻¹. Payman and Singh (2008) reported that a greater number of grains panicle⁻¹ was observed with seed rate of 60 kg ha⁻¹ than lower seed rates of 50 kg ha⁻¹ and 40 kg ha⁻¹.

Table1. Growth, yield attributes and yield of paddy varieties as influenced by seed rates

Treatments	Plant weight (cm)	Functional leaves plant ⁻¹	Dry matter plant ⁻¹	Number of tillers plant ⁻¹	Number of effective tillers plant ⁻¹	Total number of panicles plant ⁻¹	Length of panicle (cm)	No. of grains panicle ⁻¹	Weight of grains panicle ⁻¹ (g)	Test weight (g)	Grain yield (kg ha ⁻¹)
Variety(A)											
V ₁ -Poornima	91.88	28.64	27.58	11.88	8.49	8.49	24.41	113.67	1.93	16.62	3113
V ₂ -Indira aerobic-I	97.79	32.12	31.61	12.97	9.78	9.78	26.03	151.25	2.64	18.26	4138
SE (m) ±	1.36	1.89	0.17	0.31	0.30	0.30	0.23	2.60	0.10	0.58	32.00
CD at 5%	3.99	-	0.48	0.89	0.70	0.70	0.58	6.90	0.27	-	94.00
Seed rate(B)											
SR ₁ - 50 Kg ha ⁻¹	92.64	29.44	28.45	11.91	8.66	8.66	25.04	128.17	2.13	17.13	3564
SR ₂ - 75 Kg ha ⁻¹	97.03	31.33	30.74	12.93	9.61	9.61	25.41	136.75	2.44	17.75	3681
SE (m) ±	1.36	1.89	0.17	0.31	0.30	0.30	0.23	2.60	0.10	0.58	32.00
CD at 5%	3.99	-	0.48	0.89	0.70	0.70	0.58	6.90	0.27	-	94.00
Interaction(A×B)											
SE(m) ±	1.91	2.67	0.24	0.43	0.42	0.42	0.33	3.67	0.13	0.81	45.00
CD at 5%	-	-	-	-	-	-	-	-	-	-	-

Weight of grains panicle⁻¹(g)

The Indira aerobic-1 variety recorded significantly higher weight of grains panicle⁻¹(g) and was superior over Poornima variety. Garba *et al.* (2013) and Yadav *et al.* (2017) observed more weight of grains panicle⁻¹ with paddy varieties PAC837, DRRH-3 and NERICA-1. The seed rate of 75 kg ha⁻¹ recorded higher weight of grains panicle⁻¹(g) which was significantly superior to seed rate of 50 kg ha⁻¹.

Test weight (g)

There was no significant influence of different varieties and seed rates on test weight (g). The grain yield (kg ha⁻¹) was significantly influenced by different varieties. The interaction effect of variety and seed rate on yield attributes was found non-significant.

Yield

Grain yield (kg ha⁻¹)

The variety Indira aerobic -1 produced more grain yield ha⁻¹ and was found to be significantly superior in producing grain yield ha⁻¹ over the Poornima variety. The increase in grain yield by the variety may be due to its ability to produce more photosynthates utilized in the production of grains than the other variety during anthesis and grain filling stages. Suresh *et al.* (2013) and Durgam *et al.* (2016) reported higher grain yield with the paddy variety MTU1010. The seed rate of 75 kg ha⁻¹ had significant influence on grain yield ha⁻¹ and produced maximum grain yield ha⁻¹ as compared to seed rate of 50 kg ha⁻¹. The higher grain yield was observed by Dongarwar *et al.* (2018) with seed rate of 75 kg ha⁻¹ compared to other lower seed rates. The grain yield is high because of higher plant density which in turn increases the number of yield attributing characters. The interaction effect of variety and seed rate was found nonsignificant.

The present study concludes that the variety Indira aerobic -1 recorded maximum growth, yield attributes and yield in seed rate of 75 kg ha⁻¹.

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Rec. on 03.08.2019 & Acc. on 15.08.2019