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Effect of different age of seedlings and varieties on growth and yield of Aman rice (*Oryza sativa* L.)

Poonam Sidar, Narendra Kumar, Ashwani Kumar Thakur, Tejpal Chandrakar and Devendra Pratap Singh

Abstract
A field experiment was conducted at the Research cum Instructional Farm, Shaheed Gundadhoor College of Agriculture and Research Station, Jagdalpur, Bastar (C.G.) during *Kharif* season 2021 to study the Effect of different age of seedlings and varieties on growth and yield of *Aman* rice (*Oryza sativa* L.). The result revealed that M1 produced significantly taller plant, more number of tillers hill^{-1}, higher dry matter accumulation, and highest grain yield and test weight than the M2 and M3. Plant height, number of tillers hill^{-1}, Dry matter accumulation, panicle length, total number of grains panicle^{-1}, test weight, grain yield, straw yield and harvest index was recorded significantly higher in rice varieties V3.

Keywords: Age of seedlings, varieties, rice

Introduction
Rice is monocot plant that belongs to the family Poaceae. Rice is the staple meal for more than half of the world's population, hence 2004 was declared as the International Year of Rice by United Nations with the theme 'Rice is Life' which emphasizes the importance of rice as a key food supply that is crucial for food security, poverty reduction and improved livelihoods.

Rice (*Oryza sativa* L.) is the most important staple food in Asia more than 90% of the world's rice is grown and consumed in Asia, where 60% of the world's population lives (Guyer *et al*., 2014) [11]. Rice has 25 known species, only two of which *i.e*., *Oryza sativa* and *Oryza glaberrima* are widely cultivated worldwide because of its long history of cultivation and variety of habitats, it has developed a wide range of flexibility and tolerance allowing it to be cultivated in a variety of water/soil regimes ranging from severely flooded terrain to dry mountainous slopes (Lu and Chang, 1980) [13] with the rest being wild species.

Rice is the second most significant cereal crop after maize. Rice is grown in about 120 nations around the world, except Antarctica. Rice production has traditionally been dominated by Asian countries; China and India together account for more than half of worldwide rice production. Globally it covers an area of about 165.22 million hectares with the total production of 509.29 million metric tonnes and productivity of about 4.60 metric tons ha^{-1} (Anonymous, 2020a) [3].

India's rice industry is a significant contributor to the country's GDP. India is the world's second-largest rice producer and exporter with the production of about 1023.64 lakh tones in an area of total 401.05 lakh hectares and productivity of 2552 kg ha^{-1} (Anonymous, 2020b) [4]. In recent years, the country has seen a surplus of food grains produced through an integrated approach of high-yielding varieties, better mechanization, and disease and pest control. Chhattisgarh is considered as one of the agriculture domesticated state. In Chhattisgarh rice occupies an area of 3903.92 thousand hectare with the production of 8946.3 thousand metric tons and productivity of 2292 kg ha^{-1} (Anonymous, 2020c) [5].

Besides various factors, age of seedling at transplanting is an important factor transferring seedling in proper age can provide appropriate ground for achieving potential production. When seedlings stay for a longer period of time in the nursery beds, the primary tiller buds on the lower nodes of the main culm become degenerated leading to reduced tiller production (Mobasser *et al*., 2007) [14].

Adjustment in the time of transplanting enables the plants to take the advantage of natural conditions favorable for growth. Time of transplanting was found to have a great influence on the growth, yield and yield contributing characters of rice (Islam *et al*., 1999) [9]. Late planting exposes the reproductive phase as well as phenological events of the crop to an unfavorable

temperature regime, thereby causing high spikelet, sterility and poor plant growth. However, optimum rice planting dates are regional and vary with location and genotypes (Bruns and Abbas, 2006) [7].

Methods and Materials

A field experiment was conducted at the Research cum Instructional farm, Shaheed Gundadhoor College of Agriculture and Research Station, Jagdalpur, Bastar (C.G.) during *Kharif* season 2021. The experiment was laid out in Split Plot Design with three replications. The main plot treatment consists of three different age of seedling *viz.* 12 days old seedlings (M1), 17 days old seedlings (M2) and 22 days old seedlings (M3) sub plot treatments are four varieties *viz.* MTU-1001 (V1), Karma mahsuri (V2), Bamleshwari (V3) and Samleshwari (V4).

Result and Discussion

It was observed that growth and yield attributing characters like plant height, number of tillers, dry matter accumulations, panicle length, and number of grains panicle^{-1}, test weight, grain yield, straw yield and harvest index were significantly influenced by different age of seedlings and rice varieties.

Plant height (cm)

Plant height is an important growth characteristic that is relation to grain yield and biomass. The data on plant height recorded at various growth stages is shown in Table 1. The data reveals that at 30 DAT, it was observed non-significant effect due to different treatment but numerically taller plant was found in treatment M1 (12 days old seedlings) than the M2 (17 days old seedlings) and M3 (22 days old seedlings). The data reveals that taller plant showed significant effect in treatment M1 (12 days old seedlings) at 60 DAT, 90 DAT and at harvest but it was found at par with treatment M2 (17 days old seedlings) at 60 DAT and smaller plant was observed in treatment M3 (22 days old seedlings). It was found that younger seedlings had the highest plant height while older seedlings had the lowest similar result was found (Islam *et al*., 2021 and Sarkar *et al*., 2011) [10, 19], Durga *et al.* (2015) [8], Barla *et al.* (2013) [6] and Adhikari *et al.* (2013) who reported that the highest plant height is significantly affected in younger age of seedlings.

In case of varieties 30, 60, 90 DAT and at harvest, the variety V3 (Bamleshwari) was found significant taller plants but it was found on par with variety V1 (MTU-1001) at 30 DAT, 60 DAT and V4 at 60 DAT.

Interaction effect on plant height (cm)

Interaction effect on different age of seedlings and varieties on plant height are given in Table 2. The data shows that treatment M1×V3 (12 days old seedlings × Bamleshwari), M2×V3 (17 days old seedlings × Bamleshwari) and M3×V3 (22 days old seedlings × Bamleshwari) were recorded significantly taller plant among all other treatments. While lowest plant height recorded interaction M1×V2 (12 days old seedlings × Karma Mahsuri), M2×V2 (17 days old seedlings × Karma Mahsuri) and M3×V2 (22 days old seedlings × Karma Mahsuri).

Table 1: Effect of different age of seedlings and varieties on plant height at different growth stages

Treatment	Plant height (cm)			
	30 DAT	60 DAT	90 DAT	At harvest
Age of seedlings				
M1	35.88	83.91	108.88	110.55
M2	35.74	83.33	108.13	110.08
M3	35.65	81.17	107.78	109.61
SEm±	0.14	0.54	0.11	0.04
CD	NS	2.17	0.43	0.14
Varieties				
V1	37.82	84.15	115.87	116.84
V2	32.09	77.64	98.62	100.89
V3	38.03	84.50	117.58	119.78
V4	35.03	83.91	100.99	102.83
SEm±	0.09	0.60	0.21	0.10
CD	0.28	1.81	0.63	0.29

DAT: Days After Transplanting, M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 Day's old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Table 2: Interaction effect on plant height of different age of seedlings and varieties of rice

Varieties	Plant height (cm) at harvest			
	Age of seedlings (days)			Mean
	M1	M2	M3	
V1	117.29	117.12	116.12	116.84
V2	101.08	100.82	100.74	100.88
V3	119.87	119.54	119.90	119.77
V4	103.98	102.83	101.69	102.83
Mean	110.55	110.08	109.61	
	M	V	M×V	
SEm±	0.04	0.10	0.07	
CD	0.14	0.29	0.50	

M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Number of tillers hill^{-1}

The data pertaining to number of tillers are presented in Table 3. Table shows that there were significant effect among the treatments. Treatment M1 (12 days old seedlings) recorded significantly maximum number of tillers hill^{-1} at all growth stages, but it was found at par with treatment M2 (17 days old seedlings) at 30 DAT, 60 DAT and 90 DAT. It was observed in rice plant produce more number of tillers younger seedlings compare to old seedlings similar result was reported Khatun *et al.* (2002) [12], Ali *et al*. (2013) [2], Raut *et al.* (2019) [17], and Saphi and Yadav, (2018) [18].

In case of varieties, treatment V3 (Bamleshwari) produced maximum number of tillers hill^{-1} at all growth stages *i.e*., 30 DAT, 60 DAT, 90 DAT and at harvest but it was found at par with treatment V1 (MTU-1001) at all growth stages and V2 (Karma Mahsuri) at 60 DAT.

Table 3: Effect of different age of seedlings and varieties on number of tillers at different growth stages

Treatment	Number of tillers hill^{-1}			
	30 DAT	60 DAT	90 DAT	At harvest
Age of seedlings				
M1	9.13	17.52	23.31	23.86
M2	8.98	16.87	22.42	22.87
M3	6.59	16.72	21.85	22.16
SEm±	0.25	0.10	0.24	0.22
CD	0.99	0.39	0.98	0.90
Varieties				
V1	8.33	17.36	23.25	23.34
V2	8.17	17.16	22.21	22.47
V3	8.50	17.68	23.24	24.31
V4	7.94	15.96	21.42	21.75
SEm±	0.09	0.26	0.24	0.25
CD	0.28	0.77	0.78	0.73

DAT: Days After Transplanting, M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri,V3: Bamleshwari and V4: Samleshwari

Interaction effect on number of tillers hill^{-1}

Interaction effect of different age of seedlings and varieties on number of tillers hill^{-1} are given in Table 4. The data shows that treatment M1×V3 (12 days old seedlings × Bamleshwari), M2×V3 (17 days old seedlings × Bamleshwari) and M3×V3 (22 days old seedlings × Bamleshwari) was recorded significantly more number of tiller hill^{-1} among all treatments but treatment interaction M2×V3 was found at par with M2×V1, and treatment interaction M3×V3 was at par with M3×V1, M3×V2 and M3×V4.

Table 4: Interaction effect on number of tillers of different age of seedlings and varieties of rice

Varieties	Number of tillers at harvest			
	Age of seedlings (days)			Mean
	M1	M2	M3	
V1	24.44	23.18	22.41	23.34
V2	22.52	22.67	22.22	22.47
V3	26.19	24.18	22.58	24.31
V4	22.19	21.43	21.43	21.75
Mean	23.86	22.87	22.16	
	M	**V**	**M×V**	
SEm±	0.22	0.25	0.45	
CD	0.90	0.73	1.39	

M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Dry matter accumulation

The data on dry matter accumulation recorded at different growth stages is presented in Table 5. The data shows that the treatment M1 (12 days old seedlings) recorded significantly higher dry matter accumulation among all treatments at all growth stages. Younger seedlings produced more dry matter than older seedlings these result was like with Pandey *et al.* (2021) [15], Raut *et al.* (2019) [17] and Rasool *et al.* (2016) [16].

In case of varieties, variety V3 (Bamleshwari) was recorded significantly higher dry matter accumulation among all treatments at all growth stages and lowest was recorded V2 (Karma Mahsuri).

Panicle length (cm)

The data pertaining to panicle length are presented in Table 6. Although the age of seedlings was no significant effect among the treatments however, treatment M1 (12 days old seedlings) was observed numerically longer panicle length than treatments M2 (17 days old seedlings) and M3 (22 days old seedlings). It could be younger seedlings are longest panicle length due to early establishment and increase the availability of nutrients and soil moisture to plants which contributed to panicle length of rice similar result was reported Tari *et al.* (2007) [21] and Sarkar *et al.* (2011) [19]. In case of varieties, variety V3 (Bamleshwari) had recorded longer panicle length than all treatments *i.e.*, V1 (MTU 1001), V2 (Karma Mahsuri) and V4 (Samleshwari).

Table 5: Effect of different age of seedlings and varieties on dry matter accumulation at different growth stages

Treatment	Dry matter accumulation			
	30 DAT	60 DAT	90 DAT	At harvest
Age of seedlings				
M1	2.48	18.03	39.09	45.10
M2	2.26	17.32	38.25	43.97
M3	1.80	16.64	37.65	43.11
SEm±	0.02	0.08	0.11	0.08
CD	0.09	0.32	0.45	0.34
Varieties				
V1	2.08	17.65	41.09	44.27
V2	1.64	16.31	34.18	42.11
V3	2.98	18.77	42.94	46.36
V4	2.01	16.60	35.10	43.50
SEm±	0.06	0.14	0.11	0.11
CD	0.19	0.42	0.34	0.33

DAT: Days After Transplanting, M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Total number of grains panicle^{-1}

Total number of grains panicle^{-1} is shown in Table 6. Data shows that there was no statistically significant effect among all treatments. However, treatment M1 (12 days old seedlings) recorded numerically higher total number of grains panicle^{-1} and lowest was recorded in treatment M3 (17 days old seedlings). It was found the highest number of grains panicle^{-1} in younger seedlings same result reported (Tari *et al.* 2007 and Sarkar *et al.* 2011) [21, 19]. In case of varieties there was also no significant affect among varieties. However, treatment V2 (Karma Mahsuri) was recorded the highest total number

of grains panicle^{-1} and lowest grain panicle^{-1} was recorded in treatment V4 (Samleshwari).

Table 6: Effect of different age of seedlings and varieties on panicle length, total number of grains panicle^{-1}, Test weight of rice

Treatments	Panicle length (cm)	Total number of grains panicle^{-1}	Test weight (g)
	Age of seedlings		
M1	27.62	339.58	25.14
M2	26.58	281.33	25.00
M3	26.06	272.33	24.80
SEm±	0.56	26.67	0.04
CD	NS	NS	0.15
Varieties			
V1	25.92	311.44	28.36
V2	25.37	328.22	21.46
V3	29.08	284.33	28.19
V4	26.64	264.11	21.92
SEm±	0.63	20.02	0.09
CD	1.88	NS	0.26

M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Test weight (g)

Test weight was affected by treatment data presented in Table 6. The data shows that the treatment M1 (12 days old seedlings) had recorded significantly higher test weight but it was found on par with M2 (17 days old seedlings). The maximum test weight was recorded in young seedlings and minimum test weight was recorded older seedlings similar analysis recorded Ali *et al.* (2013) [2] and Islam *et al.* (2021) [10]. In case of varieties, variety V1 (MTU 1001) was recorded significantly higher test weight among all the treatments but it was found at par with variety V3 (Bamleshwari).

Interaction effect on panicle length (cm)

Interaction effect of different age of seedlings and varieties on panicle length are given in Table 7. The data reveals that treatment interaction was found no significant effect among age of seedlings and varieties. However, it was found numerically higher panicle length in interaction M1×V3 (12 days old seedlings × Bamleshwari), M2×V3 (17 days old seedlings × Bamleshwari) and M3×V3 (22 days old seedlings × Bamleshwari) and lowest panicle length was recorded in treatment interaction M1×V1, M2×V2 and M3×V2.

Interaction effect on total number of grains panicle^{-1}

The interaction effects of due to age of seedling and varieties of rice on the total number of grains panicle^{-1} are presented in Table 8. The data reveals that there were no significant effect among all treatments interaction. Whereas, treatment interaction M1×V2 (12 days old seedlings × Karma Mahsuri), M2×V2 (17 days old seedlings × Karma Mahsuri) and M3×V2 (22 days old seedlings × Karma Mahsuri) were observed numerically total number of grains panicle^{-1} was higher than other treatment interaction.

Interaction effect on test weight (g)

Interaction effect of test weight due to different age of seedling and varieties of rice are presented in Table 9. The data reveals that the interaction effect on the test weight was no significant effect among all treatment interactions. Whereas, treatment interaction of M1×V1, M2×V1 and M3×V1 were recorded numerically higher test weight than other treatments interaction. Lowest test weight was recorded in M1×V2, M2×V2 and M3×V2.

Table 7: Interaction effect on panicle length of different age of seedlings and varieties of rice

Varieties	Panicle length (cm)			
	Age of seedlings (days)			Mean
	M1	M2	M3	
V1	26.57	25.67	25.53	25.92
V2	27.00	24.90	24.20	25.37
V3	29.50	28.30	29.43	29.08
V4	27.40	27.47	25.07	26.64
Mean	27.62	26.58	26.06	
	M	V	M×V	
SEm±	0.53	0.63	1.05	
CD	NS	1.88	NS	

M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Table 8: Interaction effect on total number of grains panicle^{-1} of different age of seedlings and varieties of rice

Varieties	Total number of grains panicle^{-1}			
	Age of seedlings (days)			Mean
	M1	M2	M3	
V1	392.00	278.67	263.67	311.45
V2	385.33	300.67	298.67	328.22
V3	306.00	283.00	264.00	284.33
V4	275.00	263.00	254.33	264.11
Mean	339.58	281.33	270.17	
	M	V	M×V	
SEm±	26.67	20.02	53.34	
CD	NS	NS	NS	

M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Table 9: Interaction effect on test weight of different age of seedlings and varieties of rice

	Test weight (g)			
	Age of seedlings (days)			Mean
	M1	M2	M3	
V1	28.55	28.47	28.07	28.36
V2	21.57	21.48	21.34	21.46
V3	28.54	28.03	27.99	28.19
V4	21.92	22.02	21.80	21.92
Mean	25.14	25.00	24.80	
	M	V	M×V	
SEm±	0.04	0.09	0.07	
CD	0.15	0.26	NS	

M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Grain yield (q ha^{-1})

The grain yield data is presented in Table 10. The data revealed that significantly higher grain yield (47.92qha^{-1}) was recorded in treatment M1 which was at par with treatment M2. In general, it was observed that grain yield increased with younger seedlings same result was found (Barla *et al.*, 2013 [6], Ali *et al.*, 2013 [2] and Saphi and Yadav, 2018) [18]. In case of varieties, treatment V3 (Bamleshwari) produced significantly highest grain yield (54.11qha^{-1}) among all other treatment *i.e.*, V4 (Samleshwari), V1 (MTU 1001) and V2

(Karma Mahsuri).

Table 10: Effect of different age of seedlings and varieties on grain yield, straw yield and harvest index of rice

Treatments	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest index (%)
	Age of seedlings		
M1	47.92	70.42	40.38
M2	47.42	70.00	40.27
M3	44.92	68.58	39.49
SEm±	0.26	0.73	0.33
CD	1.06	NS	NS
Varieties			
V1	43.22	68.87	38.59
V2	43.00	70.89	37.92
V3	54.11	72.22	42.94
V4	46.67	67.66	40.73
SEm±	0.77	0.40	0.39
CD	2.30	1.21	1.16

M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Straw yield (q ha^{-1})

Effect of different treatments on the straw yield is presented in Table 10. The age of seedlings were no significantly influence on straw yield among the different treatments. However, treatment M1 (12 days old seedlings) recorded numerically maximum straw yield (70.54 qha^{-1}) followed by M2 (17 days old seedlings) and M3 (22 days old seedlings). It was found that younger seedlings produced the maximum straw yield as compared to older seedlings similar result reported (Barla *et al*., 2013 and Vijayalaxmi *et al.* 2016) [6, 22]. In case of variety, significantly more straw yield was produced by treatment V3 (Bamleshwari) as compare to V2 (Karma Mahsuri), V1 (MTU 1001) and V4 (Samleshwari).

Harvest index (%)

To partitioning behavior of grain and straw yield of the rice influenced by different age of seedling under study the harvest index value for treatments were calculated and presented in Table 10. It was obvious from the data was no significant among different treatments. But numerically maximum harvest index was recorded in treatment M1 (12 days old seedlings). Similar result was found younger seedlings had the highest harvest index while older seedlings had the lowest similar result found (Sultan *et al*., 2018 and Khatun *et al*., 2002) [20, 12]. In case of varieties, variety V3 (Bamleshwari) showed a significantly higher harvest index than V1 (MTU 1001), V2 (Karma Mahsuri) and V4 (Samleshwari).

Interaction effect on grain yield (q ha^{-1})

The interaction effects of grain yield due to different age of seedlings and varieties are presented in Table 11. The data indicate that interaction effect of grain yield was no significant effect. Whereas treatment interaction M1×V3 (12 days old seedlings × Bamleshwari) was produced numerically higher grain yield due to younger seedlings and higher yield potential variety than interaction between M2×V3 (17 days old seedlings × Bamleshwari) and M3×V1 (22 days old seedlings × Bamleshwari).

Table 11: Interaction effect on grain yield of different age of seedlings and varieties of rice

Varieties	Grain yield (kg ha^{-1})			
	Age of seedlings (days)			Mean
	M1	M2	M3	
V1	44.00	43.33	42.33	43.22
V2	44.02	43.00	42.00	43.00
V3	54.00	55.00	53.33	54.11
V4	49.67	48.33	42.00	46.67
Mean	47.92	47.42	44.92	
	M	V	M×V	
SEm±	0.26	0.77	0.53	
CD	1.06	2.30	NS	

M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Interaction effect on straw yield (q ha^{-1})

The interaction effect of straw yield due to different age of seedlings and varieties are presented in Table 12. The data reveals that interaction M1×V3 (12 days old seedlings × Bamleshwari), M2×V3 (17 days old seedlings × Bamleshwari) and M3×V3 (22 days old seedlings × Bamleshwari) produced significantly highly straw yield which was at par with M1×V2 (12 days old seedlings × Karma Mahsuri), M2×V2 (17 days old seedlings × Karma Mahsuri) M3×V2 (22 days old seedlings × Karma Mahsuri).

Interaction effect on harvest index (%)

Interaction effect of harvest index due to different age of seedlings and varieties are presented in Table 13. The data indicate that the treatment interactions were no significantly affected. However, interaction M1×V3 (12 days old seedlings × Bamleshwari) had numerically higher harvest index than the M2×V3 (17 days old seedlings × Bamleshwari) and M3×V3 (22 days old seedlings × Bamleshwari) were showed maximum harvest index. While interaction, M1×V2, M2×V2 and M3×V1 were recorded lowest harvest index.

Table 12: Interaction effect on straw yield of different age of seedlings and varieties of rice

Varieties	Straw yield (kg ha^{-1})			
	Age of seedlings (days)			Mean
	M1	M2	M3	
V1	67.33	69.00	67.30	67.87
V2	71.67	71.00	70.00	70.89
V3	73.00	72.33	71.33	72.22
V4	69.67	67.67	65.67	67.66
Mean	70.42	70.00	68.58	
	M	V	M×V	
SEm±	0.73	0.40	1.46	
CD	NS	1.21	2.53	

M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Table 13: Interaction effect on harvest index of different age of seedlings and varieties of rice

Varieties	Harvest index (%)			
	Age of seedlings (days)			Mean
	M1	M2	M3	
V1	39.52	38.57	37.68	38.59
V2	38.00	37.29	38.46	37.92
V3	42.41	43.62	42.80	42.94
V4	41.58	41.60	39.01	40.73
Mean	40.38	40.27	39.49	
	M	**V**	**M×V**	
SEm±	0.33	0.39	0.67	
CD	NS	1.16	NS	

M1: 12 days old seedlings, M2: 17 days old seedlings, M3 22 days old seedlings, V1: MTU-1001, V2: Karma Mahsuri, V3: Bamleshwari and V4: Samleshwari

Conclusion

Based on the experiment, it is concluded that treatment M1 (12 days old seedlings) and V3 (Bamleshwari) was found the best treatment increasing the crop growth and grain yield of rice because younger age of seedlings early establishment of root and nutrient uptake more than older seedlings in case of variety V3 was high yielding variety.

Referances

1. Adhikari VB, Mehera B, Haefele S. Impact of rice nursery nutrient management, seedling density and seedling age on yield and yield attributes. American Journal of Plant Sciences. 2013;4:146-155.
2. Ali MS, Hasan MA, Sikder S, Islam MR, Hafiz MHR. Effect of seedling age and water management on the performance of boro rice (*Oryza sativa* L.) variety BRRI Dhan28. The Agriculturist. 2013;11(2):28-37.
3. Anonymous. World Agricultural Production. United State of Agriculture; c2020a. p.32.
4. Anonymous. First Advance Estimates of Production of Food Grains. Directorate of Economics and Statistics. New Delhi, India: Ministry of Agriculture and Farmers Welfare, Government of India; c2020b.
5. Anonymous. Chhattisgarh Government, Agriculture Development and Farmers Welfare and Biotechnology Branch; c2020c. p.10.
6. Barla S, Upasani RR, Kulshestha SK, Thakur R. Effect of age and number of seedlings on weed dynamics, productivity and nutrient uptake of rice (*Oryza sativa*). Current Advance in Agricultural Sciences. 2013;5(2):197-200.
7. Bruns HA, Abbas HK. Planting date effects on Bt and non Bt corn in the Mid-South USA. Agron. J. 2006;98:100-106.
8. Durga KK, Rao PS, Raju K. Effect old seedling age and spacing schedule on the productivity and quality traits of rice under system of rice intensification (SRI). Journals of Cereals and Oilseeds. 2015;6(3):15-19.
9. Islam MR, Rahman MS, Rahman MH, Awal MA, Hossain SMS. Effect of date of transplanting of yield and yield after bytes of two advanced mutant of rice in Aman season. Bangladesh J Nucl. Agri. 1999;15:34-40.
10. Islam Md K, Hosssen K, Afroge M, Hosen A, Masum KAAM, Osman MA, *et al*. Effect of different age of seedlings on the growth and yield performance of transplanted Aus rice variety. Innovation of Agriculture. 2021;4:01-06.
11. Guyer D, Tuttle A, Rouse S, Volrath V, Johnson M, Potter S. Activation of latent transgenes in Arabidopsis using a hybrid transcription factor. Genetic. 2014;149:633-639.
12. Khatun A, Mollah MIU, Rashid MH, Islam MS, Khan AH. Seasonal effect of seedling age on the yield of rice. Pakistan Journal of Biological Sciences. 2002;5(1):40-42.
13. Lu JJ, Chang TT. Rice in its temporal and spatial perspective. In: rice production and utilization. Edited by Luh, B.S. Westport, C.T. USA, AVI Publishing Co; c1980. p.1-74.
14. Mobasser HR, Tari DB, Vojdani M, Abadi RS, Eftekhari A. Effect of seedling age and planting space on yield and yield components of rice (Neda variety). Asian J Plant Sci. 2007;6(2):430-440.
15. Pandey SR, Singh AK, Tiwari H, Tiwari A. Effect of age of seedlings and planting geometry on growth of rice (*Oryza sativa* L.). Journal of pharmacognosy and phytochemistry. 2021;10(1):185-188.
16. Rasool R, Singh P, Akhter S, Ramzan S. Seedling age and nitrogen application affect on dry matter accumulation, partitioning and nutrient status of rice under temperate conditions. Journal of Applied and Natural Science. 2016;8(2):743-749.
17. Raut SD, Mahadkar UV, Varnekar KD, Chavan LS, Dodke SB, Burondkar MM, *et al*. Effect of age of seedling, levels and methods of fertilizer application on growth, yield attributes and yield of rice (*Oryza sativa* L.). International Journal of Chemical Studies. 2019;7(5):1641-1647.
18. Saphi DK, Yadav DR. Effect of seedling age and variety on yield and yield parameters of rice. International Journal of Science and Research. 2018;8(1):470-472.
19. Sarkar MAR, Paul SK, Hossain MA. Effect of row arrangement, age of tiller seedling and number of tiller seedlings per hill on performance of transplant Aman rice. The Journal of Agricultural Sciences. 2011;6(2):59-68.
20. Sultan T, Rashed RU, Shawan SI, Swapan KP, Sarkar AR. Effect of age of seedlings at staggered planting and spacing on growth and yield of transplant Aman Rice (Cv. BRRI Dhan 46). Advances in Biotechnology and Microbiology. 2018;11(2):43-47.
21. Tari DB, Pirdashi H, Nasiri M, Gazanchian A, Hoseini SS. Determination of morphological characteristics affected by different agronomical treatments in rice (IR6874-3-2 Promising Line). Asian Journal of Plant Sciences. 2007;6(1):61-65.
22. Vijayalaxmi G, Sreenivas G, Rani PL, Madhavi A. Effect of plant densities and age of seedlings on growth and yield parameters of Kharif rice. International Journal of Science, Environment and Technology. 2016;5(3):1153-1162.