

Evaluating the performance of rice variety in different intercropping systems under aerobic rice cultivation

ABSTRACT

The investigation entitled Evaluating the performance of rice variety in different intercropping systems under aerobic rice cultivation was conducted during *kharif* seasons of 2021-22 and 2022-23 at MRRC, NAU, Navsari. The experiment was carried out in Randomized Block Design with four replication. Results revealed that growth parameters of different intercrops were slightly affected by different intercropping system as compared to sole crop. Yield attributes like panicle length, panicle weight and 1000 grain weight of sole rice crop were significantly higher as compared to other intercropping system but which was at par with treatment Rice + Sorghum (6 : 2) and Rice + Soybean (6: 2) for panicle length. Grain and straw yield of sole rice were recorded significantly higher as compared other intercropping system during individual year as well as pooled analysis.

KEY WORDS: *intercropping, rice, aerobic cultivation, growth and yield parameters*

INTRODUCTION

Rice is the one of the predominant cereal crop of India and the world. It is expected that by the year 2025, some of irrigated dry and wet-season rice will experience physical water scarcity. The water scarcity due to these shifts in use and the need to reduce water inputs will affect many aspects of crop management, variety choice, soil quality, organic matter, pest population, productivity and the environmental impact of these intensive rice based systems. Rice crop consumes about 90 per cent of the fresh water resources. Traditional rice production system not only leads to wastage of water but also causes other problems. Hence, aerobic rice is one of the options to minimize irrigation requirement of rice crop. Higher productivity in any crop can be achieved through ideal varieties with suitable agronomic practices. Information on the intercropping on the yield of the cultivars of rice under aerobic method is less. Intercropping of rice with vegetable and pulse crops is an emerging concept. The main objective is to achieve a substantial increase in rice yield along with yield of intercrop for building soil fertility. With this background, efforts were made to investigate suitable intercropping under aerobic method of rice cultivation with its leading varieties.

MATERIALS AND METHODS

A field experiment entitled Evaluating the performance of rice variety in different intercropping systems under aerobic rice cultivation was conducted during *kharif* seasons of 2021-22 and 2022-23 at MRRC, NAU, Navsari. The experimental site was clay in texture, low in organic carbon (0.55, 0.51 and 0.55%) and available nitrogen (227, 251 and 279 kg/ha), high in available phosphorus (140.5, 141.2 and 143.2 kg/ha) and available potassium (737.9, 857 and kg/ha). The soil was found slightly alkaline (pH 7.90, 7.93 and 7.78) with electrical conductivity (0. and 0.37 dS/m). The experiment was laid out in Randomized Block Design with four replication. Seven treatments namely, T₁: Rice + Sorghum (6:2), T₂: Rice + Soybean (6:2), T₃: Rice + Sorghum (4:2), T₄: Rice + Soybean (4 :2), T₅: Rice, T₆: Sorghum, T₇: Soybean. Rice cultivar GNR-8, Sorghum GNJ-1, Soybean Phuleagrani were sown with a seed rate using 50, 12-15 and 60-70 kg/ha respectively with 30 cm line sowing. The crops were fertilized with as their recommended dose. Irrigation application as per requirement of crops.

RESULTS AND DISCUSSION

Growth attributes:

Comment [H1]: Performance of rice variety GNR-8 under aerobic rice-based intercropping system.

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Comment [H4]: both dry and wetland

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Three year pooled data of growth and growth attributes of rice and intercrops are presented in Table 1. The result revealed that, the different intercropping system significantly influenced the growth and growth attributes of rice crop. The plant height, dry matter/plant at 60 and 90 DAS, total tillers/m² and days to 50 % flowering of rice crop were recorded significantly higher under treatment T₅: Rice as compared to different intercropping system. The three year mean data on growth attributes of intercrops were also influenced by different intercropping system were presented in Table 2. The data showed that the plant height, dry matter/plant at 60 and 90 DAS and days to 50 % flowering of different intercrops were slightly affected by different intercropping system as compared to sole crop.

Yield attributes:

The pooled data presented in Table 3 showed that, the yield attributes viz., panicle length, panicle weight and 1000 grain weight of rice crop significantly affected by different intercropping system. The data revealed that the panicle length, panicle weight and 1000 grain weight of sole rice (T₅) crop were significantly higher as compared to other intercropping system but which was at par with treatment T₁: Rice + Sorghum (6 : 2) and T₂: Rice + Soybean (6: 2) for panicle length. The three year mean data on yield attributes of intercrops was also affected due to different intercropping system as compared to sole crops (Table 4).

Grain and straw yield:

The data pertaining to grain and straw yield of rice crop during individual year as well as pooled analysis were presented in Table 5. The results revealed that the grain and straw yield of sole rice (T₅) were recorded significantly higher as compared other intercropping system during individual year as well as pooled analysis. The three year mean data on yield of intercrops were presented in Table 6 also influenced by different intercropping system.

Rice equivalent yield:

Table 1: Effect of different intercropping system on growth and growth attributes of rice (pooled)

Treatments	Plant height at harvest (cm)	Dry matter/plant (g)		Total tillers/m ² at harvest	Days to 50 % flowering
		At 60 DAS	At 90 DAS		
T ₁ : Rice + Sorghum (6 : 2)	117.82	11.91	16.73	288.92	85.63
T ₂ : Rice + Soybean (6 : 2)	117.94	12.07	16.69	285.25	83.89
T ₃ : Rice + Sorghum (4 : 2)	109.00	11.19	13.92	265.67	85.76
T ₄ : Rice + Soybean (4 : 2)	117.14	11.30	15.71	282.33	83.94
T ₅ : Rice	125.10	13.58	17.74	294.67	89.30
SEm±	1.53	0.08	0.11	0.96	0.88
CD (p=0.05)	5.00	0.25	0.36	3.14	2.87
CV%	5.11	8.29	9.59	3.99	3.13
Y					
SEm±	1.34	0.22	0.35	2.53	0.60
CD (p=0.05)	NS	NS	NS	NS	NS
Y X T					
SEm±	3.00	0.50	0.78	5.65	1.34
CD (p=0.05)	NS	NS	NS	NS	NS

Note: This table included rice intercropping system analysis.

Table.2: Effect of different intercropping system on growth attributes of intercrop (three year mean)

Treatments	Plant height (cm)	Dry matter/plant (g)		Days to 50 % flowering
		At 60 DAS	At 90 DAS	
T ₁ : Rice + Sorghum (6 : 2)	218.27	71.29	75.38	83

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T ₂ :Rice + Soybean (6 : 2)	60.33	23.36	25.29	42
T ₃ :Rice + Sorghum (4 : 2)	221.13	69.21	74.03	83
T ₄ :Rice + Soybean (4 : 2)	59.03	22.41	26.31	43
T ₆ : Sorghum	226.42	73.08	78.12	84
T ₇ : Soybean	61.07	25.34	29.36	44

Note: Analysis of this table is not done.

Table 3: Effect of different intercropping system on yield attributes of rice (pooled of three years)

Treatments	Panicle length (cm)	Panicle weight (g)	1000 grain weight (g)
T ₁ :Rice + Sorghum (6 : 2)	25.76	3.23	28.12
T ₂ :Rice + Soybean (6 : 2)	25.46	3.21	27.74
T ₃ :Rice + Sorghum (4 : 2)	23.12	2.89	26.78
T ₄ :Rice + Soybean (4 : 2)	24.43	3.28	27.51
T ₅ : Rice	26.51	3.56	30.99
SEm±	0.43	0.06	0.21
CD (p=0.05)	1.40	0.20	0.69
CV%	5.13	8.49	6.20
Y			
SEm±	0.29	0.06	0.39
CD (p=0.05)	NS	NS	NS
Y X T			
SEm±	0.64	0.14	0.87
CD (p=0.05)	NS	NS	NS

Table.4: Effect of different intercropping system on yield attributes of intercrops (three year mean)

Treatments	Length of ear head /pod (cm)	Test weight (g)	No. of pods/plant
T ₁ :Rice + Sorghum (6 : 2)	28.33	27.52 (1000)	-
T ₂ :Rice + Soybean (6 : 2)	3.25	19.13 (100)	32.5
T ₃ :Rice + Sorghum (4 : 2)	27.28	28.82 (1000)	-
T ₄ :Rice + Soybean (4 : 2)	3.14	19.33 (100)	33.4
T ₆ : Sorghum	29.42	28.32 (1000)	-
T ₇ : Soybean	3.38	20.31 (100)	35.3

Note: Treatment T₅: Rice is not mention in this table

Table.5: Effect of different intercropping system on grain and straw yield of rice

Treatments	Grain yield (kg/ha)				Straw yield (kg/ha)			
	2021	2022	2023	Pooled	2021	2022	2023	Pooled
T ₁ :Rice + Sorghum (6 : 2)	3862	4102	4082	4015	5131	5187	5203	5174
T ₂ :Rice + Soybean (6 : 2)	3908	4145	4111	4055	4995	5306	5273	5191
T ₃ :Rice + Sorghum (4 : 2)	3404	3613	3590	3536	4804	4966	4928	4900
T ₄ :Rice + Soybean (4 : 2)	3551	3901	3890	3780	4568	4738	4694	4667
T ₅ : Rice	5123	5210	5102	5145	6523	6650	6619	6598
SEm±	162.4	153.9	151.4	39.01	198.6	203.9	205.1	29.42
CD (p=0.05)	500	474	467	127	612	628	632	95.93
CV%	8.2	7.3	7.3	7.6	7.6	7.6	7.7	7.64
Y								
SEm±				69.75				90.59
CD (p=0.05)				NS				NS
Y X T								
SEm±				155.96				202.57

CD (p=0.05)				NS				NS
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Table.6: Effect of different intercropping system on grain and fodder/stover yield of intercrops

Treatments	Grain yield (kg/ha)				Fodder/stover yield (kg/ha)			
	2021	2022	2023	Mean	2021	2022	2023	Mean
T ₁ : Rice + Sorghum (6 : 2)	1839	1866	1850	1852	1939	1992	1925	1952
T ₂ : Rice + Soybean (6 : 2)	890	915	903	902	1037	1075	1021	1044
T ₃ : Rice + Sorghum (4 : 2)	1811	1845	1829	1828	2233	2181	2205	2206
T ₄ : Rice + Soybean (4 : 2)	794	833	802	810	1067	1056	1034	1052
T ₆ : Sorghum	3164	3231	3205	3200	7477	7321	7283	7360
T ₇ : Soybean	1166	1124	1110	1134	1460	1564	1541	1522

Note: Treatment T5: Rice is not mentioned in this table

Table 7: Rice and intercrop equivalent yield of different intercropping system (t/ha)

Treatment	Rice and intercrop equivalent yield (t/ha)					
	2021		2022		2023	
	Rice	Intercrop	Rice	Intercrop	Rice	Intercrop
T ₁ : Rice + Sorghum (6 : 2)	4.98	4.18	5.24	4.25	5.22	4.19
T ₂ : Rice + Soybean (6 : 2)	5.00	3.00	5.30	3.08	5.26	3.02
T ₃ : Rice + Sorghum (4 : 2)	4.45	4.23	4.70	4.28	4.67	4.25
T ₄ : Rice + Soybean (4 : 2)	4.55	2.75	4.94	2.85	4.92	2.75
T ₅ : Rice	6.55	-	6.66	-	6.55	-
T ₆ : Sorghum	-	8.67	-	8.74	-	8.74
T ₇ : Soybean	-	3.98	-	3.92	-	3.82

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Table 8: Effect of different intercropping system on rice equivalent yield

Treatments	Rice equivalent yield (t/ha)			
	2021	2022	2023	Pooled
T ₁ : Rice + Sorghum (6 : 2)	9.16	9.49	9.41	9.35
T ₂ : Rice + Soybean (6 : 2)	8.00	8.39	8.29	8.22
T ₃ : Rice + Sorghum (4 : 2)	8.69	8.98	8.92	8.86
T ₄ : Rice + Soybean (4 : 2)	7.30	7.79	7.67	7.59
T ₅ : Rice	6.55	6.66	6.55	6.59
T ₆ : Sorghum	8.67	8.74	8.72	8.72
T ₇ : Soybean	4.11	3.92	3.82	3.95
SEM±	0.31	0.19	0.21	0.08
CD (p=0.05)	0.92	0.60	0.65	0.24
CV%	8.3	4.9	5.7	6.47
Y				
S.Em.±	-	-	-	0.09
C.D. at 5%	-	-	-	NS
Y X T				
SEM±	-	-	-	0.25
CD (p=0.05)	-	-	-	NS

Comment [H21]: of different intercropping systems

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Comment [H23]: References are not as per the requirement of the research paper format. Re-write and these are not mentioned in anywhere in the manuscript.

Comment [H24]: Before reference, conclusion should be there. A brief paragraph is required to conclude the manuscript

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