GROWTH AND GROWTH ATTRIBUTES CHARACTER AND PRODUCTIVITY OF EARLY DURATION, MEDIUM DURATION AND HYBRID RICE ON *INCEPTISOLS*

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Abstract : The tallest plant at harvest was observed under T_6 (105.07 cm), which was at par with T_7 (103.83 cm). At harvest, a system with Mahamaya rice (T4 and T5) has produced as much as dry matter (30.48 and 30.52 g plant $^{-1}$) to that of Hybrid rice (30.72 and 30.64 under T_6 and T_7, respectively). At 30 DAT, the highest leaf area index (2.52) was found in T_6. At 60 DAT, the highest leaf area index (5.41 g plant^{-1}) was found in T_4. At 90 DAT, the highest leaf area index was found in T_4 system (5.89 g plant^{-1}). The maximum grain yield of rice (49.90 q ha^{-1}) was recorded under T_4 and the maximum straw yield (67.09 q ha^{-1}) was recorded in T_4. Harvest index did not differ significantly among all the three rice varieties.

Keywords : Early and medium duration rice, Growth attributes, Hybrid rice, Productivity

INTRODUCTION

Cropping systems based on rice (*Oryza sativa* L.) are prevalent in the eastern part of India, which covers 43 per cent of rice area of the country. Rice-based systems are intimately connected with development of water resources. In the era of shrinking resource base of land, water and energy, resource-use efficiency is an important aspect for considering the suitability of a cropping system (Yadav, 2005). Diversification and intensification of rice-based systems to increase productivity per unit resource is very pertinent. The diversification of cropping system is necessary to get higher yield and return, to maintain soil health, sustain environment and meet daily requirement of human and animals (Samui *et al*., 2004). Singh and Sharma (2002) reported that the grain yield of rice showed significant variation under different cropping sequences. Singh and Tuteja (2000) and Bastia *et al.* (2008) also conducted similar experiments with different rice cropping system.

MATERIAL AND METHOD

Keeping these facts in consideration, the present investigation was conducted irrigated condition during *kharif* seasons of 2009-10 at Indira Gandhi Krishi Vishwavidyalaya, Raipur under All India Coordinated Research Project on Integrated Farming Systems. Eight cropping sequences tested in randomized block design with three replications with a plot size of 14.5 x 6.0m. The soil was silty clay (*Inceptisol*) in texture and neutral in reaction, medium in organic carbon (0.49%), medium in available N (248 kg/ha), medium in available P (18.6 kg/ha) and medium in available K (262 kg/ha).

RESULT AND DISCUSSION

As the rice crop was grown under transplanted condition and seedling of rice properly placed in experimental field, the plant population did not influenced significantly due to the different cropping systems and rice varieties grown (Table 1). In general, by virtue of vertical growth character of rice plants, their height increased with advancement of crop age. But, the maximum increase was recorded during 30 to 60 DAT, while the pace of the growth was slowed down after 60 DAT (Table 1). The maximum plant height (66.50 cm) recorded at 30 DAT under T_6 (Hybrid rice 'Indira Sona') which was significantly more than T_1 (60.47 cm), T_2 (60.47 cm) and T_3 (60.50 cm). However, plant height of rice under T_7, T_4 and T_5 was similar to that of T_6. Similar trend was observed at 60 DAT and Hybrid rice T_6 again recorded maximum plant height (93.47 cm). The lowest plant height was recorded under T_1 (78.17 cm).

However, at harvest owing to the inherent character, all three varieties differ significantly among each other. Hybrid rice Indira Sona showed its superiority and grown higher than other two varieties i.e. MTU-1010 and Mahamaya. The tallest plant at harvest was observed under T_6 (105.07 cm), which was at par with T_7 (103.83 cm). The lowest plant height was recorded under T_2 (85.20) and fallowed by T_1 (88.07 cm). It is revealed from the Table 1 that the dry weight of rice crop was increased with the advancement of growth stage. At 30 DAT, the highest dry matter production (3.88 g plant $^{-1}$) was recorded in T_7 cropping system followed by T_6 and T_3 cropping system (3.80 g plant^{-1}). Whereas the lowest dry matter production was found in T_4 cropping system (3.56 g plant^{-1}) followed by T_2 cropping system (3.60 g plant $^{-1}$).

With the advancement of crop age, dry matter production differed significantly due to different rice varieties and within the group, treatments performed equally at 60 DAT and at harvest. It is evident that the dry matter production (9.44 g plant^{-1}) recorded in T_7 cropping system was at par with T_6 cropping system (9.24 g plant $^{-1}$). Whereas, plant dry weight of

Mahamaya under T_4 (8.84 g plant $^{-1}$) and T_5 (8.72 g plant $^{-1}$) and of MTU-1010 under T_1 (8.28), T_2 (8.08) and T_3 (8.12) was similar. Further, all the three rice varieties differed significantly with each other. However, at harvest, cropping systems with Mahamaya rice (T_4 and T_5) has produced as much as dry matter (30.48 and 30.52 g plant $^{-1}$) to that of Hybrid rice (30.72 and 30.64 under T_6 and T_7, respectively) and both recorded significantly higher dry matter as compared to those cropping systems where early duration MTU-1010 was grown. It is evident that, irrespective of the treatments, leaf area index was increased with the advancement of crop age. At 30 DAT, the highest leaf area index (2.52) was found in T_6 system followed by T_3 system (2.50). Whereas, the lowest leaf area index was found in T_1 system (2.39).

At 60 DAT, the highest leaf area index (5.41 g plant^{-1}) was found in T_4 system followed by T_6 system (5.34 g plant^{-1}). Whereas the lowest leaf area index was found in T_1, the existing cropping system (5.17 g plant^{-1}) followed by T_2 system (5.20 g plant^{-1}). At 90 DAT, the highest leaf area index was found in T_4 system (5.89 g plant^{-1}) followed by T_6 system (5.86 g plant^{-1}). Whereas, the lowest leaf area index was found in T_1 and T_5 system (5.59 g plant^{-1}) followed by T_3 system (5.63 g plant^{-1}). Magnitude of increase in LAI from 30 DAT to 60 DAT was greater as compared to later stage owing to the maximum tillering occurred at this stage which boosted the dry matter production by utilizing the solar energy and eventually the LAI.

It is revealed from the Table 2 that the maximum grain yield of rice (49.90 q ha^{-1}) was recorded under T_4. This was significantly superior over those cropping systems where early duration rice grown i.e. T_1 (41.22 q ha^{-1}), T_2 (42.75 q ha^{-1}) and T_3 (43.32 q ha^{-1}). However, medium duration rice produced similar grain yield to that of hybrid rice T_6 (49.70 q ha^{-1}) and T_7 (48.82 q ha^{-1}) and remained at par with T_5 system (48.68 q ha^{-1}). The rice yield was comparatively low in T_1. The nutrient exploitative nature of both cereals might be the reason for decrease in rice yield (Singh and Sharma, 2002). No significant difference in grain yield of a rice variety among different cropping systems was also reported by Padhi (1993).

Straw yield also followed same trend and the maximum straw yield (67.09 q ha^{-1}) was recorded in T_4 (Table 2). This was significantly superior over early duration rice i.e. MTU-1010 under T_1 (57.62 q ha^{-1}, lowest one), T_3 (60.38 q ha^{-1}) and T_2 (60.56 q ha^{-1}). Whereas hybrid rice 'Indira Sona' (T_6 and T_7) remained at par with medium duration rice. Harvest index did not differ significantly among all the three rice varieties (Table 2).

Table 1: Plant population, plant height, dry matter accumulation of three rice varieties as affected by different cropping systems.

Treatment		Plant population m^{-2}		Plant height (cm)			Dry matter accumulation (gplant^{-1})		
Tr	***Kharif [Rabi]***	**30 DAT**	**At harvest**	**30DAT**	**60DAT**	**At harvest**	**30DAT**	**60DAT**	**At harvest**
T_1.	Rice MTU 1010 [Wheat]	48.33	47.67	60.47	78.17	88.07	3.72	8.28	28.40
T_2.	Rice MTU 1010 [Castor + Lentil (1:3)]	48.33	47.67	60.47	84.10	85.20	3.60	8.08	28.72
T_3.	Rice MTU 1010 [Mustard +Lentil (1:2)]	48.00	47.33	60.50	81.70	90.40	3.80	8.12	28.56
T_4.	Rice Mahamaya [Sunflower + Lentil (1:3)]	48.00	47.67	65.43	86.43	101.50	3.56	8.84	30.48
T_5.	Rice Mahamaya [Wheat + Fenugreek (1:1 skip row)]	48.00	48.05	64.50	81.40	100.77	3.68	8.72	30.52
T_6.	Hybrid Rice Indira Sona [Wheat + Lentil (1:1 skip row)]	48.00	47.33	66.50	93.47	105.07	3.80	9.24	30.72
T_7.	Hybrid Rice Indira Sona [Onion + Coriander (3:1)]	48.00	47.33	65.37	92.53	103.83	3.88	9.44	30.64
T_8.	Rice MTU 1010 [Wheat]	47.67	47	60.53	83.17	88.03	3.60	8.20	28.48
SEm±		**0.61**	**0.57**	**1.79**	**3.06**	**0.73**	**0.08**	**0.08**	**0.46**
CD 5%		**NS**	**NS**	**5.42**	**9.27**	**2.23**	**0.24**	**0.24**	**1.38**

Table 2: Leaf Area Index (LAI), grain yield, straw yield and harvesting index of three rice varieties as affected by different cropping systems.

Treatment		Leaf area index			Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvest index (%)
Tr	***Kharif [Rabi]***	**30DAT**	**60DAT**	**90DAT**			
T_1.	Rice MTU 1010 [Wheat]	2.39	5.17	5.59	41.22	57.62	41.68

T_2.	Rice MTU 1010 [Castor + Lentil (1:3)]	2.48	5.20	5.59	42.75	60.56	41.39
T_3.	Rice MTU 1010 [Mustard +Lentil (1:2)]	2.51	5.22	5.63	43.32	60.38	41.77
T_4.	Rice Mahamaya [Sunflower + Lentil (1:3)]	2.50	5.41	5.89	49.90	67.09	42.65
T_5.	Rice Mahamaya [Wheat + Fenugreek (1:1 skip row)]	2.43	5.33	5.84	48.68	63.47	43.42
T_6.	Hybrid Rice Indira Sona [Wheat + Lentil (1:1 skip row)]	2.52	5.34	5.86	49.70	65.07	43.34
T_7.	Hybrid Rice Indira Sona [Onion + Coriander (3:1)]	2.48	5.33	5.84	48.82	63.69	43.39
T_8.	Rice MTU 1010 [Wheat]	2.37	5.20	5.71	42.63	60.08	41.51
SEm±		**0.02**	**0.03**	**0.01**	**0.94**	**1.32**	**0.61**
CD 5%		**0.05**	**0.09**	**0.03**	**2.85**	**4.01**	**NS**

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