Madras Agric. J. 89 (10-12).: 626-630 October-December 2002
https://doi.org/10.29321/MAJ.10.A00275

Effect of cultural practices on ratooning ability of hybrid rice

K. MANJAPPA AND A.S. PRABHAKAR
Agricultural Research Station, University of Agricultural Sciences, Sirsi-584 101, Karnataka.

Abstract: An experiment was conducted to study the effect of cultural practices on ratooning ability of hybrid rice at Agricultural Research Station, Sirsi of the University of Agricultural Sciences, Dharwad, Karnataka during *kharif* and *rabi* seasons of 1997-98 and 1998-99. The results indicated that the grain and straw yields of ratoon crop were 2385 and 4644 kg ha^{-1}, respectively (mean over two years) with 33 per cent higher population of main crop and was significantly higher than that obtained with normal population of main crop. Harvesting of main crop at physiological maturity resulted in higher grain yield (2427 kg ha^{-1}) compared to harvest maturity (2180 kg ha^{-1}). Between cutting heights, 20 cm cutting height recorded significantly higher grain yield than 10 cm. Planking soon after harvest of main crop gave significantly higher grain yield when compared to no planking.

Key words: Ratoon crop, Population, Cutting stage and Planking.

Introduction

Ratooning is one strategy to enable rice production in a shorter period of time and at a lower production cost. It is also a practical tool in exploiting the ability of the plants to regenerate after harvest. Successful ratoon cropping requires proper cultural management of the main and ratoon crops. Agronomic practices such as harvesting main crop at correct stage (Xiong *et al.* 1991) and at optimum cutting height (Chauhan *et al.* 1985) were found to influence ratoon crop performance. Spacing is another important ratoon influencing factor as it determines main crop plant population (Bahar and De Datta, 1977). Passing of planking immediately after harvest of main crop was also found to influence ratooning ability. But, the requirement of cultural practices differs according to cultivar. In recent years, efforts are initiated to introduce rice hybrids to rainfed lowlands of hill zone of Karnataka. It necessitates to explore the possibility of taking ratoon crop with hybrids also, as it helps in exploiting hybrid vigour in ratoon crop without investing on hybrid seeds. Sun *et al.* (1988) reported that the ratoon yields with hybrids were more comparable to ratoon yield of a variety. Hence, the present investigation was undertaken to study the effect of cultural practices on ratooning ability of hybrid rice.

Materials and Methods

The experiment was conducted at Agricultural Research Station (Paddy), Sirsi of the University of Agricultural Sciences, Dharwad, Karnataka during *kharif* and *rabi* seasons of 1997-98 and 1998-99. This experiment consisted of 16 treatment combinations with two levels of plant population { normal plant population (20 x 10 cm) and 33% higher plant population (20 x 7.5 cm)}, harvesting stage (physiological maturity and harvestable maturity), cutting height (10 cm and 20 cm) and cultural practices (passing plank soon after harvest of main crop and no passing of plank). The treatments were replicated three times in a randomized complete block design.

The rice hybrid KRH-2 was raised. Twenty-five days old seedlings were used for transplanting. Single seedling was planted at each hill. Recommended dose of fertilizer (75:75:87.5 kg NPK ha^{-1}) was applied to both main (planted) and ratoon crops. Fifty per cent of nitrogen and entire dose of phosphorus and potassium were applied at the time of planting for main cop and a week after harvest (WAH) for ratoon crop. Remaining 50 per cent nitrogen was applied in two equal splits (25 and 50 days after planting) for main crop and in single dose for ratoon crop *i.e.* 25 days after harvest of main crop. The main crop was harvested as per the treatments. The details of date of harvest of main and ratoon crops are given in Table 1. In the treatments having planking, it was passed immediately after harvest of crop. In ratoon crop, dried leaves, weeds and decaying stubbles were removed from the plots. The

Table 1. Details on date of planting and harvesting of main and ratoon crops

	1997-98		1998-99	
	Main crop	Ratoon crop	Main crop	Ratoon crop
Date of planting	4-8-1997	-	12-8-1998	-
Date of harvesting				
Physiological maturity	28-10-1997	12-2-1998	12-11-1998	27-2-1998
Harvestable maturity	5-11-1997		3-11-1998	

main crop (*kharif*) was grown with rainwater. Necessary measures were taken to keep standing water in the main crop by utilizing the rainwater. For ratoon crop, first irrigation was given at 10 DAH and subsequent irrigations were given a day after disappearance of ponded water.

The various yield parameters and yield were recorded at harvest. The data of individual years as well as pooled data were statistically analyzed as per the design under M-STAT-C programme. The mean values of the treatment were separately subjected to Duncan's Multiple Range Test (DMRT) at 5 per cent probability under M-STAT-C Programme.

Results and Discussion

The results indicated that the grain and straw yields of ratoon crop were influenced significantly due to population of main crop during 1998-99 and in pooled data (Tables 4 and 5). The grain yield (2240 and 2385 kg ha^{-1}, respectively) and straw yield (4954 and 4644 kg ha^{-1}, respectively) recorded with 33 per cent higher population of main crop was significantly higher than that obtained with normal population of main crop. During 1997-98, the difference in grain and straw yields was not significant due to population levels. The per cent missing hills during 1998-99 was more compared to 1997-98 (Table 2). Under such situation, extra population might have compensated the missing hills resulting in higher grain and straw yield of ratoon crop with 33% higher population than in normal population.

The difference in grain yield of ratoon crop due to population levels was mainly due to difference in panicles m^{-2}. The panicles m^{-2} were significantly higher with 33 per cent higher population (115 and 122, respectively) than normal population (105 and 116, respectively) during 1998-99 and in pooled data (Table 2). Babar and De Datta (1977) reported that spacing was an important ratoon influencing factor because it determined main crop plant population. High main crop plant population increased tiller number per unit area, therefore, increasing ratoon tiller number per unit area. This might have resulted in more panicles m^{-2} with 33% higher population of main crop. On the contrary, grain weight per hill, per panicle and grain filling per cent was higher with normal population than in 33% higher population (Tables 2 and 3). This might be due to wider feeding zone and minimum competition between plants in normal population as compared to 33% higher population (closer spacing) (Srinivasan and Purushothaman, 1993). But panicles per m^2 recorded were significantly higher with 33% higher population. This was the main factor that contributed for higher yield with 33% higher population.These results are in conformity with those of Jones and Snyder (1987) who reported that panicles per m^2 have been shown to account for upto 85 per cent of variation in ratoon grain yield.

Harvesting stages of main crop significantly influenced the grain and straw yields of ratoon crop during both the years and in pooled data. Harvesting of main crop at physiological maturity resulted in higher grain yield (2606, 2247 and 2427 kg ha^{-1}, respectively) compared to harvestable maturity (2420, 1940 and 2180 kg ha^{-1}, respectively) during 1997-98, 1998-99 and in pooled data. These results are in conformity with those of Saran and Prasad (1952) and Balasubramanian *et al.* (1970) who reported that stage of main crop harvest affected ratooning. The best harveting time for good ratooning is when the culms are still greenish. In the present investigation, the crop was harvested when 10% of the grains at the base of the panicle were still greenish and 90% of the grains turned yellow in physiological

Table 2. Effect of plant population, harvesting stages and cutting height of rice main crop and cultural practices on certain yield attributing characters.

Treatments	Per cent missing hills			Panicles per m^2			Panicle length (cm)			Grain weight per panicle (g)		
	1997-98	1998-99	Pooled	1997-98	1998-99	Pooled	1997-98	1998-99	Pooled	1997-98	1998-99	Pooled
Populations												
Normal (20 x 10 cm)	8.3$^{a\#}$	26.8^{a}	17.5^{a}	127^{a}	105^{b}	116^{b}	18.8^{a}	19.4^{a}	19.1^{a}	2.12^{a}	2.04^{a}	2.08^{a}
33% higher (20 x 7.5 cm)	6.4^{b}	22.0^{b}	14.2^{b}	130^{a}	115^{a}	122^{a}	18.4^{a}	18.8^{b}	18.6^{b}	2.01^{a}	2.03^{a}	2.02^{a}
Harvesting stages												
Physiological maturity	6.7^{b}	22.1^{b}	14.4^{b}	132^{a}	115^{a}	124^{a}	19.1^{a}	19.4^{a}	2.22^{a}	2.17^{a}	2.19^{a}	
Harvestable maturity	8.1^{a}	26.6^{a}	17.4^{a}	125^{b}	104^{b}	114^{b}	18.1^{b}	18.8^{b}	18.5^{b}	1.91^{b}	1.90^{b}	1.90^{b}
Cutting height												
10 cm	8.5^{a}	28.4^{a}	18.5^{a}	122^{b}	94^{b}	108^{b}	18.2^{b}	19.1^{a}	18.7	1.96^{b}	2.06^{a}	2.01^{a}
20 cm	6.2^{b}	20.4^{b}	13.3^{b}	135^{a}	125^{a}	130^{a}	18.9^{a}	19.1^{a}	19.0^{a}	2.16	2.03^{a}	2.08^{a}
Cultural practice												
Planking	7.4^{a}	24.1^{a}	15.8^{a}	131^{a}	113^{a}	122^{a}	18.7^{a}	19.2^{a}	19.0^{a}	2.09^{a}	2.09^{a}	2.09^{a}
No Planking	7.3^{a}	24.6^{a}	16.0^{a}	126^{b}	106^{b}	116^{b}	18.5^{a}	19.0^{a}	18.8^{a}	2.03^{a}	1.97^{b}	2.00^{b}
Av. LSD	0.8	2.3	1.1	4	6	3	0.52	0.30	0.30	0.14	0.10	0.08

** - LSD applicable to Duncan's multiple range test at 5 per cent for treatments
# - Means followed by same letters in a column are not differing significantly

maturity treatment. At that condition, the culms were still greenish in condition, which might have helped in higher regeneration of tillers than from crop harvested at harvestable maturity when the culm portion was almost dried. On an average over two years, the yield parameters *viz.* panicles per m^2 (124), panicle length (19.3 cm) grain weight per hill (5.14 g) and per panicle (2.19 g), filled grains per panicle (47.2), per cent grain filling (63.4) and 1000 grain weight (23.9 g) were also higher with physiological maturity than harvestable maturity.

Cutting height of 20 cm recorded significantly higher grain yield than 10 cm during both the years and in pooled data. The results are in conformity with those of Baha and De Datta (1977) who reported that cutting height of 20 cm significantly reduced missing hills and increased grain yield over cutting height of 5 cm. The present study also revealed that the per cent missing hills was higher with 10 cm (18.5) compared to 20 cm (13.3) cutting height. Experiment conducted at Mugad also revealed that grain yield of ratoon crop was more with 20 cm cutting height (Anon., 1992). The difference in grain yield with cutting height was mainly due to differences in yield components *viz.* panicles per m^2, number of filled grains per panicle and per cent grain filling, which were higher with 20 cm cutting than 10 cm (Tables 2 and 3).

Planking soon after the harvest of main crop gave significantly higher grain yield when compared to no planking during 1998-99 and in pooled data. During 1997-98, the difference in grain yield was not significant. These results are in line with those of Calendacion *et al.* (1992) and Devasenapathy *et al.* (1995) who reported that the planked ratoon crop

Table 3. Effect of plant population, harvesting stages and cutting height of rice main crop and cultural practices on some yield attributing characters.

Treatments	Grain weight per hill (g)			1000 grain weight (g)			Filled grains per panicle			Per cent grain filling		
	1997-98	1998-99	Pooled	1997-98	1998-99	Pooled	1997-98	1998-99	Pooled	1997-98	1998-99	Pooled
Populations												
Normal (20 x 10 cm)	4.93^{a}#	5.19^{a}	5.06^{a}	23.0^{a}	23.7^{a}	23.4^{a}	43.7^{a}	45.9^{a}	44.8^{a}	62.5^{a}	62.3^{a}	62.4^{a}
33% higher (20 x 10 cm)	4.78^{a}	4.65^{a}	4.72^{b}	22.7^{a}	23.7^{a}	23.2^{a}	44.5^{a}	43.0^{b}	43.7^{a}	62.8^{a}	59.1^{b}	60.9^{a}
Harvesting stages												
Physiological maturity	5.09^{a}	5.20^{a}	5.14^{a}	23.7^{a}	24.1^{a}	23.9^{a}	47.4^{a}	47.1^{a}	47.2^{a}	64.3^{a}	62.6^{a}	63.4^{a}
Harvestable maturity	4.6^{a}	4.65^{b}	4.64^{b}	22.0^{b}	23.3^{b}	22.7^{b}	40.8^{b}	41.8^{b}	41.3^{b}	61.0^{a}	58.9^{b}	59.9^{b}
Cutting height												
10 cm	4.61^{b}	5.02	4.81^{a}	22.5^{b}	23.7^{a}	23.1^{b}	41.6^{b}	41.7^{b}	41.6^{b}	60.7^{b}	59.7^{b}	60.2^{b}
20 cm	5.10^{a}	4.83^{b}	4.96^{a}	23.2^{a}	23.7^{a}	23.5^{a}	46.5^{a}	46.5^{a}	47.2^{a}	46.9^{a}	64.6^{a}	61.7^{a}
Cultural practice												
Planking	5.01^{a}	5.03^{a}	5.02^{a}	23.0^{a}	23.8^{a}	23.4^{a}	46.5^{a}	45.1^{a}	45.8^{a}	63.6^{a}	61.3^{a}	62.4^{a}
No Planking	4.70^{b}	4.82^{b}	4.76^{b}	22.8^{a}	23.7^{a}	23.2^{a}	41.6^{b}	43.8^{b}	42.7^{b}	61.7^{a}	60.1^{b}	60.9^{a}
Av. LSD	0.25	0.17	0.15	0.45	0.22	0.24	2.9	1.3	1.5	3.3	0.69	1.66

** - LSD applicable to Duncan's multiple range test at 5 per cent for treatments
# - Means followed by same letters in a column are not differing significantly

(lock-lodged ratoon) gave higher number of tillers, productive tillers, grains per panicle and grain and straw yields. Yield parameter *viz.* panicles per m^2, grain weight per hill and filled grains per panicle were significantly higher in plots where planking was done soon after the harvest of main crop when compared to no planking. This might have resulted in higher grain yield of ratoon crop with planking.

Thus, it can be inferred from the data that 33% higher population of main crop, harvesting of main crop at physiological maturity with 20 cm stubble height and planking soon after harvest of main crop increases the ratooning ability and in turn the ratoon crop yields.

References

Anonymous, (1992). *Annual Report 1991-92*, Agricultural Research Station, Mugad, University of Agricultural Science, Dharwad.

Bahar, F.A. and De Data, S.K. (1977). Prospects of increasing total rice production through ratooning. *Agron. J.* **69**: 536-540.

Balasubramanian, B., Morachan, Y.B. and Kaliappa, R. (1970). Studies on ratooning in rice. I. Growth attributes and yield. *Madras Agric. J.* **57**: 565-570.

Calendacion, A.N., Garrity, D.O. and Ingram, K.T. (1992). Lock-lodging a new technology for ratoon rice cropping. *Philippines J. Crop Sci.* **17**: 1-10.

Chauhan, J.S., Vergara, B.S. and Lopez, F.S.S. (1985). Rice Ratooning International Rice Research Institute Research Paper Series No. 102.

Devasenapathy, P., Palaniappan, SP. and Myilasamy, V. (1995). Lock-lodging - A new technology for rice (*Oryza sativa*) ratooning. *Indian J. Agron.* **40**: 284-286.

Jones, D.B. and Snyder, G.H. (1987). Seedling and row spacing effects on yield and yield components of drill-seeded rice. *Agronomy J.* **79**: 623-626.

Saran, A.B. and Prasad, M. (1952). Ratooning in paddy. *Curr. Sci.* **21**: 223-224.

Table 4. Grain yield (kg ha^{-1}) of main and ratoon crops of hybrid rice as influenced by plant populatio stages of harvesting, cutting height and cutural practice.

Treatments	1997-98			1998-99			Pooled		
	MC	RC	% of MC	MC	RC	% of MC	MC	RC	% of MC
Populations									
Normal (20 x 10 cm)	5582	2497[a#]	44.7	6122	1947[b]	31.8	5852	2222[b]	38.0
33% higher (20 x 7.5 cm)	5986	2530[a]	42.3	6368	2240[a]	35.2	6177	2385[a]	38.6
Harvesting stages									
Physiological maturity	5634	2606[a]	46.3	6202	2247[a]	36.2	5918	2427[a]	41.0
Harvestable maturity	5934	2420[b]	40.8	6288	1940[b]	30.9	6111	2180[b]	35.7
Cutting height									
10 cm	5784	2367[b]	40.9	6245	1755[b]	28.1	6015	2661[b]	44.2
20 cm	5784	2660[a]	46.0	6245	2432[a]	38.9	6015	2546[a]	42.3
Cultural practice									
Planking	5784	2541[a]	43.9	6245	2162[a]	34.6	6015[a]	2351[a]	39.1
No Planking	5784	2485[a]	43.0	6245	2025[b]	32.4	6015	2255[b]	37.5
Av. LSD		59			67			43	

** - LSD applicable to Duncan's multiple range test at 5 per cent for treatment MC = Main Crop
# - Means followed by same letters in a column are not differing significanly RC = Ratoon Crop

Table 5. Straw yield (kg ha^{-1}) of ratoon crop of hybrid rice as influenced by plant population, stage of harvesting, cutting height and cultural practice

Treatments	1997-98			1998-99			Pooled		
	MC	RC	% of MC	MC	RC	% of MC	MC	RC	% of MC
Populations									
Normal (20 x 10 cm)	5131	4449[a#]	86.7	5501	3947[b]	71.8	5316	4198[b]	79.0
33% higher (20 x 7.5 cm)	5579	4333[a]	77.7	5852	4954[a]	84.7	5716	4644[a]	81.2
Harvesting stages									
Physiological maturity	5217	4667[a]	89.5	5585	4654[a]	83.3	5401	4661[a]	86.3
Harvestable maturity	5493	4115[b]	74.9	5767	4247[b]	73.6	5630	4181[b]	74.3
Cutting height									
10 cm	5355	4086[b]	76.3	5676	4440[a]	78.2	5516	4263[b]	77.3
20 cm	5355	4696[a]	87.7	5676	4461[a]	78.6	5516	4579[a]	83.0
Cultural practice									
Planking	5355	4531[a]	84.6	5676	4505[a]	79.4	5516	4518[a]	81.9
No Planking	5355	4252[b]	79.4	5676	4396[a]	77.4	5516	4324[b]	78.4
Av. LSD		116			282			148	

** - LSD applicable to Duncan's multiple range test at 5 per cent for treatments
# - Means followed by same letters in a column are not differing significantly

Srinivasan, K. and Purushothaman, S. (1993). Ratooning ability of medium duration rice varieties. *Madras Agric. J.* **80:** 552-555.

Sun, X., Zhang, J. and Liang, Y. (1988). Ratooning with rice hybrids In: Rice Ratooning, International Rice Research Institute, Manila, Philippines, pp. 155-161.

Xiong, H., Fang, W. and Tan, Z.B. (1991). Effects of number of axillary buds and main crop cutting time on ratoon crop yield. *Int. Rice Res. Newsl.* **16:** 19.

(Received : May 2001 ; Revised : September 2002)