

## Effect of Different Systems and Levels of Irrigation and Pruning Heights on the Performance of Main and Ratoon Crop of DCH-32 Hybrid Cotton \*

Drip irrigation has reduced water use of cotton in California up to 50% and raised lint yield up to 670 kg/ha when compared with furrow irrigation (Wilson *et al.*, 1994). In India, research work on ratooning and drip irrigation for cotton has not been tried extensively and as such adequate data were not available about its suitability. Therefore, field investigations were carried out during September, 1990 to September, 1991 at Main Research Station, University of Agricultural Sciences, Hebbal, Bangalore to study the effect of different systems and levels of irrigation and ratooning on the performance of hybrid cotton. The soil of experimental site was red sandy loam and field capacity of the surface soil (0-15cm) was 16.60% which gradually increased to 18.25% at 60-90cm depth. DCH-32 hybrid cotton was sown on 22-9-1990 by dibbling the seeds in 90cm rows at 60cm apart, under three systems (Furrow, Emitter and Turbotape drip) and levels of irrigation (25, 50 and 75% CPE) in Factorial Randomised Block Design and treatments were replicated thrice. The main crop was harvested completely by second week of April and plants were pruned at 20 and 40cm heights from soil surface with no-pruning as control under three systems of irrigation with a common application of irrigation water 15.75% CPE level. A fertilizer dose of 150:75:75 and 75:75:75 kg NPK ha<sup>-1</sup> was applied, respectively to main and ratoon crops. Entire P and K and 50% N was applied as basal dose at sowing in the seed furrows for the main crop and for ratoon it was band placed

near the rows after pruning the main crop and then covered with soil. The remaining 50% N was given as top dressing in three equal splits at 50, 80 and 120 days after sowing/pruning. The irrigation treatments were imposed one month after sowing when seedlings were well established. The frequency of irrigation was once in ten days in furrow irrigation and daily in case of drip irrigation. The total quantity of water applied was 762, 518 and 274mm/ha at 75, 50 and 25% CPE levels of irrigation, respectively in main crop and 558mm/ha in ratoon crop at a common rate of 75% CPE level of irrigation.

Seed cotton yield did not vary significantly due to various systems of irrigation (Table 2). However, turbotape drip resulted in higher seed cotton yield in main crop (24.75 q ha<sup>-1</sup>) followed by emitter drip (24.57 q ha<sup>-1</sup>) and furrow irrigation (21.61 q ha<sup>-1</sup>). The yield data in ratoon crop revealed that the impact of irrigation systems did not reflect on the seed cotton yield. However, dry stalk yield was significantly higher under drip systems of irrigation compared to furrow irrigation (Table 2).

Seed cotton yield increased significantly with higher levels of irrigation at 75% CPE compared to irrigation at 25% CPE (Table 2). The increased yield at higher level of irrigation could be described to higher number of sympodial branches, squares and bolls plant<sup>-1</sup> (Table 1).

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Table 1. Effect of different method and levels of irrigation and pruning heights on growth and yield attributes in main and ratoon crop of DCH-32 hybrid cotton at grand growth stage.

Treatments	Plant height (cm)		Leaf area index (cm <sup>2</sup> )		Sympodial branches/ Plant		Bolls/Plant		Squares/Plant		
	Main	Ratoon	Main	Ratoon	Main	Ratoon	Main	Ratoon	Main	Ratoon	
<b>Methods of irrigation</b>											
Furrow	106.0	92.0	1.25	1.57	15.56	27.33	59.8	40.0	30.30	76.0	
Emitter	128.0	101.0	1.59	2.17	18.83	51.78	64.5	54.89	38.56	93.0	
Turbotape	127.0	105.0	2.09	2.43	23.44	38.11	60.0	48.11	43.94	101.0	
<b>Levels of irrigation</b>											
0.25 CPE	103.0	--	1.33	--	15.89	--	56.8	--	31.83	--	
0.50 CPE	117.0	--	1.66	--	17.94	--	60.6	--	38.44	--	
0.75 CPE	140.7	--	1.95	--	24.00	--	67.0	--	41.61	--	
<b>Pruning heights</b>											
No pruning	--	145.0	--	1.83	--	18.78	--	29.44	--	72.0	
Pruning at 20 cm	--	72.0	--	2.07	--	41.11	--	54.58	--	94.0	
Pruning at 40 cm	--	82.0	--	2.20	--	57.33	--	59.00	--	105.0	
C.D. at 5%											
Methods of Irrigation	8.450	NS	0.380	0.460	2.390	8.290	NS	10.730	5.230	NS	
Pruning heights	--	14.45	--	NS	--	8.290	--	10.73	--	NS	
Levels of Irrigation	8.450	--	0.380	--	2.390	--	7.50	--	5.230	--	
Methods X Levels	NS	--	NS	--	NS	--	NS	--	NS	--	
Methods X Pruning	--	NS	--	NS	--	14.360	--	NS	--	NS	

Table 2. Effect of different method and levels of irrigation and pruning heights on dry stalk yield, seed cotton yield and WUE in main and ratoon crop of DCH-32 hybrid cotton.

Treatments	Dry Stalk Yield (t/ha)			Seed Cotton Yield (q/ha)			WUE (kg/ha mm)		Net Returns (Rs/ha)		
	Main	Ratoon	Total	Main	Ratoon	Total	Main	Ratoon	Main	Ratoon	Total
<b>Methods of irrigation</b>											
Furrow	5.92	6.75	12.67	21.61	8.75	30.36	17.66	13.67	41122	15341	56463
Emitter	5.76	10.88	16.64	24.57	9.30	33.87	18.39	21.16	38621	7770	46391
Turbotape	6.26	11.55	17.81	24.75	8.97	33.72	19.48	24.09	43013	10946	53.961
<b>Levels of irrigation</b>											
0.25 CPE	5.37	--		20.89	--		27.22	--	--	--	--
0.50 CPE	6.13	--		23.93	--		16.45	--	--	--	--
0.75 CPE	6.44	--		26.14	--		11.86	--	--	--	--
<b>Pruning heights</b>											
No Pruning	--	8.53		--	7.41		--	18.40	--	--	--
Pruning at 20cm	--	9.45		--	9.32		--	18.59	--	--	--
Pruning at 40cm	--	11.21		--	10.29		--	21.93	--	--	--
C.D. at 5%											
Methods of											
Irrigation	NS	2.163		--	NS		NS	2.050	--	--	--
Pruning heights	--	NS		--	1.040		--	2.050	--	--	--
Levels of											
Irrigation	0.750	--		3.050	--		1.611	--	--	--	--
Methods X											
Levels	NS	--		NS	--		NS	--	--	--	--
Methods X											
Pruning	--	NS		--	NS		--	3.550	--	--	--

Seed cotton yield was significantly higher where plants were pruned at 40cm (10.29 q ha<sup>-1</sup>) and 20cm (9.32 q ha<sup>-1</sup>) heights compared to no pruning (7.41 q ha<sup>-1</sup>). This higher yield in plants pruned at 40 and 20cm heights is a consequence of production of higher number of sympodial branches per plant which led to production of higher number of squares and bolls (Table 1 and 2).

The Water Use Efficiency did not differ significantly due to irrigation systems in main crop but differed significantly in ratoon crop (Table 2). However, even in main crop WUE was superior under drop systems of irrigation compared to furrow irrigation and it was significantly higher with irrigation given at 25% CPE (27.22 kg ha mm<sup>-1</sup>) compared to irrigation given at 50 and 75% CPE levels.

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WUE was maximum due to pruning at 40cm height compared to pruning at 20cm height and no pruning (Table 2) and it was maximum under turbotape drip where plants were pruned at 40cm height (28.93 ka ha mm<sup>-1</sup>).

Due to higher cost of initial establishment of drip systems of irrigation, the total net returns from main and ratoon crop sequence were maximum under furrow irrigation (Rs.56,463 ha<sup>-1</sup>) as compared to drip systems of irrigation (Table 2). However, considering water as an economic input, drip system could facilitate to bring additional area under irrigation, besides, considerable saving in manual labour. Thus, benefits derived could be greater with drip systems of irrigation.

*USDA-ARS, Agriculture Economics  
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