Agric. Res. J. Kerala 1988, 26 (1) 85-9!

EFFECT OF IRRIGATION AND MULCHING *OH* THE GROWTH AND YIELD OF PINEAPPLE *(ANANAS COMOSUS* L.)

Kuruvilla Varughese, G. R. Pillai, Jose Mathew, G. Santhakumari and C. S. Gopi

Agronomic Research Station, Chalakudy 680 307, Kerala, India

Pineapple is mainly cultivated as a rainfed crop in Kerala. Being a CAM plant, it is capable of maintaining high tissue water potential under extremely high moisture stress. In India, the behaviour of pineapple in relation to irrigation and mulching has not been studied systematically. However, Naik (1949) has stressed the importance of frequent light irrigation in pineapple due to the sparse nature of its roots. Singh *et al.* (1977) have reported the profound influence of irrigation on growth and yield of pineapple. Preliminary studies at the Agronomic Research Station, Chalakudy have also indicated that pineapple responds well to irrigation and mulching. The present investigation was therefore carried out to assess the influence of irrigation and mulching on the growth and yield of pineapple variety Kew.

Materials and Methods

The experiment *was* conducted in a sandy loam soil of the Agronomic Research Station, Chalakudy from 1981 to 1985. The values of field capacity, permanent wilting point and bulk density of the soil were 14.5 per cent, 6 percent and 1.46 g/cc respectively. The pH of the soil was 6.1 with organic carbon 0.45 per cent, available, P_2O_5 7.5 kg/ha and available K_2O 55kg/ha. The ground water table of the experimental area was below *i* m from the ground surface throughout the crop period. The important mateorological parameters during the irrigation period of four years under study are presented in Table 1.

The trial was laid out as a factorial experiment in RBD. The treatments comprised the combinations of four levels of irrigation(No irrigation and irrigation at IW/CPE ratios of 0.3, 0.6 and 0.9) and two levels of mulching (without mulch and with 6000 kg/ha of dry leaf mulch applied before the commencement of irrigation during the first year planting). Uniform suckers having 10 to 14 leaves were planted in double rows in trenches taken 90 cm apart at a spacing of 60 cm between rows and 30 cm between plants. Cultural and management practices were given to all the treatments uniformly as per the recommendation of the Kerala Agricultural University (Anon., 1981). The evaporation readings were recorded daily using USWB class A pan evaporimeter and whenever cumulative pan evaporation values minus effective rainfall reached 166.67 mm, 83.33 mm or 55.56 mm differential irrigation was administered at a depth of 50 mm to 0.3, 0.6 and 0.9 IW/CPE ratios respectively. Details of irrigation given to different treatments during the dry months (from December to the onset of south west monsoon) are summarised in Table *2.*

Table 1

Important meteorological parameters during the irrigation period

Month	1981-82			1982-83			1983-84			1984-85		
	TR, mm	NRD	MOPE mm/day	TR, mm	NRD	MOPE mm/day	TR, mm	NRD	MOPE mm/day	TR, mm	NRD	MOPE mm/day
December	47.2	1	3.62	8.6	1	3.11	20.8	6	3.64	23.2	2	3.88
January	—	—	4.18	—	—	3.93	115.1	3	3.23	112.3	5	3.36
February	—	—	4.72	—	—	4.30	15.5	2	3.55	0.4	—	4.25
March	11.5	1	549	—	—	5.01	62.6	6	4.00	—	—	4.65
April	67.2	2	5.42	10.5	2	5.49	219.6	8	3.99	33.7	2	4.36
May	133.7	7	4.38	32.2	2	4.67	53.8	3	4.13	314.2	10	3.97

TR = Total rainfall, NRD = Number of rainy days, MOPE — Mean open pan evaporation

Results and Discussion

The data on fruit yield of the plant crop, first and second ratoons and their totals are presented in Table 3.

Effect of irrigation

The data revealed that irrigation treatment significantly influenced the fruit yield of the plant crop and the first ratoon. However, the) trend of response in both the seasons was not identical. The fruit yield of the plant crop increased progressively with increase in the frequency of irrigation and variations between the successive levels were significant. The schedule receiving irrigation at 0.9 ratio recorded the highest yield (22.639 t/ha), followed by ratios of 0.6 (14.028 t/ha), 0.3 (6.356 t/ha) and no irrigation (1.611 t/ha).

During the first ratoon also the lowest yield (1.279 t/ha) was recorded by no irrigation. But the highest yield was registered by irrigation at 0.3 CPE ratio (16.307 t/ha). Beyond 0.3 ratio the fruit yield declined and reached level of significance at 0.9 ratio (9.395 t/ha).

Table 2

Details of irrigation

Irrigation levels	TNI	QIW mm	TR mm	II days
1981-82				
W_1	3	150	259.6	37
W_2	7	350	259.6	19
W_3	12	600	259.6	13
1982-83				
W_1	4	200	51.3	36
W_2	6	300	51.3	22
W_3	12	600	51.3	12
1983-84				
W_1	1	50	487.4	121
W_2	3	150	487.4	40
W_3	6	300	487.4	20
1984-85				
W_1	3	150	171.5	40
W_2	6	330	171.6	25
W_3	10	500	171·6	14

TNI = Total number of irrigation
QIW = Quantity of irrigation water
TR = Total rainfall
II = Irrigation interval

Contrary to the plant crop and first ratoon the fruit yieid of second ratoon was not influenced by irrigation schedules. The treatment without irrigation and mulch has produced fruits only during this season. The comparatively high and evenly distributed rainfall received during the dry months of 1983-'84 might have reduced the effect of irrigation on fruit yield of the second ratoon.

Fruit yield in the plant crop was influenced by the yield attributing characters viz., length and weight of fruits as well as the percentage of plants fruited per unit area. However, the fruit yield in the first ratoon was influenced only by the fruiting percentage. In the second ratoon neither the yield attributes nor the percentage of plants fruited was influenced by the treatments, resulting in a non-significant variation in fruit yield (Table 4).

Statistical analysis of the total fruit yield obtained from the three crops (plant crop, first and second ratoons) indicated that 0.9 ratio produced the highest yield (52.008 t/ha), which was on par with 0.6 ratio (47.528 t/ha) and significantly superior to the other treatments. Among the irrigation treatments the schedule receiving irrigation at 0.6 ratio produced consistantly higher fruit yield in all the three seasons. The 0.9 and 0.6 ratios received a total of 40 and 22 irrigations respectively during the crop period. Alberts (1984) reported that higher yield was obtained in pineapple by irrigations at F 0.3 over no irrigation. However, the present study revealed that irrigating pineapple during summer season at 0.6 IW/CPE ratio is optimum. It reguires 5 to 6 irrigations during the dry months at an interval of 22 days.

The plant height and number of leaves per plant were significantly influenced by irrigation in the plant crop. However, the differences were revelled off in the first and second ratoons (Table 5).

Table 3

Fruit yield of pineapple at different levels of irrigation and mulching, t/ha

Treatments	Plant crop	First ratoon	Second ratoon	Total of 3 years
Irrigation				
W_0	1.611	1.279	20.060	22.950
W_1	6.356	16.307	17.659	40.322
W_2	14.028	14.280	19.220	47.528
W_3	22.639	9.395	19.974	52.008
CD (0.05)	3.585	2.956	NS	5,318
Mulching				
M_0	.11.978	13.559	17.702	36.857
M_1	16·704	13.095	20.754	44.549
CD (0.05)	2.917	NS	NS	4.333
Irrigation x Mulching				
CD (0.05)	NS	NS	NS	NS

Table 4

Influence of irrigation and mulching on fruit and fruiting characters of pineapple

Treatments	Weight of single fruit, kg			Length of fruit, cm			*Fruiting per cent of plants		
	Plant crop	First ratoon	Second ratoon	Plant crop	First ratoon	Second ratoon	Plant crop	First ratoon	Second ratoon
Irrigation									
W_0	0.857	1.160	1.613	13.35	17.40	20.04	1.5(1.2)	2.9(1.7)	63.3(8.0)
W_1	1.160	1.253	1.516	16.99	16.11	19.55	13.1(3.6)	30.6(5.5)	50.5(7.1)
W_2	1.174	1.270	1.516	16.91	17.45	19.77	20.5(4.5)	27.0(5.1)	58.3(7.6)
W.	1.197	1.258	1.587	17.36	16.67	19.75	39.6(6.3)	14.9(3.9)	57.2(7.6)
CD(0.05)	0.194	NS	NS	1.47	NS	NS	1.4	1.0	NS
Mulching									
M_0	1.184	1.330	1.539	16.67	17.17	19.71	15.6(3.9)	20.3(4.5)	55.5(7.4)
M_1	1.190	1.191	1.577	16.92	17.10	19.84	21.7(4.7)	17.4(4.2)	59.1(7.7)
CD(0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
Interaction x Mulching									
CD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

*Transformed values are presented in parenthesis

Table 5

Influence of irrigation and mulching on growth attributes of pineapple

Treatments	Height of plant, cm				No. of leaves/plant			
	12	24	36	48	12	24	36	48
	MAP	MAP	MAP	MAP	MAP	MAP	MAP	MAP
Irrigation								
W_0	45.68	69.21	88.4	89 7	16.02	24.53	45.8	46.7
W_1	55.31	80.50	92.6	95.0	19.37	33.09	47.1	48.9
W,	53.33	79.12	93.7	95.6	17.17	32.88	46.4	48.6
W_2	61.90	82.63	93.6	96.4	18.46	31.80	48.9	50.9
CD (0.05)	4.15	5.85	NS	NS	NS	4.12	NS	NS
Mulching								
MO	50.57	76.62	88 5	91.3	17.02	29.53	45.8	47.5
M_1	57.53	79.11	95.7	97.0	18.47	31.62	48.3	50.0
CD (0.05)	5.88	NS	NS	NS	NS	NS	NS	NS
Irrigation x Mulching								
CD(0.05)	NS	NS	NS	NS	NS	NS	NS	NS

MAP = Months after planting

Effect of mulches

Mulching with dry leaves during the first year exerted a positive and significant influence on fruit yield in the plant crop. Though favourable, the effect was not significant in the second ratoon. However, the increase in total fruit yield of the three seasons due to mulching over no mulching (20.86%) proved to be significant. The increase in yield might be due to the advantages like better conservation of soil moisture and suppression of weeds associated with mulching.

Summary

A field experiment was conducted in a sandy loam soil of the Agronomic Research Station, Chalakudy, Kerala for four years from 1981 to 1985 to study the response of irrigation and mulching on the growth and yield of pineapple. Both irrigation and mulching influenced the fruit yield significantly. The study revealed that irrigating pineapple during summer months at 0.6 IW/CPE ratio (5 cm depth of water) and mulching the crop with dry leaves @6000 kg/ha was optimum. It requires five to six irrigations during the dry months at an interval of 22 days.

Acknowledgement

The authors are grateful to the Indian Council of Agricultural Research and Kerala Agricultural University for providing necessary facilities for the study.

References

Alberts, A. 1984. *Irrigation of Queen Pineapple.* Information Bulletin, Levubugelicd, South Africa 1447: 8

Anonymous, 1981. *Package of Practices Recommendations.* Directorate of Extension, Kerala Agricultural University, Vellanikkara, Trichur, 150-151.

Naik, K. C. 1949. *South Indian Fruit and Their Culture.* P. Varadhachery & Co,, Madras.

Singh, H. P., Dass, H. C., Ganapathy, K. M. and Subramanian, T. R. 1977. Nitrogen requirement of pineapple under irrigated and rainfed conditions. *Indian J. Hon.* 34:377-334.