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RESPONSE OF *AMORPHOPHALLUS* TO IRRIGATION AND MULCHING

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Amorphophallus campanulatus Blume ex Ene is a minor root crop cultivated in Kerala. The corm of this aroid is used as a vegetable. Though traditionally a rainfed crop, it is becoming popular as an irrigated crop especially in the irrigation commands of Kerala owing to the higher yield and better market price for the produce. For want of any recommended water management practice, the farmers are resorting to faulty irrigation practices to this crop. The farmers are also not paying much attention to moisture conservation measures like mulching for increasing the water use efficiency which is all the more important in summer season. With this background, an experiment was undertaken to formulate an optimum schedule of irrigation for amorphophallus and to study the benefits of using locally available organic waste materials as mulch.

Materials and Methods

The two year study was undertaken at the Agronomic Research Station, Chalakudy, Kerala during 1983-'84 and 1984-'85. The soil of the experimental area was sandy loam with pH 6.1. The field capacity and permanent wilting point of the soil were 15.5 and 7.2 per cent, respectively. It contained 0.56 per cent organic carbon, 14.8 kg/ha of available P_2O_5 and 55.6 kg/ha of available K_2O. The monthly data on important weather parameters during the experiment period are furnished in Table 1.

The treatments comprised the combinations of four levels of irrigation (No irrigation and irrigation at 0.3, 0.6 and 0.9 IW/CPE ratio) and four mulches (No mulching and mulching with dried leaves, paddy waste and coir dust). Dried leaves and paddy waste were applied at the rate of 6 t/ha and coir dust at the rate of 8 t/ha. The study was laid out as a factorial experiment in randomised block design with three replications.

Whole or cutpieces of corms of a local variety, each weighing approximately 1 kg, were used as the seed material. Before planting, the seed materials were dried under shade for two days after dipping in cowdung emulsion. The cured corms wore planted vertically at a spacing of 90 cm in channels taken 100 cm apart during December-January after cessation of north east monsoon. After applying cowdung at tha rate of 2.5 kg per corm the channels were covered with soil and mulched uniformly according to treatments. Recommended dosage of fertilizers (80:60:100 kg/ha NPK) and other cultural and management practices were adopted in all the treatments uniformly as per the package of practices recommendations of the Kerala Agricultural University (Anon., 1983).

Irrigation was started one month after planting (so as to avoid the rotting of seed materials especially the cut ones). For scheduling irrigation, the daily evaporation readings were recorded using a USWB class A pan evaporimeter and whenever cumulative pan evaporation minus rainfall reached 166.67 mm, 83.33 mm and 55.56 mm differential irrigations were given at 0.3, 0.6 and 0.9 IW/CPE ratios respectively, at a depth of 50 mm. The details of water use are furnished in Table 2.

Results and Discussion

Corm yield (Table 3)

The effect of differential irrigation on the corm yield was significant during both the years of study and in pooled analysis. The unirrigated control invariably recorded the lowest yield. There was more or less a linear increase in yield with increase in the frequency of irrigation and 0.9 IW/CPE ratio out yielded all the lower irrigation levels significantly. Though the no irrigation treatment recorded significantly lower yield as compared to all the irrigated treatments during the first year, it was comparable with 0.3 IW/CPE ratio during the second year probably due to the receipt of comparatively higher precipitation. Irrigations at 0.9 IW/CPE ratio recorded an yield increase of 6.459, 11.400 and 16.729 t/ha over irrigations at 0.6 and 0.3 IW/CPE ratios and no irrigation control, respectively. This worked out to 20, 41 and 75 percentage increase respectively. The results of the study thus clearly indicated that the December-January planted amorphophallus is to be irrigated at 0.9 IW/CPE ratio during summer season to achieve higher corm yield. It requires about 10 irrigations at an approximate interval of 12 days during non-rainy periods.

The corm yield increased significantly when mulched with all the three organic materials as compared to the unmulched crop during both the years of study and in pooled analysis. The yield increase was attributed to the better soil moisture conservation, soil temperature regulation and other related benefits like weed control achieved through mulching. Mulching with dried leaves recorded the highest yield followed by that with paddy waste and coir dust. The respective yield increases over the unmulched crop were 14.074, 10.923 and 8.175 t/ha respectively. The corresponding percentage increases were 62, 48, and 27. Though the crop mulched with dried leaves and paddy waste recorded comparable yields during the first year of study, dried leaves out yielded other treatments during the second year of study. This indicated that dried leaves was the best mulching material in irrigated amorphophallus. However where dried leaves is not available other organic waste materials like paddy waste and coir dust can be successfully used for mulching. While paddy waste included chaff and other crop residues including poor quality straw, coir dust is the unwanted waste material from coir industry which the people often found difficult to dispose. The study thus indicated the importance of this low cost technology of utilzing farm residues in boosting production of amorphophallus.

Table 1

Important weather parameters during the crop growing season

Month	1983—'84					1984—'85				
	Rainfall		Temperature (C°)		OPE	Rainfall		Temperature (C°)		OPE
	Total (mm)	No. of rainy days	Maximum	Minimum	(mm/day)	Total (mm)	No. of rainy days	Maximum	Minimum	(mm/day)
December	8.6	1	32.9	20.4	3.11	,20.8	6	30.0	22.5	3.64
January	—	—	35.0	19.5	3.93	111.1	3	32.2	21.8	3.23
February	—	—	35.5	22.4	4.30	15.5	2	33.8	22.8	3.55
March	—	—	36.7	24.2	5.01	62.6	6	34.2	23.9	4.00
April	10.5	2	37.2	25.6	5.49	219.6	8	33.6	25.1	3.99
May	32.2	2	35.7	26.5	4.67	53.8	3	34.3	25.8	4.13
June	274.1	19	32.1	25.0	3.67	909.0	28	28.6	23.4	2.80
July	1079.9	27	30.1	24.0	4.09	735.5	29	28.3	23.2	2.62
August	677.2	25	29.3	23.8	3.09	239.7	19	29.4	23.6	3.16
September	629.7	26	30.1	24.6	3.33	82.8	7	30.0	24.0	3.89
October	181.5	11	30.3	24.9	3.03	375.0	12	29.7	23.1	3.33
November	98.5	6	31.5	25.4	2.78	28.6	4	32.3	22.9	3.88

OPE = Open pan evaporation

Table 2

Details of water used by amorphophallus

Particulars	IW/CPE ratio			No irrigation
	0.3	0.6	0.9	
Number of irrigations given	3	6	10	—
Depth of each irrigation (mm)	50	50	50	—
Total irrigation water applied during the crop season (mm)	150	300	500	—
Effective rainfall (mm)	494	494	494	494
Water requirement (mm)	644	794	994	494
Interval between irrigation during the non-rainy period (day)	37	18	12	—
Consumptive use during tho period (4 month) of supplemental irrigation (mm)	120	237	401	67

Table 3

Corm yield and WUE of amorphophallus as influenced by irrigation and mulching

Treatments	Corm yield (t/ha)		Pooled Mean	WUE (kg/ha mm)
	1933-'84	1984-'85		
Irrigation				
Control	22.038	22.593	22.315	45.2
0.3 IW/CPE	28.878	26 412	27.645	42.9
0.6 IW/CPE	32.879	32.292	32.586	41.0
0.9 IW/CPE	41.121	36.968	39.045	39.3
CD (0.05)	5.111	3.911	3.071	—
Mulching				
Control	22.686	22.523	22.605	30.9
Dried leaves	36.488	36.879	36.679	50.1
Paddy waste	34.647	32.408	33.528	45.8
Coir dust	31.101	26.458	28.780	39.3
CD (0.05)	5.111	3.911	3.071	
Interaction	NS	NS	NS	—

Table 4

Growth and yield attributes of amorphophalius as influenced by irrigation and mulching

Treatments	Height of plant (cm)	Canopy radius (cm)	Circumference of corm (cm)
Irrigation			
Control	34.5	53.9	51,7
0.3 IW/CPE	35.0	57.3	51.9
0.6 IW/CPE	38.1	62.3	61.2
0.9 IW/CPE	47.0	69.7	66.4
CD (0.05)	3.2	4.7	6.0
Mulching			
Control	35.0	53.2	51.3
Dried leaves	41.6	69.0	66.0
Paddy waste	39.3	61.0	60.7
Coir dust	38.7	60.0	53.3
CD (0·5)	3.2	4.7	6.0
Interaction	NS	NS	NS

The effect of interaction between irrigation and mulching was nonsignificant during both the years of study.

Growth and yield attributes (Table 4)

The height and canopy radius recorded at the active growth stage of amorphophallus (eight months after planting), showed positive and significant response to irrigation. The no irrigation control invariably recorded the minimum values which increased with increase in the frequency of irrigation from 0.3 to 0.9 IW/CPE ratios. These attributes, especially the radius of canopy, which is a fair measure of the photosynthetic surface of the plant, has definitely contributed to the yield increase obtained through irrigation. Similar response to irrigation as in the case of corm yield was noted in the case of circumference of the corm also. This indicated that bigger sizad corms were obtained through more frequent irrigations upto 0.9 IW/CPE ratio.

Mulching significantly favoured the height and canopy radius of the plant end circumference of the corm. The highest values in respect of these characters

were observed when the crop was mulched with dried leaves followed by that with the paddy waste, coir dust and no mulching, in that order. The favourable impact of mulching on these characters helped in the ultimate yield increase.

Summary

A study was undertaken in the sandy loam soil of the Agronomic Research Station, Chalakudy during 1933-'84 and 1984'85 to know the response of December January planted amorphophallus to irrigation and mulching. Four irrigation (no irrigation and irrigation at 0.3, 0.6 and 0.9 IW/CPE ratios) and four mulching (no mulching and mulching with dried leaves, paddy waste end coir dust) in factorial combinations constituted the treatments. From the results of the study, it was found that amorphophallus planted in December-January has to be irrigated at 0.9 IW/CPE ratio with 50 mm water through furrows in summer season for higher corm production. It requires about 10 irrigations at an approximate interval of 12 days in non-rainy periods. The study also revealed the importance of mulching with organic waste materials like dried leaves, paddy waste and coir dust in boosting corm yield in irrigated amorphophallus.

Reference

Anonymous 1983. *Package of Practices Recommendations*. Kerala Agricultural University, Trichur, pp. 98-99.