

RESPONSE OF CASSAVA TO IRRIGATION UNDER PURE AND MIXED STANDS

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It is estimated that approximately 40 percent of cassava cultivated in Latin America and 50 per cent or more in Africa are intercropped (Leihner, 1984). This is because the interspace in cassava during the early stages of its growth can be effectively utilized for raising short duration crops especially under irrigated conditions due to the slow build up of canopy. Prabhakar and Pillai (1983) reported that groundnut, french beans and cowpea can be profitably intercropped with cassava. Earlier studies conducted at Chalakudy revealed that irrigation for a pure crop of cassava is to be scheduled at 0.5 IW/CPE ratio during summer season for higher tuber yield (Sushama *et al.*, 1982). Cultivation of cassava in rotation with rice on terraced slopes and garden lands of the irrigated commands of Kerala is gaining popularity. However, there is hardly any research information in Kerala and elsewhere relating to the irrigation requirement of tapioca intercropped with other crops. Investigations were therefore undertaken to select suitable intercrops for irrigated cassava and to find out its irrigation requirement under pure and mixed stands.

Materials and Methods

The experiment was undertaken for the two consecutive years (1980-'81 and 1981-'82) at the Agronomic Research Station, Chalakudy, Kerala. The soil of the experimental field was sandy loam in texture with a field capacity of 12.6 per cent. The ground water table of the experimental area fluctuated between 31 cm and 2 m from the ground surface during the crop period. The important meteorological parameters during the course of study are presented in Table 1.

The trial was laid out as factorial experiment in randomised block design with two replications. The test variety of cassava was M 4, an erect type and hence ideal for intercropping. The treatments consisted of factorial combinations of five cropping systems (cassava alone and cassava intercropped with groundnut (TMV 2), cowpea (V 16), greengram (ML 26), and blackgram (T 9) and three levels of irrigation (IW/CPE ratio of 0.3, 0.6 and 0.9). The depth of irrigation was 50 mm. Irrigations were scheduled during the dry months upto the onset of south west monsoon. The irrigation treatments viz., 0.3, 0.6 and 0.9 IW/CPE ratios received on an average 150,300 and 550 mm of water in 3, 6 and 11 irrigations respectively during each irrigation period. The corresponding irrigation intervals were 37, 18 and 13 days.

The main crop cassava was planted on ridges at a spacing of 120 cm x 80 cm during the first week of November. Intercrops were sown on the same day on either side of the ridges at a spacing of 20 cm between plants. A fertilizer dose

of 50:50:50: kg N:P₂O₅:K₂O per hectare was applied uniformly to all the treatments. The harvest of all the intercrops was completed within a period of 100 days from the date of sowing. Cassava was harvested during the last week of May and the first week of June during the first and second years of study respectively.

Results and Discussion

Tuber yield

The data on tuber yield of cassava as influenced by cropping systems and levels of irrigation are presented in Table 2.

It could be seen from the data that the irrigation levels, cropping systems and their interaction did not have any significant influence on the tuber yield of cassava. Since the yields obtained with irrigations at IW/CPE ratios of 0.3, 0.6 and 0.9 were on par, it could be inferred that the lowest level of irrigation tried (IW/CPE ratio of 0.3) was sufficient for optimum yield under all cropping systems. Shanmugavelu *et al.* (1973) reported profound influence of irrigation on tuber yield in cassava. Sushama *et al.* (1982) reported that 5 to 6 irrigations at an approximate interval of 24 days are required for cassava. However, in the present study the high ground water table might have contributed substantially to the water requirement of cassava resulting in a non-significant influence on tuber yield due to levels of irrigation. In short the study reveals that under shallow water table conditions supplementary irrigation at IW/CPE ratio of 0.3 with 50 mm water is enough for cassava raised under pure and mixed stands. It requires three irrigations at an interval of 37 days during the dry periods of crop growth.

It is also evident from the data (Table 2) that the tuber yields of cassava in all the cropping systems were on par with each other. Intercrops like greengram, cowpea, blackgram or groundnut thus gave an additional income from the same piece of land without adversely affecting the yield of main crop. Prabhakar and Pillai (1983) reported that groundnut, french beans and cowpea have exhibited good growth and yielded satisfactorily with cassava.

Growth characters

The growth and ancillary characters of the main crop as influenced by the treatments are summarised in Table 3. It is observed from the data that the height of main crop was reduced by cowpea and groundnut throughout the growth period. The above two intercrops were also causal in reducing the number of leaves of cassava, but the effect reached the level of significance only during the early stages of growth. Among the tuber characters only the length of tuber was affected by the treatments. There was a significant increase in tuber length of pure crop as compared to cassava intercropped with cowpea. The other characters viz., the number of tubers per plant and the girth of tuber were not influenced by the cropping systems.

Table 1
Mean monthly data on meteorological parameters during crop growth period

Period	1980-'81			1981-'82		
	Total rainfall (mm)	Number of rainy days	Mean open pan evaporation (mm/days)	Total rain fall (mm)	Number of rainy days	Mean open pan evaporation (mm/days)
November	233.6	9	3.3	238.8	10	3.3
December	195	4	3.4	47.2	1	3.7
January	—	—	4.5	—	—	4.2
February	—	—	4.7	—	—	4.7
March	12.5	1	5.8	11.5	1	5.5
April	237.5	6	4.6	67.2	2	5.4
May	212.9	8	4.2	133.7	7	4.4

Table 2
Yield of cassava and intercrops as influenced by cropping systems levels of irrigation

Treatments	1980-'81		1981-'82		Pooled Mean	
	Yield of cassava (t/ha)	Yield of intercrops (kg/ha)	Yield of cassava (t/ha)	Yield of intercrops (kg/ha)	Yield of cassava (t/ha)	Yield of intercrops (kg/ha)
<i>Cropping system</i>						
Cassava alone	20.94	—	18.43	—	19.69	—
Cassava + groundnut	20.44	769	16.07	328	18.26	549
Cassava + cowpea	16.92	876	16.44	704	16.68	790
Cassava + greengram	19.78	595	18.80	202	19.29	399
Cassava + blackgram	20.19	947	16.53	269	18.36	608
CD (0.05)	NS		NS		NS	
<i>Levels of irrigation</i>						
IW/CPE ratio 0.3	18.33		16.06		17.20	
IW/CPE ratio 0.6	20.31		16.42		18.37	
IW/CPE ratio 0.9	20.32		19.16		19.74	
CD (0.6)	NS		NS		NS	

Table 3

Growth characters and yield attributes of cassava as influenced by cropping systems and levels of irrigation

Treatments	Plant height (cm)		Total number of leaves per plant		Number of tubers per plant	Mean length of tuber (cm)	Mean girth of tuber (cm)
	3 months after planting	At the time of harvest	3 months after planting	At the time of harvest			
<i>Cropping systems</i>							
Cassava alone	49.8	143.8	43.1	150.4	9.5	23.1	14.6
Cassava + groundnut	42.6	123.5	37.7	130.4	9.1	21.1	13.4
Cassava + cowpea	39.8	107.7	35.3	128.2	7.2	19.4	13.7
Cassava + greengram	46.9	134.5	44.3	144.0	9.5	21.7	14.4
Cassava + blackgram	45.6	135.5	44.4	138.8	9.3	21.7	14.4
CD (0.05)	6.23	16	5.87	NS	NS	2.26	NS
<i>Levels of irrigation</i>							
IW/CPE ratio 0.3	44.2	127.5	40.8	134.2	8.7	21.0	13.5
IW/CPE ratio 0.6	43.8	128.3	40.9	137.6	9.0	21.0	14.2
IW/CPE ratio 0.9	46.9	131.2	41.3	143.3	9.1	21.4	14.5
CD (0.05)	NS	NS	NS	NS	NS	NS	NS

Table 4

Economics of intercropping and irrigation in cassava

Treatments	Cost of production (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	Profit index
<i>Cropping system</i>				
Cassava alone	5065	9850	4785	100
Cassava + groundnut	6065	11346	5281	110
Cassava + cowpea	6035	12092	6057	127
Cassava + greengram	5795	11924	6129	128
Cassava + blackgram	5767	11480	5713	119
<i>Levels of irrigation</i>				
IW/CPE ratio 0.3	5104	8600	3496	100
IW/CPE ratio 0.6	5628	9195	3567	102
IW/CPE ratio 0.9	6504	9870	3366	96

The irrigation levels did not exert any significant influence on growth characters and yield attributes of the main crop.

Economics

The economics of intercropping and irrigation in cassava are presented in Table 4. The data show that all the intercrops tried in this experiment gave higher profit index than that of pure crop of cassava. The highest profit index of 128 was obtained by intercropping cassava with greengram followed by cowpea, blackgram and groundnut (127, 119 and 110 respectively).

As in the case of tuber yield gross income showed an increasing trend with increase in the level of irrigation. However, the net profit increased marginally only up to 0.6 IW/CPE ratio whereupon it declined due to the extra cost involved in irrigation without a commensurating increase in yield. The optimum schedule of irrigation viz., IW/CPE ratio of 0.3 gave a net profit of Rs 3436 per hectare. The profit index also decreased from 100 at IW/CPE ratio of 0.3 to 96 at IW/CPE ratio of 0.9.

Summary

A field experiment was conducted for two consecutive years in the sandy loam soil of the Agronomic Research Station, Chalakudy to study the effect of different irrigation schedules (0.3, 0.6 and 0.9 IW/CPE ratios) on the growth and yield of cassava under pure and mixed stands (cassava (M 4) alone and cassava intercropped with groundnut (TMV 2), cowpea (V 16), greengram (ML 26), and blackgram (T 9). It was revealed that under shallow water table conditions cassava requires irrigation only at IW/CPE ratio of 0.3 (approximately once in 37 days in the dry period) both under pure and mixed stands. It was also observed that cultivation of intercrops viz., greengram, cowpea, blackgram and groundnut gave additional income from the same piece of land without adversely affecting the yield of cassava.

സംഗ്രഹം

തനിവിളയായും ഇടവിളയോടുകൂടിയും നിലക്കടല, പയർ, ചെറുപയർ, ഉഴുന്ന് എന്നിവ വളർത്തിയ മാച്ചീനിയുടെ വളർച്ചയിലും വിളവിലും വിവിധ ഇടവേളകളിലുള്ള ജലസേചനം (0.3, 0.6, 0.9 എന്നീ IW/CPE ratio) എന്നീ സാധനങ്ങൾ ഉപയോഗിച്ച് നടത്തുന്ന എന്ന് അറിയുന്നതിനുവേണ്ടി ചാലക്കുടി അഗ്രോണമിക് ഗവേഷണ കേന്ദ്രത്തിലെ മണ്ണൽ കലർന്ന പശിമരാശി (ffisolraiS) തുടർച്ചയായി രണ്ടു വർഷം ഒരു പരീക്ഷണം നടത്തുകയുണ്ടായി. ഭൂഗർഭ ജലവിതാനം (rarojldSio) ആഴത്തിലല്ലാത്ത പ്രദേശങ്ങളിൽ മാച്ചീനിയ്ക്ക് (തനിവിളയ്ക്കും ഇടവിളയുള്ളപ്പോഴും) 0.3 IW/CPE അനുപാതത്തിൽ (മഴ ഇല്ലാത്തപ്പോൾ ഏകദേശം 3.7 ദിവസത്തിലൊരിക്കൽ) നനയ്ക്കുന്നതാണ് അനുയോജ്യമെന്നു തെളിഞ്ഞു. പ്രധാന വിളയായ മാച്ചീനിയുടെ വിളവിനെ കാര്യമായി ബാധിക്കാതെ തന്നെ ചെറുപയർ, പയർ, ഉഴുന്ന്, നിലക്കടല എന്നീ ഹ്യൂസുകാല വിളകൾ ഇടവിളയായി വളർത്താമെന്നും (raisjoro raaro) കൃഷി സാധനങ്ങളുടെയും കൂടുതൽ ആദായം ലഭ്യമാക്കാമെന്നും ഈ പഠനത്തിൽ നിന്നും വ്യക്തമായി.

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