

by *M. coeruleifrons* was endemic in Sangli and Satara districts and that the infestation was less in light and well drained soils. The present studies indicated that maggots are associated only with rhizome rot affected ginger and they were absent in healthy ginger.

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Effect of Growth Retardant CCC on Growth and Productivity of Turmeric under Monoculture and in Association with Coconut

Turmeric is presently cultivated along with other perennial and plantation crops in most of the southern states of India. But very little information is available about the growth and productivity of this crop as influenced by different cropping systems. Previous studies conducted at Central Plantation

Crops Research Institute, Kasaragod with three important cultivars of turmeric had revealed that the yield of one of the cultivars, Cls. No. 24 was considerably reduced when raised as an intercrop in coconut garden, and this was partly due to the low harvest index (Satheesan, 1984). Hence, an attempt was made to

modify the assimilate partitioning of this cultivar by the application of growth retardant CCC (2-Chloroethyl) trimethyl ammonium chloride so as to favour more accumulation of photosynthates in the rhizome. Such beneficial effects on yield by foliar application of CCC have been reported in starch producing crops like potato (Dyson, 1965; Humphries and Dyson, 1967) and cassava (Dasgupta, 1976).

Two trials, one under monoculture (pure stand) and the other in association with coconut of West Coast Tall (WCT) variety of thirty years of age (intercropped stand), with the turmeric cultivar Cls. No. 24 were conducted during the cropping season 1978 adopting a completely randomised design with five replications. Five beds each with an area of 3.3 m² constituted a plot. Both coconut and turmeric (pure as well as intercropped stands) were manured as per the recommended package of practices. The CCC treatments were of the following concentrations, 2000 ppm, 4000 ppm, 6000 ppm, and distilled water as control. These were applied as foliar sprays at 4th, 6th and 10th weeks after planting at the rate of one litre for four beds of fortyfour plants each. Different growth components like height, number of tillers, maximum leaf area index (LAI) attained as well as dry matter accumulation and harvest index (HI) were determined and the data are presented in Table I.

Under intercropping, the tiller production of turmeric was significantly higher for CCC treatments with 2000 ppm and 4000 ppm while the reduction

noticed in the height of the plants following the CCC treatments was not significant. The tiller production and height of the plants in the pure stand of turmeric were not significantly affected by the CCC treatments. Under monoculture, control as well as treated plants attained maximum LAI by 18th week. But under intercropping, the CCC treatments with 2000 ppm and 4000 ppm recorded maximum LAI by 18th week, while for control plants, attainment of maximum LAI delayed upto 22nd week. In the case of root, tuber and rhizomatous crops, it had been established that once a closed canopy was established, further leaf growth is required only to maintain that canopy, and the maximum amount of assimilates should be transferred to the relevant storage sink (Kawkami, 1978). The early attainment of maximum LAI registered by the CCC treated plants will facilitate translocation of more assimilates to their rhizomes than in control plants, under intercropping. This was reflected in the HI recorded under this cropping system where the values were significantly higher for CCC treatments with 2000 ppm and 4000 ppm than for the control. The higher rhizome yield of the CCC treated plants under intercropping was the result of this higher efficiency in partitioning of assimilates towards their rhizomes. Under monoculture, this difference in HI was not marked, where the difference in rhizome yield between the treated and control plants was also not significant.

El-Fouly (1973) reported that application of the growth retardants will help in maintaining the balance between the shoot and storage root

Table I. Number of tillers, height of the plants, maximum leaf area index (LAI) attained, dry matter accumulation and harvest index (HI) of pure and intercropped stands of turmeric as influenced by CCC treatments

Treatments	No. of tillers	Height (cm)	LAI		Dry matter accumulation			HI
			18th week	22nd week	Shoot	Rhizome	Whole Plant	
Distilled water 2000 ppm CCC 4000 " " 6000 " " CD (P=0.05) CV (%)	3.8	92.2	5.2	4.1	332	475	837	0.57
	3.8	91.8	5.1	3.9	330	472	832	0.57
	4.0	91.3	5.2	4.0	335	479	842	0.57
	3.8	90.7	4.8	3.7	325	452	806	0.56
	NS	NS	NS	NS	NS	NS	NS	NS
	6.3	3.1	8.3	8.0	8.5	7.6	7.8	0.1
Distilled water 2000 ppm CCC 4000 " " 6000 " " CD (P=0.05) CV (%)	2.9	94.2	3.8	4.6	297	325	608	0.53
	3.5	92.9	4.8	4.2	281	404	715	0.57
	3.6	91.7	5.0	3.9	287	432	751	0.58
	3.4	90.1	4.5	4.7	290	390	707	0.55
	0.5	NS	0.77	NS	NS	37.8	83.0	0.03
	11.0	5.3	12.8	18.1	12.0	7.1	8.5	5.3

growth, and favour accumulation of more reserves in the storage organs. The results of the present study revealed that the reduction in rhizome yield when turmeric is intercropped with coconut as compared to its pure stand can be compensated to a greater extent by the application of CCC through a longer duration of rhizome bulking brought out by earlier attainment of maximum LAI. A concentration of 4000 ppm registered maximum increase in rhizome yield and HI even though this increase was not significantly higher than that obtained with 2000 ppm. The increase in rhizomes yield was found to be least at higher concentration of 6000 ppm. Tolbert (1960) found that the growth pattern obtained after the application of growth retardant CCC was similar to the growth in high light intensity. It is noteworthy that the HI recorded for CCC treatments with 2000 ppm and 4000 ppm under intercropping are comparable with that obtained for control plants in monoculture.

Eventhough under monoculture, the HI and rhizome yield were not affected significantly by the CCC treatments, these values tend to be reduced at higher concentration of 6000 ppm. Nafziger, Wax and Brown (1986) found that eventhough the CCC treatments were quite effective in decreasing plant height in wheat cultivars, there was a tendency for occasional yield decrease under less favourable conditions. The application of CCC to the pure stand of turmeric will not favour more accumulation of assimilates in the rhizome and may even reduced the total dry matter production at higher concentrations.

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Asexual Propagation of Cocoa (*Theobroma cacao* L.)*

Cocoa plantations by and large are of seed origin resulting in variation both in production and productivity. In order to achieve higher yields per unit area and to obtain quality product, it is imperative to resort to vegetative propagation for clonal multiplication. Establishment of clonal seed gardens with vegetative progenies would help in generation of superior planting materials for supply to growers. Earlier

trials conducted by Somappa and Rao (1983) got 58% of rooted layers with the application of root promoting hormones while Nair (1983) achieved a success of about 80% with the cuttings, under polythene and hardening the rooted cuttings by gradual exposure to natural conditions. Planting materials produced through cuttings in a large scale have a low spreading habit of growth in Trinidad as indicated by Moll

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