

EFFECT OF GREEN MANURING ON THE PRODUCTION OF ARECANUT

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ABSTRACT

Annual application of green leaf to arecanut palm is a common practice in Karnataka and Kerala. A field experiment was conducted at Central Plantation Crops Research Institute, Hirehalli from 1969 to 1972 to study the effect of growing six selected green manure crops in arecanut with reference to organic carbon status of soil and yield of arecanut. The studies revealed that there were no significant differences amongst the treatments in yield and yield attributes of arecanut. However it was observed that *Mimosa invisa* and *Centrocema pubescens* yielded significantly more green matter when compared to *Pueraria javanica*, *Calopogonium muconoides*, *Crotolaria anagyroides* and *Sesbania speciosa*. From the point of improvement in the organic carbon status in the soil *Mimosa invisa* and *calopogonium muconoides* were found to be ideally suited.

Introduction

Maintenance of high organic matter status in the soil all the year round is an important factor in the production of a perennial crop like arecanut. Annual application of green leaf to arecanut palm is a common practice in Karnataka and Kerala to maintain the organic carbon status in the soil. Generally leaf is collected from the nearby forest areas and applied to arecanut during September and October months. It is necessitated to search for suitable green manure crops to be grown in arecanut garden due to deforestation. Studies on green manure crops confirmed the suitability of *Calopogonium muconoides* for raising as green manure crops in loamy soil areas (Anonymous, 1960). Increased availability of N in soil after green manuring has been reported by Boawn *et al* 1963 and Shende and Sen, 1958, Prabhakar *et al* 1972 also observed that application of green manure increased the available P content by 17% in red sandy loam as well as black clay loam soil. Increased availability of K in soil after green manuring has also been reported (Kute and Mann 1969., Debnath and Hajra, 1972). The green manure crops have other advantages such as fixation of N, recycling of nutrients in the soil and prevention of soil erosion. Keeping these points in view, a field experiment was conducted to find out the green matter yielding ability of few selected green manure crops, their capacity to add nutrients to the soil and their effect on the production of arecanut.

Materials and methods

This experiment was started in year 1969 and continued till 1972 at the Central plantation Crops Res-

earch Institute, Hirehalli. The trial was laid out in seven years old arecanut garden with seven treatments and four replications. The green manure seeds were sown in the months of May-June each year and harvested at the flowering stage. The green matter yields and moisture percentages were recorded for comparison and applied to the arecanut basins at the rate of 10 kg green matter to each of the palms. Analysis of soil for organic carbon content was carried out periodically, till the next growing season. Arecanut yield attributes such as number of nuts and weight of nuts were recorded annually.

The experimental soil was found to have a pH of 6.3, organic matter of 0.55%, available nitrogen 250 ppm, available phosphorus 25 ppm and available potash 96 ppm. Texturally the soil was clayey loam with 51% clay, 38% of sand and 11% silt.

Results and discussion

The data on the moisture percentage of different green manures grown under the canopy of arecanut are presented in Table-1. It was observed that there were no significant differences in the moisture percentages of different green manures. However, higher percentage of moisture was observed in *Pueraria javanica* (77.3%) than other with least moisture in *Calopogonium muconoides* (66%). The data on the green matter yield as influenced by different green manures in the arecanut garden are presented in Table-2. From the table, it was observed that there were significant differences in the yield of green matter. *Mimosa invisa* and *Centrocema pubescens* yielded 11.9 and 9.1 tonnes of green matter per hectare.

These were significantly higher than the green matter obtained from other crops. It is evident from the results as well as other visual observations that *Mimosa invisa* and *Centrocrema pubescens* are vigorously growing even under the canopy of arecanut which resulted in higher green matter production from these. Mohapatra and Bhat (1982) concluded that *Pueraria javanica* and *Mimosa invisa* were good green manure and cover crops in arecanut gardens. In the current studies at Hirehalli, the performance of *Mimosa invisa* was similar to the earlier results reported with a mean green matter yield of 11.9 tonnes per hectare from four years data. *Pueraria javanica* provided poor yields in 1970 and 1971 in succession and hence its mean yields came down to 4.7 tonnes per hectare. *Centrocrema pubescens* on the other hand started off with a higher yield of 15.8 tonnes per hectare and thus provided a mean yield of 9.1 tonnes per hectare. The yield and yield attributes of arecanut are presented in Table 3(a) and 3(b). It is observed from the table that there were no significant differences in the yield and yield attributes of arecanut due to growing of different green manure crops in arecanut. However, it was observed that mean number of nuts varied from 392 to 464 per palm and the mean yield from 6.85 to 8.69 kg/palm. The yield in all the treatments 7.47 to 8.69 kg/palm except with *Pueraria javanica* (6.86 kg/palm) was more than control plot (7.17 kg/palm). Thus, this study indicated that raising six green manure crops was only marginally helpful in improving the yields of arecanut. Perhaps, green manuring could not provide the requisite quantities of major nutrients as per the needs of the crop, as would be the case with the application of fertilisers. Besides, the effect of green manuring like that of providing bulky organic manures may have to be judged over a long period. Though not a major improvement in arecanut yields, it is seen that green manuring could improve the soil carbon status. The data on the effect of application of green manures to arecanut palm on the soil carbon status are presented in Table-4. It is observed from the data that there were differences in the organic carbon present in different depths of soil because of incorporation of different organic manures to the basins of arecanut. The soil carbon percent was highest in the surface at 0 to 0.25 cm depth (0.59 to 0.76%) medium in the middle depth of 25 to 50 cm (0.41 to 0.51%) and low in deeper layers of 50 to 100 cm (0.30 to 0.40%), since the surface soil is usually the region where enrichment of carbon from green manuring could be expected. On examination of the top 0.25 cm depth of soil indicated that *P. javanica* (0.70%), *C. muconoides* (0.75%), *C. pubescens* (0.76%) and *M. invisa* (0.75%) had all fairly higher carbon percent from the initial soil status of 0.36 to 0.37% carbon while control (0.59%), *C. anagyroides* (0.65%) and *S. speciosa* (0.59%) had little or no improvement in soil carbon percent. These improvements in soil carbon percent must be regarded as low compared to the rise in fertility through organic manures in general from 0.62% carbon to 1.29% between pretreatment and post-treatment periods as observed by Mohapatra and Bhat (1982). However, the results of this investigation confirm the benefits of

green manuring to arecanut though on a smaller magnitude. Thus on an average of the three depths *C. muconoides* and *M. invisa* which provided higher mean percent of 0.56 compared to others and control (0.46) could be recommended for general practice purely from the stand point of maintaining and building up of organic matter in the soils in this perennial crops of arecanut.

Acknowledgement

I Thank Dr. K. V. Ahamed Bavappa, Director, Central Plantation Crops Research Institute, Kasaragod for providing facilities. Thanks are also due to Dr. A.R. Mohapatra and his colleagues for having analysed the soil samples at CPCRI, Regional Station Vittal.

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TABLE 1—Moisture percentage of different green manures grown in arecanut garden

Treatment	1971	1972	Mean
1. <i>Pueraria javanica</i>	77.3	74.4	77.3
2. <i>Calopogonium muconoides</i>	73.3	59.0	66.1
3. <i>Centrocema pubescens</i>	72.6	68.0	70.3
4. <i>Crotalaria anagyroides</i>	76.6	72.3	74.4
5. <i>Sesbania speciosa</i>	76.0	73.2	74.6
6. <i>Mimosa invisa</i>	72.0	71.0	71.5
F Test	N.S.	N.S.	N.S.

TABLE 2—Green matter yield as influenced by different green manures in the arecanut garden (Tonnes/ha)

Treatment	1969	1970	1971	1972	Mean
1. <i>Pueraria javanica</i>	8.23	2.19	1.30	7.40	4.79
2. <i>Calopogonium muconoides</i>	7.96	1.78	1.08	1.48	3.07
3. <i>Centrocema pubescens</i>	15.83	4.97	7.85	7.90	9.14
4. <i>Crotalaria anagyroides</i>	4.25	4.22	1.27	4.93	3.67
5. <i>Sesbania speciosa</i>	—	3.85	—	4.10	3.98
6. <i>Mimosa invisa</i>	22.89	10.57	9.01	5.30	11.94
F Test	*	*	*	*	*
CD at 5%	3.965	2.780	2.165	2.450	2.445

TABLE 3—(a) Arecanut yield (number of nuts per palm) as influenced by growing different green manure crops in arecanut garden

Treatment	1970-71	1971-72	1972-73	Mean
1. <i>Pueraria javanica</i>	190.7	546.1	438.2	391.7
2. <i>Calopogonium muconoides</i>	243.2	502.6	512.3	419.4
3. <i>Centrocema pubescens</i>	225.7	471.5	546.1	414.4
4. <i>Crotalaria anagyroides</i>	305.0	561.8	524.1	463.6
5. <i>Sesbania speciosa</i>	252.9	475.2	511.5	413.2
6. <i>Mimosa invisa</i>	197.0	479.8	541.7	406.2
Control	214.7	473.4	501.4	396.5
Mean	232.7	501.5	510.7	—
F Test	N.S.	N.S.	N.S.	—

TABLE 3(b)—*Arecanut yield (Net weight kg/palm) as influenced by growing different green manure crops in arecanut garden*

Treatment	1970-71	1971-72	1972-73	Mean
1. <i>Pueraria javanica</i>	2.98	9.38	8.21	6.86
2. <i>Calopogonium muconoides</i>	4.28	8.73	9.69	7.57
3. <i>Centrocema pubescens</i>	3.70	8.33	10.64	7.56
4. <i>Crotalaria anagyroides</i>	5.33	10.18	10.55	8.69
5. <i>Sesbania speciosa</i>	4.61	8.44	9.36	7.47
6. <i>Mimosa invisa</i>	3.47	8.65	10.36	7.49
Control	3.91	8.37	9.24	7.17
Mean	4.04	8.87	9.72	—
F Test	N.S	N.S.	N.S.	—

TABLE 4—*Organic carbon percent of soils at different depth as influenced by the application of different green manures to arecanut palm. (Average of 3 samples)*

Treatment	Depth of soil			Mean
	0-25 cm	25-50 cm	50-100 cm	
1. <i>Pueraria javanica</i>	0.70	0.46	0.30	0.49
2. <i>Calopogonium muconoides</i>	0.75	0.48	0.35	0.56
3. <i>Centrocema pubescens</i>	0.76	0.42	0.34	0.51
4. <i>Crotalaria anagyroides</i>	0.65	0.51	0.32	0.49
5. <i>Sesbania speciosa</i>	0.59	0.42	0.40	0.47
6. <i>Mimosa invisa</i>	0.75	0.47	0.36	0.56
Control	0.59	0.41	0.38	0.46

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