INFLUENCE OF COCONUT SHADE ON MULBERRY AND SILKWORM REARING

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ABSTRACT

Results of an investigation on the effect of coconut shade on mulberry as a whole and its influence in turn on cocoon yield in particular are reported. The coconut shade affected not only the morphology of the mulberry plants but also the quality of leaves, which in turn influenced the weight of the larvae as well as cocoons. The morphological changes include increase in internodal length, increase in number of leaves per Kg, and differences in size and colour of leaves. The changes in life cycle of silkworm included, increase in duration of moulting and difference in weight of the larvae.

INTRODUCTION

The mulberry (*Morus alba L.*) is grown in many parts of the world under varied environmental conditions. The plant shows variations in morphology and structure according to soil type, fertility and climatic conditions Tazima, 1972). In Arsikere taluk, mulberry is grown as a mixed crop in coconut gardens. In the present study, the effect of coconut shade on the yield and quality of mulberry leaves in general and its influence on cocoon yield in particular were investigated. Observations were also made on the yield and health of the coconut palms.

MATERIAL AND METHODS

The experiment was conducted on an 18 year-old private coconut garden near Arsikere with the following treatments:

(*a*) Mulberry grown under coconut shade

(*b*) Mulberry grown as mono–crop in open

(*c*) Coconut as mono–crop.

Coconut and mulberry were grown singly or in combination on homogeneous soil in adjacent plots as per the treatments given above. The first two treatments were given the same quantities of nutrients and irrigation. The third treatment received the usual local cultivation practices.

Mulberry was grown by pit system of planting (60 × 60 cm), 90 cm away from the bole of coconut palms in both the treatments, and all agricultural practices were followed as described by Ullal and Narasimhanan (1978). One hundred disease-free layings of cross breed (MYS × NB 18) silkworms (*Bombyx mori*) were used for each rearing experiment.

Results and Discussion

The data on the morphology of mulberry plants and weight of the larvae as well as cocoons are presented in Tables 1 to 4.

I. Influence of coconut shade on mulberry plant: The biometric observations recorded during the growth of the mulberry are as follows: (Table 1).

(*a*) Slender and succulent plants with long internodes in shade compared to open, (*b*) thin, broad and pale green leaves weighing little less than that of open field plants, and (*c*) quick and luxuriant growth of plants under shade compared to open field.

II. Effect on silkworm and cocoons: The life cycle of *Bombyx mori* was increased to 24-28 hours when fed with mulberry leaves grown under coconut shade. Larvae fed with open field leaves and their cocoons weighed slightly more than those fed with leaves grown under shade (Tables 2, 3).

III. Effect on coconut yield: The nut yield of coconut was more when mulberry was grown as intercrop compared to a pure stand of coconut (Table 4). There was an increase of 9 nuts/palm/year on an average over a period of three years.

IV. Pests and diseases on mulberry: The growth of powdery mildew fungus (*Phyllactinia corylea*) was more when mulberry

Table 1. Effect of coconut shade on mulberry (mean of 10 plants)

Habitat	Branches no./tree	Leaves no./tree	Internodal length*(cm)			Height of plants (cm)	Size of leaves**		Colour of leaves	Leaves per Kg no.
			B	M	T		L	B		
Mulberry grown in open	5 to 8	18 to 26	3.1	6.0	5.6	100 to 138	19	14	green	546
Mulberry grown under coconut shade	4 to 7	16 to 23	3.5	6.5	5.9	125 to 155	19	16	pale green	592

*B, M and T refer to Bottom, Middle and Top respectively

**L and B refer to length and breadth respectively.

Table 2. Effect of coconut shade on the quality of mulberry leaves—duration of different instars and moulting periods

Instars and Moults	Leaves from trees in open field		Leaves from trees under shade	
	Duration	Quantity of leaf fed (kg)	Duration	Quantity of leaf fed (kg)
I Instar	3.5 d	2.5	3.5 d	2.5
I Moult	22 h	—	24 h	—
II Instar	2.5 d	6.0	3.0 d	6.0
II Moult	24 h	28.0	26 h	28.0
III Instar	4.0 d	28.0	4.5 d	28.0
III Moult	24 h	82.0	28 h	82.0
IV Instar	5.0 d	82.0	6.0 d	82.0
IV Moult	26 h	—	24 h	—
V Instar	8 d	624.0	7-8 d	624.0
Total	27d	742.5	28.25-29.25	742.5

Feeding Hours: 6,10,14,18 and 22 h IST d—days h—hours
Rearing conditions: Room temperature 27°C to 29.5°C and relative humidity 75 to 83 per cent.

Table 3. Effect of coconut shade on mulberry leaves–rearing observations

Particulars	Leaves from trees in open field	Leaves from trees under shade
Number of layings reared	100 DFLS (C.B.)	100 DFLS (C.B.)
Average weight of 10 larvae at 5th stage	31.10 g	30.23 g
Average weight of 10 cocoons after a day of spinning	11.84 g	11.32 g
Number of days taken from hatching to cocoon formation	27d	28.3 to 29.3 d
Total quantity of leaves fed upto the date of spinning	742.5 kg	742.5 kg
Yield	43.4 kg	41.5 kg

Table 4. Effect of mulberry intercropping on coconut yield (Mean of 40 palms) Average for 3 years (1980–82)

Treatment	Yiled of coconut nuts/palm/year
Coconut + mulberry	85
Coconut alone	76

plants were grown under shade. On such plants, larvae and adults of *Illis cincta* (Coccinellidae) were found to feed on the fungus and helped in suppressing the spread of the fungus to a certain extent.

Scutillarid bug *Chrysocoris stolli* (Scrutillaridae) was found feeding on the central surface of the top leaves in groups. Sucking of the plant sap resulted in outward curling of the mulberry leaves. Three to five bugs were recorded on a single leaf on the mulberry grown under shade. Such bugs were rarely found on the mulberry grown in an open field. These bugs did not appear to cause any economic damage to the mulberry.

Discussion

The morphological changes in mulberry, such as increase in the internodal length, size of the leaves and paleness of leaves may be attributed to the shade effect of coconut palm. The appearance of such characters is reported to be common in plants grown in shade and marshy habitat (Daubenmire, 1974).

The differences in weight of the larvae, cocoons and life cycle could be attributed to the difference in nutrient contents of the leaves grown in two treatments. The difference in weight of the cocoon was negligible (Table 3).

The increase in the yield of coconuts could be due to the better availability of nutrients and water in the plots where mulberry was grown. Such an increase in the yield of coconut was recorded when cacao was grown as an intercrop with coconut (Nair, 1979).

The increase in fungal growth on mulberry leaves under shade may be due to higher humidity. Similar observations in coconut gardens were made by Alexopoulos (1972).

The market price of both coconut and silkworm cocoons fluctuated widely. Based on the prices which prevailed between September and October 1982, the gross income from the coconut-mulberry mixed planting was estimated at Rs. 29,520/- per annum per ha compared to Rs. 13,500/- from a pure plantation of coconut (Table 5). The present investigation opens up the possibility of growing

Table 5. Effect of coconut shade on mulberry—economics of intercropping

Particulars	Coconut + mulberry			Coconut alone
	Coconut	Mulberry (cocoons)	Total	
Fruits/Cocoons harvested per year/ha	8000 no.	420 kg	—	7500
Estimated value of produce Rs./ha/year,	14400	15120	29520	13500

Note: (*a*) 100 coconut trees/ha (*b*) average productivity of 80 coconuts/tree/year in case of mixed garden and 75 in case of pure plantation (*c*) coconut at Rs. 1800/ thousand nuts (*d*) cocoons at Rs. 36/kg (*e*) average weight of cocoons at 42 kg/100 DFLS and only four crops reared in a year.

mulberry profitably in coconut gardens. The quality of mulberry leaves was not affected when grown under coconut shade, and the yield of cocoons was not affected appreciably when fed with these leaves.

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