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Effect of Mite Feeding in Relation to Depletion of some Organic, Minerals and Inorganic Compounds in the Leaves of Coconut (*Cocos nusifera*)

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Abstract

The study showed that significant depletion of important organic, minerals and inorganic compounds was caused due to mite infestation in the leaves of Coconut (Cocos nusifera). Among organic compounds, chlorophyll, total protein, phenol and total carbohydrate were selected for the study. Among minerals, Mg, Zn,Cu and Fe were selected and among inorganic materials nitrate and nitrite were selected. It was found that amount of chlorophyll, total protein, total cabohydrate, Mg, Zn,Cu, fe, nitrate and nitrite were reduced by 23.00, 19.32, 00.00, 29.81, 15.73, 18.03, 17.16, 6.75, 24.24, 51.66% respectively. It was found that mite feeding has no significant effect in the amount of phenol content.

Key words : Mite feeding, Coconut leaves, Depletion, Minerals, Organic compounds.

Mites are a group of arachnid arthropod. They are most important and significant pests of crops causing serious yield losses. Insect pests have received sufficient attention in India, mites have remained neglected probably due to their microscopic size, even though they have the potentiality of causing extensive damage to the agricultural and horticultural crops. A good number of plant mites are injurious pests of agricultural and horticultural crops causing considerable yield loss to the farmers; 50—80% in mango due to *Aceria mangiferi;* 27—39% in chilli due to *Polyphagotarsonemus latus,*10—15% in vegetables due to spider mites; 20—25% in paddy due to *Oligonychus oryzae;* 20—30% in sugar cane due to *Oligonychus indicus;* 13–30% in brinjal, 23—25% in lady's finger due to spider mites (1). Since very little or nothing is known as to what extent the feeding of different mite influences changes in the biochemical components of leaves of coconut, it was thought to undertake a preliminary study on this aspect.

Methods

The estimation of chlorophyll was done following the method of Arnon (2). Total carbohydrate was estimated using anthrone reagent following the method of Hedge and Hofreiter (3). Phenol was estimated following the method of Spies (4). Before analysis, fresh uninfected leaves were collected to serve as control and those were processed separately for analysis.

Quantitative estimation of minerals like Mg, Cu, Zn, Fe, will be made by digesting the oven-dried samples in concentrated HNO_3. Before analysis, fresh uninfected healthy leaves were collected to serve as control and those were processed separately for analysis.

Heavily infested leaves and uninfested healthy leaves of coconut were collected. Out of those leaves (both uninfested and infested), 20 grams each of uninfested leaves and heavily infested leaves are subjected to oven drying for about 3 hours at 105C for complete drying of leaves. Infestation status of the leaves can be easily concluded by the examination of damage symptoms, due to mite feeding, by hand lens. The whole experiments were repeated five times. The results obtained during the study were statistically analyzed for inference.

Results and Discussion

A marked depletion in percentage content of organic, inorganic compounds and minerals were recorded in coconut. The chlorophyll was decreased by 23.00% (Tables 1 and 2).

The recorded depletion of total protein was

Tabel 1. Increase or decrease of organic compounds in the leaves of coconut plant due to mite feeding (10—20 mites per 4.0 sq inch leaf area). (D) = Percentage decrease, n= Number of replication.

Name of organic components	Control (amount ± SD) [n=5]	Infested (amount ± SD) [n=5)	Percentage of decrease or increase (percentage ±SD) [n=5]
Chlorophyll	10.00 ± 0.77 mg/g	7.70 ± 0.60 mg/g	23.00 (D)
Total protein	56.15 ± 0.95µg/g	45.30 ± 0.68 µg/g	19.32 (D)
Phenol	0.530 ± 0.56 µg/g	0.530 ± 0.09 µg/g	00.00
Total carbohydrate	32.10 ± 0.69 mg/100mg sample	22.53 ± 0.39 mg/100mg sample	29.81 (D)

19.32%. The phenol, contents showed no marked change in control and infested leaves. Therefore, mite infestation might cause negligible effect on phenol content in coconut leaves. The decrease in total carbohydrate content in coconut leaves due to mite feeding was found to be 29.81%. Marked depletion of minerals was observed in coconut due to mite infestation. The depletions of mineral contents like magnesium, zinc, copper and iron were 15.73, 18.03, 17.16, 6.75% respectively. Among inorganic compounds the depletion of nitrate and nitrite compounds was quite high (24.24 and 51.66%).

It was found that infestation mites is known to cause various biochemical changes including changes in minerals, inorganic and organic compounds in plants leading to their physiological and morphological changes (5). The decrease in chlorophyll level is due to mechanical damage of chloroplasts of leaves caused by mite feeding or it may be due to decoloration of chloroplasts (6). Kolodoziej et al. (7) showed positive correlation between increase in mite density with decrease of chlorophyll. Chatterjee and Gupta (8) reported chlorophyll damage to the extent of 33.62% on *Luffa acutangula* due to infestation of *Tetranychus ludeni*. Goyal and Sadana (9) reported chlorophyll loss of 63.12% mg/m^2 in *Coleus* sp.infested by *Brevipalpus obvatus*. Therefore, the chlorophyll loss as was recorded in the present study was low. Ghoshal et al. (10) reported chlorophyll loss of 13.45 ± 0.00% in jute (*Corchorus capsularis* Linn.) due to the infestation of mite *Polyphagotarsonemus latus* (Banks).

The reduction of total protein was found to be 19.32% which was not so high. Similar observation was recorded by Nangia et al. (11) where depletion varied from 57.50% in Mysore local variety of mulberry leaves to 38.80% in RFS-175 variety, due to feeding of *Eotetranychus suginamensis*. Reduction of protein due to feeding by different species of mites was also reported. Ghoshal et al. (10) reported depletion of total protein by 42.00% in jute (*Corchorus capsularis* Linn.) due to the infestation of mite *Polyphagotarsonemus latus* (Banks).

The decrease of total carbohydrate was alarmingly high i.e. 29.81%. Similar observation was made by Usha et al. (12) who reported total reduction of total sugar, reducing sugar and non-reducing sugar levels, in plants due to mite infestation. Ghoshal et al.

Table 2. Decrease of minerals and inorganic components of coconut leaves due to mite feeding. (10–20 mites per 4.0 sq inch leaf area). (D) = Percentage decrease, n= Number of replication.

Name of minerals and inorganic components	Control (amount ± SD) [n=5]	Infested (amount ± SD) [n=5]	Percentage of decrease/increase (percentage ± SD) [n=5]
Mg (Magnesium)	40.35 ± 0.67 µg/ml	34.0 ± 0.93 µg/ml	15.73 (D)
Zn (Zinc)	2.55 ± 0.34 µg/ml	2.09 ± 0.83 µg/ml	18.03 (D)
Cu (Copper)	1.34 ± 0.32 µg/ml	1.11 ± 0.85 µg/ml	17.16 (D)
Fe (Iron)	42.50 ± 0.75 µg/ml	39.63 ± 0.06 µg/ml	6.75 (D)
Nitrate	4.33 ± 0.66 µg/g	3.28 ± 0.62 µg/g	24.24 (D)
Nitrite	4.51 ± 0.79 µg/g	2.18 ± 0.24 µg/g	51.66 (D)

(10) reported depletion of total carbohydrate by 56.22% in jute (*Corchorus capsularis* Linn.) due to the infestation of mite *Polyphagotarsonemus latus* (Banks).

There was depletion of minerals and inorganic components of coconut leaves infested by mites. The depletions of iron and zinc were by 66.4 and 70% in *Luffa acutangula* due to feeding of *Tetranychus ludeni* (8), which were much higher as compared to the values reported in the present study. Golek (13), and Goyal and Sadana (9) reported changes in calcium, potassium and magnesium contents of leaves as found in the present study. Das (14) reported reduction in iron and zinc contents by 42.9 and 31.11% respectively in *Dolichotetranychus floridanus* on pineapple and those results are also on much higher side as compared to the values found in the present study. Ghoshal et al. (10) reported depletion of magnesium, zinc, copper and iron by 8.33, 22.22, 13.88 and 8.66%, respectively in jute (*Corchorus capsularis* Linn.) infested by *Polyphagotarsonemus latus* (Banks).

The reductions of nitrate and nitrite were by 24.24 and 51.66% respectively as compared to 51.1 and 3.12% in *Luffa acutangula* by feeding of *Tetranychus ludeni* (8). Ghoshal et al. (10) reported depletion of nitrate and nitrite by 25.73 and 19.35% respectively in jute (*Corchorus capsularis* Linn.) due to the infestation of mite *Polyphagotarsonemus latus* (Banks).

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