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# A note on recovery of coconut palms affected by tapering disorder through fertilizer application

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**Abstract**

Stem tapering or narrowing of the stem also called 'pencil point' disorder was observed in coconut (*Cocos nucifera* L) gardens in coastal sandy and laterite soils of Kerala. This type of disorder was also reported from Myanmar, New Guinea, Sri Lanka and India. Important symptoms of the disorder included reduced vigour, stunted growth and lanky appearance. The older leaves become chlorotic first, to be followed by other leaves in succession. The affected palms show reduction in size, the number of fronds and spathes. The palms in the advanced stage of the disease cease to produce any nuts. There is a gradual reduction in the girth of the stem towards the tip presenting the appearance of 'pencil point'. In course of time growth ceases and the palms succumb to be malady. There are different causes for the unfavourable growth and development of the palm such as drought, disease, heavy pest attack, repeated fire damage, mineral deficiencies, inadequate drainage or general negligence and high weed growth. These factors diminish the palm's vigour and affect its development. Studies conducted at Central Plantation Crops Research Institute, Regional Station, Kayangulam revealed that the disease has been found to be associated with deficiency of nutrients. Application of 500g N., 300g $P_2O_5$ and 1000 g $K_2O$ with 500g Mg $SO_4$ and 200g borax and 200g $ZnSO_4$ + 25 kg cowdung per palm per year was found to be effective in alleviating the disorder and the stem regains its old diameter.

*Key words:* Coconut, disorder, tapering, fertilzer application

## Introduction

Tapering stem (wilt) or pencil pointed disorder was observed in coconut palms (*Cocos nucifera*-L) in several gardens in coastal sandy and laterite soils of Kerala. The incidence of the malady ranged from 0 – 40 percent (Baskaran *et al.*, 1978 and 1979). It affects the crops by reducing the vitality and thereby productivity and causes premature death of the palm. It has been reported that no pathogenic organism was associated with the disease and the malady is probably associated with the nutritional disorders (Jaganathan and Ramaswamy, 1977; Velayudham and Singh, 1978). Earlier workers (Menon and Pandalai, 1960) have attributed water logging, improper drainage, presence of hard pan of iron stone and nutrient deficiency (Cooke, 1950,1951) may be the possible cause of this malady. Teodora (1925) stated that in Philippines, the narrowing of the trunks of the coconut palms immediately below the crown was probably caused by malnutrition. In the garden selected for the study there was neither drainage problem nor heavy dose of manuring practiced thus ruling out the possibility of root damage. Hence, the nutrient status of the soil samples and the leaf samples were determined to find out, whether any nutritional deficiency was involved in causing this malady.

## Disease symptoms

The affected palms exhibited reduced vigour and stunted growth. Initially the basal leaves became chlorotic and in due course subsequent leaves also became pale and reduced in size. Thus the crown of a healthy good yielding palm became unsymmetrical and untidy, the upper leaves were green instead of dark green and the lower leaves yellowish – green. The fronds and spathes and were reduced in number. Trees in advanced stage of this disorder produced only very few spathes, buttons or nuts, if at all produced, were immature and deformed . Accompanied by the symptoms there was a gradual reduction in girth of the stem at the top portion presenting the appearance of a pencil point (Fig 1). In the final stage, the growth ceased completely and the trees succumbed to the disorder.

Fig 1. Palm showing tapering/pencil point disorder

## Materials and methods.

A field trial was laid out in the State Agricultural Farm, Anchal on ten year old WCT palms in laterite soil. The experiment was designed in RBD and comprised of 6 palms per plot with three replications. The following treatments were included in the experiment.

1. 500g N:300g $P_2O_5$:1000g $K_2O$:500g $MgSO_4$+25 kg Farm Yard Manure (FYM)
2. 500g N:300g $P_2O_5$:1000g $K_2O$:500g $MgSO_4$+50 kg (FYM)
3. 500g N:300g $P_2O_5$:1000g $K_2O$:500g $MgSO_4$+ 200 g borax +200 g $ZnSO_4$+25 kg FYM
4. 500g N:300g $P_2O_5$:1000g $k_2O$ +2 kg NaCl
5. Borax, copper sulphate, zinc sulphate, ferrous sulphate and manganese sulphate — 200 g each + ammonium molybdate 10 g

It was supplied in 50 litres of water as soil drench.

Soil samples were collected at a depth of 0 – 50 cm and analysed for their nutrient content. First fully emerged leaf was taken for chemical analysis, as the total number of leaves in the crown were less (6 or 7) in number compared with the total number of leaves (35 – 40) in a healthy palm.

## Results and Discussion

The morphological characters are presented in Table 1.There was marked increase in the production of total number of leaves in the crown, number of leaves per palm , number of spathes produced per palm, number of female flowers produced per palm after the treatments and there was no chlorotic leaf in the treated palms.

The data of chemical composition of leaves before and after treatment imposition are presented in Tables 2 & 3. Mg was very low in the leaves of affected palms. (Critical concentrations are N-1.8-2.0 %, P-0.11-0.12 %,K-0.8-1 %, Ca-0.5 %,Mg-0.3-0.4 %, Fe-50 ppm, Mn-60 ppm, Zn-15 ppm, Cu-4-5 ppm B-8-10ppm).

**Table 1. Data of morphological characters**

| Treatment | Girth at collar(m) | | Number of leaves/palm | | Spathes produced/ palm | | Buttons produced/palm | | Setting percentage | | Yield (No.of nuts / palm) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | A | B | A | B | A | B | A | B | A | B | A |
| 1 | 0.43 | 0.45 | 14 | 19 | 7 | 9 | 15 | 125 | 8 | 11 | 10 | 35 |
| 2 | 0.49 | 0.52 | 16 | 21 | 5 | 9 | 16 | 132 | 7 | 12 | 15 | 45 |
| 3 | 0.48 | 0.53 | 21 | 28 | 6 | 12 | 21 | 135 | 7 | 15 | 18 | 80 |
| 4 | 0.44 | 0.52 | 22 | 26 | 6 | 8 | 20 | 139 | 7 | 13 | 22 | 68 |
| 5 | 0.43 | 0.53 | 20 | 26 | 6 | 10 | 20 | 142 | 6 | 11 | 22 | 74 |
| CD P=.05 | | 0.01 | | 0.50 | | 0.80 | | 10.8 | | 0.93 | | 2.0 |

*B – before the treatment*
*A – after the treatment – 3rd year*

**Table 2 .Status of major nutrients in the leaf – 1st leaf (per cent)**

| | N | | P | | K | | Ca | | Mg | |
|---|---|---|---|---|---|---|---|---|---|---|
| Treatment | B | A | B | A | B | A | B | A | B | A |
| 1 | 1.71 | 1.82 | 0.13 | 0.14 | 1.7 | 1.8 | 0.18 | 0.19 | 0.08 | 0.22 |
| 2 | 1.60 | 1.75 | 0.14 | 0.15 | 1.8 | 1.9 | 0.16 | 0.19 | 0.06 | 0.24 |
| 3 | 1.58 | 1.82 | 0.13 | 0.14 | 1.8 | 1.9 | 0.15 | 0.19 | 0.07 | 0.22 |
| 4 | 1.67 | 1.78 | 0.14 | 0.16 | 1.7 | 1.9 | 0.18 | 0.19 | 0.08 | 0.22 |
| 5 | 1.60 | 1.76 | 0.13 | 0.15 | 1.8 | 1.9 | 0.14 | 0.18 | 0.09 | 0.15 |
| CD-P=.05 | - | 0.01 | - | - | - | - | - | 0.08 | - | 0.04 |

*B – before the treatment*
*A – after the treatment – 3rd year*

Table 3.Status of micronutrients in the leaf (ppm)

| Treatment | Fe | | Cu | | Mn | | Zn | | B | |
|---|---|---|---|---|---|---|---|---|---|---|
| | B | A | B | A | B | A | B | A | B | A |
| 1 | 31 | 35 | 5.1 | 6.1 | 28 | 62 | 10.1 | 28.6 | 4.2 | 7.8 |
| 2 | 28 | 33 | 5.5 | 6.0 | 26 | 60 | 9.6 | 26.6 | 4.5 | 7.8 |
| 3 | 25 | 32 | 6.8 | 7.1 | 21 | 71 | 9.6 | 30.1 | 5.1 | 7.9 |
| 4 | 27 | 34 | 6.5 | 7.2 | 20 | 74 | 8.4 | 28.4 | 5.3 | 7.8 |
| 5 | 27 | 34 | 6.4 | 7.4 | 20 | 66 | 8.8 | 30.4 | 4.8 | 8.2 |
| CD P=0.05 | | 0.02 | - | 0.11 | - | 0.18 | - | 1.1 | - | 1.2 |

*B – before the treatment*
*A – after the treatment – 3rd year*

It was observed that N, Ca &Mg status of the leaves was significantly increased after the treatment. growth parameters, yield attributes and yield compared to the other treatments.

Table 4.Chemical composition of soil at 0-50 cm depth before and after the treatment

| Treatment | N% | | P(ppm) | | K(ppm) | | Ca(ppm) | | Mg(ppm) | | Org C % | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B | A | B | A | B | A | B | A | B | A | B | A |
| 1 | 0.10 | 0.13 | 25 | 28 | 40 | 112 | 0.42 | 1.2 | 0.32 | 0.62 | 0.09 | 0.12 |
| 2 | 0.11 | 0.14 | 24 | 55 | 52 | 120 | 0.65 | 1.5 | 0.44 | 0.84 | 0.08 | 0.14 |
| 3 | 0.11 | 0.16 | 25 | 45 | 45 | 135 | 0.55 | 1.8 | 0.65 | 0.92 | 0.07 | 0.16 |
| 4 | 0.09 | 0.16 | 28 | 52 | 48 | 140 | 0.65 | 1.4 | 0.55 | 0.65 | 0.09 | 0.15 |
| 5 | 0.09 | 0.14 | 28 | 55 | 45 | 80 | 0.55 | 1.6 | 0.65 | 0.82 | 0.06 | 0.14 |
| CD P=0.05 | - | 0.03 | - | 0.08 | - | 1.8 | - | 1.0 | - | 0.08 | - | 0.10 |

*B – before the treatment*
*A – after the treatment – 3rd year*

Table 5. Micronutrient status of soil samples before and after the treatment

| Treatment | Fe(ppm) | | Mn(ppm) | | Cu(ppm) | | Zn(ppm) | |
|---|---|---|---|---|---|---|---|---|
| | B | A | B | A | B | A | B | A |
| 1 | 50.2 | 58.2 | 14.6 | 18.2 | 1.8 | 2.0 | 3.5 | 4.9 |
| 2 | 55.4 | 58.2 | 17.2 | 21.2 | 1.9 | 2.1 | 4.0 | 4.8 |
| 3 | 55.4 | 62.1 | 18.2 | 22.1 | 2.0 | 2.8 | 4.0 | 5.6 |
| 4 | 45.6 | 55.8 | 16.4 | 18.2 | 1.9 | 2.8 | 4.2 | 5.2 |
| 5 | 45.8 | 72.8 | 19.4 | 28.2 | 1.9 | 3.8 | 3.8 | 8.2 |
| CD P=0.05 | - | 1.1 | - | 0.12 | - | 0.8 | - | 1.1 |

*B – before the treatment*
*A – after the treatment – 3rd year*

The micronutrients such as Fe, Mn, Zn & B were also very low in the leaves of affected palms , but after the application all the micronutrient status of the leaves were significantly increased. Deficiency of nutrients may be one of the contributing factors of this malady (Jaganathan *et al.*, 1977 and Cook,1951).

The results revealed that all the nutrients were comparatively low in the soil in the affected garden (Table 4 & 5). But after the application of fertilizers and manures, the nutrient content in the soil significantly increased.

Thus an improvement of tapering palms by manuring has been recorded. This is in agreement with the findings of Briton Jones (1940) that the application of complete fertilizer mixture will help to improve the condition of the palm. Among the treatments application of 500 g N, 300 g $P_2O_5$, 1000 g $K_2O$, 500 g $MgSO_4$, 200 g borax , 200 g $ZnSO_4$ and 25 kg FYM has significantly increased the nutrient status of the leaf, improved the

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