MANAGEMENT OF TAPERING DISORDER IN COCONUT

By

Kamala Thirumalaiswamy*, H. Vijayaraghavan*
and M.A.J.R. Savery*

ABSTRACT

The tapering stem wilt of coconut was amply proven to be a physiological disorder, with relevance to physiological and bio chemical investigations of the 14th frond analysis. The experiments, in a rainfed garden, revealed that the occurrence of this malady was mainly due to deficiency of iron, associated with copper and manganese at lower level. The management of this malady was possible by root feeding of micronutrient mixture (Fe+Cu+Mn+B) for two years at six monthly interval. The synergistic effect of Fe, Cu, Mn has indirectly acted on the improvement of tapering disorder, as they are part of metabolic enzymes.

INTRODUCTION

Coconut palm is an important plantation crop occupying a high place in the economy of Tamil Nadu. Inspite of its hardy nature, this crop is affected by a number of pathogenic and physiological disorders. Among them, the tapering stem wilt or pencil point disease has been observed in many gardens along the coastal sandy and laterite soils and the incidence ranged even upto 40 percent. This disease affected the crop by reducing the vitality and productivity and causes pre-mature death. Though the disease has been recorded as early as 1903 in Jamaica and in 1923 from Burma (Furtado, 1923), detailed studies on the effect of the disease and etiology, commenced from 1950 by Cooke (1950). He observed that tapering stem wilt disease is definitely a manifestation of malnutrition, either due to the deficiencies in the soil or the unsatisfactory conversion of available plant food by the living plant tissues. This was later observed to be due to genetic nature of that particular palm or may be due to some physiological blockage in the process of translocation.

No pathogenic organisms or insects were found to be associated with the affected palms (Jaganathan and Ramaswami, 1977). The symptoms did not resemble any of the established virus disease. Earlier workers have attributed water logging (Menon and Pandalai), 1960), improper drainage (Furtado, 1923), presence of hardpan of iron stone, coral or other formations, senility (Park and Fernando, 1941) and nutrient deficiency (Dwyer, 1937; Cooke, 1950) as possible causes of this malady. Cooke (1950) distinguished 'Slow tapering' which appeared to be caused by soil exhaustion, soil hardening or water logging and "quick tapering" which was attributed to nutrient deficiency (Vijayaraghavan & Ramachandran, (1989). Cooke (1950) suspected the possibility of sodium and magnesium deficiency to be the causal factor in the coastal area but the study on the effect of trace elements have not led to any definite results.

Later, during 1978, Bhaskaran et al (1978) reported that the micronutrients given in different combinations as soil application proved to be an effective control measure but the process of recovery was very slow. Hence later during 1988, micronutrients were tried singularly and in different combinations as root feeding in the hot spot area in a rainfed garden for the quick management of this malady. (Anonymous, 1990-1991).

---

*Coconut Research Station, Veppankulam Thanjavur Dt. South India

Symptomology

The affected palms exhibit reduced vigour and stunted growth coupled with lanky and unthrifty appearance. Initially, the basal leaves become chlorotic and in due course, subsequent leaves also become pale and reduced in size. The fronds and spathes are greatly reduced in number. Trees in advanced stages of the disease seldom produce any buttons or nuts; if produced they are mostly immature and deformed in nature. Accompanied by these symptoms, there is a gradual reduction in the girth of the stem at the collar region presenting the appearance of a "Pencil Point" and hence it is known as "Pencil Point" disorder. In the final stage, the growth ceases completely and the tree succumbs to this disease. The symptomology revealed this malady as physiological disease or disorder in the absence of any pathogen.

Index for grading of the disorder

In an attempt to formulate an index for grading the degree of disorder, a total of 100 affected coconut palms were screened for their extent of disorder, by recording the girth at base and collar region of stem and number of functional leaves at the crown. These parameters were associated with the degree of disorder and could be visually used for grading. Among the 100 palms, 3 groups were identified with the mean values as given in the table.

Table: Grading of stem tapering malady

S.	No. Grading	No. of Leaves/ Palm	Girth at Base (cm)	Ratio of Girth at base/ coliar
1. Low	21-30	85	56	1.36
2. Moderate	11-20	76	53	1.64
3. Severe	3-10	67	51	1.67

It could be observed that the number of functional leaves was found to be on the decrease with the increase in the severity of stem tapering. The ratio of girth at base/coliar region, on the other hand, showed increasing trend, with severity. It is concluded that in the case of severe disorder (that is below 3 -10 leaves on the crown) the improvement of the affected palms is not possible. Only in the case of moderately affected palms in which the number of functional leaves ranged between 11-20, there is a possibility of improvement by root feeding of micronutrients.

Field trial for the Management of stem tapering disorder in coconut

A field trial was conducted in a purely rainfed garden, where more than 100 palms were affected by this malady, during the years 1988-1992. Root feeding of micronutrients were given singularly and in different combinations for a precise evaluation of the specific micronutrient involved in the improvement. The root feedings were given as 200 ml solution at six monthly intervals for 2 years. Evaluation on morphological, biochemical, physiological and yielding potential was done at the end of second year.

RESULTS AND DISCUSSION

The mean nut yield of post treatment (4 years period) was subjected to covariance analysis. Considering the pre-treatment yield of 3 years as independent variable, over which the post treatment yield was regressed upon. The yield increase was statistically significant (C.D. 30.7). Comparison of

the mean nut yield of post treatment indicated that among the different treatments, root feeding of 2000 ppm of Ferrous ammonium sulphate was significantly superior and on par with root feeding of $MnSO_4$ +$CUSO_4$ and healthy control. Hence it was concluded that the pencil point disorder could be controlled by giving 200 ml of root feeding of 2000 ppm of ferrous ammonium sulphate at six monthly interval for 2 years, at the initial stages of the disorder (15-20 leaves stage).

The following are the salient findings brought out in support of the conclusion, from the trial on the management of tapering disorder in coconut.

1. Morphological differences between diseased and improved palms

    a) The improvement of this malady is possible only in the case of moderately affected palms (15-20 leaf stage). In severely affected palms, it is not possible to improve.

    b) The increase in the number of functional leaves on the crown was evident by significant increase from 19 to 29/palm.

    c) Visually the length and breath of the leaves increased and turned to dark green from pale yellow.

    d) Thickness of collar region was improved from 54.3 to 69.6 cm.

    e) The number of nuts/palm/year increased from 18 to 82 in a course of treatment for 2 years.

2. Bio-chemical difference between diseased and improved palms

    a) The diseased palm exhibited very low iron content (10-18 ppm), low manganese (25 46 ppm) and copper (2-3 ppm) in the 14^{th} frond of coconut palm.

    b) The deficiency of iron was overcome by application of Ferrous ammonium sulphate or a mixture of Ferrous ammonium sulphate + copper sulphate + $MnSO_4$ (2000 + 1000 + 2000 ppm respectively.

    c) Wherever borax (1000 ppm) was added, the production of functional leaves increased indicating the quick translocation of the nutrients to the newly developing tissues.

    d) The association of iron, copper, manganese with boron appears to be more relevant than other micronutrients for the correction of this malady.

    e) The nitrogen and potassium uptake was on the increase in the leaf tissues due to the inf luence of Fe + Mn + Cu. This has resulted in the increased number of functional leaves and improvement in the growth and yield of nuts.

3. Physiological difference between diseased and improved palms

    a) The combination of (Fe + Mn + Cu + Bo) micronutrient mixture, given as root feeding has improved the metabolic functions like chlorophyll synthesis, photo synthesis, carbon assimilation and yielding potential.

    b) It could be brought out from these analysis, that the synergistic influence of iron, copper and manganese on the uptake of other major and micronutrients, has indirectly

acted on the improvement of tapering disease of coconut as they are part of metabolic enzymes.

c) Adjacent to a severe case of tapering diseased palm, a healthy palms with good yield may also been seen in the same f ield. The reasons like nutrient disorder, hard pan, water logging condition could not be pointed out within such a close distance. As per Cooke (1950) it is likely, that this particular palm, may have physiologically poor capacity for conversion of available food materials, which is again governed by genetic make up of particular palm. Hence selection of genetically good seedling is important.

REFERENCES

Anonymous Research High lights (1981-1982) TNAU, CBE.

BHASKARAN, R. JAGANATHAN, T, and CHANDRASEKAR, G. (1978) Role of Micronutrients and fertilizers in Pencil Point disease of coconut Proc. PLAC ROSYM I : 3, 54 - 359.

COOKE, F. C. (1950). Tapering disease of coconut. Ceylon Coconut Quarterly. 1 (i) : 17 - 21.

COOKE, F. C. (1951). Tapering disease of coconut. Ceylon Coconut Quarterly, 2 (2/3): 100.

DWYER, R. E. P. (1937) The diseases of coconuts (Cocos nucifera) in New Guinea. New Guinea Agric. Gaz 3 : 28 - 93.

FURTADO, C. X (1923). Coconut tapering disease. Tropical Agriculturist. 61:126

JAGANATHAN, T. and RAMASWAMY, R. 1977. Pencil Point disease of coconut in Tamil Nadu. Indian Coconut J.8 : 3-6.

MENON, K. P. V. and PANDALAI, K. M. 1960. The coconut palm. A Monograph. PP 384.

PARK, M. and FERNANDO, M. 1941. Diseases of village crops in Ceylon, Colombo.

VIAJAYARAGHAVAN, H. and RAMACHANDRAN, T. K. 1989. Pencil Point disorder of coconut. Farmer and Parliament XXIV : 6 : 16.