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EFFECT OF ZINC AND MOLYBDENUM ON ROOT (WILT) AFFECTED COCONUT PALMS*

A. S. Mathew, A. I. Jose[1], Jose Abraham, S. Robert Cecil and P. G. Kamalakshi Amma

Central Plantation Crops Research Institute, Regional Station, Krishnapuram 690 533, Kayamkulam, Kerala, India

The root (wilt) disease of coconut palm is observed in all soil types of Kerala. Studies on the nutrient status of soils and leaf samples from healthy and affected areas were carried out by several workers (Menon *et al.* 1950, Menon and Pandalai 1960, Menon and Nair, 1949, Cecil, 1969, Mathew and Varkey, 1976). Ramanandan and Pandalai (1962) reported maximum ameliorative effect on palms showing foliar yellowing due to the application of molybdenum. Improvement in foliar conditions was observed by manuring and spraying trials with bordeaux mixture and micronutrients (Nair and Radha, 1962). Davis and Pillai (1966) concluded from a micronutrient trial that the application of micronutrients to coconut palms did not prevent fresh incidence of disease but helped the palms to give an economic yield. Pillai *et al.* (1975) observed from the comprehensive survey conducted in healthy and disease affected tracts covering all soil groups of Kerala that major nutrients were not involved in the incidence of root (wilt) disease. However, they found low values for Fe, Mn and Zn in soils and for S, Fe, Mn, Zn and Mo in leaf samples drawn from diseased tracts compared to healthy tracts. Out of these Zn and Mo were found much lower in concentration in diseased leaf samples. Based on these observations a micronutrient trial on adult coconut palms using zinc sulphate and amonium molybdate was conducted to see how far application of Zn and Mo would be effective in controlling the root (wilt) disease.

Materials and Methods

Three plots consisting of 96 palms each of identical age one in CPCRI farm and two in cultivators field in Krishnapuram village were selected for the study. Palms in each plot were grouped into three categories viz., group I (disease index 0-10), group II (disease index 11-25) and group III (disease index 26-50). For indexing the disease intensity of palms, the method described by George and Radha (1973) was followed. The experiment was laid out in randomised block design with the three disease groups as blocks and a plot size of eight trees each. There were twelve treatments including control. They were 1) control —with the recommended dose of NPK as inorganic fertilizers; 2) farm yard manure @ 30 kg/palm + NPK (total NPK equal to that of control), 3) Foliar application of 0.2% zinc sulphate 2 l/palm, 2 sprays a year (half yearly); 4) Foliar application of 0.2% zinc sulphate 2 l/palm, 4 sprays a year (quarterly); 5) Soil application of zinc

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[1] Kerala Agricultural University, Vellanikkara-680 654, Trichur. India.

sulphate (a 150 g/palm in the basin; 6) Soil application of zinc sulphate (a 300 g/palm in the basin; 7) Foliar application of 0.01% ammonium molybdate, 2 l/palm, 2 sprays a year (half yearly) 8) Foliar application of 0.01 % ammonium molybdate, 2 l/palm, 4 sprays ayear (quarterly); 9) Soil application of ammonium molybdate @ 4 g/palm in the basin; 10) Soil application of ammonium mylybdate (@ 8g/palm inthe basin; 11) Foliarapplication of 0.2% zinc sulphate + 0.01 % ammonium molybdate 2 l/palm, 2 sprays a year (half yearly); 12) Soil application of 300 g zinc sulphate + 8g of ammonium molybdate per palm in the basin.

In the soil application, zinc sulphate and ammonium molybdate were supplied in the basins only once in the active root zone after removing the top soil. The recommended doses of NPK fertilizers (0.5 kg N, 0.32 kg P_2O_5 and 1.2 kg K_2O) were given to all the experimental palms excepting treatment 2. The experiment was started in 1975 and continued for a period of four years. Pre and post treatment yield and disease index of the experimental palms were collected. To study the absorption pattern of the micronutrients applied, leaf samples from the experimental palms in CPCRI farm were collected for analysis of zinc. Leaf samples from palms under zinc and zinc+molybdenum foliar application treatments were collected at intervals of 1,4,15 and 30 days after the initial spray in the case of half yearly and quarterly sprays and at intervals of 2 days, 15 days, 1 month and 2 months in the casa of palms that received zinc and zinc+molybdenum as soil application. The leaf samples were collected and prepared by the method described by Fremond *et. al* (1966). The zinc content in the diacid extracts (1:2 perchloric : nitric acid) was determined by using an atomic absorption spectrophotometer.

Results and Discussion

Pattern of Zn uptake: The mean foliar contents of zinc (ppm) at various intervals after foliar and soil application under each treatment are given in Table 1 and 2 respectively. The pre and post treatment average disease index and yield of experimental palms are given in Table 3. It is observed from Table 1 that there was increase in the absorption of zinc in the foliar application group. The concentration of zinc was raised from a pre-treatment value of 16.3 ppm to 35.4 ppm one day after foliar spray and came down to almost original level after 15 days. In the case of leaf samples collected from treated trees in the soil application group, there was no increase in the zinc content of leaves upto 15 days after application. But the concentration of zinc was raised from a pre-treatment value of 22.3 ppm to 49.3 ppm one month after soil application and came down to almost original level after two months.

Effect of treatments on yield and disease index: The pre and post treatment index and yield data were statistically analysed. The results showed that all the treatments are on par in effect with regard to disease index and yield. The results show

Table 1

Mean foliar content of zinc (ppm) at various intervals after foliar spray

Nutrient sprayed and spraying intervals	Mean foliar content of zinc (ppm)				
	Pre-treatment	1 day	4 days	15 days	30 days
Zinc sulphate quarterly spray	16.8	34.6	28.0	15.6	16.8
Zinc sulphate half year spray	16.3	34.6	27.0	17.5	13.4
Zinc sulphate + ammonium molybdate, half yearly spray	15.7	37.0	23.1	16.6	17.6
Overall mean	163	35.4	26.0	16.6	15.9

Table 2

Mean foliar content of zinc (ppm) at various intervals after soil application

Nutrient applied in soil	Mean foliar content of zinc (ppm)				
	Pre-treatment	2 day	15 days	1 month	2 months
150 g zinc sulphate	23.4	10.0	19.3	46.8	33.1
300 g zinc sulphate	28.0	16.9	20.6	45.6	13.4
300 g zinc sulphate + 8 g ammonium molybdate	15.6	18.4	19.0	55.4	21.3
Overall mean	22.3	18.1	19.6	49.3	22.5

Table 3

Mean yield and disease index of palms treated with micronutrients

Treatment No.	Disease index		Yield, nuts/palm/year	
	Pre-treatment	Post-treatment	Pre-treatment	Post-treatment
1	20.97	27.17	47.87	44.20
2	20.97	25.70	52.27	43.37
3	23.37	24.57	51.30	47.70
4	21.37	23.40	43.17	43.40
5	23.73	26.80	67.63	46.00
6	22.20	29.30	64.33	49.70
7	20.13	26.67	68.27	51.47
8	21.43	24.30	64.80	58.20
9	22.60	26.33	65.37	56.07
10	21.90	23.87	67.57	45.87
11	22.17	27.07	64.53	53.87
12	21.97	26.27	61.83	60.17
Mean	21.94	25.95	59.91	50.00

that there is a consistent increase in disease index and a decrease in yield in all the treatments and control. Ramadasan (1964) reported from micro-nutrient trial conducted on healthy and disease coconut palms that the treatments not only failed to improve the diseased condition of the palms but also more than 50% of the experimental palms contracted root (wilt) disease. Lal and Radha (1964) could not observe any reduction of disease development from studies of foliar application of micronutrients on root (wilt) disease affected palms. They also didnot find any significant increase in the average annual yield of palms under treatment. Rawther and Abraham (1973) found from field trials conducted on arecanut palms that application of macro and micronutrients did not have any effect on the yellow leaf disease. Davis (1964) observed from field trial using micronutrients as soil application that molybdenum had a depressive effect on yield of healthy palms. Radha (1965), from studies on the effect of foliar application of micronutrients on leaf rot and yield of coconut, could not find any significant difference either between the average yields for pre and post treatment periods or between treatments and control.

The results indicate that the application of Zn and Mo was not effective either in preventing the incidence of disease or in improving the condition of diseased palms. It was also not effective in increasing the yield of palms.

Summary

A micronutrient trial using Zn and Mo as foliar and soil application was conducted on root (wilt) disease affected palms under different stages of disease for a period of four years. The study indicated that applications were not effective either in reducing the intensity of disease or in increasing the yield of palms.

സംഗ്രഹം

സിങ്ക്, മോളിബ്ഡിനം എന്നീ സൂക്ഷ്മ മൂലകങ്ങളം പല വിധത്തിൽ നൽകുന്ന തുഷി കാറ്റുവീഴ്ച പിടിപ്പെട്ട തെങ്ങിന്റെ ഉൽപ്പാദനക്ഷമത വർദ്ധിപ്പിക്കുവാനോ രോഗം നിയന്ത്രിക്കാനോ കഴിയുമോ എന്നു പഠിക്കാനായി കായംകുളം കേന്ദ്രതോട്ട ഗവേഷണ കേന്ദ്രത്തിൽ 63(0) പരീക്ഷണം നടത്തുകയുണ്ടായി. മേൽപ്പറഞ്ഞ മൂലകങ്ങൾക്ക് രോഗ കാഠിന്യം കുറക്കുന്നതിനോ രോഗം വന്ന തെങ്ങിന്റെ ഉൽപ്പാദനം വർദ്ധിപ്പിക്കുന്നതിനോ കഴിഞ്ഞില്ല.

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