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ROLE OF NEEM CAKE IN THE CONTROL OF THANJAVUR WILT OF COCONUT

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Application of neem cake increased the total population of fungi in the rhizosphere region of coconut palm. It also inhibited the growth of *Ganoderma lucidum* (Leys) Karst., the suspected pathogen of Thanjavur wilt of coconut. Despite increase in population of rhizosphere fungi, neem cake application @ 10kg/palm/year was equal to the combined treatment of stem injection of aureofungin-sol + soil drenching of Bordeaux mixture 1% + neem cake application in its effectiveness in containing Thanjavur wilt of coconut. Moreover, there is a saving of approximately Rs. 20/ per palm by resorting to neem cake application over the present recommendation of the above combined treatment.

The coconut (*Cocos nucifera* L.) is affected by a number of diseases, some of which are fatal while others gradually reduce the vigour of the palm causing severe loss in yield. Thanjavur wilt is a lethal disease which derives its name as it was first noticed in Thanjavur district of Tamil Nadu during 1952 and 1955 after cyclones. It spreads from tree to tree and garden to garden at an alarming rate. The affected palms exhibit wilting and drying of leaves and bleeding patches at the bottom of the palm.

Development of brackets of *Ganoderma* on the affected palms suggests the association of *Ganoderma lucidum* in disease syndrome. However, experimental evidence is yet to be established. Though the disease is being classified under uncertain etiology, attempts have been made in the past one decade to evolve a suitable control measure with the advent of many broad spectrum fungicides. Present recommendation of stem injection of aureofungin-sol 2g + copper sulphate 1 g. in 100 ml. of water combined with soil drenching of 40 litres of bordeaux mixture 1% does not appear to control the disease satisfactorily. Moreover the injury made on the palm for stem injection of aureofungin-sol exposes the palm for the attack of many pathogens. Hence the present study was prompted to find out an effective alternative for containing the fast spreading disease.

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MATERIALS AND METHODS

"In Vitro" Evaluation

a) ***Evaluation of fungicides and neem cake against wilt pathogen :***

Aureofungin-sol, Bordeaux mixture and neem cake alone and in combination were evaluated for their activity *in vitro* against *Ganoderma lucidum*, the suspected pathogen of Thanjavur wilt of coconut by poisoned Food technique.

b) ***Effect of different treatments on soil microbial activity :***

Soil samples were collected from the rhizosphere regions of Bordeaux mixture and neem cake treatment, wilt affected as well as healthy palms. Soil dilution plate technique (*Brierley, et al.* 1927) was adopted. Rose bengal agar and soil extract agar were used as media for the enumeration of fungi and bacteria respectively.

In Vivo Evaluation

Aureofungin-sol, Bordeaux mixture and neem cake either alone or in combination were evaluated for their efficacy in field trials also. A field experiment was conducted in randomised block design with six treatments (vide Table 3) and four replications each in a five tree-plot. Application of fungicides and neem cake were done twice a year at six monthly intervals. Initial disease index was worked out prior to fungicidal application. Disease intensity under different treatments was graded at monthly intervals and disease index was calculated by using the following formula (Vijayan and Natarajan 1975)

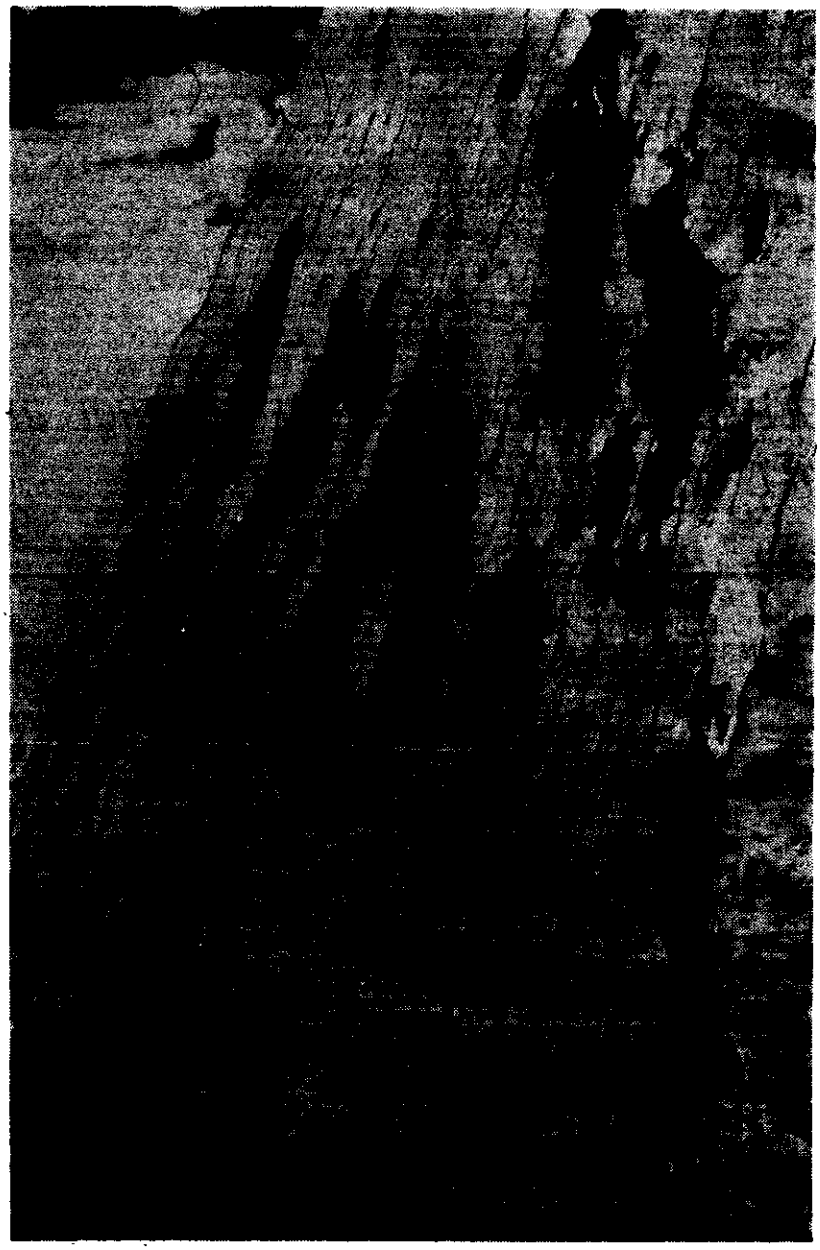

Fig. 1. Bleeding patches on the basal portion of stem in Thanjavur wilt affected coconut palm

$$\text{Disease Index} : \frac{A}{10} + \frac{B}{10} + \frac{C}{10} + (D \times 10) + (E \times 10)$$

where, A = No. of fresh bleeding patches.
B = No. of old bleeding patches.
C = Area of patches in cm^2.
D = Height of patches in metre.
E = No. of palms wilted.

Fig. 2. A palm in the very advanced stage of infection. All the leaves on the crown have fallen leaving only the spindle

The economics of different treatments were worked out taking into consideration the cost of different chemicals.

RESULTS AND DISCUSSION

Effect of treatments *in vitro*

Out of the two fungicides and neem cake tested, aureofungin-sol and neem cake alone or combination of aureofungin stem injection + soil drenching with Bordeaux mixture with and without neem cake inhibited the growth of the fungus (Table-1 and Fig. 1) Bordeaux mixture 1% produced no inhibition zone and the growth of *Ganoderma lucidum* was so profuse as in the case of control.

Effect of treatments on soil microbial population

The bacterial and fungal populations are higher in the case of neem cake applied palms (Table - 2) indicating that neem cake promotes microbial activity in the soil. Wajid Khan *et al.* (1974) reported that application of neem, groundnut and castor cakes resulted in higher populations of fungi than the control in the rhizosphere of the egg plant.

Effect of chemicals *"in vivo"*

Bhaskaran and Ramanathan (1983) reported that application

Fig. 3. Stem of infected palm showing discoloured and decayed tissues.

Fig. 4. Another view of stem pieces showing internal decay caused by Thanjavur wilt pathogen

of neem cake in combination with soil drenching of Bordeaux mixture and stem injection of aureofungin-sol were the most effective in reducing the intensity of disease. However, the results of further study on the efficacy of fungicides and neem cake under field conditions (Table 3) revealed that application of neem cake alone was significantly effective in containing Thanjavur wilt of coconut. This treatment was not only most effective but also cheaper than the combined treatment of stem injection of aureofungin-sol + drenching of Bordeaux mixture 1% + neem cake application (Table 4). Drenching of Bordeaux mixture 1% alone at the rate of 40 litres/ palm was not effective and on par with untreated control. *In vitro* studies also confirmed the above finding. Though soil drenching of Bordeaux mixture 1% solution has been reported to control Thanjavur wilt of coconut (Anon. 1978 (a), 1978 (b), 1981, 1983), recent studies indicate that it is not effective. The present finding on the efficacy of neem cake on the suspected pathogenic fungus is similar to the results obtained by Pabavizas (1963) and Papavizas and Davey (1960) in bean. Wajid Khan *et al.* (1974) reported that despite an increase in the total population of fungi in soil treated with organic amendments like neem cake, there has been considerable reduction in the parasitic fungi such as *Rhizoctonia solani* and *Fusarium* sp.

ECONOMICS OF DIFFERENT TREATMENTS :

Neem cake application resulted in a saving of Rs. 19.40 per palm (Table 4) over the present recommendation. Though stem injection of aureofungin-sol is cheaper, the injury caused by injection exposes the coconut palm to the invasion of various pathogens since the monocots do not have a natural healing process. Moreover neem cake treatment can be combined with regular fertiliser application without any additional cost on labour. The present studies indicate that neem cake application alone is effective and economical in containing Thanjavur wilt of coconut.

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TABLE - 1

Evaluation of fungicides and neem cake against *Ganoderma lucidum* in vitro

Sl. No.	Treatments	Radial growth of fungus (m. m) in PDA medium. Mean for 4 replications.
1.	Stem injection of aureofungin-sol 2g + CuSo4 1g. in 100ml of water	No growth
2.	Soil drenching of Bordeaux mixture 1% / palm	54.0
3.	Combination of treatments 1 + 2	No growth
4.	Neem cake application 10kg/palm	No growth
5.	Combination of treatment 1 + 2 + 4	No growth
6.	Control	83.0

TABLE - 2

Effect of treatments on soil microbial population in the rhizosphere region

Sl. No.	Treatments Soil samples from rhizosphere of	Number of microbial colonies. Mean value for 2 replications each	
		Bacteria (10^{-3})	Fungi (10^{-1})
1.	Bordeaux mixture treated palms	54.0	126.0
2.	Neem cake treated palms	275.0	178.0
3.	Untreated control (wilt affected palm)	175.0	59.0
4.	Healthy palm	58.0	72.0

TABLE - 3

Cumulative disease index under different treatments

Sl. No.	Treatments	*Disease Index-Mean			Mean
		1982	1983	1984	
1.	Stem injection of aureofungin-sol 2g + CuSo4 1g. in 100 ml. of water.	10.22	11.84	11.68	11.25
2.	Soil drenching of Bordeaux mixture 1%@ 40 litres/palm	11.49	12.11	14.10	12.57
3.	Combination of treatment 1 + 2	9.22	10.33	10.21	9.92
4.	Application of neem cake 10kg/palm/annum	8.72	9.73	9.50	9.32
5.	Combination of treatments 1 + 2 + 4	10.26	10.93	11.40	10.86
6.	Control	10.57	13.50	15.55	13.21
	SE	0.27	0.71	0.96	—
	CD at 5%	0.81	2.10	2.91	—

*Significant at 5%

TABLE - 4

Cost of different fungicides and neemcake

Sl. No.	Treatments	*Cost of chemicals in Rs/palm
1.	Stem injection of aureofungin-sol + copper sulphate	6.00
2.	Application of Bordeaux mixture 1%@ 40 litres/palm	20.40
3.	Combination of treatments 1 + 2	26.40
4.	Neem cake application @ 10kg/palm	17.00
5.	Combination of treatment 1 + 2 + 4 Expected saving of the new recommendation (4) over the present recommendation (5)	19.40

*Application charges not included