https://doi.org/10.29321/MAJ.10.A02723

Madras agric. J 69 (5): 321—325, May, 1982

Studies on Phyllody Disease of Gingelly (*Sesamum indicum* L.) I. Amelioration of Symptoms by antibiotics

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Prophylactic sprays in the field with antibiotics belonging to tetracycline and macrolide group and the fungicide benomyl were not effective in preventing incidence of gingelly phyllody disease. When applied to diseased plants by wick feeding through the stem tetracycline, hydrochloride and oxytetracycline hydrochloride ameliorated disease symptoms resulting in the elongation of internodes, increase in size of leaves and production of normal flowers which set capsules. However, these antibiotics were not effective when applied to soil by drenching.

Gingelly ranks second among the oilseed crops in world production. Among the diseases of gingelly, phyllody is most important. The mycoplasmal nature of this disease was first reported by Cousin *et al.* (1970). Tetracycline and macrolide antibiotics and the systemic fungicide benomyl have been reported to either delay the symptom development or ameliorate the symptoms of mycoplasmal diseases of plants (Doi *et al.*, 1967). The effect of such chemicals on gingelly phyllody disease was investigated and the results are presented in this paper.

MATERIAL AND METHODS

For assessing the prophylactic effect, two field experiments were conducted. A split plot design with seven antibiotics as main-plot treatments was used. Four tetracycline antibiotics namely tetracycline hydrochloride, oxytetracycline hydrochlorid chlortetracycline, hydrochloride and demethyl color tetracycline hydrochloride and Agrimycin-100 (a product containing 15 per cent streptomycin activity and 5 per eent oxytetracycline activity) and two macrolide antibiotics namely erythromycin stearate and tylosine tartrate were tested at 1000 ppm concentration. Five sprays were given at intervals of ten days starting from 20 days after sowing. The disease incidence was recorded on 90 days old plants.

The curative effect of four antibiotics viz., tetracycline, oxytecracyline, demethyl chlortetracycline and erythromycin and the systemic fungicide benomyl (methyl 1- (butyl carbamoyl) 2-benzimidazole carbamate) on disease symptoms was studied by wick feeding, foliar spray and soil application using 0.1 per cent solution. Distilled water

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was used as control. The application was started 15 days after the production of first phyllioid flower and continued for 35 days. Five replications were mainted for each treatment.

Soil application was done by pouring 250 ml of the solution at 500 and 1000 ppm concentrations around the root zone of plants 15 days after the appearance of phylloid flowers. The applications were made at two-day intervals and 15 drenchings were given. The treatments were eplicated five times. Plants drenched with water served as control.

RESULTS AND DISCUSSION

PROPHYLACTIC SPRAY

The data on disease incidence on 90-day old plants are presented in Table I.

The differences between treatments during *kharif* were not significant. During *rabi*, plots receiving tetracycline hydrochloride recorded significantly less incidence of phyllody than control. The differences in disease incidence between the four concentrations of the antibiotics were not significant

2. CURATIVE EFFECTS BY WICK-FEEDING

The results are presented in Table II.

Tetracycline hydrochloride, oxytetracycline hydrochloride and demethyl chlortetracycline hydrochloride ameliorated the disease symptoms. In plants fed with tetrecycline hydrochloride, indication of amelioration of symptoms was observed in the form of internodal elongation and increase in leaf size 13 days after the commencement of the treatment. Normal flowers were produced in all the treated plants in another three days. In plants treated with oxytetracycline and demethyl chlortetracycline internodal elongation was observed 18 and 23.6 days respectively after commencement of treatments. In these two treatments, the plants produced normal flowers about five days after this initial amelioration. However, erythromycin stearate and benomyl did not have any ameliorative effect on disease symptoms.

The length of internodes and size of leaves were measured in the growth made subsequent to commencement of treatments. The results are presented in Table III.

Diseased plants treated with tetracycline hydrochloride and oxytetracycline hydrochloride produced internodes which were longer than those produced internodes which were longer than those produced by control plants. Significant increase was observed from the third internode produced after applications of these two antibiotics. The length and broadth of leaves also increased significantly in plants treated with tetracycline hydrochloride, oxyte-

tracycline hydrochloride and tetracycline hydrochloride, oxytetracycline hydrochloride compared to control. The increase in leaf size was seen from the leaf arising out of the second node produced after the treatments. It is from this point that internodal elongation commenced.

The pollen size and fertility rate from five flowers of recovered plants were compared with those of healthy and diseased control plants. The data are presented in Table IV. The fertility rate and size of pollen from flowers of recovered plants were almost equal to those of healthy plants. Such flowers subsequently set capsules and all the seeds from such capsules when sown in pots in green house, produced healthy plants. The antibiotics were applied as foliar spray and the results are presented in Table V.

All the plants sprayed with 1000 ppm tetracycline hydrochloride at intervals of one and four days produced normal flowers 21 and 23 days respectively after the spray. However, when the interval between sprays was increased to eight days, this antibiotic did not have any ameliorative effect. At 500 ppm concentration, this antibiotic produced normal flowers after 24 days when sprayed at one day interval but this concentration was not effective when sprayed at 4 and 8 days intervals. Oxytetracycline hydrochloride at 1000 ppm was also effective in producing normal flowers when sprayed at 1 and 4 days intervals. Foliar application of these two antibiotics did not produce any change in the internodal length and leaf size of sprayed plants.

Application of antibiotics to soil did not ameliorate the disease symptoms.

The sensitivity of plant mycoplasmas to tetracycline antibiotics has offered an important approach to the control of plant diseased caused by them (Doi *et al*, 1967; Davis *et al*., 1968). These antibiotics are mycoplasmastatic. When prophylactic sprays with antibiotics were given to healthy gingelly plants, the disease incidence was not significantly reduced Wick feeding with tetracycline hydrochloride and oxytetracycline hydrochloride brought about elongation of Internodes and increased the length and breadth of leaves in the new growth of diseased gingelly plants. The treated plants also produced normal flowers with fertile pollen which subsequently set capsules. Benomyl, a systemic fungicide has been reported to completely cure sandal trees from spike disease which is a mycoplasmal disease (Raychaudhuri *et al*., 1972). However, benomyl was not effective in curing gingelly from phyllody disease.

Foliar spray of tetracycline hydrochloride and oxytetracycline hydrochloride at one day interval with 1000 ppm concentration was effective

in ameliorating disease symptoma. When the cost benefit ratio is taken into account foliar spray may not be economical for the gingelly crop. Foliar sprays of tetracycline antibiotics are reported to suppress symptoms of several mycoplasmal diseases (Bowyer and Atherton, 1972)

The senior author thanks the Council of Scientific and Industrial Research, New Delhi for the award of a Senior Research Fellow during the tenure of which the investigation were carried out and to the Tamil Nadu Agricultural University, Coimbatore for according permission to publish the Doctoral thesis submitted by the senior author.

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TABLE III Effect of chemicals on growth of diseased gingelly plant

Nature of plant	Treatments	Internode length (mm)	Leaf length (mm)	Leaf breadth (mm)
Healthy	Untreated	14.2	38.2	10.5
Diseased	Tetracycline	13.8	31.5	9.6
,,	Oxytetracycline	12.6	29.4	8.8
,,	Demethyl chlortetracycline	8.6	27.8	7.9
,,	Erythromycin	6.2	18.4	6.3
,,	Benomyl	5.9	20.9	6.5
,,	Control	5.6	18.2	5.4
C. D. (P = 0.05) between treatments		1.9	2.6	0.7
C. D. (P = 0.05) interaction		4.2	4.5	4.7

TABLE IV Fertility rate and size of pollen from gingelly plants

Nature of plant	Pollen fertility (per cent)	Pollen size (μ)
Healthy	98.1	74.6 × 68.3
Recovered	76.6	52.7 × 67.5
Diseased	100	38.8 × 46.1