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Studies on the Chemical Control of Bacterial Blight of Cotton*

K. STALIN JEYACHANDRAN¹ and N. SHANMUGAM²

Three applications of Agrimycin 100 (0.01%) + Copper oxychloride (0.1%) effectively reduced the secondary infection of bacterial blight of cotton and enhanced the yield of kupa.

Bacterial blight caused by *Xanthomonas malvacearum* (E.F. Smith) Dowson is one of the most important diseases of cotton in Tamil Nadu. With large scale cultivation of improved varieties and hybrids of cotton, there are frequent reports about heavy incidence of this disease in Madurai, Ramanathapuram, Salem and Coimbatore districts of Tamil Nadu. Since the report of Sivaprakasam *et al.* (1965), no attempt appears to have been made to evaluate new chemicals for the control of this important disease. The paper presents the results of studies conducted in 1976 at the Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.

MATERIAL AND METHODS

The following treatments were evaluated for their relative ability to inhibit the growth of the pathogen *in vitro* by adopting the inhibition zone technique.

1. Copper oxychloride 2500 ppm
2. Agrimycin - 100, 100 ppm + Copper oxychloride 1000 ppm
3. Streptomycin sulphate 150
4. Plantvax (2,3-dihydro-carboxanilido - 6-methyl-1,4-oxathiazin-4, 4-dioxide) 500 ppm.

5. Aureofungin Sol 50 ppm + Streptocycline 500 ppm
6. Daconil (Tetrachloro-isothalonitrile) 2000 ppm
7. Dithane M.45 (Mn-Zinc ethylene bis(1-thiocarbamate) 2000 ppm
8. Duter (Phenyl tin hydroxide) 2000 ppm
9. Bavistin (2-(methoxy-carbonyl) benzimidazol) 500 ppm
10. Control

The diameter of the zones of inhibition was measured and the inhibition annules calculated using the formula, $\pi (R_1 + R_2) (R_1 - R_2)$ where R_1 = radius of the inhibition zone in mm and R_2 = radius of the disc in mm.

The same set of treatments was evaluated for their effectiveness in controlling bacterial blight of cotton in the field. The cotton culture 441-B was used as the test variety. The experiment was laid out adopting the randomised block design with three replications. Sprayings were given on 60th, 80th and 100th days after sowing using a spray volume at 500 literes/ha.

To find out the optimum spray schedule, the most effective treatment was considered for single, double and triple applications. The treatments were

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¹ - 2: Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore-641 003.

arranged in a separate trial with suitable control and replicated five times.

RESULTS AND DISCUSSION

The plants were scored at 110 days after sowing for disease reaction on a 0-7 scale as per the scoring method recommended by the Indian Central Cotton Committee. Further, the per cent disease index (PDI) was worked out by using the formula

$$\text{PDI} = \frac{\text{Sum of individual ratings}}{\text{Total number of leaves graded}} \times \frac{100}{\text{Maximum grade}}$$

TABLE I. Effect of fungicides and antibiotics on growth of *X.malvacearum* in 'vitro'

Treatment	Inhibition annules (mean of three replications)
Control	—
Copper oxychloride 2500 ppm	547.66
Agrimycin-100 100 ppm + Copper oxychloride 100 ppm	445.88
Streptomycin sulphate 150 ppm	290.44
Plantvax 500 ppm	207.76
Aureofungin-sol 50 ppm + Streptomycin 50 ppm	211.68
Daconil 2000 ppm	290.44
Dithane M.45 2000 ppm	150.98
Duter 2000 ppm	72.22
Bavistin 500 ppm	40.82
C.D. (P = 0.05)	80.22

oxychloride (1000 ppm) followed by Streptomycin sulphate 150 ppm, Copper oxychloride 2500 ppm, Dithane M.45 2000 ppm, Aureofungin sol 50 ppm + Streptomycin 50 ppm and Plantvax 500

Laboratory evaluation (Table I) revealed that copper oxychloride at 2500 ppm and combination of Agrimycin 100 (100 ppm) and copper oxychloride (1000 ppm) were significantly superior to the rest of the treatments inhibiting the growth of the causal bacterium. However, when the same treatments were used in the field trial, effective reduction in disease was noticed in the treatment Agrimycin 100 (100 ppm) + copper

ppm. However, the highest yield was recorded in Aureofungin sol + Streptomycin combination which was followed by Bavistin and Agrimycin 100 + Copper oxychloride (Table II). Even though Agrimycin 100 + Copper oxychloride recorded the highest per cent reduction in disease incidence (64.1) it gave the next highest yield when compared to Aureofungin + Streptomycin combination which recorded the maximum yield with a per cent reduction in disease by 47.32. It is probable that highest yield increase was obtained due to the added efficacy of Aureofungin against other fungal diseases affecting cotton besides bacterial blight. It has been found from experiments conducted in this laboratory, that aureofungin being a systemic antibiotic was most efficacious against *Cercospora* and *Alternaria* leaf spots and rust of cotton with a potential of increasing kapas yield to the maximum (Bhaskaran and Shanmugam, 1973).

TABLE II. Effect of fungicides and antibiotics on the bacterial blight incidence and kapas yield of cotton

Treatments	PDI (mean of three replication)	Per cent reduction over control	Yield in kg/ha	Per cent increase over control
Control	36.83 (37.36)	—	573.88	—
Copper oxychloride 2500 ppm	16.16 (23.62)	56.12	918.33	60.02
Agrimycin-100 100 ppm + Copper oxychloride 1000 ppm	13.20 (20.71)	64.15	1097.22	91.19
Streptomycine sulphate 150 ppm	15.10 (22.73)	59.00	883.33	53.92
Plantvax 500 ppm	20.87 (27.18)	43.33	988.22	72.20
Aureofungin-sol 50 ppm	19.40 (26.12)	47.32	1202.40	109.52
Streptomycin 50 ppm	22.43 (28.19)	39.09	1043.88	81.90
Dithane M.45 2000 ppm	19.30 (25.98)	47.59	982.22	71.15
Duter 2000 ppm	21.36 (27.38)	42.00	1077.22	67.71
Bavistin 500 ppm	23.13 (28.59)	37.19	1126.66	96.32
C.D. (P=0.05)	6.477		270.02	

(Figures in parentheses are transformed values)

TABLE III. Determination of spray schedule of Agrimycin + Copper oxychloride

Treatments	PDI	Per cent reduction over control	Kapas yield kg/ha	Per cent increase over control	Approximate net return per hectare in Rs.
Control	34.60 (36.01)	—	564.14	—	—
Single application	26.40 (30.83)	31.06	574.99	1.92	24.00
Double application	18.70 (25.17)	60.23	724.46	28.41	590.00
Triple application	17.10 (24.48)	66.29	990.33	75.54	1700.00
C.D. (P=0.05)	1.784		C.D. (P=0.05)	50.406	

(Figures in parentheses are transformed values)

The efficacy of Agrimycin-100 under field conditions was reported by Bhandari *et al.* (1969) and Mathur *et al.* (1973). Sivaprakasam *et al.* (1965) reported significant control of the disease by spraying fytolan 0.25 per cent (copper oxychloride). Singh and Verma (1973) recommended copper oxychloride 0.2 per cent for spraying against bacterial blight of cotton. However, in the present study it was found that combined applications of Agrimycin 100 + Copper oxychloride are effective in controlling bacterial blight. The cost of treatment comes to Rs. 207.00/ha and a net monetary return of Rs. 2409/ha may be expected from such treatment.

In the trial to determine the optimum spray schedule in controlling bacterial blight it was found that three applications of the combination spray of Agrimycin 100 and copper oxychloride were most effective in controlling the disease besides appreciably increasing the kapas yield with maximum net return of Rs. 1700/ha (Table III).

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