

## CHEMICAL CONTROL OF BACTERIAL LEAF BLIGHT OF RICE USING ANTIBIOTICS

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Bacterial leaf blight caused by *Xanthomonas campestris* sp. *oryzae* is one of the major diseases of rice. Many chemicals including several antibiotics had been tried for the control of this disease from time to time. Wakimoto and Mukoo (1963) reported that chloramphenicol was best for control of bacterial leaf blight of paddy. Pal and Oas (1968) observed that growth of *Xanthomonas campestris* sp. *oryzae* was completely checked by Agrimycin-100 at 15 g in 112 litres of water. There are controversial reports on the control of this disease by streptomycin by different workers (Jain 1970; Verma *et al.* 1980). Control of this disease by streptomycin sulphate was reported by Reddy and Reddy (1971). The present paper reports the results of studies conducted at the College of Agriculture, Veliayani on the control of bacterial leaf blight of paddy using antibiotics both under laboratory and field conditions.

### Materials and Methods

The sensitivity of the bacterium to nine antibiotics viz., Agrimycin-100 (Streptomycin 15% + Terramycin 1.5%), Ambistryn-S (streptomycin sulphate), Ampicillin (ambicillin trihydrate), Chloromycetin (chloramphenicol and sodium succinate), Penicillin (fortified procaine penicillin injection I. P.), Paushamycin (Streptomycin + oxytetracycline), Streptomycin (Streptomycin 12% + chlorotetracycline, hydrochloride 1.5%), Terramycin (oxytetracycline hydrochloride) and Tetracycline (tetracycline hydrochloride I. P.) were tested *in vitro*. Solutions of antibiotics were prepared at concentrations of 100, 250 and 500 ppm. Sterile filter paper discs of 10 mm diameter were dipped in the appropriate dilutions and placed over potato sucrose peptone agar medium seeded with 24 h old culture of the bacterium. The test was conducted with three replications. Observations on the zone of inhibition were recorded after 48 h.

From among these nine antibiotics tested in the laboratory, the most effective antibiotics Penicillin, Terramycin and Agrimycin-100 were evaluated for their field performance. A pot culture experiment was laid out in completely randomised design with seven treatments replicated five times (Table 2). The highly susceptible variety Taichung (Native) 1 was used for this study. The plants were artificially inoculated with 24 h old bacterial suspension ( $10^9$  cells/ml) by the standard clipping method combined with spraying. The first three treatments were given eight days before inoculation (pre-inoculation spray). Treatments 4, 5 and 6 were given on 8th and 16th day after inoculation (post-inoculation sprays). Disease development and spread was watched and scoring of the disease was done using the scale developed by IRRRI (standard evaluation system for rice, 1976) and the disease index was worked out using the formula.

$$\frac{\text{Sum of all numerical ratings} \times 100}{\text{Total number observed} \times \text{maximum rating}}$$

Observations were recorded on the day of each spraying and eight days after the last post-inoculation spraying.

### Results and Discussion

Among the nine antibiotics tested Penicillin gave the highest zone of inhibition followed by Terramycin and Ampicillin which were on par (Table 1). Ampicillin and Tetracycline were on par. But Terramycin was significantly superior to Tetracycline. Agrimycin-100 and Ambistryn-S were significantly different and inferior to Penicillin, Terramycin, Ampicillin, Tetracycline and superior to Chloromycetin, Paushamycin and Streptocycline, Chloromycetein and Paushamycin were on par and significantly superior to the least effective antibiotic Streptocycline.

The higher concentration of 500 ppm of all the nine antibiotics tested was found to be significantly superior to their lower concentration of 100 ppm. The 250 ppm concentration of all the antibiotics except Penicillin, Terramycin and Tetracycline was superior to their lower concentration of 100 ppm.

The results of the pot culture experiment are presented in Table 2. The effect of antibiotics on the intensity of the disease was taken two weeks after the pre-inoculation spray and one week and two weeks after the post inoculation sprays.

The observations taken two weeks after pre-inoculation spray showed that all the treatments were better than control. Statistical analysis of the data revealed that there was no significant difference between the treatments.

The observation taken one week after first post inoculation spray showed that all the treatments were significantly superior to control. Agrimycin-100 pre and post-inoculation sprays were on par. They were significantly superior to Penicillin pre-inoculation spray and Terramycin post inoculation spray which were on par. Terramycin pre-inoculation spray, though was the least effective, was significantly superior to control.

The observations taken one week after second post-inoculation spray showed that all the treatments were significantly superior to control and all the post inoculation sprays were significantly superior to pre-inoculation sprays. Among the post-inoculation sprays Penicillin and Agrimycin-100 were on par, Agrimycin-100 and Terramycin were on par but Penicillin was significantly superior to Terramycin.

Swamp *et al.* (1965) reported that Penicillin G (100 ppm) gave maximum inhibition against *Xanthomonas campestris* pv. *oryzae*. Mondal and Mukherjee (1978) noted that the antibiotics such as Tetracycline and Ampicillin were of promise against *Xanthomonas campestris* pv. *oryzae*. The present study also indicated that Penicillin (500 ppm) exerted maximum inhibition to the growth of the bacterium *in vitro*.

From the *in vivo* studies using antibiotics both as pre and post-inoculation spray it was observed that none of the treatments gave any absolute control of the disease. But it was noted that the percentage disease status was minimum on all antibiotic sprayed plants and the maximum on control. It was further observed that

Table 1  
*In vitro* sensitivity of antibiotics at different concentrations to *Xanthomonas campestris* pv. *oryzae*

Sl. No	Antibiotics	Inhibition zone in mm		
		100 ppm	250 ppm	500 ppm
1	Chloromycetin	11.3	13.1	26.6
2	Terra myc in	25.8	26.0	29.8
3	Penicillin	31.5	32.0	32.8
4	Tetracycline	24.5	25.0	29.4
5	Ampicillin	22.0	27.0	32.0
6	Ambistryn-S	10.0	22.0	27.0
7	Paushamycin	15.6	17.6	21.5
8	Agrimycin-100	20.0	24.6	30.9
9	Streptocycline	10.0	12.0	16.0

C. D. (0.05) for comparison between antibiotics = 0.717

Table 2  
 Chemical control of bacterial leaf blight of rice using antibiotic sprays

Sl. No.	Treatments	Percentage index of disease status		
		16 days after pre-inoculation spray	8 days after first post inoculation spray	8 days after second post inoculation spray
1	Pre-inoculation spray with penicillin 250 ppm	17.43	25.33	36.48
2	Pre-inoculation spray with Terramycin 250 ppm	17.80	27.93	36.39
3	Pre-inoculation spray with Agrimycin-100 250 ppm	17.53	26.69	36.84
4	Post-inoculation spray with Penicillin 250 ppm (2 sprays)	19.46	25.47	33.08
5	Post-inoculation spray with Terramycin 250 ppm (2 sprays)	19.46	27.07	34.13
6	Post-inoculation spray with Agrimycin-100 250 ppm (2 sprays)	19.46	25.30	33.68
7	Control	19.46	28.64	41.38
C.D. (0.05)		0.556	0.857	0.941

post-inoculation sprays offered better control of the disease than pre-inoculation sprays. Among the post-inoculation sprays Penicillin 250 ppm and Agrimycin-100 at 250 ppm were equally effective. Agrimycin-100 being a commercial preparation for plant disease control it would be better to use this antibiotic preparation against the disease in the absence of more effective methods of control of the disease.

Summary

Studies using antibiotics on the control of bacterial leaf blight disease of rice at the College of Agriculture, Vellayani has shown that Penicillin at 500 ppm gavethe maximum inhibition to the growth of the bacterium *in vitro*. In *in vivo* Penicillin or Agrimycin-1 00 (250 ppm) post-inoculation sprays twice at eight days interval were equally effective in lowering the disease intensity.

സംഗ്രഹം

നെല്ലിന്റെ ബാക്ടീരിയൽ ബ്ലൈറ്റ് രോഗത്തെ ആൻറിബയോട്ടിക് മരുന്നുകളുപയോഗിച്ച് നിയന്ത്രിക്കുന്നതു സംബന്ധിച്ച പഠനത്തിൽ പരീക്ഷണശാലയിൽ ബാക്ടീരിയയുടെ വളർച്ചയെ ഏറ്റവും കൂടുതൽ പെനിസിലിൻ എന്ന ആൻറിബയോട്ടിക് തടയുന്നതായും രോഗം വന്നതിനു ശേഷമാണെങ്കിൽ പെനിസിലിൻ, അഗ്രിമൈസിൻ-100 എന്നീ മരുന്നുകളിലേതെങ്കിലും ഒരാഴ്ച ഇടവിട്ട് രണ്ടുപ്രാവശ്യം തളിച്ചാൽ രോഗം ഒരു പരിധി വരെ നിയന്ത്രിക്കുന്നതായും കാണുവാൻ സാധിച്ചു.

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