

B. CONTROL OF BROWN-LEAF SPOT
DAMAGE TO FIGS.

Introduction

Brown leaf spot disease of rice is widely prevalent in all rice-growing regions of India. Helminthosporium oryzae, the causal organism of the disease, infects rice plant at all stages of growth. The most notorious case of brown spot was the outbreak in West Bengal, India, in 1942-43 when between 50 and 90% of the rice crops were destroyed thus contributing as a major factor to the West Bengal famine in which 8-million people died in starvation⁽¹¹³⁾. Recently various fungicidal formulations have been found to be effective in controlling primary seed borne and secondary air borne infection of H. oryzae. Copper oxychloride, zinc ethylene bis-dithiocarbamate, phenyl mercury acetate etc. are some fungicides commonly used for this purpose.

From in vitro studies, it has been observed (Page 80 and 128) that both the mycelial growth and conidial germination of H. oryzae are significantly inhibited by the compounds like bis (triphenyltin) oxalyl bis-*m-p*-tolyl hydroxamate,

tributyltin diphenyl carbazotate and tributyltin acetate.

Based on these findings, the present investigation was undertaken to find out the effect of these compounds for controlling brown leaf spot disease.

1. Materials and methods:

1(a) Seed sample:

Seeds of 'Dhariat', a cultivar of rice, susceptible to brown leaf spot disease, was used in the following experiments.

1(b) Compounds:

Bis (triphenyltin) oxalyi bis-*o*-*p*-tolyl hydroxamate, tributyltin diphenyl carbazotate and tributyltin acetate were used.

1(c) Control of soil-borne Helminthosporium infection on rice by seed treatment:

To determine the protectant activity of the test compounds, healthy rice seeds were treated with 3 different concentrations of the compounds. Seeds were dipped in compound suspension for 4 hours and then allowed to dry in open petriplates for 1 hour. For control, water with appropriate amount of acetone was used. Treated and control seeds were sown in non infested and H.oryzae infested soil contained in 6 inch diameter earthenware pots. In each pot 100 seeds were sown and 3 replicates were maintained for a treatment. To

infest the soil with H. oryzae, a conidial conia mycelial suspension of the pathogen, prepared from 15 days old culture on malt agar was added to soil, previously steam sterilized at 20 p.s.i. for 1 hour. Approximately 1×10^6 conidia were added per gram of soil. The pots were kept in $26 \pm 1^\circ\text{C}$ and after 20 days the percentage of infected seedlings was recorded.

1(A) Protectant activity on rice seedlings:

45 days old plants were sprayed twice at 1 hour interval almost to run off with suspension of 3 different concentrations of compounds. Plants sprayed with water with appropriate amount of acetone served as control. After 6 hours, plants were inoculated by spraying with a conidial suspension of H. oryzae (5×10^5 conidia/ml). The inoculated plants were kept for 48 hours in a chamber in which a high relative humidity and a temperature of $26 \pm 1^\circ\text{C}$ were maintained. After incubation, plants were placed in a green house. The disease index was calculated after 10 days by using a modification of method of Sinha and Srivedi⁽¹¹⁴⁾. The number and size of the spots appearing on leaves were recorded. The spots were graded into 3 size groups, small (upto 2.5 mm), medium (2.5 - 5.0 mm) and large (above 5.0 mm) with respective values of 0.25, 0.5 and 1.0 assigned to them. The number of spots in each size group was multiplied by the value assigned

to it and the sum total of such values for all of the leaves gave the disease index for a plant.

2. Results:

The results in table - 32 reveal that among the 3 test compounds, bis (triphenyltin) oxalyli bis-*o*-*p*-tolyl hydroxamate is the most effective one for controlling the soil-borne Helminthosporium infection on rice by seed treatment. At 50 μ g/ml concentration, bis (triphenyltin) oxalyli-bis-*o*-*p*-tolyl hydroxamate, tributyltin diphenyl carbazenate and tributyltin acetate reduce the number of infected seedling by 33, 44 and 43% respectively where the corresponding figure is 54% in control.

Regarding the protectant activity of tested compounds (table -33) against Helminthosporium infection on rice plants, bis(triphenyltin)oxalyli bis-*o*-*p*-tolyl hydroxamate at 50 and 25 μ g/ml concentrations significantly inhibit the plant infection of 69.05 and 32.93% respectively compared to control. Tributyltin diphenyl carbazenate and tributyltin acetate at 50 μ g/ml concentration inhibit the infection of 32.81 and 31.70% respectively.

3. Discussion

Considering all the experiments with H.oryzae, such higher concentrations are needed for controlling soil-borne

Table -92

Control of soil borne Helminthosporium infection on rice
by seed treatment.

Treatment	Concentration ($\mu\text{g/ml}$)	Percentage of infected seedlings
Diis(triphenyltin)oxalyl bis- <i>m-p</i> -tolyl hydroxamate	50.00	33
	25.00	45
	12.50	51
Tributyltin diphenyl carbamate	50.00	44
	25.00	49
	12.50	55
Tributyltin acetate	50.00	43
	25.00	49
	12.50	53
Control	-	54

Table - 65

Protectant activity of Organotin compounds against Helminthosporium infection on rice plants.

Treatment	Concentration ($\mu\text{g/ml}$)	Mean no. of spots/plant (a)	Mean disease index/plant (a)	Percentage of inhibition of infection (b)
Bis(triphenyltin) oxalyl bis- <i>o</i> - <i>p</i> - tolyl hydroxamate	50.0	4.75	1.55* \pm 0.35	69.05
	25.0	8.05	2.60* \pm 0.27	32.08
	12.5	10.15	3.37 \pm 0.26	13.14
Eributyltin diphenyl carbazonate	50.0	7.60	2.65* \pm 0.37	32.21
	25.0	9.40	3.14 \pm 0.34	19.07
	12.5	12.10	4.04 \pm 0.43	-
Eributyltin acetate	50.0	8.90	2.65* \pm 0.36	31.70
	25.0	9.45	3.13 \pm 0.34	19.32
	12.5	11.45	3.83 \pm 0.56	1.23
Control	-	11.95	3.83 \pm 0.36	-

* Significant at 5% level

(a) Average of 20 plants

(b) Percentage of inhibition of infection = $\frac{E_n - P_t}{E_n} \times 100$ E_n = Disease index of control plants P_t = Disease index of treated plants.

and seedling infection of rice compared to concentrations needed for conidial germination inhibition in vitro. It is also evident that tributyltin acetate is highly effective for inhibition of conidial germination of H. oryzae in vitro among the test compounds where as bis(triphenyltin) oxalyl bis-*m-p*-tolyl hydroxamate shows its better activity for controlling the soil borne and seedling infection of rice from H. oryzae in pots, which accelerate the observation of Hartel ^(23,87) where he showed that in the laboratory, trialkyl - and particularly tributyltins are better fungicides than triaryltin compounds but that the reverse is true in the field.