

TOXIC EFFECT OF THE CULTURE FILTRATE OF *GERLACHIA ORYZAE* ON LEAF, SEEDLING AND SEED GERMINATION OF RICE

BY

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Toxic effect of the culture filtrate of *Gerlachia oryzae* on leaf, seedling and seed germination of rice was studied. The culture filtrate fractions of the fungus caused uniform bronzing or browning of rice leaves, wilting of seedlings and reduction of germination of rice seeds.

INTRODUCTION

The leaf scald disease of rice (*Oryza sativa* L.) caused by *Gerlachia oryzae* (Hashioka and Yokogi) W. Gams is considered as a minor disease of rice. But it has been found to occur in a severe form during the rainy seasons in the Central Research Farm, Orissa University of Agriculture and Technology, Bhubaneswar since last 10 years (Ojha, 1980) causing complete drying of leaves. The production of toxin and metabolic biproducts in culture filtrates of pathogenic fungi and their active principles in disease development on rice was studied by several workers (Memmi and Matsuura, 1928; Goto, 1953; Tamari and Kaji, 1954; Asada, 1956; Vidyasekharan *et al.*, 1970). The present study, was therefore, undertaken to assess the toxin production by *G. oryzae* and its role in pathogenicity on rice leaves, seedlings and seed germination.

MATERIALS AND METHODS

The fungus was isolated from the infected rice leaves and maintained on potato dextrose agar medium. For toxin studies, the culture filtrate was collected by growing the fungus in a synthetic liquid medium (Hansen's medium) for 20 days. The filtrate collected was refiltered. A portion of the filtrate was centrifuged after adding equal quantity of acetone at 5000 rpm for 10 minutes. The supernatant was collected and the precipitate was dissolved in a small volume of distilled water. The acetone from both the fractions was evaporated by passing an air current through them. The volume, in case of precipitate, was made up by adding distilled water. Half of the supernatant was taken separately in a sterile conical flask and the other half was autoclaved at 15 psi for 20 minutes. Some quantity of

the culture filtrate without centrifugation was taken and autoclaved. A portion of the raw filtrate was also taken for the study. Thus the culture filtrate fractions used in this work were : 1) sterilized supernatant ; 2) unsterilized supernatant ; 3) precipitate ; 4) sterilized raw filtrate ; and 5) unsterilized raw filtrate.

Effect of Culture filtrate on leaves

Healthy leaves were collected, washed thoroughly with tap water and surface sterilized with 0.1% mercuric chloride solution. The leaf tips were punctured with the help of sterile needle and a drop of each fraction was placed on it. The basal portions of the inoculated leaves were dipped in sterile water in conical flasks which were incubated under bell jars. Symptom development was recorded at 24 h interval.

Effect of culture filtrate on rice seedlings

Roots of 20 day-old seedlings of potted plants were washed thoroughly with sterile water for several times. The roots were then dipped in different filtrate fractions except the precipitate and incubated under bell jars at room temperature,

Effect of culture filtrate on rice seed germination

Healthy rice seeds of the variety "Keshari" were surface sterilized with 0.1% mercuric chloride solution. Fifty seeds were spread over circular blotting papers moistened with each of the culture filtrate fractions except sterilized raw filtrate separately so that the filtrates would be absorbed by the seeds.

Sterile distilled water served as control. All the experiments were replicated six times. Symptoms if any were recorded at 24 h intervals in case of experiments 1 and 2 and percentage of seed germination was recorded in experiment 3.

RESULTS AND DISCUSSION

Effect of culture filtrate on leaves

Leaves treated with precipitate and sterilized supernatant produced typical water soaked areas which enlarged and finally became blackish brown with a yellowish zone merging gradually with the healthy green tissues. Typical bronzing symptoms developed on leaves when kept in unsterilized raw filtrate of the pathogen. Leaves treated with unsterilized supernatant showed copper coloured discolouration starting from tip to downwards. Leaves of control plants did not develop any symptoms.

Effect of culture filtrate on seedlings

Seedlings dipped in precipitate solution showed water soaking symptoms on the

older leaves first and gradually on the younger leaves. Seedlings became shriveled and leaves dropped. Seedlings treated with sterilized supernatant showed water soaking and yellowing and the entire plant showed wilting symptoms. Seedlings dipped in unsterilized supernatant produced symptoms of tip drying with water soaked zones towards the green portion of the leaves and finally the seedlings wilted. Seedlings dipped in unsterilized raw filtrate showed bronzing of the tip of the leaves. No such symptoms appeared on healthy plants.

Effect of culture filtrate on rice seed germination

Toxins produced by *G. oryzae* not only produced the disease symptoms on leaves of the rice plant but also inhibited the percentage of rice seed germination (Table 1) significantly. Among the treatments, maximum seed germination

Table 1. *Effect of culture filtrate of G. oryzae on rice seed germination*

Treatment	No. of seeds treated	No. of seeds germinated	Percentage of germination (Angular value)
Sterilized supernatant	50	38	60.72
Unsterilized supernatant	50	24	43.85
Precipitate	50	40	63.53
Raw filtrate (Unsterilized)	50	40	63.53
Control	50	50	90.00
CD (0.05)	—	—	3.76

inhibition occurred in seeds treated with unsterilized supernatant. There was no significant variations of seed germination among the treatments like unsterilized raw filtrate, precipitate and sterilized supernatant. Toxic effect of the culture filtrate of *Trichothecium roseum* (Anahosur, 1976) and head fungi (Tripathy 1974) of sorghum on the inhibition of seed germination has been reported. The present study indicates that the culture filtrate fractions of *G. oryzae* could cause leaf infection, seedling wilt and inhibition of seed germination of rice.

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