

STUDIES ON SOME FUNGI CAUSING SOIL AND SEED BORNE
DISEASES OF RICE PLANTS IN U.A.R.

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(B.Sc. in Agric.)



Thesis

Submitted in Partial Fulfilment of
the Requirements of the Degree of

3351

Master of Science

in

Plant Pathology

Ain Shams University
Faculty of Agriculture
Botany Department

1969

C O N T E N T S

	Page
INTRODUCTION.....	1
REVIEW OF LITERATURE.....	3
MATERIAL AND METHODS.....	26
I- Isolation of the causal organisms.....	26
II- Pathogenicity tests.....	28
A. Pat experiments.....	28
B. Laboratory experiments.....	29
III- Physiological studies	30
1- Effect of different media.....	33
2- Effect of temperature.....	33
3- Effect of relative humidity.....	34
4- Effect of pH value.....	34
5- Effect of nitrogen source.....	36
6- Effect of carbon sources.....	36
7- Effect of eliminating each constitu- ent of Glucose peptone medium.....	36
8- Effect of various concentration of glucose-peptone medium.....	37
9- Effect of filtrate of <u>F.moniliforme</u> and <u>S.rolfsii</u> :.....	
A- On seeds germination.....	38
B- On seedling development.....	39
10- Effect of different concentrations of fungicides.....	39
IV- Pot experiments:	
1- Effect of fertilizers.....	44
2- Effect of soil pH value.....	44



	Page
Pot experiments:.....	99
1- Effect of fertilizers on the severity of infection.....	99
2- Effect of soil pH on damping-off....	105
3- Effect of seed dressing with fungicides	107
4- Effect of soil inoculation with more than one fungus.....	109
5- Effect of different rice varieties..	115
6- Effect of organic matter on disease severity and soil microorganisms:..	117
A- On disease severity.....	118
B- On the rhizosphere and soil microorganisms.....	119
a)Total count of microorganisms.....	119
b)actinomycetes count.....	121
c)Total fungal count.....	123
d) <u>Fusarium</u> spp. count.....	126
e) <u>Sclerotium</u> count.....	126
7- Effect of soil texture on the severity of infection	129
DISCUSSION.....	132
SUMMARY.....	142
REFERENCES.....	150
ARABIC SUMMARY.	

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ACKNOWLEDGMENT

This work was conducted under the Supervision of Dr. W.E. Ashour, Dr. A.R. Sirry. Profs. of Plant Pathology Fac. of Agric., Ain Shams University and Dr. T. Abdel Hak Director General of Plant Pathology Dept., Ministry of Agriculture. The writer gratefully acknowledges his appreciation to them for suggesting the problem, supervising the work, their constructive criticism and advices throughout the investigation.

Thanks to all members of the cereal diseases research Div., Plant Prot., Dept., Ministry of Agriculture for supplying all facilities during this investigation.

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INTRODUCTION

The fact that rice is the principal food in many countries makes it vital importance to economy of countries concerned. Rice is considered one of the cheif crops in U.A.R. particulary in the northern parts of Egypt. It occupies the second rank after cotton as an exported crop (Amon, 1966). An area of more than one million feddans of rice is annually under paddy, and this area will increase in the future parallel with the increase in the saved water by the high dam.

The United Arab Republic maintains the second or the third rank among the other rice producing countries as far as the average yield per hectar is concerned.

Several diseases are known to attack rice plants such as blast, seedling blight, brown spot and root rots. The importance of these diseases is generally recognized by their damage and their easy and quick spread.

It was noticed, lately, that the damage due to root-rot diseases on rice plants increased considerably in the last few years in U.A.R.

The present investigation aimed to study the following factors:

1- Isolation, detection and identification of fungi occurring on or in any of the seed parts of rice.

2- Studying the effect of environmental conditions on the prevalence of these fungi, their pathogenic capabilities and also their importance in causing damping-off diseases of rice plants.

3- Studying seedling blights from the point of view of the causal pathogens, their physiological behavior and their control especially by seed and soil treatment with different fungicides.

4- Studies on the spread of the fungi causing damping off and seedling blights in rice in different provinces in U.A.R.

REVIEW OF LITERATURE

Isolation of Causal organism :

Reinking (1918), Tisdal 1921 and Thompson 1928 reported that the fungus which caused seedling blight was Sclerotium rolfsii.

Reyes (1934) and Mcrae (1935) found that Fusarium moniliforme caused foot rot and wilt in philippine.

Tullis (1936, 1940) reported the isolation of Fusarium miniliforme from pink and yellow discolored rice kernels.

Martin and Altstatt (1940) reported that Curvularia lunata, Helminthosporium oryzae and Trichoconis caudata could produce systemic infection.

Fernando (1940) found that Sclerotial diseases of rice (Sclerotium oryzae and Rhizoctonia solani) are particularly virulent in Swampy land.

Marchionatto (1943) showed that rice grains bearing brown, chestnut-brown, dark or whitish spots on

Results revealed the presence of Alternaria and Curvularia species which were predominating over other isolated species of Helminthosporium, Epicoccum, Fusarium, Brachysporium, and Phoma sp.

Del Prado and Christensen (1952) made mould counts in stored rice grains of 12 rice varieties and found that the predominant species were Aspergillus glaucus, A. niger, A. terreus, Penicillium sp., Fusarium sp., and Curvularia sp.

Padmanabhan (1956) described the symptoms extent of damage and control of the following diseases of rice in India: blast (Piricularia oryzae), stem rot (Leptosphaeria salvinii) and foot rot (Gibberella fujikuroi).

Padmanabhan (1959) reported that in India, diseases of rice caused about 10% loss of production annually, and the most important were stem rot caused by Sclerotium spp and foot rot by Gibberella fujikuroi.

Cheremisinov (1959) reported that F. moniliforme, M. oryzae and Fusarium spp. were isolated from seed and cob samples.

El-Helaly et al (1963) reported the association of Acremonium sp., Alternaria sp., Fusarium sp., and Phoma glumarum, with blotched rice-grains in Egypt. They added that in certain limited fields, Piricularia oryzae B. et Cav., Helminthosporium oryzae var. Breda de Haan, Sclerotium oryzae catt., and S. rolfsii were also isolated.

Pathogenicity:

A. Sclerotium rolfsii.

Reinking (1918) found the disease to be most severe when there was a lack of water in the seed-beds, and Tisdale (1921) found that irrigation completely checked further development. He carried out inoculation tests, in which rice was sown with Sclerotia of S. rolfsii and showed that isolates from wheat and rice caused a marked reduction in germination of rice seedlings, while from Soy-bean caused less reduction.

Bertus (1929) attempted to infect paddy seedlings with mycelium from S. rolfsii mixed with water and spread over the surface of the soil. Only the outer sheaths were affected and the plants survived and developed normally.

The fungus appeared to be a soil inhabitant and to decrease in prevalence or vigour with a depletion of organic matter in the soil in a viable state as sclerotia, and could even remain viable when immersed in water throughout a summer in the Southern United States.

Tullis (1940) stated that this disease was most common during periods of moist, warm weather after the rice seedlings emerge and before irrigation.

B. Fusarium moniliforme.

Nisikado and Matsumoto (1933) working with 66 strains of G. fujikuroi from rice and 5 strains of G. moniliforme from wheat, using corn as a test plant, noted that isolates from rice caused overgrowth while those from wheat did not. They distinguished the two as separate entities.

Seto (1937) determined the most favourable stage of development for seed infection by spraying the developing flowers and grains over a period of five weeks. He found that infection took place readily at the time of flowering, more than 74 per cent success being

B. Fusarium moniliforme:

Fikry (1932) stated that growth of mycelium was generally thin and fluffy on media poor in nutritive constituents; it was profuse and compact on rich media.

Ashour & Gamal El-Din (1960) reported that P.D.A was the best medium for the growth of F. moniliforme.

Saad (1966) found that P.D.A. was the best medium for the growth of F. graminearum followed by corn-meal dextrose.

Dia-El-Deen (1967) found that the best media for Fusarium were P.D.A., Czapek's and glucose-peptone media.

Effect of temperature:

A. Sclerotium rolfsii.

Stevens (1917), found that S. rolfsii was limited to warm regions and important only during hot weather.

Higgins (1927), recorded that the minimum, optimum and maximum temperatures for its growth were 8, 35 and 40°C respectively.

Nakata (1928), found that sclerotia developed best at 32°C.

Fajardo and Mendosa (1935), found that the growth of the fungus was obtained between 10°C and 35°C.

Borzini and Picco (1949), reported that S. rolfsii was more virulent at 21°C than at 17°C.

Epps and others (1951), found that the pathogen was most active in soil at 30 to 35°C.

Weimer and Allison (1953), found that hot and wet weather favoured the development and spread of S. rolfsii.

Gondo (1964) found that growth temperature of S. rolfsii was at 25°C - 30°C with optimum soil temperature at 30°C for mycelium and 25° for sclerotia.

Soad (1967) found that S. rolfsii gave its best rate of growth at 30° and 35°C.

B. Fusarium moniliforme

Kurosawa (1931) had already shown that the optimal temperature for the development of the fungus, as

judged by increase in diameter of colonies on agar, lies between 25° and 30°C. Growth was reduced at 35°C and inhibited at 2°C and 40°C. He noted that in fields where the temperature during the growing season was low, no bakanae plants could be found.

Kurosawa (1931) and Seto (1932) found that the abnormal lengthening of diseased seedlings induced by liquor extract from G. moniliforme, was only between 20°C - 35°C.

Niskado, Matsumoto, and Yamauti (1933) found the minimum temperature of F. moniliforme to be 7 to 8°C and the optimum 27°C.

Seto (1933) found that at 35°C there were large numbers of "bakanae" seedlings, while only few were observed at 25°C.

Seto (1933, 1935) showed that a temperature of 35°C was most favourable for seedling growth and for infection.

At 40°C growth was much retarded, and the appearance of the disease was suppressed. On reducing the soil temperature to 25°C. the bakanae seedlings could

be found, but they failed to appear at 20°C.

Seto (1933) reported also that while the fungus grew best at 25°C., the temperature most suitable for seedling growth and infection was 35°C. "Bakanae" seedlings developed to some extent at 25°C. but not only at all at 20°C. At 40°C the seedlings were retarded and the development of diseased ones was suppressed.

The effect on the disease would thus appear to be due to the action of the soil temperature on the seedlings rather than on the fungus.

Vorheés (1933) mentioned that the minimum, optimum and maximum temperatures for mycelial growth of F. moniliforme were 10-14° and 35-39°C respectively.

Edwards (1936) added also that the fungus grew between 25-40°C with the optimum of 30°C. Similar results were obtained by Ashour and El-Kady (1950) who found that the optimum temperature was around 25°C.

Orrenigo (1956) stated that at 28°C Fusarium moniliforme strain E caused symptoms of the disease known as "bakanae" in Japan (*Gibberella fujikuroi*) where the optimum for their development is 35°C.