CHAPTER-I

INTRODUCTION
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Rice, the most important food crop of the developing world, belongs to the genus *Oryzae* and has 25 wild species inhabiting mainly in Asia, Africa, and America. The genus has two cultivated species *viz. Oryza sativa* L. & *O. gleberrima*. Of these, the first one is cultivated almost in all continents while the latter is confined to Africa only. It is staple food of more than 60% of the population in the far, east, and southeast Asian, African, and South American countries. It is cultivated in 149.6 million hectares in varied climatic conditions all over the world with the production of 488.3 million tones. In Asia, it is grown in 130.1 million hectares with a production of 446.4 million tones, and in India, the area under rice grown on about 45 million hectares, which accounts for nearly a third of the total area under food grains in the country. The annual production of rice is approximately 89.45 million tones with a yield of 2576 kg/ha as against the world average of 3346 kg/ha (F.A.O. 1989). In Uttar Pradesh, it is the most important kharif crop and is grown in 5.5 million hectares with a total production of 10.2 million tones and with an average yield of the 1867 kg/ha which is below to the national average.

Over 3000 varieties of the crops are grown under widely varying climatic conditions of the tropical and sub-tropical regions and widely varying agronomic conditions. These varieties differ in their duration, grain quality, and other plant characters, water requirement, response to fertilizers, resistant to drought alkalinity and salinity. The cultivation practices adopted...
in different parts of the country vary widely depending upon the climatic condition, soil availability of water and crop variety. All these factors including cultivation practices greatly influence the susceptibility of the variety to one or more diseases. The crop suffer maximum damage due to diseases because it grow during the monsoon season when high temperature and heavy rain condition, which are congenial for the development of the disease. Among the various rice diseases, stem rot caused by Magaporthe salvinni (Catt.) Krause and Webster (Sclerotium oryzae Catt. conidial stage Helminthosporium sigmoideum cav.) are endemic in localized areas of the state causing significant loss all over the India (Singh and Pavgi 1966, Chauhan et.al. 1968).

A stem rot coexist with rice cultivation and is an important disease particularly in water logged areas most striking feature of the disease is that the lower most sheath show black discoloration followed by rotting and production of sclerotia. Sclerotium oryzae was first reported from Italy by Cattaneo (1976). Where as in India it was recorded in Noakhali (now in Bangladesh and Bihar (Shaw 1913). It was estimated that a high as 75% losses in yield have been reported from Arkansas USA (Cralley 1936, Chauhan et.al. 1968) have reported an annual losses ranging from 5-15% with box during 1952, an epidemic year.

In India the disease has been reported from the state of Assam, Bihar, Hariyana, Punjab, Tamil Nandu, Uttar Pradesh and West Bengal. The annual losses due to disease ranged between 5 and 15% (Shaw 1913; Butter 1918;
Introduction

Nandi 1941; Mishra and Mohammad 1964; Singh and Pavgi 1966 and Srivastava and Ahuja 1973).

Typical symptoms are apparent as the crop approaches maturity whereas symptoms of the disease appear after 3-4 weeks of transplanting at the water line on outer leaf sheath as discolored brown, oval to irregular lesions which become dark brown. These lesions are without distinct margin and enlarge gradually finally affecting the inner sheath and culms of the 2 or 3 basal internodes. The affected internodes soften and get darkness. Diagnostic symptoms of the disease appear late in the season when plants are at pained initiation/flowering stage. When the basal internodes culms are split open grayish weft or mycelium is observed with abundant small, spherical, shining black sclerotia, which are mentioned at appropriate place in the present task (Plate A, B, C, D).

The two other sclerotia fungi namely *S.oryzae* (Catt.) var-irregulare cralley and Tullis and *S.hydrophilum sacc* have also been reported to be associated with the disease producing identical symptoms. The seloratial stage of *S.oryzae* var- irregular is similar to the sclerotia of *S.oryzae* expect the presence of irregular sclerotia, whereas *S. hydrophilum* has larger, globose, or pear shaped rough walled sclerotia than *S.oryzae*.

The genesis of stem rot of rice in general manifest through conidia and sclerotia, which are formed during the erase of growth and development of its causal organism, the sclerotia not only serve as the infective agent, but also perform the secondary function of perennation. Since the fungus form sclerotia to withstand the unfavorable vagaries of nature and remains
Introduction

protected within the rice leaf sheaths or soil matrix. It can survive for a long time. As such it is very difficult to control the disease by killing the hard bodies sclerotia, the soil born sclerotia, of the fungus serve as over wintering or over summering propaguales for the survival of the pathogen. When the fields are flooded with water the soil born sclerotia, floats on its surface. The buoyant sclerotia come in contact with the emerging rice tillers through the old outer sheath and produces infection cushion or lobate mycelia in the “infection court” which in turn causes the disease by gradual establishment in the host per se. (Ou 1997)

Thus the soil environment serving as the huge reservoir for in column and water serving as the sole sources for inducing infection, the ecological study of the fungus is of paramount importance in alleviating losses to rice crop production and disease management.

Though the disease is widespread and prevalent in mild to severe form causing significant losses in yield, much attention of the researcher particularly for this disease, because the native district Sant Ravidas Nagar (Bhadohi) of Uttar Pradesh is widely occurrence of the stem rot disease and more production are damaged at every year. However much attention has been paid to work on the different aspect of the disease in various part of India as well as the world. But nothing short of a fairly complete knowledge and comprehension of the ecological situation is know about the morphology and physiology of the sclerotial and not sufficient idea available to control the soil born disease specially stem rot of rice in eastern part of Uttar Pradesh. Second prevalent reason for study of the present disease that
the physiology and morphological aspect of stem rot of rice mostly varies from one place to another place due to varying reasons such as the ecological and edaphic factors.

Bearing in mind the above ideas and the problems often discussed in the national forum faced by the marginal farmers in the waterlogged low land areas where the stem rot disease in sever form is often associated with the rice crop from seed to seed. An attempt has been made in the present investigation to study the following aspect of the test pathogen/disease.

1. Physico-Chemical analysis of soil of affected fields.
2. Morphological study of test pathogen from 10 different isolates of various parts of India on following aspect.
   (a) Radial growth of colony.
   (b) Colour of colony.
   (c) Diameter of sclerotia.
   (d) Length, width and septation of conidia.
3. Physiological studies of test pathogen.
   (a) Study of pathogenicity.
   (b) Nutritional studies of test pathogen by some important macro and microelement.
   (c) Study of test pathogen in varying region of environmental conditions such as temperature and pH.
   (d) Mode of infection and disease development.
   (e) Survivability of the test pathogen at different physical properties of the soil.
Introduction

(a) Application of chemical fertilizers N.P. and K in different ratio.
(b) Application of green and organic manuring.
(c) Effect of soil moisture at various level.
(d) Maintenance of different soil pH.

5. Quantitative analysis of other soil microorganisms and their effect on sclerotial mortality.

(a) Effect of raw sludge treatment.
(b) Effect of ammonia gas treatment.
(c) Effect of cement dust treatment.
(d) Relation of some dominant rhizosphere fungi to test pathogenicity.


8. Application of some important fungicides and their effect on test pathogen.

9. Statistical analysis of obtained data for causes and effects in support of experimental findings.

10. Conclusion will be drawn under the light of recent researches and control measure will be suggested.