بسم الله الرحمن الرحيم

قالوا سبحانك لا علم لنا إلا ما علمتنا
إنك أنت العليم الحكيم

IN THE NAME OF ALLAH, THE BENEFICENT,
THE MERCIFUL

They Said : " Be glorified we have no knowledge except that which you have taught us. Indeed you are the knower, the wise ".

STUDIES ON STRAWBERRY LEAF SPOT DISEASES

By

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THESIS

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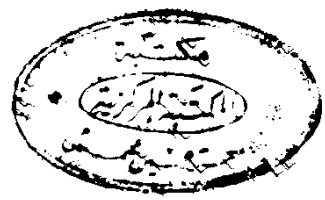

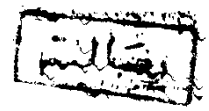

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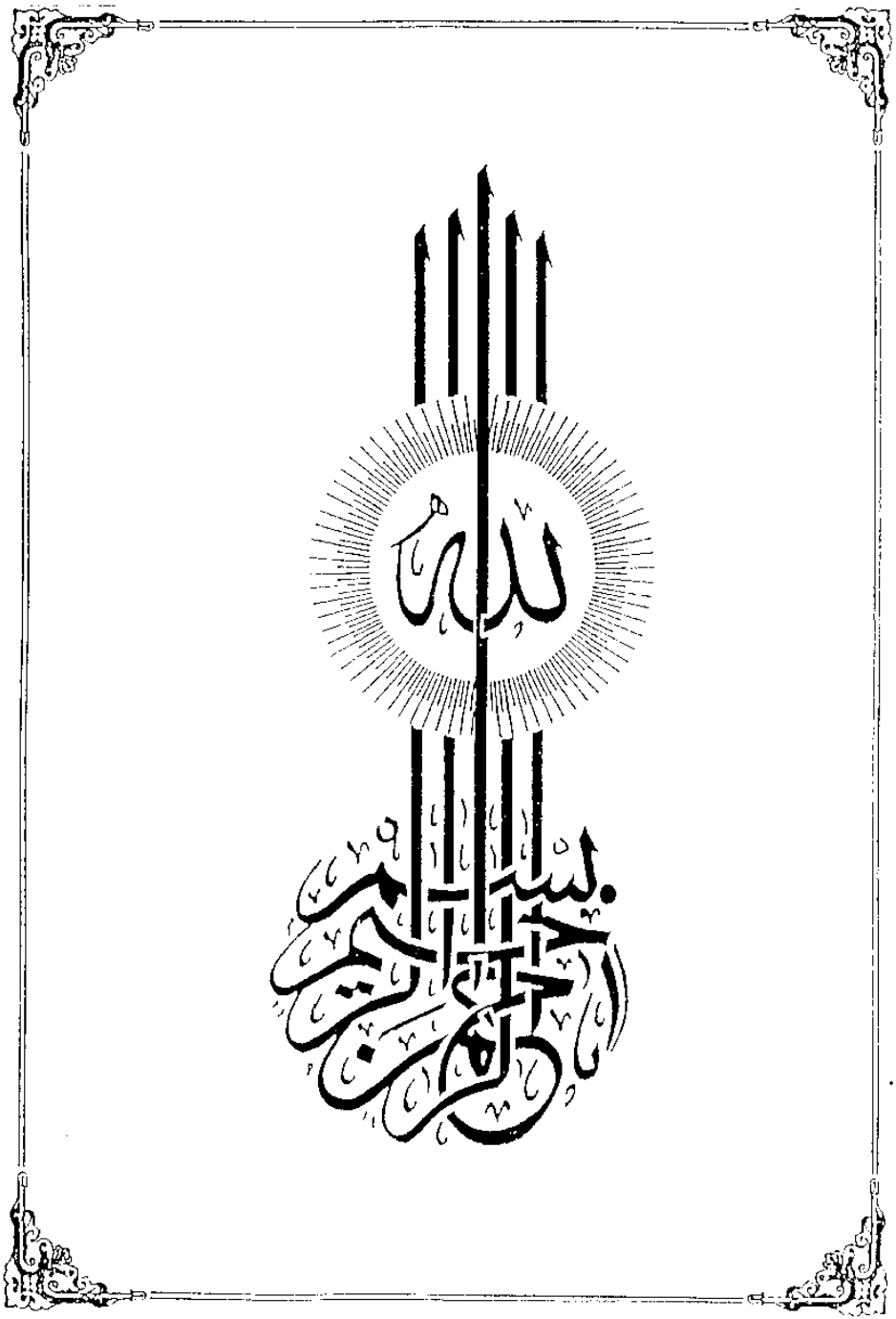

APPROVAL SHEET

STUDIES ON STRAWBERRY LEAF SPOT DISEASES

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C O N T E N T S

INTRODUCTION

Strawberry (*Fragaria vesca*) is a favourite fruit in the markets of European countries.

In A.R.E., the production of this crop don't exceed 1045 feddans which produced approximately 2102 tons with an average of 2.01 tons per feddan.

From the economical point of view extra higher profits were obtained in last years. A crop with these higher potentialities needs the knowledge of the optimum factors suitable for the crop improvement.

Several diseases are known to attack strawberry such as leaf-spots, red-steel and root rot.

It was noticed that the damage due to leaf spot diseases (leaf spot and leaf blight) of strawberry increased considerably in last few years in A.R.E.

The problem of strawberry leaf spots has received a considerable attention in many provinces.

The present investigation represents the results of experiments designed to illustrate the main pathogens of leaf spot diseases (*Mycosphaerella fragariae* (Tul.) Johans. ex Oud. (*Ramularia tulasnei* Sacc.) and Phomopsis (Dendrophoma) obscurans (Ell. & Ev.) Sutton). It also includes some physiological, greenhouse and chemical control studies on the disease.

1. Physiological studies:

   Effect of different temperatures.

   Effect of different media.

   Effect of relative humidity.

   Effect of pH values.

   Effect of C/N ratio.

   Effect of different fungicides.

2. Greenhouse studies:

   Effect of temperature on disease severity.

   Effect of different humidities.

   Response of strawberry varieties to infection.

3. Field experiment:

   Effect of different fungicides.

REVIEW OF LITERATURE

Causal Organisms:

The organism responsible for leaf blight of strawberry is Mycosphaerella fragariae (Tul.) Lindau. The perfect stage was described by the tulasane brothers in 1863 as a Stigmatia. Later this was transfered to genus sphaerella, and then to Mycosphaerella. The imperfect stage was described as Ramularia tulasneii by saccardo in 1819. Peck also described this stage in 1883 under the name R. fragariae, evidently under the impression that it was different from the European species (Andrson 1956).

Viegas (1946) recorded the conidial state of Mycosphaerella fragariae (Tul.) Johans. ex Oud., on strawberry in Brazilian.

Alexopoulous and Cation (1949) observed on fruits of Robsinson strawberries bored pycnidia closely resembling those of Dendrophoma obscurans (Ell. & Ev.) Sutton, the causal agent of a leaf blight, which was not previously reported in connection with fruit rot.

Plakidas (1949) gave an account of inoculation tests to confirm the evidence of many years observations as to the existence of distinct strains of Mycosphaerella fragariae (Tul.) Johans. ex Oud. varying in their pathogenicity to different strawberry varieties.

Sarejanni, et al. (1950) found that an extensive area of strawberry near Florida was affected by Mycosphaerella fragariae.

Vade (1950) reported that the most prevalent fungal disease was leaf spot (Mycosphaerella fragariae), on strawberry in Tasmania.

Botton (1959) recognized 25 cultural types of Mycosphaerella fragariae among isolates from several commercial strawberry varieties, yielding a more or less distinct cultural type. Isolates from native friginiana from different areas varied in colour, pigment production, rate of growth, topography of colony, and rate of conidial production. Isolates produced variants in culture on artificial media and exhibited differences in stability. Two cultural types produced variants or mutations after passing 5 times through hosts other than their original ones. It was postulated that the number of distinguishable types of Mycosphaerella fragariae occurring in nature is infinite, being limited only by the possible number of genetic variations in the host.

Macnaab and Gourley (1964) found that the most prevalent pathogen was Mycosphaerella fragariae on strawberry foliage in Nova Scotia-cand, Other disease, blight caused by Dendrophoma obscurans was wide spread, but did not cause economic losses.

Stton (1965) proposed Dinemasporium cytosporioides for Dendrophoma cytosporioides and Phomopsis obscurans for Dendrophoma obscurans., the agent of strawberry leaf blight.

Szalay-marzo (1967) reported that a new disease of strawberry, observed in 1965-66, was caused by Dendrophoma obscurans.

Kulikova (1968) found that Ramularia tulasnei (Mycosphaerella fragariae) was the most wide spread pathogen of strawberry. Perithecia were found on dead infected leaves only. The fungus over-wintered on plant litter and on plant litter and on living infected leaves.

Darozhkin and Gryshanovich (1972) reported Ramularia tulasnei was wide spread on strawberry in Byelorussia and lowered the yield. Heavy and frequent showers, particularly in conjunction with moderate temperature during growth, favoured fungal development. Formation and germination of conidia occurred much faster in light than in the shade, which explained the higher incidence of the disease in the open. Older, density planted areas with weed sare were attacked more heavily.

Isolation and Identification:

Plakidas (1941) found that the fungus Mycosphaerella louisinae is characterized by groups of erumpent, amphigenous, black, globose, ostiolate perithecia, 34 to 75 by 34 to 75 (average 56.9 by 59.8) u, and cylindrical to clavate asci, borne on short stalks, fasciculate, the marginal ones are curved, the central straight, aparaphysate, 27.3 to 39 by 5.9 to 7.3 (32.7 by 6.4) u, each containing eight imperfectly biseriate, hyaline, bicellular, obtuseasco spores, 6.8 to 10.2 by 2.4 to 3.4 (8.9 by 3.1) u. No conidial stage was observed either in nature or in culture, but since the perithecia develop soon after the death of infected leaves, no other types of fructification are necessary to ensure the perpetuation of the fungus, which thrive on a number of standard media at 25°C. M. louisianae plakidas differed from M. fragariae (Tul.) Johans ex Oud.) in its perithecia, asci, and ascospores and in its predominant hypophyllous instead of epiphyllous position of perithecia. The purplish lesion of those produced by M. louisinae never develop the greyish-white centre characteristic of those due to M. fragariae. It also differed in producing no conidia in culture. Conclusive proof of genetic connexion between M. fragariae and Ramularia tulasnei has hitherto been lacking. It was obtained by sowing on agar disks, single and multiple ascospores, derived from perithecia

on over-wintered-wild strawberry (Fragaria virginina) leaves in Michigan, which gave rise to an abundance of conidia morphologically indistinguishable from Louisiana specimens of R. tulasnei. However, judging by scarcity of mature perithecia and profusion of sclerotia on over-wintered foliage from widely separated areas, the ascogenous stage of R. tulasnei is of little importance in perpetuation of the fungus, even in northern latitudes.

Cisneros (1946) recorded that the presence of the strawberry leaf blight caused by Dendrophoma obscurans was first recognized in Argentina. The symptomatology, morphological and cultural characteristics of the causal fungus were described. Dendrophoma obscurans was readily isolated in pure culture on standard media, of which rolled oats and 2 percent dextrose agar were the best. The spores germinated in 2 to 7 days at 25°C.

Alexopoulos and Calion (1949) found that the fungus Dendrophoma obscurans cultured on maltose agar from berries, calyxes and peduncles yielded colonies and fruiting bodies indistinguishable from those produced by isolations from typical leaf blight lesions, associated with the pycnidia of Dendrophoma obscurans in culture and on strawberry calyxes and peduncles were black, globose perithecia, 236 to 545 u in diameter (on maize meal agar),

deeply embedded in the substrate, from which their long beaks (600 to 1.455 u in culture) project. Asci were formed, but they deliquesced on the maturation of the spores, which released in a droplet of liquid through the ostiole. Ascospores from cultures measured 7 to 11.5 by 2 to 3 u. Pycnidiospores of D. obscurans gave rise to perithecia when they were sown on potato dextrose and oat agar. Ascospores from these perithecia yielded pycnidia on the same types of media. The perfect stage of the fungus was assigned to as yet undetermined species of Gnomonia. The perithecial stage of D. obscurans that was described was very similar to that of Zytnia fragariae, the causal organism of strawberry leaf blotch in England.

Rikenberg, et al. (1971) recorded that Dendrophoma obscurans was consistently isolated from diseased leaves showing M. fragariae-type lesions. Plants inoculated with the isolate develcped characteristic leaf spot symptoms. Spots caused by the two fungi can easily be confused in the field. Observations over three years indicated that D. obscurans is by far the more prevalent and destructive in many parts of Natal. This appeared to be the 1st record of the form genus Dendrophoma in S. Africa

Howard and Albragts (1973) found that plantings of the Tioga and Fresno strawberry varieties in Florida were severely attacked by a seven fruit rot caused by

D. obscurans, the cause of strawberry leaf blight. Isolates from leaf blight lesions caused fruit rot in inoculation tests and vice versa. Cultural characteristics and spore sizes of both isolates of fruits and leaves were identical.

Pathogenicity:

Cisneros (1946) recorded that the incubation period of the pathogen Dendrophoma obscurans was 20 days as against ten days reported by other workers, the discrepancy being presumably due to differing environmental conditions.

Plakidas (1949) found that an account was given for inoculation tests of distinct strains of Mycosphaerella fragariae varying in their pathogenicity. The potted plants (of ten varieties) were sprayed with conidial suspensions from bean pod and potato dextrose agar cultures and were immediately transferred, for three days, to a moist chamber of saturated humidity, in which the temperature was maintained at 75° to 80° F. The lesions generally began to appear between the 12th and the 15th day after inoculation and final records were taken at the end of 28 days.

It was found that many strawberry seedlings, that were resistant to infection when repeatedly inoculated in the green-house with conidial suspension from mixed