FURTHER STUDIES ON EARLY BLIGHT OF POTATOES CAUSED BY ALTERNARIA SOLANI

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APPROVAL SHEET

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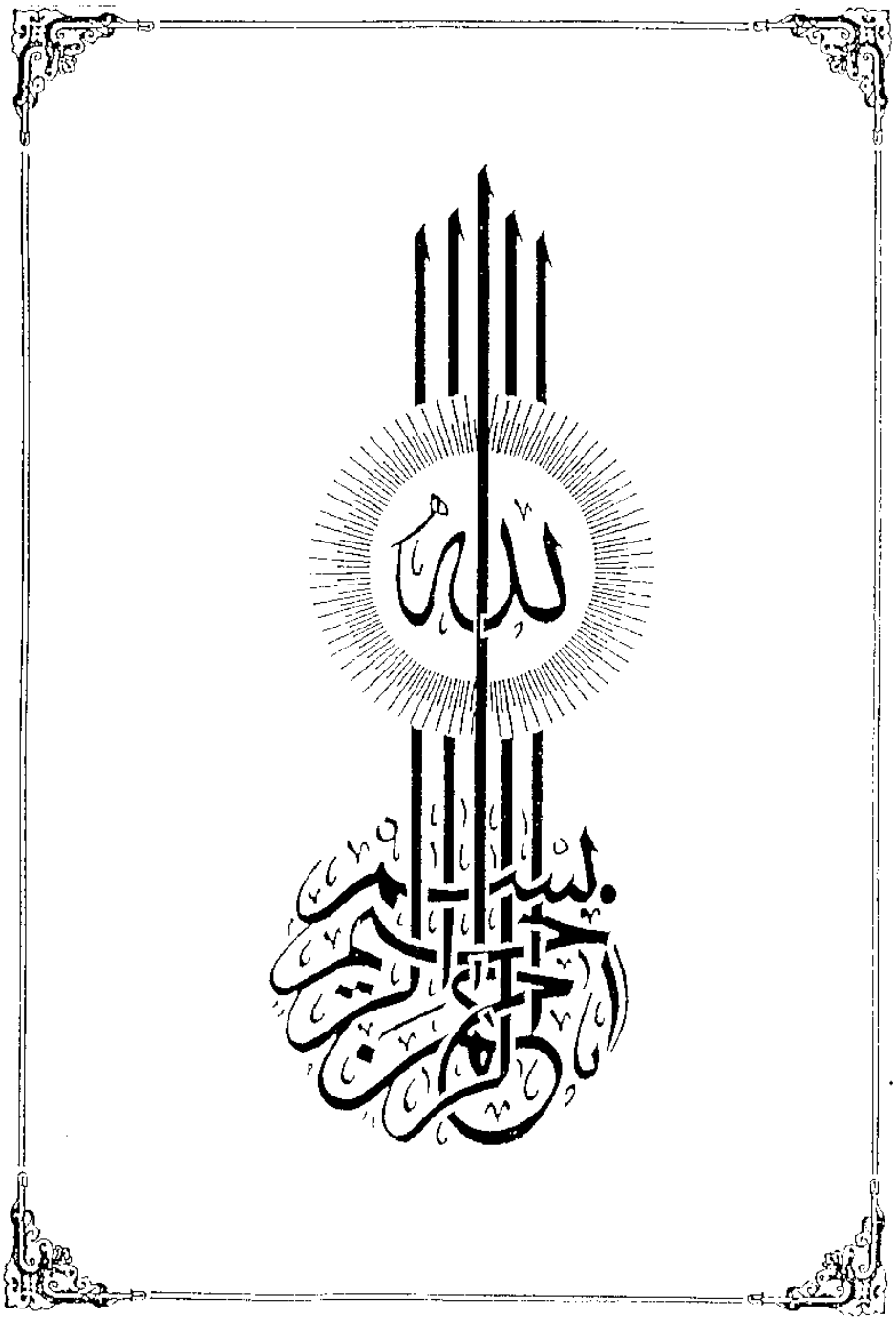

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CONTENTS

INTRODUCTION

The potato (*Solanum tuberosum*, L.) is one of the most important vegetable crops in the U.A.R. both for local consumption and export. It ranks second after onion with regard to the tonnage exported to foreign markets and third after onion and tomato with regard to acreage. The area of potatoes increased remarkably during the last fifty years.

The area planted with potato crop increased from 15035 and 17016 feddans in Summer and Nili seasons in 1954 to 30616 and 36609 feddans in 1968 respectively.

The U.A.R. government is pressing hard to increase the production of potato to meet the increasing demand of the population and to increase the tonnage of export. Increasing the total production of potato could be achieved by horizontal expansion through growing more area and by vertical expansion through improving the average yield per feddan and also by improving the new method of protecting plants from fungal diseases and insects.

Potato plants suffers considerably in the field from early blight disease caused by Alternaria solani (E.M.) which causes severe losses in most growing area.

The present investigation was planned to study the following factors :

In the laboratory :

The effect of different media, the effect of temperature, the effect of relative humidity and the effect of adding different concentrations of fungicides on the behaviour and the growth of the causal organism were studied.

In the field :

The effect of fertilizers, date of sowing, distance between plants, varieties and fungicides on the percentage of infection and the yield of Solanum tuberosum L. were studied.

Due consideration was also given to the influence of the above factors on the nitrogen, phosphorus and potassium uptake by Solanum tuberosum L. plants.

REVIEW OF LITERATURE

I. The causal Organism :

The fungus A.solani (E.M.) Jones & Grout was described by Ellis and Martin (1882). Jones (1892) in Vermont, Chester (1893) in Dclowar, Sturgis (1894) in Connecticut, Sorauer (1896) in Germany, Mc Alpine (1896) in Australia, Whetzel (1923) in Bermuda, Folsom and Bonde (1925) in U.S.A., Gratz and Bonde (1927) in U.S.A. also and Pittman (1929) in Australia.

II. Physiological studies :

Effect of temperature :

Several writers have studied the effect of temperature on the rate of growth, amount of growth and germination of spores in culture in the laboratory and disease severity on plants in the field.

Roth (1936), Klaus (1940), Zacha (1948), Tweedy & Duight Powell (1960) found that the optimum temperature for the growth of A.solani was 28°C while Arya & Prasade (1953), Kapoor and Hingorani (1960) reported that the optimum temperature for the growth of the fungus was 29°C. Working on the effect of temperature on spore

germination, Kapoor and Hingorani (1960) in India found that the optimum temperature for germination was 29°C. whereas Tweedy and Duight Powell (1960) reported that 26°C was the best for sporulation.

Gratz & Bonde (1927) reported that the optimum temperature for the development of the lesions of early blight on potatoes was 13°C. to 16°C. with a minimum at 5° to 7°C and a maximum below 25°C.

Moore (1942) noticed that the infection increased with rising the mean temperature within the ranges of 12°C to 17°C and 23°C to 28°C.

Westphalen & Brigittor (1956) noticed that the optimum temperature for infection was 20°C.

Effect of fungicides :

Strecker (1927) reported that the action of the dithiocarbamates, Ferbam, Ziram, Thiram, Nabam and Zineb of trichlorodichloro-trichloro and penta chloronitrochloro benzens and malachite green, Quinsol and cersan were toxic to A.solani.

Kanjanasoon et al (1963) found that Perenox (0.3%) checked the growth of A.solani.

III. Field experiments :

Various workers have studied the effect of different fungicides on early blight and yield of potato.

Cook (1922) and Chittenden (1923) found that Bordeaux mixture gave good control for A.solani. They also stated that the yield increased in the treated plots than the control.

Tilford (1925) reported that copper-lime dusts and liquid Bordeaux sprays gave good control to potato early blight. The yield was greater with spraying than with dusting.

Martin (1926) & Riha (1928) reported that good results in controlling early blight of potatoes were obtained by application of 5 -. 5 - 50 Bordeaux mixture. They also found that application of 10 .- 10 - 50 Bordeaux mixture resulted in higher yield.

Smith (1931) found that cupric sprays controlled the early blight in Jamaica.

Wager (1931) reported that five applications with Bordeaux mixture (4-4-50) gave good results. The yield

was increased by 8 to 50 per cent. Satisfactory control of A.solani has also been obtained by dusting with Bordeaux or copper-lime dust.

Narasimhan (1932) found that good control has been obtained by the application of 0.5 or 1 per cent Bordeaux with casein when the crop is 20 days old and again at after six weeks or two months.

Moore & Wheeler (1933) controlled the disease either by spraying with Bordeaux mixture or dusting with copper-lime. They noticed that the yield was increased. They also found that seven or more applications should be made at seven to ten days intervals throughout the growing season, beginning when the plants are about 4 inches in height.

Narasimhan (1934) found that 0.5 per cent Bordeaux mixture gave good control for early blight. The first application was given when the crop was 15 to 20 days old and the second a month later.

Narasimhan (1934) observed, that spraying with calcium arsenate (1 lb. in 50 galls water) checked the infection. In (1935) he added that calcium arsenate

(1 Lb. in 50 galls water) when applied 30, 40 days after planting increased the yield in the treated plots.

Memento (1937) showed that Bordeaux mixture application secured remarkable results for early blight control. He found also that disinfection of the seed bed with formalin (2 in 100) a week before sowing considerably reduced the infection of young plants.

Petty (1938) used 4-4-50 Bordeaux mixture for early blight.

Jehle (1940) showed that spraying with Bordeaux mixture (4-4-50) controlled early blight.

Stapel (1943) showed that two applications of 2% Bordeaux mixture reduced early blight infection and increased the yield.

Wager (1945) recommended successive spraying with Bordeaux mixture or dusting with copper-lime dust for early blight control.

Wilson & Sleesman (1945) found that spraying Zerlate gave a higher yield than Bordeaux. They also noticed that zerlate was equal to Bordeaux in early blight control.

Heuberger & Stearns (1946) used Bordeaux, Zerlate (compound A. Zinc dimethyl dithiocarbamate) and (disodium ethylene bisdithiocarbamate) Dithane + Zinc sulphate-lime for controlling early blight.

Littauer & Palti (1946) found that Bordeaux mixture and peronox were equally effective in reducing the infection with early blight.

Ruehle (1947) noticed that Dithane zinc-sulphate lime (1½ - 1 - 1½) controlled early blight effectively.

Buchholtz et al (1948) reported that Dithane D-14 plus zinc sulphate plus lime, and parzate provided the best foliage protection against early blight and gave slightly higher yields, followed by phygon tribasic copper, and Bordeaux mixture.

Campagne & Genereux (1948) noticed that seven applications of Bordeaux mixture (4-4-40) and peronox caused best control and increased the yield.

Harry et al (1948) indicated that tow-copper high-zinc chromate complex (169 at 4 to 6 Lb. in 100 galls water) controlled early blight in Pennsylvania.