STUDIES ON SOME FUNGI CAUSING ROOT-ROT TO *PHASEOLUS VULGARIS*

By

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Introduction.

Dry and snapbeans (*Phaseolus vulgaris* L.) is one of the most important economic vegetable crops in U.A.R. The total cultivated area increased during the last year, as it reached about 21632 feddans in 1968 yielding 47175 tons of dry and snapbeans (Department of Agricultural Economic Statistics, April. 1969 in Arabic).

The U.A.R. government is pressing hard to increase the production of bean to meet the increasing demand of the population and to increase the tonnage of export in purpose of the hard currency. As regards bean export, it ranks the second vegetable export crop after potatoes. The exported tonnage was 3210 tons in 1968 and 3963 tons in 1969, the reciprocal cash out put was equal to L.E. 401,000 and 461,000 respectively, (The General Egyptian Organization for Trade 1970).

It is worthy noting that the canning bean industries are important especially in wartime.

Several diseases are known to attack beans such as rust and root-rots.

It was noticed lately, that the damage due to root-rot diseases on beams increased considerably in the last few years in U.A.R., (Hassanein 1967).

The problem of root-rot of bean had received a considerable attention in many countries.

The present investigation represents the results of experiments designed to illustrate the main pathogens of root-rot. It also includes some physiological, greenhouse, and field studies on the disease and its causal organism as follows:

1. Physiological studies initiated to study the effect of different media, temperatures, relative humidities, pH values, and fungicides.

2. Greenhouse studies on the effect of varietal resistance, fertilizers, depth of sowing, fungicides, soil type, watering, and organic matter.

3. Field studies were designed to study the effect of varietal resistance, irrigation, fertilizers, seed dressing, and organic matter on the disease.

REVIEW OF LITERATURE

Causal Organisms:

Atienza (1927), found that *Sclerotium rolfsii* was the most serious pathogen on french-bean. This finding was also reported by Fajardo and Mendoza (1935), and Westcott (1960).

Other workers, on the otherhand, reported *Rhizoctonia solani* as the main pathogen which causes root-rot to beans and other plants. Among these workers, Anon. (1943), Person (1944), Houston (1945), Duggar and Stwart (1945), Brayon (1945), Schnathorst et al. (1953), Andersen and Huber (1962), Flentje (1964), Crosier et al. (1967), and Maciejowska and Boguslawski (1968). Both *Rhizoctonia solani* and *Sclerotium rolfsii* were reported by Borzini and Picco (1949), and Luttrel and Garren (1952).

Anon. (1941), reported that *Fusarium* spp., *Rhizoctonia* spp., *Macrophomina phaseoli* and *Sclerotium rolfsii* caused various mortality percentages on beans.

Anon. (1944), indicated that the roots and stems of snapbeans were mainly rotted by *Sclerotium rolfsii*, *Macrophomina phaseoli*, and *Corticium solani*.

Anon. (1945), reported that snap-bean root-rot was attributed to *Rhizoctonia solani* and *Macrophomina phaseoli*.

Meiners (1950), stated that *Pythium butteri* caused *Pythium* wilt on bean varieties in Southern Idaho.

Anon. (1955), reported that the principal pathogen causing root-rot on legumes was considered to be a race of *Fusarium oxysporum* f. *pisi*. It was added that *Macrophomina phaseoli*, *Corticium solani*, and *Fusarium solani* were occasionally associated with *Fusarium oxysporum*.

Lopez (1958), stated that *Sclerotium* sp., *Fusarium* sp., and *Rhizoctonia* sp., were found to be the most prevalent fungi associated with seed decay and damping-off of bean in CauCa valley.

Snyder and others (1959), recorded that root-rot of berkeley bean in the Salinas valley was caused by *Fusarium solani* f. *phaseoli*, R. (*Corticium*) *solani*, and *Thielaviopsis basicola*.

Brown (1961), mentioned that root rots of beans caused by *Fusarium* sp., *Sclerotium rolfsii*, and *Rhizoctonia solani* were important in the central coastal region of Peru.

Harper (1964), isolated *Pythium* spp., and *Fusarium* spp. from diseased roots of peas.

Shirley (1965), found that hypocotyl rot of bean was incited by *Fusarium solani* f. *phaseoli*, *Rhizoctonia solani*, and *Pythium* spp., in different degrees of infection.

Shaw-ming and Hagedorn (1966), recorded *Rhizoctonia solani*, and *Pythium* spp. as causers of root-rot of processing bean in Wisconsin.

Watanabe (1968), proved that *Macrophomina phaseoli* caused mortality for bean in both naturally and artificially infested soil.

Ballantyne (1968), recorded *Fusarium solani*, *Rhizoctonia* sp., *Pythium* spp., and *Sclerotium rolfsii* as causers for summer death of bean.

Physiological Studies:

Media:

Ashour and El-Kady (1958), reported that *Rhizoctonia solani* gave the highest amount of mycelium on Czapek's and glucose-peptone medium.

Sirry and Rushdi (1962), found that some isolates of *Rhizoctonia solani* gave the best growth on Potato agar, other isolates gave the best growth on Czapek's and Potato media.

Temperature:

Lauritzen and Whitney (1933), found that the optimum temperature of *Rhizoctonia solani* extends from 24°C to 32°C.

Le clerge (1939) and Person (1944), reported that the optimum temperature of *Rhizoctonia solani* ranged from 25°C - 30°C according to the isolate.

Houston (1945), indicated that the optimum for *Rhizoctonia solani* Kühn was 28°C, while its maximum was 33°C.

Kendrick (1951), reported that the optimum for the growth in culture of *Rhizoctonia solani*, isolated from various districts in California, varied from 64 to 91°F. (17.5 - 32°C.)

Shaw (1960), stated that *Rhizoctonia solani*, *Rhizoctonia* sp., and other mycelia sterilia grew well at 16-24°C.

Baker and Waker (1962), found that the optimum temperature for the mycelial growth of Wisconsin isolate of *Pellicularia filamentosa* was 24°C while it was 28°C for north Carolina isolate.

Sirry and Rushdi (1962), reported that isolates of *Rhizoctonia solani* gave the best growth at 25°C.

Raffray and Sinclair (1965), found that the optimum temperature for the growth of *Rhizoctonia solani* was 24°C.

Relative Humidity:

Abd-El-Salam (1933), indicated that the optimum relative humidity of *Rhizoctonia solani* was 100 % at 28°C.

Ashour and El-Kady (1958) & Ashour and I.F. Gamal El-Din (1961), found that the optimum growth of *Rhizoctonia solani* was between 92.9 to 100 % R.H.

pH value:

El-Arosi (1957), reported that the optimum pH value for *Rhizoctonia solani* was 5.9

Ashour and El-Kady (1958), found that the optimum pH value was about 4.2 for *Rhizoctonia solani*.

Ashour and Gamal El-Din (1961) mentioned that the range of pH value was 3.6 - 11.4 for *Rhizoctonia solani*.

Ross (1960), reported that *Rhizoctonia* sp., *Rhizoctonia solani*, and other mycelia sterilia grew well at pH 5.8.

Sirry and Rushdi (1962), declared that some isolates of *Rhizoctonia solani* grew at a wide pH range i.e., from 5.2 to 7.5.

Environmental Conditions:

Varietal resistance:

Borsini and Picco (1949), stated that "Regina atla di Monsummano" was the most tolerant for *Rhizoctonia solani* and *Sclerotium rolfsii* root rots among five bean varieties tested.

Zaumeyer and Thomas (1953), stated that no bean varieties were resistant to Sclerotium root-rot.

Anon. (1956), stated that some Mexican bean varieties were highly resistant to *Fusarium* root-rot.

Hilton and Cook (1963), mentioned the bean variety "Pinto" as the most susceptible to pre-emergence damping-off, small white bean variety as intermediate, and "N 203" bean variety as the most resistant one.

Kimati and Mascarenhas (1967), found that the varieties Creme, Pintado, Feijao 60, and Preto G-1 were tolerant of root-rot caused by *Fusarium* sp., *Rhizoctonia solani*, and *Sclerotium rolfsii*.

McCLEAN and others (1968), found that in snapbean 12 breeding lines out of 600 showed resistance to *Rhizoctonia solani*, they added that the most resistant line had dark seed coats and woody hypocotyls or small cotyledons which abscissed early.

Prasad and Weigle (1969), stated that the varieties Venezuela 54, pl 165426, and Valentine had the highest resistance to *Rhizoctonia solani*, and they attributed the resistance to the low amino acid content and the production of secondary substances in resistant hosts.

Mineral fertilizers:

Anderson (1939), found that the supplemental soil nitrogen increased root-rot disease on snapbeans.

Blair (1943), noticed that the addition of nitrogen to the soil had not increased the growth of Rhizoctonia solani.

Anon. (1944), reported that super phosphate fertilizer reduced the loss due to Rhizoctonia solani root-rot of bean.

Tyner (1948) and Papavizas (1963), found that high nitrogen application decreased numbers of bean rhizosphere antagonists.

Dubey (1958), mentioned that there was a negative correlation between "N" content of soil and the disease incidence, and a positive one between the latter and the "k" content.

Davey and Papavizas (1960), stated that the supplementary nitrogen in the forms of NH_4NO_3 & Uramite was effective in reducing Rhizoctonia disease of bean when applied alone.

Kaufman and Williams (1965), claimed that the total numbers of fungi were unaffected by phosphorous and Potassium fertilization, they added that the total and proportions of antagonists were increased by phosphorous and potassic fertilization. They also found that nitrogen fertilization increased the total numbers of fungi.

Depth of Sowing:

Wilson (1953), decided that bean root-rot caused by *Sclerotium rolfsii* occurred near the soil line.

Enrico and Krag (1961), recorded that the rate of post-emergence damping-off was less at shallow sowing (1-2 cm.). They added that emergence decreased and post-emergence damping-off was enhanced when seeds were deeply sown.

Crossan (1965) & Wester and Goth (1965), declared that seeding of snapbean at 3-inch depth consistently resulted in a greater amount of pre-emergence decay and serve root rot than seeding at 1-inch depth.

Fungicides:

Young (1940), stated that seedtreatment with Ceresan or Red copper oxide gave good control of *Rhizoctonia solani* root-rot.

Anon. (1941), explained that seedtreatment with Yellow Cuprocide or Spergon prevented pre-emergence seed decay and damping-off caused by *Rhizoctonia solani*, *Fusarium* spp, *Sclerotium bataticola*, and *Sclerotium rolfsii*.

Busha (1942), reported that the Sulphur Compound 50 %, and TMTD prevented rotting and stimulation of pre-, and post-emergence damping-off of ground nut.

Anon. (1944), reported that seeddressing by Agrosan or Ceresan reduced *Rhizoctonia solani* losses on broad bean .