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SUMMARY

Fusarium oxysporum f. sp. *garlic* Matuo, Miyagawa and Saito attacks garlic plants causing basal rot disease in Upper Egypt causing severe losses to crop production through the growing season and storage period. Therefore an attempt was made to document the record of *Fusarium oxysporum* f. sp. *garlic* as a new forma speciales on garlic in Upper Egypt, study some factors affecting disease incidence and control of such disease by using soil solarization and biological control.

Results of this work can be summarized as follows:

- 1 - Nine isolates of *Fusarium oxysporum* f. sp. *garlic* Matuo, Miyagawa and Saito were isolated from naturally diseased garlic plants collected from different localities of Assiut Governorate, Egypt. These isolates proved to be able to infect Chinese garlic cultivar causing wilting, yellowing of the leaves, brown discoloration and dry rot of basal bulb. On the other hand, these isolates were not able to infect Giza 6 onion cultivar. Isolates of the causal pathogen varied in their virulence on Chinese garlic cultivar.
- 2 - Studies on the effect of certain factors on incidence of basal rot disease, growth and yield of garlic showed that:
 - A- Under greenhouse as well as field conditions in 2000/2001 and 2001/2002 growing seasons, sowing large and small cloves greatly decreased and increased the percentage of infected plants with basal rot disease caused by *Fusarium oxysporum* f. sp. *garlic*, respectively as compared with the control. On the other hand, sowing medium cloves greatly decreased the percentage of infected plants with basal rot disease under field conditions in the two growing seasons, whereas it had no effect in this respect under greenhouse conditions. Under field conditions in the two

growing seasons, sowing large cloves size greatly increased plant height, bulb diameter and bulb fresh weight, while sowing small cloves gave the reverse results in these aspects as compared with the control. Sowing medium cloves greatly increased the plant height in the two growing seasons as compared with the control.

B.1- Under greenhouse as well as under field conditions in 2000/2001, 2001/2002 growing seasons, treating cloves of garlic by 0.1% solution of zinc, copper and cobalt decreased the percentage of infected plants with basal rot disease as compared with the control. Zinc was the most effective one in this respect followed by copper and cobalt. Boron had no effect in this respect. Results also, revealed that zinc and copper caused increase in plant height, bulb diameter and bulb fresh weight as compared with the control in the two growing seasons. Cobalt and boron increased the plant height, whereas they had no effect on bulb fresh weight as compared with the control in the two growing seasons. On the other hand, cobalt and boron varied in their effect on bulb diameter from season to another.

B.2- Copper, zinc, cobalt and boron showed toxic effect on *Fusarium oxysporum* f. sp. *garlic in vitro* at 10 to 400 p.p.m. concentrations except cobalt at 10 p.p.m. and boron at 10 and 25 p.p.m. concentrations had no effect in this respect. Copper was the most effective one.

3 - Studies on control of garlic basal rot disease by using soil solarization and biological control revealed that:

3.1- Studies on the effect of soil solarization on soil temperatures, population of the causal pathogen, incidence of garlic basal rot disease, growth and yield showed that:

- 3.1.1. Tarping moist soil with transparent polyethylene tarps during August and September months was remarkably effective in increasing soil temperature at 10 and 20 cm depths in 2000 and 2001 seasons.
 - 3.1.2. Mulching the soil with transparent polyethylene tarps for 15, 30 and 45 days greatly reduced the populations of *Fusarium oxysporum* f. sp. *garlic* in soil in 2000 and 2001 seasons. Tarping the soil for 45 days was more effective than 30 and 15 days in reducing populations of the tested pathogen in the soil. In tarped soil, populations of the causal pathogen greatly reduced at depth of 0-10 cm more than that at 10-20 cm soil depth.
 - 3.1.3. Soil solarization effectively controlled garlic basal rot disease in 2000/2001 and 2001/2002 seasons. Tarping the moist soil with transparent polyethylene tarps for 15, 30 and 45 days significantly decreased the percentage of infected plants with basal rot disease compared with the nonsolarized soil. Tarped soil for 45 days in the two successive growing seasons was the most effective one in reducing the percentage of infected plants followed by tarped soil for 30 and 15 days.
 - 3.1.4. Soil solarization for 15, 30 and 45 days caused highly significant increase in both plant height and bulb fresh weight. Mulching the soil for 45 days was the most effective one in these respects followed by mulching the soil for 30 and 15 days.
- 3.2. Studies on the effect of certain microorganisms associated with garlic roots as biocontrol agents and their culture filtrates on the

causal pathogen *in vitro*, incidence of basal rot disease, growth and yield of garlic showed that:

- 3.2.1. Four isolates of fungi were isolated from the rhizosphere of Chinese garlic cultivar. Two isolates were identified as *Trichoderma pseudokoningii*, one isolate identified as *T. longibrachiatum* and one isolate identified as *T. harzianum*. Also, three isolates of bacteria were isolated from the rhizosphere of the same cultivar and identified as *Bacillus subtilis*.
- 3.2.2. All fungal and bacterial isolates obtained from the rhizosphere of garlic plants inhibited the mycelial growth of *Fusarium oxysporum* f. sp. *garlic in vitro* and varied in their antagonistic effect.
- 3.2.3. Culture filtrates of either *Trichoderma* isolates or *B. subtilis* isolates inhibited mycelial growth of *F. oxysporum* f. sp. *garlic in vitro*.
- 3.2.4. Under greenhouse conditions as well as field conditions in 2000/2001 and 2001/2002 growing seasons, infestation of the soil separately with *Trichoderma pseudokoningii* and *T. harzianum* and treating cloves with *B. subtilis* significantly reduced the percentage of infected plants with basal rot disease compared with the control.
- 3.2.5. Infestation of soil separately with *T. pseudokoningii* and *T. harzianum* as well as treating cloves with *B. subtilis* greatly increased plant height and bulb fresh weight as compared with the control in the two growing seasons.