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EVALUATION OF VARIOUS FUNGICIDES ON STEM ROT OF CANTALOPE CAUSE BY Sclerotinia sclerotiorum

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Green house and laboratory experiments using seed dressing in combination with foliar spray methods with different fungicides were effective for controlling Sclerotinia sclerotiorum the causal agent of basal stem rot of cantaloupe. Of the fungicides tested quintozene as seed treatment and foliar spray gave the most promising results followed by chlorothalonil. In laboratory test using poisoned food technique the sclerotial number and size decreased using quintozene fungicide at the rate of 0.2%.

1. INTRODUCTION

Sclerotinia sclerotiorum attacks cantaloupe seedlings causing stem rot especially in the basel area of the stem, besides causing decay of the fruits under transit and market conditions. The disease occurs in most of the cantaloupe growing fields in Alexandria. The effectiveness of some fungicides in controlling *Sclerotinia* in cucurbit plants has been reported (Keim & Webster, 1975; Dana and Vaughan, 1950). So far there is no report including the phytotoxic level of seed treatment and foliar spray of different fungicides on cantaloupe seedlings. The following investigations have been made to study the effect of seed treatment and foliar application of fungicides on stem rot of cantaloupe seedlings and to study the correlation between the *in vitro* fungitoxicity using the poisoned food technique and fungal control *in vivo*.

2. MATERIALS AND METHODS

2. 1. Seed treatments

Six different fungicides (benomil, carboxin, chlorothalonil, quintozene, thiram, triforine) were used at the rate of 1.0, 2.0 and 2.5 g a.i./kg of cantaloupe seeds. The seeds and fungicides were mixed together in a plastic container till a nice coating was obtained.

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Seeds were sowed in a special seed bed container, only one seed in each square of the bed. Before sowing, compost soil and 14 days old culture of the pathogen (2% w/w) grown in PDA medium with enormous sclerotia were mixed and the nursery seed bed was prepared. Seedling rot was assessed after seven days.

2. 2. Foliar application

In order to observe the performance of seedlings treated with fungicides, a pot trial was conducted. Fifty healthy seedlings (15 days old) were inoculated by putting the *S. sclerotiorum* inoculum around each seedling. The same was done for fifty seedlings originating from seed treated with different fungicides. The fungicides were sprayed at 0.1 and 0.2% using an atomizer. Controls were maintained without any treatment. The disease incidence was assessed during a period of 15 days from the date of spraying. Three replicates were done for each treatment.

2. 3. Poisoned food technique

An *in vitro* study with six different fungicides (Table 1) was conducted via the classical poisoned food technique (PFT) (Schmitz, 1930). Suspensions of each fungicid at variable concentrations were added to sterilized PDA media just before pouring in petriplates. Checks were maintained without addition of fungicides. Small disks (6 mm) of the fungus culture were transferred aseptically to the center of each plate. All plates were incubated at 25^{o} C. The sclerotial number and size compared with control was recorded 10 days after inoculations. Percent inhibition was calculated by the following formula devised by Vincent (1947): P= [(C-T)X100]/C, where, P= Percent inhibition, C= No. of sclerotia in control, T= No. of sclerotia in treatment.

Table 1. Efficacy of different fungicides against *S. sclerotiorum* using PFT.

Fungicides	Chemical name	Conc. %	Average No. of sclerotia	% of Inhibition	Average size of sclerotia (cm)
Benomyl	N-(2,6-dimethylphenyl)-N-(methoxyacetyl)alanine methyl ester.	0.2 0.1	03.16 06.33	85.18 70.32	0.37-0.25 0.50-0.30
Carboxin	5,6-dihydro-2-methyl-1, 4-oxathiin-3-carboxanilide).	0.2 0.1	04.33 13.66	79.69 38.30	0.50-0.16 0.50-0.24
Chlorothalonil	tetrachloroisophthalonitrile..	0.2 0.1	09.50 13.66	55.46 35.95	0.48-0.36 0.80-0.54
Triforine	N,N-[1,4-piperazinediylbis(2,2,2-trichloroethylidene)]bis[formamide].	0.2 0.1	05.50 19.83	74.21 07.03	0.85-0.47 0.76-0.39
Quintozene	peptachloronitrobenazene.	0.2 0.1	00.00 13.83	100.00 35.16	0.0-0.0 0.60-0.50
Thiram	80% tetramethyl thiuram-disulphide.	0.2 0.1	06.66 16.16	68.77 24.23	0.37-0.14 0.44-0.22
Control	--	--	21.33	--	0.60-0.43

3. RESULTS AND DISCUSSION

3. 1. Seed treatments

Percentage seed germination and seedling infection are given in Figure 2 & 3. There was a marked difference in seed germination among the seeds treated with different fungicides at different concentrations. Seeds treated with quintozene showed the highest germination followed by carboxin treated seeds. Quintozene also reduced stem rot and was not phytotoxic even after 30 days. The incidence of stem rot was about 16.33% in untreated seeds while it was less in all treatments. Pre-emergence damping-off was noticed in untreated seeds only and it occurred more frequently than the post-emergence damping-off. There were no phytotoxic symptoms even after 30 days with all the fungicides at all concentrations used except in case of piperazine the plants were stunted in growth with malformed and wrinkled cotyledonary leaves and the true leaves were reduced in size compared to other treatments. This clearly indicates that piperazine should not be used for seed dressing since it induces phytotoxicity. Fuchs *et al.* (1971) have reported phytotoxicity due to piperazine at high rates of spray in cucumber and tobacco. It is evident from these results that seed treatments alone cannot completely protect against *S. sclerotiorum* infection from inoculum present in the soil but it can reduce the losses caused by the fungus.

3. 2. Foliar spray

Seedlings which received foliar spray of fungicides following seed treatments showed less infection (Figure 4). Quintozene and chlorothalonil foliar sprays were highly effective in controlling the disease. Carboxin and piperazine did not completely control the fungal infection. No phytotoxicity was noticed with any fungicide used at different concentrations except piperazine that induced phytotoxicity at the rate of 0.2%. It is evident from these results that a foliar spray of 0.2% quintozene is able to completely control the fungal infection up to 15 days and it may be the best method to control stem rot in cantalope seedlings. When a 0.1% foliar spray of quintozene was used, an initial seed treatment with quintozene clearly gave an additional protective effect. The same phenomena was observed for chlorothalonil. Out of the fungicides tested, quintozene as a foliar spray gave the most promising results followed by benomyl and chlorothalonil at the rate of 0.2%. Many reports indicate that quintozene is effective against many soil fungi like species of *Rhizoctonia, Sclerotium and Macrophomina* (Pergola and Garibaldi, 1975; Ilyas *et al.*, 1975; Hoch and Hagedorn, 1974) but is ineffective against *Pythium, Phytophthora* and *Fusarium* (Barnes and Zerkel, 1961; Reavill, 1954). Netzer and Dishon (1970) found that a foliar spray with benomyl was not so effective to control *S. sclerotiorum* on cantaloupe.

3. 3. Poisoned food technique

Increasing concentrations of fungicides caused a gradual decline in the number and size of fungal sclerotia during incubation period of study (Table 1). However, the number of sclerotia as well as the size was different by using different tested fungicides.

Only 0.2% quintozene completely inhibited the formation of *S. sclerotiorum* on PDA agar.

From the different results obtained it can be concluded that there is a good correlation between the *in vitro* fungitoxicity of quintozene and benomyl using PFT and fungal disease control by quintozene or benomyl *in vivo*. Nene and Thapliyal (1982) stated the same correlation for fungal diseases control by benomyl. This means that the PFT technique may give indications about the usefulness of specific fungicides for disease control *in vivo*. It should be noted, however, that some of the tested fungicides failed to control the disease when used as a foliar spray but gave good results when tested by PFT. There are many reasons for this but the major difficulties seem to be firstly, the large quantities of the chemical that are often necessary to kill sclerotia and secondly, the breakdown of the fungicides in the soil. This was discussed in detailed by Smith and Cooke (1971).

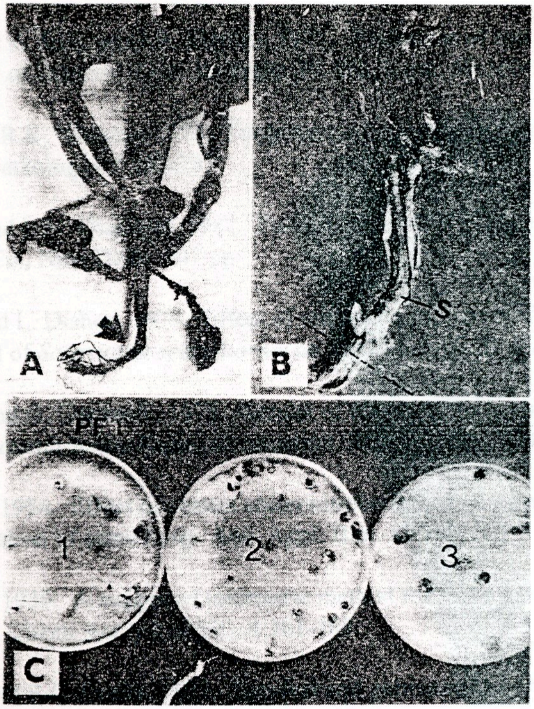


Figure 1.

A. Cantaloupe seedling infected with *S. sclerotiorum* in the basel area of the stem.

B. Cantaloupe plant highly affected by the fungus.

C. PFT showing the effect of quintozene (plate 1) and chlorothalonil (plate 2).

Legends: S= stem, PFT= Poisoned food technique.

Fig.2. Effect Of Seed Treatments

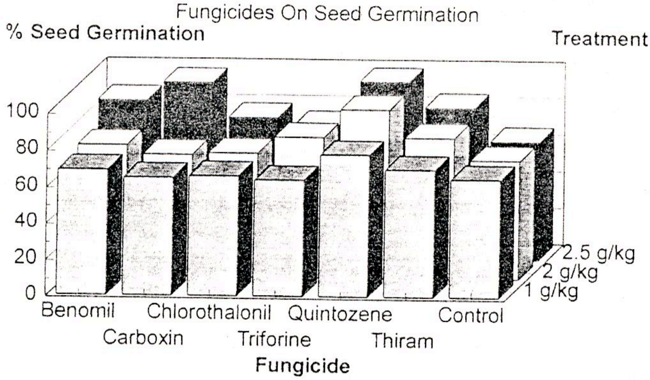


Fig.3. Effect Of Seed Treatments

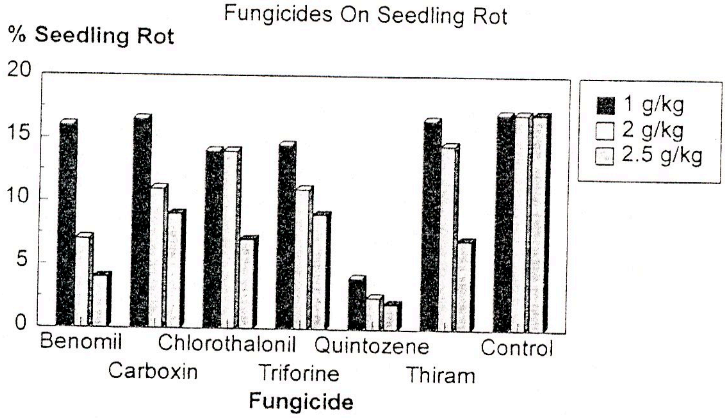
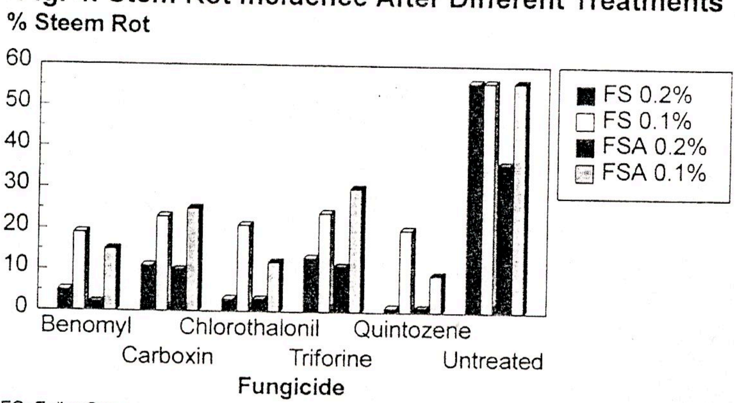


Fig. 4. Stem Rot Incidence After Different Treatments



FS: Foliar Spray.

FSA: Foliar Spray After Seed Treatment with the same fungicides

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