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BRIEF ARTICLE:

Effect of Fungicides on Damping off of Cucumber and Tomato Caused by *Pythium debaryanum*

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Abstract. The fungicidal activity of bavistin, benlate, cupravit and dithane M-45 against *Pythium debaryanum* was evaluated by two procedures: Inhibition of fungal growth on culture media amended with fungicides, and by their effectiveness in controlling damping off of cucumber and tomato seedlings in the greenhouse.

Cupravit and dithane M-45 at 200 ppm inhibited the growth of the fungus. These two fungicides were also effective against the fungus at 150 ppm. Bavistin and benlate at all concentrations tested did not inhibit fungal growth. The damping off of cucumber and tomato seedlings was controlled by cupravit and dithane M-45 at all concentrations tested (50, 100, 150 and 200 ppm). Bavistin and benlate were found to be ineffective against damping off. Potentially cupravit and dithane M-45 seem to be useful for the control of damping off caused by *P. debaryanum* under conditions of Saudi Arabia.

Introduction

Damping off of cucumber and tomato seedlings caused by *Pythium* species is a destructive disease in nurseries causing heavy losses [1 - 4]. The seedlings become resistant to damping off with increase in age [5]. Resistance of old plants to damping off appears to be due to physiological rather than anatomical factors [6].

The disease is mainly controlled through fungicidal treatment. Shamsher and Baker [1] observed that dexon (p-dimethylaminobenzenediazo sodium sulfonate) used at the rate of 25, 50 or 100 ppm inhibited the growth of *Pythium ultimum* Trow *in vitro*. Dexon, also in an *in vivo* study controlled the damping off of alfalfa and cucumber. Gupta *et al.* [7] has reported that the growth of *P. deliense* Meura *in vitro*

was decreased when various fungicides were used at different concentrations. Dan Neely [8] reported that metalaxyl used as a drench treatment in the greenhouse experiments gave excellent control of poinsettia root rot caused by *Pythium* spp. He has also reported that soil incorporated granules of MF-687 or Truban and a drench of Truban + thiophanate-methyl gave good protection against damping off of impatiens. In glasshouse and field trials, metalaxyl applied as a soil drench significantly reduced *Phytophthora cinnamomi* root rot of grapevines [9]. Alexandri *et al.* [10] observed that cymoxanil and thiram when mixed were antagonistic against *P. debaryanum in vitro*. Dannenhauer, *et al.* [11] has reported that the seedling diseases of some vegetables caused by *P. debaryanum* were controlled when cyanamide at the rate of 250 or 500 mg/kg was added to the soil. Fungicides have also been successfully used for the control of other fungi causing damping off on other plants [12 - 14].

The aim of the present study was to evaluate the effects of bavistin, benlate, cupravit and dithane M-45 on the growth of *P. debaryanum* Hesse *in vitro* as well as on the damping off disease of cucumber and tomato seedlings caused by this fungus.

Materials and Methods

The substrate soil used in all experiments was formulated from field soil, peat moss and sand in ratio of 2:2:1, respectively. The fungicides were thoroughly mixed into the soil at 50, 100, 150 or 200 ppm at the beginning of each experiment. The water content of the soil was brought up to field capacity (35%).

Following the method of Shamsher and Baker [1], two slightly modified techniques were used to ascertain the activity of the fungicides against *P. debaryanum;* a laboratory method using fungal discs and greenhouse pot test in which the severity of damping off was measured. Four fungicides namely: bavistin, benlate, cupravit and dithane M-45 which are known for their fungicidal property were used in all the experiments. The fungicides were added to the medium (Potato Dextrose Agar) at the rate of 50, 100, 150, or 200 ppm. Untreated check plates were maintained without adding any fungicide to the medium. Discs (6 mm in diameter) taken from five day old actively growing cultures of *P. debaryanum* were placed in the centre of amended and untreated PDA plates and then incubated at 25°C for three days. The growth of the mycelium was recorded at the end of the incubation period.

In the greenhouse experiments, the inoculum potential from 2-3 week old cultures (grown in a sterile mixture of sand with 2% corn meal) was mixed with the sterile soil at the rate of 2% by weight. The infested soil was covered and allowed for three days for fungal colonization. After three days, the fungicides were thoroughly mixed to the infested soil at the rate of 50, 100, 150, or 200 ppm. Infested soil but

without any fungicide was used as a check treatment. Cucumber and tomato (5 seeds each/same pot) were planted in infested soil. Soil free of inoculum and without any fungicide was used as control. There were four replications for each treatment. The pots were watered to field capacity and then covered with cellophane to maintain constant moisture conditions during germination. After emergence, the cellophane was removed and the pots were watered as required. Temperature within the greenhouse varied from 27-30°C during these experiments. A regular observation of the disease development was made.

Results and Discussion

Results of laboratory experiments (Fig. 1) reveal that bavistin and benlate did not inhibit the growth of the fungus at the concentrations tested, yet benlate expressed slight effect on mycelial growth when tested at 150 and 200 ppm. Cupravit and dithane M-45 substantially reduced the growth of mycelium at the concentrations tested.

In the greenhouse experiments, it was observed that cupravit and dithane M-45 controlled the damping off disease of cucumber and tomato seedlings caused by *P. debaryanum* at all concentrations tested (Table 1). Statistical analysis of the data was carried out by Duncan's multiple range test. The analysis showed that cupravit is significantly effective against damping off of cucumber and tomato seedlings followed by Dithane M-45 at the concentrations tested. Bavistin and benlate at the concentrations tested did not reveal any significant differences when compared with the control + pathogen treatments.

In these experiments, it was observed that cupravit and dithane M-45 were effective in inhibiting the growth of *P. debaryanum, in vitro* and in greenhouse trials. These two fungicides significantly reduced damping off of cucumber and tomato seedlings at all concentrations tested. The application of chemicals to soil before planting is expensive and is usually limited to nurseries [9]. *P. debaryanum* can cause damping off in the seedlings of three or four weeks old. After the seedlings are mature, they become resistant to damping off [5] and after transplanting to the field the fungus cannot attack it. Potentially cupravit and dithane M-45 seem to be useful for the control of damping off disease caused by *P. debaryanum* in the nursuries, under conditions of Saudi Arabia.

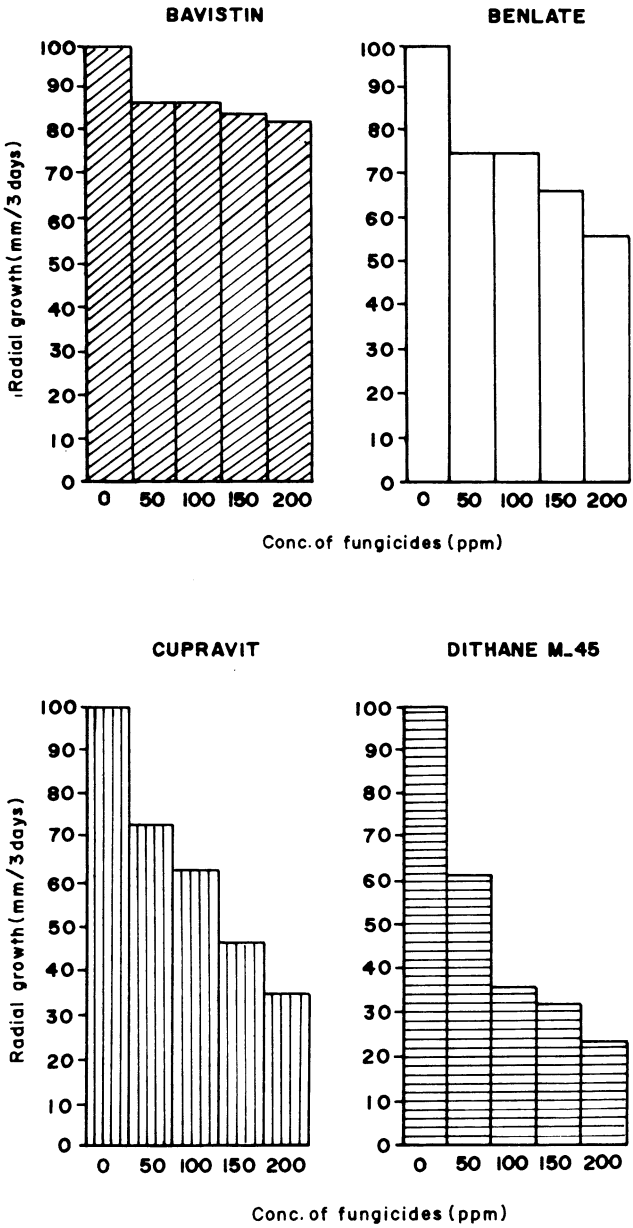

Fig. 1. Effect of different fungicides on the growth rate of *Pythium debaryanum*. O = CHECK

Table 1. The effect of different concentrations (ppm) of the candidate fungicides on the control of damping off of cucumber and tomato caused by *Pythium debaryanum.**

Treatment / Plant	Control	Control + Pathogen	*Bavistin*				*Benlate*				*Cupravit*				*Dithane* M-45			
			50	100	150	200	50	100	150	200	50	100	150	200	50	100	150	200
	**																	
Cucumber	100	10	20	20	20	20	–	20	20	–	60	80	80	80	40	60	60	60
	a	d	e	e	e	e		e	e		c	b	b	b	f	c	c	c
	***																	
Tomato	100	20	20	20	–	–	20	20	–	–	100	100	100	80	60	80	80	40
	a	e	e	e			e	e			a	a	a	a	c	b	b	f

* The data shown is the mean of four replicates.

** Indicates the percentage of living plants.

*** Duncan's multiple range test.

– No Plants.

Mean with the same letters are not significantly different.

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بحث مختصـــر

تأثير المبيدات الفطرية على مرض ذبول بادرات الخيار والطماطم المتسبب عن فطر بيثيوم ديباريانم

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(استُلم في ١٠ رمضان ١٤٠٩هـ، قُبل للنشر في ٢٣ ربيع الآخر ١٤١٠هـ)

ملخص البحث. تم تقييم تأثير أربعة مبيدات فطرية (البافستين، البنليت، الكيوبرافيت والدايثان ام ـ ٤٥) على فطر بيثيوم ديباريانم بواسطة طريقتين: الأولى عن طريق تثبيط نمو الفطر على بيئة النمو المعاملة بهذه المبيدات الفطرية عند تركيزات مختلفة، والثانية عن طريق تأثير تلك المبيدات الفطرية على مرض ذبول بادارت الخيار والطماطم المزروعة في الصوبة الزجاجية.

لوحظ في هذه الدراسة أن الكيوبرافيت والدايثان ام ـ ٤٥ قد يثبطا نمو البادرات تمامًا عند تركيز ٢٠٠ جزء في المليون، وكان لهما أيضًا تأثير فعال عند تركيز ١٥٠ جزءا في المليون، أما مبيدا البافستين والبنليت فلم يمنعا نمو الفطر عند معاملات التراكيز كافة. وقد أمكن مقاومة مرض ذبول بادرات الخيار والطماطم بواسطة مبيدي كيوبرافيت ودايثان أم ـ ٤٥ عند جميع التراكيز المستخدمة بينما كان أثر مبيدي البافستين والبنليت محدودًا في مكافحة فطر بيثيوم ديباريانم.

ويمكن تفسير الاختلاف في النتائج جزئيًا بالسهولة النسبية للفطر في غزو بيئة النمو. وقد أظهرت هذه الدراسة أن لمبيدا الكيوبرافيت والدايثان ام ـ ٤٥ مقدرة ملحوظة ومفيدة في مقاومة مرض ذبول البادرات المتسبب عن فطر بيثيوم ديباريانم تحت ظروف المملكة العربية السعودية.