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FACTORS AFFECTING SEVERITY OF BOTRYODIPLODIA THEOBROMAE ON DATE PALM OFF-SHOOT AND ITS CONTROL

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Abstract

Zaghlol variety of date palm was the most susceptible to *Botryodiplodia theobromae*, The optimum temperature for infection with the fungus ranged between 30 and 35°C at 50% relative humidity. Propiconazole was the best fungicide to inhibit the linear growth of the pathogen and to eliminate new infections in the field.

INTRODUCTION

Botryodiplodia theobromae was found to be the most important fungus that infect date palm off-shoots in Egypt (Barakat *et al.* 1992) and Abdel-Megid and Gafar (1966). They also noticed that the disease was more frequent and severer in the northern areas. So, some factors affecting the severity of date palm off-shoot deterioration and its control were studied.

MATERIALS AND METHODS

An isolate of *Botryodiplodia theobromae* was isolated from naturally infected date-palm off-shoots by Barakat *et al.* (1992).

Two different plant materials were employed in this study: (1) Date palm off-shoots *Phoenix dactylifera* var. Zaghlol were used in the chemical control experiments in the field. These off-shoot were about 2 years old and were provided by the nursery of the Ministry of Agriculture Located at Bosaily, Rasheed, Behera Governorate , (2) Rachides of yound off-shoots var. Zaghlol were cut into parts, 20 cm long. These parts were used to study the effect of some factors on disease development in laboratory experiments. Similar plant materials were used to test the relative susceptibility of some local palm varieties (i.e., Zaghlol, Samani and Hayani). Inoculation of these parts was done as described by Barakat *et al.* (1992) using 5 mm fungal disks and kept at 30°C and 50% relative humidity in ethanol-sterilized plastic boxes. The length of lesions on each rachis was measured after 8 days and considered as an indication to the severity of artificial infection. Also, the effect of temperature as well as relative humidity were studied. Each box contained four parts and each treatment consisted of 4 replicates. The relative humidity inside the boxes was adjusted, using the method adopted by Solomen (1951).

To study the effect of leaf age on its susceptibility to the pathogen parts from internal (younger) and external older leaves were used . The effect of eight fungicides, i.e. propiconazole (Ciba Geigy), carbenadazim (Basf), Benomyl (Du Pont), Zineb + maneb (Pepr overseas), Mancozeb (Rohm and Hass), copper hydroxide (Kennecott), thiophanatemethyl (Nippon Soda) and carboxin captan (ICI) on *B. theobromae* were studied *in vitro*. Different amounts of each compound were incororated into sterilized P.D.A. medium immediately before pouring, to have concentrations ranging from 10 to 200 ppm. Four plates were used for each treatment. The inhibitory effect of these fungicides was measured according to the linear growth of the tested fungus (Kulik and Tims 1960) after incubation at 30°C for 3 days.

The effect of six of the above mentioned fungicides on the disease in the field were studied during 1989-1990 at Bosaily - Rasheed, Behera Governorate. The off-shoots were naturally infected with *B.theobromae* and free of insects or acarides attack. Concentrations of fungicides used were as recommended by the producers.

One concentration of each fungicides was selected according to its *in vitro* toxicity to the pathogen.

The fungicides were sprayed at three consecutive dates; 1st spray at the end of April 1989, 2 nd spray at the end of February 1990 and the 3rd at the end of

April 1990 while control off-shoots were sprayed with water. Data of the average percentage of infection were taken 30-40 days after each spray. Each treatment consists of 4 replicates of about 2 year old off-shoots.

The infection rate and disease severity rate (DSR) were calculated as follows:

$$\text{Infection \%} = \frac{\text{Number of infected off-shoots} \times 100}{\text{Total number of off-shoots}}$$

$$\text{DSR} = \frac{(n \times v)}{N}$$ where N = total number of infected rachides,

n = number of rachides per category and V = category number, which was expressed as follows, 0 = No. apparent symptoms, 1 = Length of lesions ranged from 1-5 mm, 2 = Lesion area was > 5 cm^2 and some small lesions coalesced, 3 = infection was randomly distributed and infected tissue begin to collapse, 4 = half or more of the rachis collapsed but the rachis was still alive, and 5 = most of the rachis collapsed and dried and the base of rachis was already infected. The DSR was suggested by Chastanger and Ogawa (1979).

RESULTS

Varietal susceptibility :

Table (1) shows that the largest infected area with the fungus was obtained on rachides of Zaghlol variety after 8 days incubation at 30°C, while the smallest infection area was noticed on rachides of Smani variety of Hyani was moderate between Zaghloe and semmani varieties . The infection on rachides of Hyani was moderate between zaghlol and samani varieties. First symptoms appeared after 5 days of infection as brown necrotic area around the site of infection.

Effect of temperature :

Date in Table (2) show that the optimum temperature for infection with *B. theobromae* on date palm rachides ranged between 30 and 35°C. No significant dif-

ference was noticed in the area of infection at both degrees. However, disease expression had sharply declined below 30°C with a minimalreading 5.5 mm at 25°C. No infection was observed on rachides incubated at 40°C.

Effect of relative humidity (R.H.):

Data in Table (3) show that the highest infection rate (13.6 mm) was obtained at 50% relative humidity. The lowest rate of disease development accurred at both extremes (i.e. 14.5 and 90% R.H.). High rate of disease incidence was also recorded at 74% R.H. Thus, it may be concluded that the optimal R.H. lies between 50 and 74%.

Effect of leaf age :

Table (4) show that the rachides of young leaves of date palm off-shoot were more susceptible to infection with *B.theobromae* than the older leaves of the same off-shoot. However, statistical analysis proved insignificant differences between both leaf ages.

Chemical Control :

Laboratory screening of different fungicides :

Propiconazole, benomyl, carbendazim and thiophanate M. were effective at the rate of 10 up/ml. Moderate growth inhibition was obtained by Carboxin-Captan, Mancozeb and both copper fungicides. The least effective one was copper hydroxide.

For the effect of chemical control in the field table (6) show that Tilt 250 (50 up/ml), Benlate (500 ug/ml) ad Dithane M45 (200 ug/ml), were the most effective fungicides in producing healthy new leaves. Thus, percent infected leaves was significantly reduced. None of these fungicides could reduce disease severity on infected leaves.

DISCUSSION

Date - palm off-shoot deterioration was more frequent and severe in the Northern areas where the relative humidity ranged from 50 to 75% and less frequent in the mid valley area and virtually disappears in the drier areas of Upper Egypt where the climate was less humid (Barakat *et al.* 1992).

Laboratory experiment confirmed this finding as 50 % and 74% relative humidity enhanced the highest percentage of infection. However, Raga et al. (1971) reported that the growth of *B.theobromae* (mango isolate) on media was favoured by high atmospheric humidity. Radwan (1985) and Korra (1989) found that *B.theobromae* gave the highest rate of growth at 80-100 % R.H. These results are agreeable with Verma and Singh (1970) who stated that the development of mango die-back disease was at its optimum at relative humidity less than 80%.

The optimum temperature for infection with *B.theobromae* ranged between 30 and 50°C. These results are in conformity with the findings of many authors. El-Helaly *et al.* (1955) found that black fruit disease of banana caused by the same fungus was higher at 25-35°C. These results may explain the geographical distribution of the disease on date palm off-shoots.

Date palm varieties exhibited different reactions in their susceptibility to the pathogen. Zaghlol variety was the most susceptible one while Samani variety was the least. From laboratory experiments and field sureys, it was concluded that none of the tested date - palm varieties has shown effective resistance to *B. theobromae.*

There was no significant difference in susceptiblity of young and old leaves to the pathogen. This might explain, why there is no given trend of the disease extention. The fungus may infect the outer leaves and then infect the younger ones and the terminal bud. Sometimes, the central leaf cluster may die before the older leaves. This was also reported by Abdel-Megid and Gafar (1966). Although there was no significant difference between the length of lesions on younger and older leaves, they were usually longer in younger ones. This may be attributed to the tenderness of the younger tissues.

The majority of the tested fungicides were effective in inhibiting linear growth of *B. theobromae in vitro* as well as rate of infection *in vivo* studies, propiconazole 50 ug/ml. them benomyl 500 ug/ml and thiophanate methyl 420 ppm were

Table 1 . Susceptibility of three varieties of date palm off-shoots to *B.theobromae.*

Varieties	Length of infected lesion (mm) After 8 days at 30°C
Zaghlol	19.00
Samani	9.25
Hayani	14.25
L.S.D. at 0.05	5.36

Table 2 . Effect of temperature on infection of rachides with *B.theobromae.*

Temperature (°C)	Length of infected lesion (mm) After 8 days of incubation
25	5.5
30	19.0
35	17.0
40	0.0
L.S.D. at 0.05	4.14

Table 3 . Effect of relative huymidity R.H. on infection of rachides with *B.theobromae.*

r.h. values (%)	Length of infected lesion (mm) Incubated at 30°C for 8 days
100	8.6
95	9.6
90	8.6
80	9.6
74	11.3
50	13.6
14.5	8.6
L.S.D. at 0.05	3.5

Table 4 . Effect of leaf age on infection with *B.theobromae.*

Temperature	Length of infected lesion (mm)
Yount leaf	17
old leaf	12

Table 5 . Average linear growth (mm) of *B.theobromae* at different fungicides

Common name	Conc. of fungicides in media (ug/ml)					
	10	50	100	500	1000	2000
Mancozeb	61.3	32.5	23.0*	0	0	0
Propiconazole (proposal)	0	0	0	0	0	0
Copper hydroxide	90.0	90.0	90.0	74.8	42.7	39.9
Zineb + maneb	90.0	90.0	79.5	0	0	0
Copper oxychloride	0	0	0	0	0	0
Benomyl	0	0	0	0	0	0
Carbendazim	0	0	0	0	0	0
Thiphanate-methyl	88.3	23.6	10.3	0	0	0
Carboxin 37.5 Captan 37.5	90.0	90.0	90.0	90.0	90.0	90.0
Control						

* Each figure is the average of 4 areplicates recorded after 3 days at 30°C Fungicides (A) Conc. (B).

L.S.D. at 5% for (A) 0.074

L.S.D. at 5% for (B) 2.28

L.S.D. at 5% for (A) (B) 5.59

the best in reducing the percentive of infected rachides but none of them has significantly reduced the disease severity.

This may prove that these fungicides had a protective action and eliminate new infections on newly developed leaves. Also, lesion size on already infected leaves was not reduced, thus disease severity was unaffected on treated off-shoots.

REFERENCES

1 . Abdel - Megid, M.K., K. Gafar 1966. Diplodial leafstalk and off-shoots disease of date palm. J. Microbiol. U.A.R., 1 (2): 201-206.

2 . Barakat, F.M., K.K. Sabet, S.A., Hussein, M.F., Rashad. 1992. Pethological studies on the deterioration of date palm off-shoot caused by *Botryodiplodia theobromae.* Bulletin of Faculty of Agriculture, University of Cairo, in Press.

3 . Chastanger, G.A., J.M. Ogawa. 1979. A fungicide treatment to suppress *Botrytis cinerea* and protect freshmarket tomatoes. Phytopathology, 69: 59-63.

4 . El-Helaly, A.F.; I.A. Ibrahim, and H.M. El-Arosi. 1955 . Studies on Botryodiplodia fruit-rot on banana in Egypt. Alex. Jour. Agric. Res., 3 (2) : 109 - 121.

5 . Kulik, M.M., and E.C. Tims. 1960. Screening of fungicides and chemotherapeutants for control of Pink root of onions and shallots. Plant Dis. Retr., 44: 379 - 382.

6 . Korra, A.M.K. 1989 . Die - back of pome and stone fruit trees with special reference to peach die-back. M.Sc. Thesis, Fac. Agric., Cairo Univ. 169 pp.

7 . Radwan, F.M. 1985 : Studies on grapevine fruit - rot in A.R.E. M.Sc. Thesis, Fac. Agric., Cairo Univ.

8 . Ragab, M.M.; K.A. Sabet, and A. Nadia Dawood. 1971. *Botryodiplodia theobromae* Pat. the cause of fruitrot and die-back of mango in A.R.E. Agric. Res. Rev. 91: 81 - 97.

9 . Soloman, M.E. 1951. Control of humidity with potassium hydroxide, sulphuric acid and other solutions. Bull. En. Res., 42 : 543-554.

10 . Verma, O.P. and R.D. Singh. 1970. Epidemiology of mango die - back caused by *Botryodiplodia theobromae* Pat. Indian, Jour. Agric. Sci., 40 (9) : 813 - 818.

العوامل المؤثرة علي شدة إصابة فسائل نخيل البلح بالفطر *Botryodiplodia theobromae* ومقاومته

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يعتبر نخيل البلح من أهم أشجار الفاكهة فى مصر. وتحت الظروف البيئية المصرية تصاب الفسائل المعدة للزراعة أثناء تواجدها بالمشتل بالعديد من الأمراض الفطرية التى تؤدى الى تدهورها وإنخفاض نسبة نجاح زراعتها فى الأراض المستديمة بعد ذلك ويعتبر الفطر *Botryodiplodia throbromae* من أهم الفطريات التى تصيب فسائل النخيل فى المشتل والأرض المستديمة. وتتلخص النتائج المتحصل عليها من دراسة بعض العوامل المؤثرة على شدة الإصابة بهذا الفطر فيما يلى :

١- أختبرت قابلية بعض أصناف نخيل البلح للإصابة بالفطر *Botryodiplodia throbromae* ووجد أن صنف الزغلول أكثر قابلية للاصابة بهذا الفطر من صنفى السمانى والحيانى وذلك بالعدوى الصناعية على جريد فسائل هذه الاصناف.

٢- بدراسة تأثير الحرارة على شدة الإصابة بهذا الفطر وجد ان درجة الحرارة المثلى لحدوث الإصابة تقع بين ٢٠ – ٣٠ م ، بينما لم يتكشف المرض عند ٤٠م.

٣- كانت أعلى درجة فى شدة الإصابة بالفطر على جريد الفسائل عند درجة رطوبة نسبية ما بين ٥٠ – ٧٥ ٪.

٤- كانت الأوراق الداخلية (الحديثة) لفسائل نخيل البلح أكثر قابلية للإصابة بالفطر من الأوراق الخارجية (المسنة).

٥- وجد ان التجارب المعملية لإختبار فاعلية بعض المبيدات الفطرية على الفطر *Botryodiplodia throbromae* المسبب لهذا المرض حيث أن نموه الفطرى على أطباق البترى حدث له تثبيط كامل عند تركيز ١٠ متير وجرام/ميللي متر لكل من المبيدات الفطرية التالية :-

تلت ٢٥٠ ، بنيليت ٥٠ ٪، بافستين ، توبسن م ٧٠، وعند تركيز ٥٠٠ متير وجرام/ميللي متر للمبيدات الفطرية : دياثين م ٤٥ وكوبروزان سوبر ر ٣١١ ، فيتافاكس كابتان.

٦- أظهرت تجارب المقاومة لهذا المرض فى الحقل على فسائل النخيل المصابة أن أكثر المبيدات فعالية لمقاومته هى : تلت ٢٥٠ ثم يليه بنليت ٥٠٪ واخيرا دايثين م ٤٥ حيث كانت الأوراق الحديثة بعد المقاومة بحالة سليمة خالية من المرض.