THE RESPONSE OF SOME ROSE VARIETIES TO THE ATTACK OF THE PATHOGEN DIPLOCARPON ROSAE WOLF IN THE CLIMATIC CONDITIONS OF 2023

Adelina Larisa Munteanu[1], Rodi Mitrea[2]

[1]University of Craiova, PhD student, Faculty of Horticulture, Doctoral School of Animal and Plant Resources Engineering, Plant Protection – Phytopathology
E-mail:adelinamunteanu94@yahoo.com

[2] University of Craiova, Faculty of Horticulture, Faculty of Horticulture, Department of Biology and Engineering, Strada Alexandru Ioan Cuza, Number 200585, Craiova.
E-mail:rodimitrea@yahoo.com

Corresponding author email: adelinamunteanu94@yahoo.com

Abstract

The research was carried out on 10 varieties of roses grown in the "Alexandru Buia" Botanical Garden. During the growing season, field ratings were made on the frequency (F%) and intensity (I) of attack in order to calculate the degree of attack (GA%). The determinations were made at three different times, namely in June, September and October.Depending on the average values of the degree of attack at the three determinations, it was found that two varieties behaved as sensitive with attack degree values of 8.06% and (Ajsa) and 10% (Terracotta), respectively, and eight varieties as very sensitive with values between 15.83% (Velvet Fragance) and 35% (Melina).The quantification of the effect of the attack of the pathogen Diplocarpon rosae Wolf on the monitored rose varieties revealed changes in some biological characteristics related to the ratio of foliole length and width to the same parameters in the case of unattacked organs. The most severe loss was due to their response to attack by the pathogen Diplocarpon rosae Wolf.

***Key words**: pathogen, rose varieties, frequency of attack, degree of attack.*

INTRODUCTION

Nauta and Spooner (2000) state that black spot caused by *Diplocarpon rosae wolf* is the most economically important disease affecting garden roses worldwide. Typical symptoms of this disease are manifested by the appearance of black, rounded spots on the adaxial part of the leaves, while the abaxial epidermis remains uninfected. The disease can cause the development of chlorosis around the lesion and possible defoliations (Blechert and Debener, 2005; Gachomo et al., 2006; Horst and Cloyd, 2007).

Through repeated cycles of infection, the disease can reduce growth, decrease flower production, or eventually cause plant death (von Malek and Debener, 1998).

The optimal growing conditions of this pathogen are high humidity, frequent rains and a cold climate. The optimum temperatures are 18ºC and 24ºC for conidia germination and disease development, respectively (Drewes-Alvarez, 2003; Horst and Cloyd, 2007; Walker et al., 1995).

Two types of disease resistance have been characterized in roses that respond to this disease. Vertical or complete resistance, this blocks sporulation and severely restricts micellial growth of the pathogen, usually being controlled by major genes (Rdrs) (Debener, 1998; von Malek and Debener, 1998; Whitaker et al., 2007; Yokoya et al.,2000).

Partial or horizontal resistance has been identified in roses by Xue and Davidson (1998). This resistance does not prevent infection of the pathogen, but rather delays disease development and results in reduced lesion size, reduced sporulation, and/or delayed infection after inoculation (Parlevliet, 1981; Whitaker and Hokanson, 2009; Xue and Davidson, 1998).

Noack (2003) found that partial resistance is more durable in the range of pathogenic breeds.

Eleven *breeds of Diplocarpon rosae Wolf* have been identified among isolates obtained from North America and Europe (Whitaker et al., 2010).

MATERIALS AND METHODS

The study was conducted in the summer of 2023 on 10 varieties of roses grown in the Alexandru Buia Botanical Garden in Craiova.

- **Holstein pearls:** The height is 120-150 cm; The leaves are semi-glossy green; The flowers are solitary with 17-25 petals.

- **Glorious:** Shrubs of medium vigor 75/40 cm, with thick and straight branches; The leaves are large and dense and have a light-green, glossy color; The flowers are large and involute with 35 pure yellow petals, slowly opening and spirally with a moderate fragrance.

- **Orient express:** At maturity, the plant reaches a height of 2-2.5 m;The foliage is dark green in color; The flower has a diameter of 14 cm with about 50 petals having yellow color with pink-bengal edges.

- **Melina:** Maximum height of two meters and width up to 120 cm;The flowers are rosette-shaped with a purplish color that opens to pale blue.

- **Terracotta:** The height of the plant is 90-110 cm; It has a very dense foliage of a medium green semi-matte; The flower has a diameter of 11 cm with 30 petals of scarlet color Siena. Flowering is abundant.

- **Cluj 2010:** It presents bushes of medium vigor (45-80 cm), with semi-erect thorny branches, dark green and glossy foliage. The flowers are voluble, spherical, have yellow petals with an admixture of red - orange, bloom in successive waves throughout the vegetative seasons, until late autumn.

- **Mc. Cartney:** Its origin is Nirvana, Papa Meilland and the First Prize; It is of medium vigor, 70/50 cm, the branches are erect; The leaves are semiglossy and dark-green; The flowers are large with 25 petals, the buds open spirally, the petals are intense pink that does not fade, which has a strong fragrance of rose and lemon.

- **Asja –** is a teahybrid, reaches a height of 90-100 cm, diameter of 70-90 cm, foliage is a vivid green.

- **Velvetfragance:** The plants are 100 cm tall, the growth is erect; The leaves are large, dark green and semi-glossy; The flowers are large, involving with about 25 dark carmine-red petals, appear mostly solitary on the stems. The fragrance is intense with a hint of raspberries and cloves.

- **Mythos:** Height 60-80 cm**;** The flowers are cream with a tinge of green, its diameter is 7-10 cm.

Studies of changes in biological characteristics following natural attacks by the pathogen Diplocarpon rosae involve the implementation of measurements related to the length and width of the foliole, compared to attacked and unattacked species.

In order to establish the response of the 10 varieties to the attack of the *Diplocarpon rosae Wolf* pathogen, during the growing season, field notes were made on the frequency (F%) and intensity (I) of

attack in order to calculate the degree of attack (GA%).

The determinations were carried out at three different times, namely in June, September and October.

The frequency of attack (F%) represents the number of attacked plants or plant organs in relation to the number or organs analyzed, expressed as a percentage according to the formula:

F%=(n•100)/N

Where:

n - the number of attacked plants or organs;

N – number of attacked organs.

The intensity of the attack (I%) indicates the degree of disease of the plant or one of its organs.

To calculate the intensity of the attack, the formula is used:

$$I = \frac{\sum(i \times f)}{n}$$

where:

i = grade or percentage coverage;

f = number of attack cases;

n = total number of attack cases.

The degree of attack (GA %) is the level of attack to all plants on a given surface, or to all organs on the plant. In this case, the analysis of the attack frequency is done on the organ/plant.

The degree of value attack is given by the relationship:

$$GA\ \% = \frac{F\% \times I\ \%}{100}$$

Where: F % = attack frequency;

I % = intensity of attack ;

According to the GA % value, varieties were classified into:

- Resistors (R) – GA%=0-1%
- Medium resistant (MR) – GA %=1-5%
- Sensitive (S) – GA%=5-10%
- Very sensitive (FS) – GA%>10%

In order to establish the losses (P%) at the level of the attacked organs, biometric measurements were made on 8 plants / variety, on each plant being measured the length and width of 10 folioles both attacked and unattacked.

The loss for each parameter analyzed was calculated according to the formula:

P % = (1 - b/a) x 100 (after Savecu, 1967)

Where:

b=value at the level of the attacked body;

a=value at the level of the unattacked organ.

RESULTS AND DISCUSSIONS

The disease was reported in the field on June 15 on the Mythos variety.

The attack was soon present in the other varieties studied. Of the 10 varieties studied on 20 June, only the Asja variety registered with a strike value (GA%) slightly below 10 %, behaving like a sensitive variety, the rest of the varieties being very sensitive (Table 1) with attack values ranging from 15 % (Paul Mc. Cartney variety) to 40 % (Melina and Cluj 2010 varieties)

On September 7, when the second determination was carried out following the emergence of a new wave of infection with *Diplocarpon rosae Wolf*, it was noted that the values of the attack degree were between 5% (Terracota and Asja) and 15% (Mythos, Melina, Orient Express) (fig.1). As a result of this determination, 2 varieties

behaved as very sensitive, 4 as sensitive and 2 as medium-resistant.

Figure 1. Diplocarpon rosae Wolf – attack on leaves (original)

On October 1, when a new determination was made, it was found that the attack rank values (GA%) were high, oscillating between 5% (Terracotta) and 60% (Holstein Perle). With high values of the respective attack degree of 50%, Melina and Mythos varieties were also registered, and the Cluj 2010 variety was found the phenomenon of defoliation (fig.2).

At this determination as medium-resistant, the Terracotta variety behaved, as sensitive Velvet Fragance and Asja varieties, and the rest of the varieties as very sensitive.

Figure 2. Diplocarpon rosae Wolf – attack on leaves (original)

Table 1

Quantification of the effect of the attack of the fungus Diplocarpon rosae Wolf. on the growth and development of a rose variety grown in the field

Item No.	Variety	June		September		October	
		GA%	Resistance class	GA%	Resistance class	G.A. %	Resistance class
1.	Mythos	35%	FS	15 %	FS	50%	FS
2.	Velvet Fragance	30%	FS	10 %	S	7,5 %	S
3.	Terracotta	20%	FS	5 %	MR	5 %	MR
4.	Glorious	35%	FS	10 %	S	30 %	FS
5.	Paul Mc. Cartney	15%	FS	10 %	S	25 %	FS
6.	Asja	9,2 %	S	5 %	MR	10 %	S
7.	Holstein Pearls	20%	FS	10 %	S	60 %	FS
8.	Melina	40 %	FS	15 %	FS	50 %	FS
9.	Cluj 2010	40%	FS	TOTAL DEFOLIATION			
10.	Orient Express	30%	FS	15 %	FS	50 %	FS

Due to the fact that the incidence and virulence of the attack had high values, the effect of the attack was quantified by comparative biometric measurements of attacked and unattacked leaves (Table

2).The length and width of the folioles from which the loss (P%) of foliar areas was calculated. It was found that following the attack of the pathogen *Diplocarpon rosae Wolf*, folioles reduce their size, length and width ratio, undergoing changes depending on the variety. The most pronounced reduction was registered for the Orient Express variety, the length and width ratio decreased by 41.5% and 36%, respectively, variety at which the average value of the attack degree at the three determinations was 31.66%.

A sharp decrease in the two parameters taken in the studio was also recorded in the Mythos variety.

Table 2

Results on quantification of black spot attack in rose varieties

No.crt.	Variety	Variable	Foliola		Mean G.A. % June-September-October Resistance class
			Length (cm)	Width (cm)	
1.	Mythos	Unattacked	6,78	4,87	33.3 % (FS)
		Attacked	4,03	3,19	
		Diminished appropriation P %	40,5 %	34,4 %	
2.	Velvetfragance	Unattacked	6,1	3,85	15.83 % (FS)
		Attacked	4	2,54	
		Diminished appropriation P %	34,4 %	34%	
3.	Terracotta	Unattacked	7,49	4,67	10,0 % (S)
		Attacked	4,67	3,22	
		Diminished appropriation P %	37,6 %	31 %	
4.	Glorious	Unattacked	5,25	3,06	25.0 % (FS)
		Attacked	3,63	2,29	
		Diminished appropriation P %	30,8 %	25,1 %	
5.	Paul Mc. Cartney	Unattacked	6,15	3,93	16.66 % (FS)
		Attacked	4,78	2,65	
		Diminished appropriation P %	22,2 %	32,5 %	
6.	Asja	Unattacked	6,74	3,68	8,06 % (S)
		Attacked	4,58	2,53	
		Diminished appropriation P %	32 %	31,2 %	
7.	Holstein Pearls	Unattacked	5,57	3,71	30.0 % (FS)
		Attacked	3,87	2,86	
		Diminished appropriation P %	30,5 %	22,9 %	
8.	Melina	Unattacked	5,51	3,9	35.0 % (FS)
		Attacked	4,11	2,67	
		Diminished appropriation P %	25,4 %	31,5 %	
9.	Cluj 2010	TOTAL DEFOLIATION (FS)			
10.	Orient Express	Unattacked	5,9	4,05	31.66 % (FS)
		Attacked	3,45	2,59	
		Diminished appropriation P %	41,5 %	36 %	
AVERAGE OF VARIETIES 20,55 G %					

CONCLUSIONS

In the 3 determinations, the 10 varieties taken in the study showed mean attack values ranging from 8.06% (Asja variety) to 35.0% (Melina variety).

Depending on the average values of the degree of attack, it is observed that 2 varieties behaved as sensitive, and 8 as very sensitive.

From the recorded data it resulted that the black spotting of the rose influences the normal development of the plant by slowing down the growth rate of the leaves, but also by reducing the foliar area.

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