RESEARCH CONCERNING THE BIOLOGY OF THE GRAPEVINE EXCORIOSIS (*PHOMOPSIS VITICOLA* SACC.*)* UNDER THE CONDITIONS OF THE VINEYARDS IN VRANCEA

CERCETĂRI PRIVIND BIOLOGIA EXCORIOZEI VIȚEI DE VIE (*PHOMOPSIS VITICOLA* SACC.) ÎN CONDIȚIILE PODGORIILOR DIN VRANCEA

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Abstract. *The pathogenic agent Phomopsis viticola Sacc. produces the disease called "Phomopsis cane and leaf spot", and was first detected in our country during 1958-1960 (Crisan,1962). It is the second most important lignicolous pathogenic agent contributing to the decline of grapevine plantations. Recently the disease spread throughout all the vineyards, producing serious damage (Rafaila, 1970; Oprea and Dumitru, 1988/1989; Marmureanu and Contributors, 1990). Plants lose vigor and partially or entirely dry, thus having a negative influence on the yielding capacity. This disease has a significant economic impact since it may endanger the existence of viticultural plantations. This paper presents a synthesis of the role of the lignicolous fungi Phomopsis viticola Sacc. witch the main characteristics concerning its influence in the decline of the grapevine, its distribution and biological paramete.*

Rezumat. *Phomopsis viticola Sacc. este agentul patogen care produce boala denumita "Excorioza vitei" de vie, fiind semnalata pentru prima data la noi in tara in perioada anilor 1958-1960, (Crisan,1962) si ca importanta al doilea agent patogen lignicol care contribuie la declinul plantatiilor de vita de vie. In ultima perioada, boala s-a extins in toate podgoriile, producand pagube insemnate (Rafaila, 1970; Oprea si Dumitru, 1988/1989; Marmureanu si colab.,1990). Plantele isi pierd vigoarea, se usuca partial sau total, cu influente negative asupra capacitatii de productie. Impactul economic al acestei boli este mare, deoarece poate pune in pericol existenta plantatiilor viticole. In lucrarea de fata sunt prezentate, in sinteza, rolul ciupercii lignicole Phomopsis viticola Sacc. si principalele caracteristici cu priviere la influenta acesteia in declinul vitei de vie, raspandirea si parametrii biologici.*

KEY WORDS: parasite, fungus, in vitro, etiologic agent, culture environment.

The etiological agent of the grapevine excoriosis - *Phomopsis viticola* Sacc. is the second most important pathogenic agent contributing to the decline of grapevine plantations (Oprea and Dumitru 1988/1989). In our country, the disease spread, causing significant damage. (Crisan. 1962; Rafaila, 1970; Oprea and Dumitru,1988/1989; Marmureanu and Contributors, 1990; Podosu and Oprea, 1999). In the vineyards of the

Vrancea district, (Tica, 1990), grapevine excoriosis has been studied under the characteristic pedoclimatical conditions, with the purpose of establishing the necessary measures so as to reduce the damage caused by the disease spreading.

MATERIAL AND RESEARCH METHOD

The biologic material consists of grapevine arms, shoot and roots, withered or dry, collected from plantations which showed signs of decline. The samples were kept in the humid chamber at temperatures of 18-22˚C for 3 weeks. After the treatment, the characteristic fructification has appeared, and fungi were isolated on a GCA medium and then purified in test tubes or Petri dishes. The in vitro biological aspects seeked to determine the influence of some agarised culture media (Tuitte, 1969; Constantinescu, 1974), of the GCA culture medium reactions and the effect of temperature and relative humidity on the growth and spore-production of the fungus.

The expansion of the colonies has been observed daily by measuring their diameter; the spore-production was observed macroscopically and microscopically. The resulting data have been processed statistically by analyzing the variant.

On the basis of the observations made in plantations it as been established that during the offshoot growth phase, damage is significant, and the influence of this damage on the quantity and quality of the yield has been assessed.

RESULTS AND DISCUSSIONS

The research in the vitcultural area in Vrancea materialized by highlighting the lignicolous pathogenic agents involved in the decline of grapevine plants (Fig.1). By examining the diseased biological material, the following lignicolous pathogenical agents were observed: *Eutypa lata* with a frequency of 47.8%; *Phomopsis viticola* Sacc. with 34.8%; *Stereum hirsutum* with 7.8%; *Phoma uvicola* with 4.8%; *Diplodia vitis* with 4.8%.

The typical sympathology of the grapevine has been described, worldwide, by various authors and the debates lasted for 80 years (Bulit and Contributors.,1972; Galet, 1977, 1991; Emmett and Contributors,1992 and others.) They all expressed suggestively the manifestation of the disease: “spotted anthracnose” in France, “bark necrosis” in Italy, “dead arms disease” in U.S.A., “the black spot disease” in Germany etc.

In our country, Oprea and Dumitru (1988/1989), Marmureanu and Contributors. (1990) have presented the symptoms of excoriosis in the premature death of the grapevine, considering it a focal point disease. Its spreading is due primarily to collecting material from diseased vine shoots and using it for grafting, which caused damage starting in the nursery.

The first symptoms appear at the beginning of the growing season, as dark spots at the basis of the shoots, isolated or joined, of 0,5-2,0 x 0,3-1,0 cm in size. The growing infection produces ulcerations, kills the buds at the base of the shoots, leaving only those at the top still viable, which leads to losing the fruit bearing elements, and the offshoot growth phenological phase is delayed. During the summer, round, brown-black spots, with a yellow-orange halo towards the center will appear on the leaves, the leaf stalks, on the racemes and the pedicles. In the case of a severe attack, the

offshoots do not grow properly and spread out in the form of a fan, coming off easily. After the start of the ripening, the grapes rot and are covered by the pycnids typical of the pathogen.

The pathogenic agent. The French, Italian and German authors consider that the *Phomopsis viticola* Sacc. fungus is the pathogenic agent of the grapevine excoriosis (Bulit and Contributors, 1973; Pezet, 1974, 1976; Bulit and Bugaret, 1975; Pezet and Ducrot, 1978; Bugaret and Contributors,1980, 1983; Bulit, 1980; Mansencol,1982; Dubos and Contributors,1983; Bugaret and Pezet, 1985; Cavani and Contributors, 1987; Kast, 1988, 1989, 1991; Bugaret and Clerjeau, 1991 etc).

In our country, Crisan (1962), Rafaila (1970) and later, Hulea and Contributors, (1984, 1987) as well as Oprea and Dumitru (1988/1989) noted the presence of grapevine excoriosis, ascribing it to the *Phomopsis viticola* Sacc. pathogenic agent. Isolating the pathogen was obtained by keeping the contaminated material in the humid chamber, where the necrosis affected areas began to show the pycnids typical for the fungus, with orange cilia, and pycnospores of the alpha and beta type, with a role in spreading the disease.

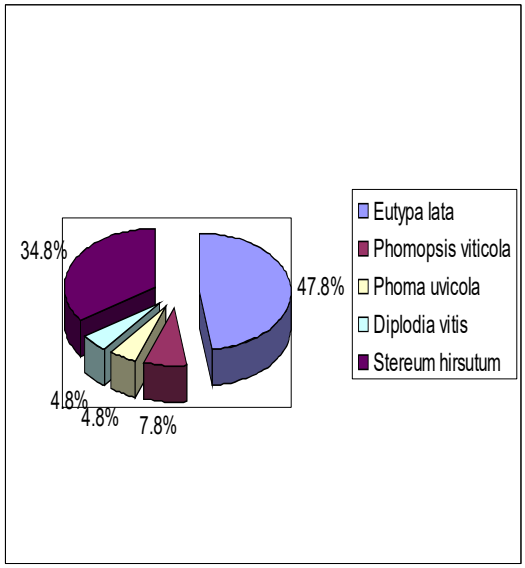

Fig.1: The frequency of lignicolous fungi associated with the decline of grapevine in the vineyards of Vrancea

Data about the two categories of pycnospores can be found in research presented by Pezet (1974) and also Beffa and Contributors. (1988), pointing to their importance in the biology of the fungus.

Epidemiological elements:

a) Life cycle. The *Phomopsis viticola* Sacc. fungus survives the winter in the form of pycnids, on the arms situated at the basis and as mycelium in the dormant buds (Bulit and Contributors,1973).During winter, the pycnids formed in autumn mature. The pycnospores start to form near the end of winter (in February) and are present in large quantities in the offshoot growth phenological phase. According to Bugaret (1975), for spreading the infection, a continuous humidity lasting 7-10 hours, at temperatures of 15-18°C is sufficient. The most sensitive to infections are the young offshoots,

from the beginning of the offshoot growth until the spring rains (Boniface and Contributors, 1981).

b) Spreading. *Phomopsis viticola Sacc.* is spread over all grapevine growing areas, except for South America (Smith and Contributors, 1988).

In the Vrancea vineyards, after observations in the field, the presence of the *Phomopsis viticola* Sacc. fungus was detected in the three vineyards, a follows:

-in the Odobesti vineyard, in the varieties: Regal Feteasca, Italian Riesling, Sarba, Furmint, Chasselas dore, Odobesti Golden, Plavaie;

-in the Panciu vineyard, in the varieties: Regal Feteasca, Italian Riesling, Sarba, Chasselas dore, Rkatiteli, Aligote;

-in the Cotesti vineyard, in the varieties: Regal Feteasca, Italian Riesling, Sarba, Chasselas dore, Aligote, Plavaie, White Feteasca, Hamburg Muscat, Afuz-Ali.

The loss percentage in the vineyards situated in river meadows, on low, cold and humid terrains reached 35%.

c) Biology. From the V.W.R.-D.S. Odobesti collection, the pathogen was isolated, observing the biology of the fungus, the influence and reaction of some „in vitro" culture media and also the influence of temperature and atmosphere humidity on the growth and fructification of the fungus.

-Concerning some culture media (Fig.2) it has been noted that the fungus spore-production was very good in the GCA medium, good on the malt extract and typical medium for *Phomopsis viticola* and absent on the Blakslee and Czapek culture media.

-Concerning the pH of the culture medium, it has been observed (Fig. 3) that the fungus grew and produced spores starting with a neutral pH(7.0) to a strong basic one(10.0-11.0)

-The temperature factor holds a very important role in the growth and spore production of the pathogen, so that between 16 and 30°C the growth was vey good and the optimal growth temperature was between 18 and 30°C (Fig.4)

-The relative humidity is another important factor conditioning the growth and development of the *Phomopsis viticola* Sacc. Fungus. Under conditions of low relative humidity 31-38 % the growth was not substantial (0,1-0,4 cm in diameter), with white, feeble colonies with no production of spores (Fig. 5). At a high relative humidity, of 95% the colonies became thick, normally dveloped and with a good production of spores.

Concerning grapevine varieties behaviour, in the Vrancea area, toward the attack of this pathogen under natural infection conditions (Table 1), it was found that it is different in the same variety depending on the pedological and climatic conditions of the vineyard. Thus, a resistence has been proved in the varieties: Merlot, Francusa, Chasselas dore, Aligote, (GA=0,1-1,3%) and even Hamburg Muscat (GA=5,8%).

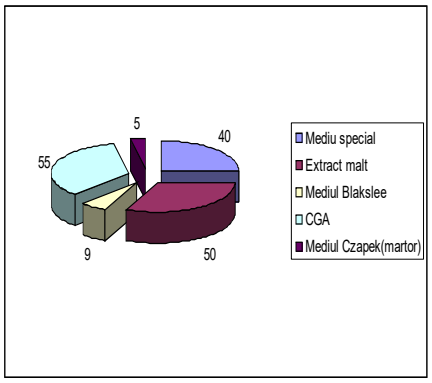

Fig.2 The influence of various culture environments on the evolution of evolution *Phomopsis viticola* Sacc.

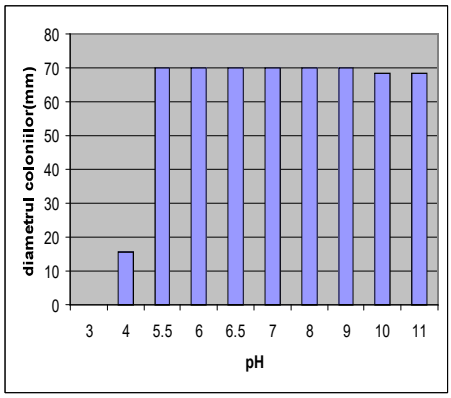

Fig.3 The influence of pH values in culture environments on the of *Phomopsis viticola* Sacc

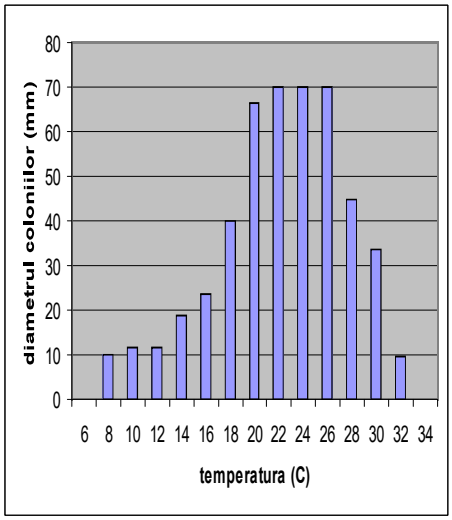

Fig.4 The influence of temperature on the evolution of *Phomopsis viticola* Sacc.

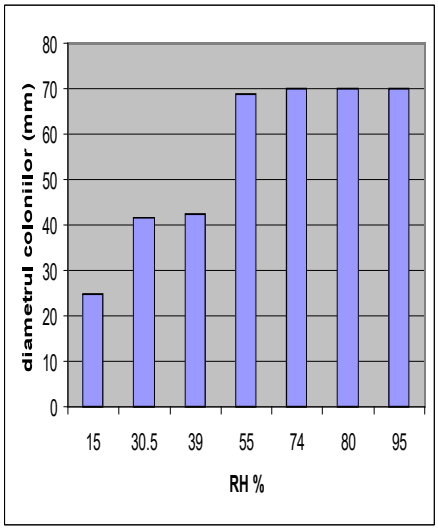

Fig.5 The influence of relative humidity on the evolution of *Phomopsis viticola* Sacc.

From the data obtained in the experiment but also from the data in the specialized literature, the Merlot variety is showing resistance in Vrancea, in the Dealul Mare vineyard and those in France, while the Aligote and Chasselas dore varieties, which became resistent in Romania, are sensitive to the pathogen in France (Smith and Contributors, 1988).

Generally, excoriosis produces significant damage (Bolay,1979; Bulit,1980; Kast,1988; Smith and Contributors,1988) in the live fruit bearing plantations. The grape yield in the 6 studied varieties (Table 2) decreased in the attacked plants with 48,8% (Plavaie) to 5,9% (Chasselas dore), followed by Odobesti Golden and Sarba (local varieties), Furmint and Italian Riesling, and the most sensitive, the Plavaie variety.

Table 1

Grapevine varieties behavior under the *Phomopsis viticola* Sacc.attack, in the conditions of the vineyards in Vrancea

Variety	Odobesti		Cotesti		Panciu	
	GA %	Calificativul	GA %	Calificativul	GA %	Calificativul
Royal Feteasca	14,2	S	10,9	S	1,7	R
Italian Riesling	2,2	R	10,5	S	8,4	MR
Sarba	1,3	R	11,4	S	2,9	R
Chasselas dore	0,3	R	0,7	R	0,4	R
Aligote	-	-	1,3	R	0,6	R
Rkatiteli	-	-	3,9	R	5,8	MR
Galbena de Odobesti	17,3	S	8,1	MR	-	-
Merlot	0,1	R	0,4	R	-	-
Furmint	13,9	S	6,6	MR	-	-
Francusa	0,2	R	0,2	R	-	-
Plavaie	16,6	S	52,4	FS	-	-
White Feteasca	4,2	R	10,3	S	-	-
Hamburg Muscat	1,5	R	2,2	R	-	-
Afuz-Ali	12,3	S	22,2	S	-	-

The sugar content was also lower in plants attacked by excoriosis (between 126-197 g/l) compared to the healthy grapevine plants (between 140 g/l and 210 g/l).

Table 2

The influence of various culture environments on the evolution of *Phomopsis viticola* Sacc.

Variety	Healthy vines			Contaminated vines			Yield compared to the control %
	Average yield Kg/vine	Quality		Average yield Kg/vine	Quality		
		Sugar g/l	Acidity g/l H_2SO_4		Sugar g/l	Acidity g/l H_2SO_4	
Plavaie	1,860	166,1	4,5	0,960	164.0	4,2	51,6
Odobesti Golden	5,465	163,5	5,5	3,920	160,3	5,3	71,7
Furmint	5,475	180,5	6,3	3,540	176,2	6,5	64,6
Italian Riesling	6,420	187,3	5,7	3,870	178,3	6,7	60,3
Sarba	5,300	209,7	5,3	3,860	197,4	4,9	72,8
Chasselas dore	6,130	139,6	7,4	5,770	125,8	6,5	94,1
Average	**5,108**	**174,4**	**5,8**	**3,653**	**165,5**	**5,6**	**69,2**

CONCLUSIONS

During research, a massive spread of the *Phomopsis viticola* Sacc. fungus (the aetiological agent of the grapevine exoriosis) has been observed, causing significant damage also under the pedological and climatic conditions in Vrancea, especially in the ofsoot growth phenological phase. Along with other ligrnicolous pathogenic agents: *Eutypa lata*, *Stereum hirsutum*, *Phoma uvicola* and *Diplodia vitis* and the factors determining the weakness of the grapevine plants, contribute substantially to their premature death.

Based on the study of grapevine behaviour under excoriosis attack, in the conditions present in the vineyards of Vrancea, a degree of resistance has been established for each variety, and the most resistant were Chasselas dore, Merlot, Aligote, Hamburg Muscat; varieties with a behaviour oscilating between high resistance and medium resistance were: Plavaie, Odobesti Golden, Furmint, Royal Feteasca, Italian Riesling and Sarba; the Afuz-Ali variety proved to be the most sensitive.

If the environmental conditions do not determine a severe reaction of the pathogenic agent, production loss of up to 50% may be recorded, where quality and quantity are concerned.

It is reccommended that in the plantations affected by excoriosis phitosanitay quarantine measures be applied together with attack recognition, being elliminated from breeding.

In plantations where the attack does not produce significant damage, rational long cuts arereccomended, by keeping the healthy shoots, limiting the centers of contagion and thus the spread of th disease.

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