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The Behavior of some Table Grapevine Cultivars in Relation to *Phomopsis Viticola* (Sacc.) Attack in Târnave Vineyard

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RESEARCH ARTICLE

Abstract

Phomopsis viticola (Sacc) causes excoriosis (Phomopsis cane and leaf spot), this results in high loses in grape production and in severe cases, death of the grapevine. The symptoms are as follows: the base of affected canes swells and blackens, and the scarred cortex may tear in longitudinal streaks, these canes are extremely fragile and easily break beneath their own load, other canes can completely dry. Data was collected and calculated (*Phomopsis viticola* AD, attack degree on leaves and canes) for the years 2021 and 2022, from the following cultivars: Kodryanka, Arkadia, Muscat New York, Moldova, Original, Muscat Poeloeske, and Muscat bleu as *Vitis* interspecific crosses cultivars, Victoria, Muscat Hamburg, Timpuriu de Cluj. Splendid and Transilvania as *Vitis vinifera* cultivars..Data comparison was done using the StatView software, ANOVA and ANCOVA test. In the present research work, it was demonstrated that in Tîrnave vineyard different table grapes cultivars behave differently to *Phomopsis viticola (Sacc)* attack.

Keywords: attack degree, grapevine cultivar, *Phomopsis viticola (Sacc),* table grapes.

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INTRODUCTION

One of the most commercially significant and widely grown perennial fruit crops in the world are grapevines (*V. vinifera* L. and *Vitis* spp). (Torregrosa et al. 2015 Gramaje et al. 2018). In particular, the development of rootstocks, the production of wine, table grapes, and other secondary products depend on *V. vinifera* and numerous other species from the *Vitis* genus, along with their interspecific hybrids. Romania is the fifth-ranked country in Europe for productive vineyard area as of 2020 (FAOSTAT). Târnave vineyards, one of Romania's significant winegrowing regions, is known for its major production of premium white wines, premium aromatic white wines, sparkling wines, and table grapes (Oprea, 2001; Comşa et al. 2021). Numerous fungi species attack grapevines, but the most hazardous ones are *Plasmopara viticola* (Gessler et al. 2011), which causes downy mildew, *Uncinula necator* (Doster and Schnathorst, 1985), which causes powdery mildew, Esca, an amalgam of fungi species (Fischer and Peighami-Ashnaei, 2019), which causes physiological decline, and *Phomopsis viticola* which causes Phomosis dieback or excoriosis (Ùrbez-Torres et al. 2013; Gamaje et al. 2018) may also cause cane and leaf spot (Savu et al. 2020, Baumgartner et al. 2012; Urbez-Torres et al. 2013). Excoriosis affects grapevines anywhere they are cultivated, and it does the most harm in the early growing season when precipitation levels are high. The illness can result in stunted leaves, dead buds,

poor shoot growth, and later in the season, when the shoots are heavier, breaking from the base. Although excoriosis spreads rather slowly, over time it accumulates and the vigor and output of the vines deteriorate (Pearson and Goheen, 1988; Phillips, 1998). Affected shoots develop base swelling and the bark may fracture. Such shoots can easily dieback while others can be highly fragile and easily fall under their weight. After harvest, the canes' black spots become grey or white and are coated with black fruit bodies that are immersed in the tissues of the host plant. All of these symptoms, together with bud loss and the potential for shoot dieback, are considered to be typical (Pearson and Goheen, 1988). Excoriosis was discovered in vineyards in Valea Călugarească, Odobești, Cotești - Vrancea, Pietroasele and Drăgășani, Ciumbrud, and Târnave at the start of the growing season (Tomoiagă and Chedea, 2020; Muntean et al. 2022), (Oprea and Podosu, 2008). In 1925, France signaled the first reports of excoriosis in Europe (Ravaz and Verge, 1925). Later, the pathogen had spread to every continent where grapes were planted (Galet, 1977).

MATERIALS AND METHODS

Data was collected and calculated with the following formula: Attack Degree = (Frequency x Intensity)/100, (*Phomopsis viticola* AD, attack degree on leaves and canes) for the years 2021 and 2022, from the following cultivars: Codreanca, Arkadia, Victoria, Muscat New York, Moldova, Original, Muscat Hamburg, Muscat Poeloeske, Timpuriu de Cluj, Splendid, Muscat bleu and Transilvania. Treatments were applied with conventional products (Table 1 and Table 2). Data comparison was done using the StatView software, ANOVA and ANCOVA test (Figure 2, Figure 3, Figure 3, Figure 4).

Table 1. The treatments and doses applied before data collection in 2021

Active Substance	Date	Dose/ha
CabrioTop	10.05.2021	2.0 kg
Equation Pro **Thiovit Jet**	24.05.2021	0.4 kg 3.0 kg
Equation Pro	08.06.2021	0.4 kg
Zorvec zelavin **Sercadis** **Taegro**	16.06.2021	1.5 l 0.15 l 0.375 kg
Universalis	28.06.2021	2.0 l

Table 2. The treatments and doses applied before data collection in 2022

Active Substance	Date	Dose/ha
Cabrio Top **Thiovit Jet**	1.05.2022	2.0 kg 3.0 kg
Cabrio Top **Thiovit Jet** **Vertimec**	10.05.2022	2 kg 3 kg 0.8
Folpan **Dinaly**	30.05.22	1.5 kg 0.65 l
Orondis Ultra + **Pergado** **Topas**	08.06.22	0.2 l 0.6 kg 1.0 kg
Orondis Ultra **Pergado** **Switch**	20.06.22	0.2 l 0.6 kg 1.0 kg
Zorvec zelavine+ **Flowine** **Prosper**	28.06.22	0.2 l 1.25 kg 1.0 l

RESULTS AND DISCUSSIONS

Excoriosis symptoms have been found on almost all observed varieties. In Figure 1, is presented the evolution of the general symptoms of the disease.

In 2021, the highest leaf AD (Figure 1) was registered at the cultivar Victoria (*V. vinifera*) (20.66%), higher statistical difference compared to all other cultivars. The lowest leaf AD was registered at the cultivar Moldova (*V. interspecific cross*) (0.16%), but is not statistically different from all the other cultivars.

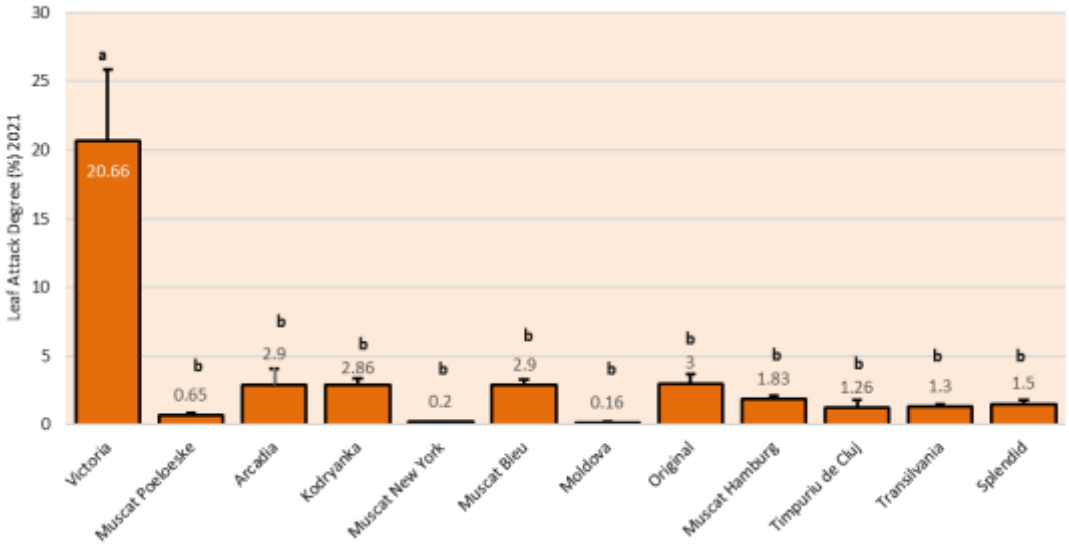

Figure 1. Leaf Attack Degree (%) 2021

Note: The variants with different letters are statistically different ($p < 0.05$), the differences of the variants with the same letter are statistically insignificant

In 2022, the highest leaf AD (Figure 2) was registered at the cultivar Victoria (*V. vinifera*) (20.33%), higher statistical difference compared to all other cultivars. The lowest leaf AD was registered at the cultivar Muscat New York (0%), along with Muscat Poeloeske (0.1%), Kodryanka (0.96%), Muscat Bleu (1.7%), Moldova (1%), Original (0.53%), Muscat Hamburg (*V. vinifera*) (0%) and Transilvania (*V. vinifera*) (1.8%), these cultivars had no statistical difference when compared with each other. Arcadia (4.1%), Transilvania (1.8%), Timpuriu de Cluj (*V. vinifera*) (1.46%), Splendid (*V. vinifera*) (4.53%), Muscat Bleu (1.7%) and Moldova (1%) had no statistical difference when compared with each other.

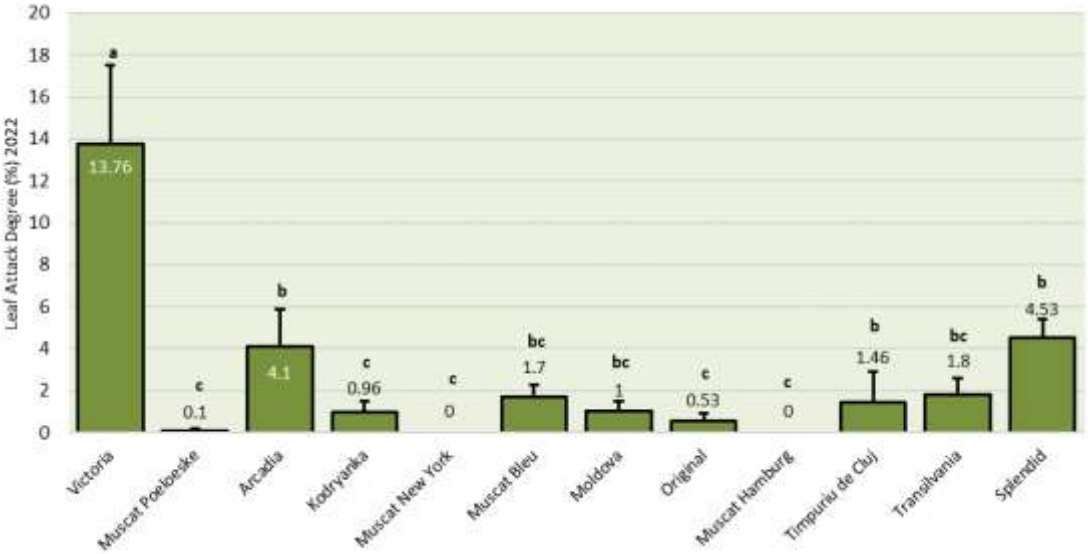

Figure 2. Leaf Attack Degree (%) 2022

Note: The variants with different letters are statistically different ($p < 0.05$), the differences of the variants with the same letter are statistically insignificant

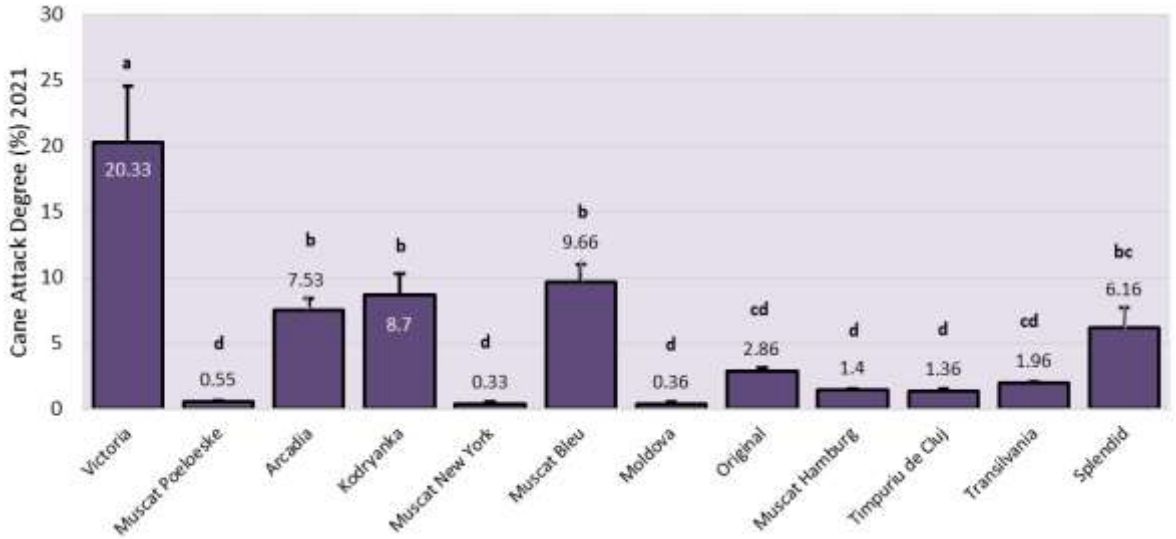

Figure 3. Cane Attack Degree (%) 2021
Note: The variants with different letters are statistically different ($p < 0.05$), the differences of the variants with the same letter are statistically insignificant

Regarding the cane AD (Figure 3) in 2021, statistically differenced values registered at the cultivar Victoria (20.33%), higher than the other cultivars. Statistically different higher values have been registered at Arcadia (7.53%), Kodryanka (8.7%), Muscat Bleu (9.66%) and Splendid (6.16%) compared to Muscat New York (0.33%), Moldova (0.36%), Original (2.86%), Muscat Hamburg (1.4%), Timpuriu de Cluj (1.36%) and Transilvania (1.96%). The lowest cane AD was registered at Muscat New York (0.33%).

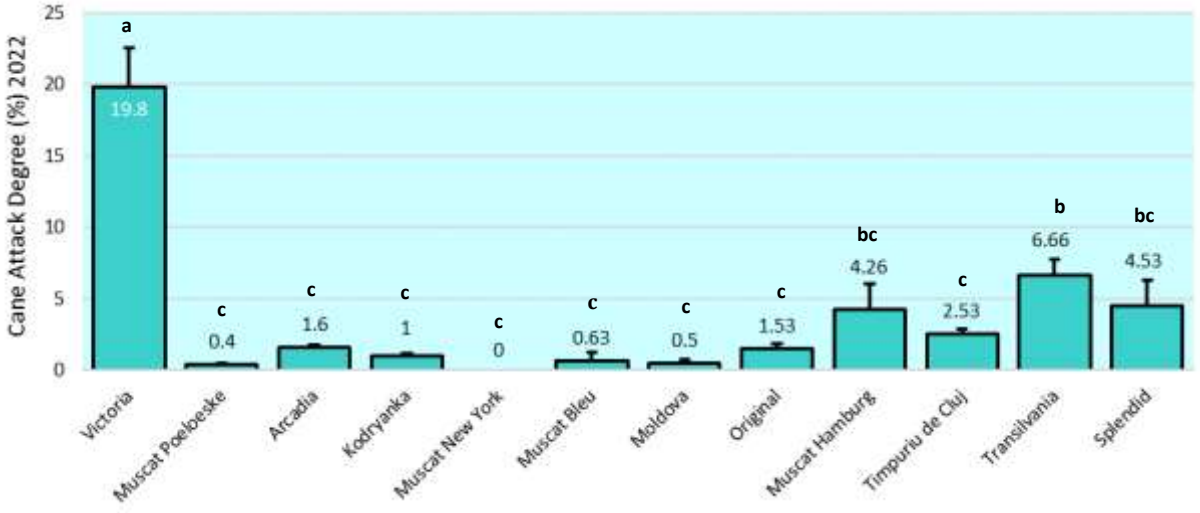

Figure 4. Cane Attack Degree (%) 2022

Note: The variants with different letters are statistically different ($p < 0.05$), the differences of the variants with the same letter are statistically insignificant

In 2022, the highest cane AD (Figure 4) was registered at the cultivar Victoria (19.8%), higher statistical difference compared to all other cultivars. The lowest leaf AD was registered at the cultivar Muscat New York (0%), along with Muscat Poeloeske (0.4%),Arcadia (1.6%), Kodryanka (1%), Muscat Bleu (0.63%), Moldova (0.5%), Original (1.53%), Timpuriu de Cluj (2.53%) and Splendid(4.53%) , these cultivars had no statistical difference when compared with each other. Muscat Hamburg (4.26%),Transilvania (6.66%) and Splendid (4.53%). had no statistical difference when compared with each other.

(a) (b) (c)

Figure 5. Excoriosis symptoms: (a) Longitudinal streaks on green canes; (b) Severity of excoriosis damage; (c) Excoriosis symptoms on young leaves

CONCLUSIONS

Victoria was the most affected cultivar, data shows the highest AD on canes and leaves in 2021, respectively canes and leaves in 2022, significantly different from the rest of cultivars. Three cultivars had consistently low AD in both years: Muscat New York (, Muscat Poeloeske and Moldova, this may suggest that tolerance/resistance to *Phomopsis viticola (Sacc)* can be found in different cultivars. Moldova, Muscat Poeloeske and Muscat New York are all three hybrid descendant cultivars, pointing to a potential source of genetic tolerance/resistance for future breeding projects.

Author Contributions: V.B. Wrote the paper, collected data; M.C. Collected data, performed the analysis; S.A. Contributed analysis; V.C. contributed analysis; M.M. Contributed analysis; H-S.R. Contributed analysis. L.L.T Contributed analysis.

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Conflicts of Interest

The authors declare that they do not have any conflict of interest.

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