

Assessment of selected traits of 18 traditional wine *Vitis vinifera* cultivars in Central Poland

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Abstract. In the years 2008–2011, 18 wine cultivars described as traditional and used for production of wine of recognized quality were assessed in the collection of grapevine in Skierniewice (Central Poland, latitude 51°57' N, longitude 20°08' E). This group included 16 cultivars which have been cultivated in Europe for centuries: Auxerrois, Cabernet Sauvignon, Chardonnay, Chasselas Blanc (Chrupka Złota), Pinot Blanc, Pinot Gris, Pinot Meunier, Pinot Noir, Pinot Noir Precoce, Portugieser, Riesling (Weisser Riesling), Saint Laurent, Sauvignon Blanc, Silvaner, Tauberschwartz, Traminer Rot and two cultivars dating back to the 19th century: Goldriesling and Mueller-Thurgau. Bushes of enumerated cultivars, grafted on *V. berlandieri* x *V. riparia* SO 4 rootstocks, were planted in 2007 and annually covered for winter. Taking into account fertility, quality of fruit, susceptibility to frost and fungal diseases, the following cultivars proved most suitable for cultivation in the conditions of Central Poland: Auxerrois, Pinot Gris, Pinot Noir, Riesling and Chasselas Blanc, which is classified as both wine and table cultivar. The assessment of frost resistance, based on observation of those parts of bushes which were not covered, showed that least susceptible to frost damage were plants of the cultivar Riesling, and most susceptible were plants of Mueller-Thurgau, Portugieser, Sauvignon Blanc and Silvaner. To the group of cultivars most susceptible to infections caused by pathogens of fungal origin belonged: Cabernet Sauvignon, Chardonnay, Mueller-Thurgau, Portugieser, Sauvignon Blanc, Silvaner and Tauberschwartz.

key words: *Vitis vinifera*, wine cultivars, yielding, tolerance, frost, fungal diseases

INTRODUCTION

Recently in Poland there has been increased interest in the cultivation of grapevine which provides material for the

production of wine. The field experiment aimed to assess preliminary the usefulness (in the conditions of Poland) of *Vitis vinifera* cultivars, whose vines may be planted in both commercial and amateur vineyards, and whose wine may be introduced into market in accordance with the EU laws. Zielona Góra surroundings is the region of western Poland where vineyards were maintained since the Middle Ages until 1970s. They were the place of cultivation of traditional *V. vinifera* cultivars, such as Riesling, Silvaner, Traminer Rot, Portugieser and cultivars from the Pinot group, typical of regions characterised by cooler climate (Kres, 1966; Kuleba, 2005). Current restitution of Polish vineyards relies on the use of interspecific hybrids whose vines are more resistant to low winter temperature and fungal diseases than *V. vinifera* (Lisek, 2009, 2010). In the neighbouring countries, however (such as Germany, Czech Republic and Slovakia), *V. vinifera* cultivars are planted, due to high and recognised quality of wine produced from those cultivars' grapes (Pospišilová, 1981; Pospišilová et al., 2005; Lott et al., 2010).

MATERIALS AND METHODS

The experiment was conducted in the field collection of the Research Institute of Horticulture in Skierniewice (latitude 51°57' N, longitude 20°08' E) consisting of 276 genotypes. Each of them was represented by three vines, planted at spacing of 2.5 × 1 m and maintained in the form of low head with spur pruning. In the years 2008–2011, was conducted an assessment of 18 wine cultivars described as traditional and used for production of wine of recognized quality. This group included 16 cultivars grown in Europe for centuries: Auxerrois (B), Cabernet Sauvignon (N), Chardonnay (B), Chasselas Blanc (Chrupka Złota) (B), Pinot Blanc (B), Pinot Gris (R), Pinot Meunier (N), Pinot Noir (N), Pinot Noir Precoce (N), Portugieser (Portugalskie Niebieskie) (N), Riesling (Weisser Riesling) (B), Saint Laurent (N), Sauvignon Blanc (B), Silvaner (B),

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Tauberschwarz (N), Traminer Rot and two cultivars dating back to 19th century: Goldriesling (B) and Mueller-Thurgau (B). Letters next to the names of cultivars stand for the colour of skin of the berries: B – blanc, R – rose, N – noir. Due to many years' lack of commercial vineyards in Poland, it is difficult to determine standard cultivars. As far as the amateur cultivation is concerned, Chasselas Blanc, used as a table cultivar, is most often encountered. On account of historical conditioning and through the analogy with the neighbouring countries, Riesling and Pinot Noir may be considered standard wine cultivars. Vines of the cultivars assessed, grafted on *V. berlandieri* x *V. riparia* SO 4 rootstocks, were planted in 2007 and covered during winter annually. In each season plants were treated twice with fungicides containing mancozeb and sulphur. In 2010 and 2011 the plants were treated once with a mixture of fungicides piraclostrobin + boscalid. The average sum of active temperatures (SAT) – medium daily temperature higher than 10°C – in Skierniewice in 2008–2011 amounts to 2548°C. SAT varied from 2422°C in 2010 to 2718°C in 2011.

The following features were assessed: susceptibility of vines to frost and fungal diseases, fertility of the bushes, weight of clusters and berries, time of overall ripening, soluble solids content and taste of fruits.

Susceptibility to frost damage was assessed in March (during pruning) in the following manner: 1 – lack of da-

mage, 2 – frozen buds not exceeding 10%, 3 – 11–50% of frozen buds, 4 – more than 50% of frozen buds and damage on the one-year shoots, 5 – dead bushes. In the course of conducting the research, the following minimum winter temperatures were noted: -23.0°C (6.01.2009); -28.1°C (26.01.2010); -22.3°C (22.02.2011).

Assessment of damage caused by downy (*Plasmopara viticola* (Berk. et Curtis ex de Bary) Berl. et de Toni) and powdery mildew (*Uncinula necator* (Schw.) Burr.) was conducted directly before harvest on each plot in five-grade scale according to following criteria: 1 – lack of damage, 2 – up to 20% of leaves and vines infested by mildew, 3 – 21–50% of infested leaves and vines, 4 – heavily infested leaves and vines, together with slight (up to 10%) infestation of berries, 5 – heavily infested leaves, shoots (more than 50%) and berries (more than 10%).

Occurrence of excoriosis (*Phomopsis viticola* Sacc.) which causes death of wood and buds, was assessed in the period of pruning (first two weeks of March) in five-grade scale: 1 – lack of damage, 2 – damage up to 20%, 3 – 21–50%, 4 – 51–100% of shoots internodes infested, 5 – death of skeletal parts of bushes and whole plants. Infestation was assessed on the basis of both the colour of shoots (change from brown to grey) and the excoriosis visible on cross-sections of older shoots.

Susceptibility to decay caused by grey mould (*Botryotinia fuckeliana* (de Bary) Whetzel) was assessed during

Table 1. Yielding of 18 traditional wine *V. vinifera* cultivars. Skierniewice, 2008–2011.

Cultivars in alphabetical order	Time of ripening	Average year yield [kg/vine]	Weight of cluster [g]	Weight of 100 berries [g]	% of soluble solids
Auxerrois	30.09	1.01 bc	102.5 cdef	172 def	18.1 abc
Cabernet Sauvignon	9.10	0.83 abc	99.5 cde	148 bcd	17.9 ab
Chardonnay	2.10	0.57 abc	88.5 bc	185 efg	18.6 bc
Chasselas Blanc	22.09	1.10 c	150.0 i	294 i	16.9 a
Goldriesling	22.09	0.74 abc	105.3 cdef	152 cd	18.2 abc
Meuller-Thurgau	29.09	0.86 abc	126.0 gh	210 gh	19.4 c
Pinot Blanc	8.10	0.57 abc	97.5 cde	163 cde	17.4 ab
Pinot Gris	1.10	0.87 abc	96.3 cde	138 abc	17.9 ab
Pinot Meunier	5.10	0.55 ab	94.3 cde	117 ab	17.7 ab
Pinot Noir	2.10	0.98 bc	91.3 cd	119 ab	17.5 ab
Pinot Noir Precoce	9.09	0.73 abc	63.8 a	113 a	18.0 abc
Portugieser	1.10	0.91 abc	187.8 j	192 efgh	18.8 bc
Riesling	11.10	0.99 bc	108.0 def	138 abc	17.5 ab
Saint Laurent	10.10	0.44 a	128.5 h	135 abc	18.2 abc
Sauvignon Blanc	9.10	0.86 abc	111.3 efg	195 fgh	19.4 c
Silvaner	4.10	0.99 bc	116.8 fgh	221 h	18.0 abc
Tauberschwarz	29.09	0.47 ab	104.5 cdef	193 efgh	17.5 ab
Traminer Rot	8.10	0.62 abc	74.5 ab	139 abc	18.1 abc

Averages marked by the same letter do not differ significantly at the $p = 0.05$ according to Duncan test.

Table 2. Winter hardiness and healthiness of vines of traditional wine grape cultivars. Skierniewice, 2008–2011.

Cultivar	Winter hardiness (scale 1–5)	Susceptibility to downy mildew (scale 1–5)	Susceptibility to powdery mildew (scale 1–5)	Susceptibility to excoriose (scale 1–5)	Susceptibility to grey mould (scale 1–6)
Auxerrois	3.6	3.5	3.5	1.6	2.1
Cabernet Sauvignon	4.0	3.8	4.3	1.6	1.7
Chardonnay	3.8	3.9	4.5	1.6	2.3
Chasselas Blanc	3.5	3.8	3.5	1.5	1.9
Goldriesling	3.6	3.9	3.8	1.7	2.2
Meuller-Thurgau	4.3	4.1	3.7	1.6	3.1
Pinot Blanc	3.8	3.8	3.8	1.6	2.6
Pinot Gris	3.6	3.6	3.7	1.6	2.3
Pinot Meunier	3.7	3.5	3.6	1.6	2.5
Pinot Noir	3.5	3.5	3.6	1.7	2.9
Pinot Noir Precoce	3.6	3.5	3.6	1.6	2.6
Portugieser	4.1	4.0	3.9	1.6	2.5
Riesling	3.1	3.5	3.6	1.7	2.3
Saint Laurent	3.9	3.5	3.8	1.6	2.4
Sauvignon Blanc	4.3	3.8	4.1	1.6	2.3
Silvaner	4.1	3.6	4.0	1.6	2.3
Tauberschwarz	3.7	3.5	3.5	1.9	4.1
Traminer Rot	3.5	3.5	3.5	1.6	2.1

Explanation: susceptibility to frost injuries (average in winters 2008/2009, 2009/2010 and 2010/2011) and fungal diseases: 1 – resistant, 5–6 – susceptible

harvest, in six-grade scale: 1 – lack of damage, 2 – damage up to 3%, 3 – 4–10%, 4 – 11–25%, 5 – 26–60%, 6 – more than 60% of fruit infested.

Soluble solids content of a grape juice was determined by the index of refraction and was measured using an optical hand held refractometer. Taste of fruits was assessed together with their aroma. Clear or so called neutral taste, was typical of grapes, without any distinct aroma. Mature grapes with typical colour of berry skin, firmness of flesh and brown seeds, were harvested separately from each evaluated vine. All bunches was counted. 100 berries collected from 3 typical bunches on each vine were weighted.

RESULTS

The assessment of fertility, quality of fruit, susceptibility of bushes to frost and fungal diseases showed that among 18 genotypes of *V. vinifera* the following typical wine cultivars should be considered as the most useful in the conditions of Central Poland: Auxerrois, Pinot Gris, Pinot Noir, Riesling and Chasselas Blanc which is both wine and table cultivar. The highest mean annual yield of grapes was gathered from bushes of cv. Chasselas Blanc. Only three cultivars: Pinot Meunier, Saint Laurent and Tauberschwarz bore significantly smaller yield of grapes (Table 1). Taste of berries of assessed accessions, connected to

the their aroma, was varied. Fruits of Chasselas Blanc had a clear taste. The grapes of Mueller-Thurgau had a slightly muscat and fruity aroma. Most complex aroma, combining muscat, fruits and rose was characteristic of Traminer Rot. Grapes of other cultivars had delicate fruity aromas, e.g. of currants (Cabernet Sauvignon) or citruses (Riesling). During the process of assessment, which was carried out on those parts of vines that were not covered against frost, Riesling proved to be least susceptible to frost damage, while Mueller-Thurgau, Portugieser, Sauvignon Blanc and Silvaner turned out to be most susceptible to frost damage (Table 2). The group of cultivars characterised by highest susceptibility to infections caused by pathogens of fungal origin consisted of: Cabernet Sauvignon (powdery mildew), Chardonnay (powdery and downy mildew), Mueller-Thurgau (downy and powdery mildew), Portugieser (downy and powdery mildew), Sauvignon Blanc (powdery mildew), Silvaner (powdery mildew) and Tauberschwarz (grey mould) (Table 2).

DISCUSSION

Presented results are on the whole compatible with data from Germany and Slovakia. This compatibility concerns above all such traits as susceptibility to frost damage and fungal pathogens, size of clusters and berries and mutual

relations between cultivars in the ripening season (Pospíšilová, 1981; Pospíšilová et al., 2005; Lott et al., 2010). Results vary most from the foreign data in respect of yielding of bushes which was lower than in the neighbouring countries. Fertility of the bushes is connected not only to particular genotypes, but also to tolerance to environmental conditions, especially to minimum winter temperatures, spring frosts and fungal pathogens. Minimum winter temperatures noted in the course of conducting the research had no influence on the covered bushes but caused damage on the buds that were not covered, even in the case of the most tolerant *V. vinifera* cultivars. Vines of this genus should be preventively covered for winter, which provides sufficient protection against cold but is quite laborious. That the cover is needed is proved by the fact that it was performed in historical Zielona Góra vineyards (Kuleba, 2005). The winters in Zielona Góra are relatively warmer than in Central Poland. Damage to vine and reduction of harvest due to spring frosts took place in 2009, 2010, and 2011. Below are given minimal temperatures after the vegetation started and the date of the occurrence: -4.0°C (20.04.2009), -1.8°C (15.05.2009); -2.5 (25.04.2010); -1.5°C (20.04 and 4.05. 2011). Intensive rainfalls that were noted e.g. in July 2011 (262.5 mm), posed a threat of fungi diseases even in the case of those cultivars which are described in foreign literature as moderately resistant. Verification of selected functional features, conducted in the conditions of the research, allowed to diversify the assessed cultivars according to their usefulness. The research showed that cultivars widely grown or prospective in Germany and Slovakia, such as Silvaner, Portugieser, Saint Laurent, Chardonnay, Mueller-Thurgau, Cabernet Sauvignon, Sauvignon Blanc are in Polish conditions more unreliable in yielding than Auxerrois, Pinot Gris, Pinot Noir, Chasselas Blanc and

Riesling. Restitution of domestic vineyards with the use of *V. vinifera* refers to cultural traditions and is possible if the management (i.e. covering the bushes for winter) and protection against fungal diseases are performed properly.

CONCLUSIONS

1. In Central Poland, from the 18 assessed genotypes, the cultivars Auxerrois, Pinot Gris, Pinot Noir, Riesling and Chasselas Blanc are most useful in cultivation.
2. Bushes of *V. vinifera* cultivars, characterised by highest tolerance to adverse biotic and abiotic factors, mentioned in the Conclusion 1., in the conditions of the experiment were damaged by low temperature and fungal pathogens.

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