ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS
SBORNÍK MENDELOVY ZEMĚDĚLSKÉ A LESNICKÉ UNIVERZITY V BRNĚ

Volume LVI 38 Number 2, 2008

PRELIMINARY RESULTS OF TESTS OF GRAPEVINE ROOTSTOCKS RESISTANCE TO LIME-INDUCED CHLOROSIS

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Received: December 10, 2007

Abstract

PAVLOUŠEK, P.: *Preliminary results of tests of grapevine rootstocks resistance to lime-induced chlorosis*. Acta univ. agric. et silvic. Mendel. Brun., 2008, LVI, No. 2, pp. 299–302

Resistance to lime-induced chlorosis is very important characteristic of grapevine rootstocks. Lime-induced chlorosis influence yield and quality of grapes. Evaluation of chlorosis resistance is very important for grape growing and breeding. The aim of this work is provide results of evaluation grapevine rootstocks to chlorosis. High resistance was show in Fercal. From the viewpoint of the resistance to chlorosis, the rootstocks registered in the State Variety Book of the Czech Republic can be ranked from the most resistant to the most sensitive as follows: *Craciunel 2 – SO 4 – Kober 125 AA – Kober 5 BB – Teleki 5 C – Amos – LE-K-1*.

grapevine, rootstock, resistance, lime, chlorosis.

A successful growing of grapevine is very dependent on a proper selection of rootstock varieties. Grapevine rootstock varieties are obtained also on the base of a purposeful selection. The main goal of rootstock breeding is the selection of new varieties with a high degree of resistance to phylloxera. A good adaptation of plants to site conditions is also very important. Grapevine is commonly grown under very different soil and climatic conditions. The adaptation of rootstocks to calcareous soils and arid growing conditions represents also an important property of grapevine plants and for that reason the resistance to lime-induced chlorosis and drought plays also an important role.

Lime-induced chlorosis influence yields and quality of grapes produced on calcareous soils throughout the world (FREGONI, 1980)

Chlorosis a widespread physiological deficiency affecting plants grown on soils with a high content of calcium carbonate. This deficiency causes either yellowing of intervein areas and loss of chlorophyll from the leaf blade (OSTROVSKAYA *et al*., 1990).

In *Vitis* spp. the genetic variability of lime-induced chlorosis was dealt with in many important ampelographic studies (VIALA, VERMOREL, 1910; GALET, 1988).

Within the framework of breeding work it was possible to select many genotypes resistant to chlorosis and these are nowadays used when growing grapevine plants on calcareous soil (POUGET, 1980).

In spite of this fact, however, the testing and selection of new rootstock varieties with an increased resistance to this lime-induced chlorosis is very important.

Among others, for example BAVARESCO *et al*., 1993; BAVARESCO *et al*., 1994 and KSOURI *et al*., 2005 evaluated the resistance of grapevine plants to this resistance in pot experiments.

The aim of this paper is to provide preliminary results of our tests and evaluation of resistance of standard rootstock varieties used in the Czech Republic and of some new, phylloxera-resistant hybrids to this physiological deficiency.

MATERIAL AND METHODS

Testing and evaluation were performed in the container room of the Faculty of Horticulture, Mendel University of the Agriculture and Forestry Brno, in Lednice na Moravě. The experiment was established in 2006 and the first evaluation was performed in the same year.

The following rootstock varieties and hybrids were evaluated within the framework of this research: Kober 5 BB, Kober 125 AA, Craciunel 2, Teleki 5C, SO4, Amos, LE-K-1 and Fercal.

One-year-old wood was cut and rooted in a glasshouse in January 2006. The experiment was establish in containers with a volume of 4 litres; each container was under drip irrigation and the soil humidity was maintained on percentages approaching to values of field capacity (BAVARESCO *et al*., 1994).

Pots contained the substrate Klasmann with the following parameters: pH_{KCl} = 5.2; N = 210 mg.l^{-1}; P_2O_5 = 240 mg.l^{-1}; K_2O = 270 mg.l^{-1} and Mg = 120 mg.l^{-1}. The experimental substrate was enriched with 25% $CaCO_3$ (see KOCSIS *et al*., 1998). Controls (without 25% $CaCO_3$) were grown in a pure Klasmann substrate.

Evaluations were performed twice, viz. 90 (25. July) and 150 (23. September) days after the onset of germination of experimental plants. The evaluation was performed using the IPGRI scale (1997), the grades of which are presented in Tab. I.

I: *Scale for the evaluation of chlorosis (IPGRI, 1997)*

Grade	Description
1	Very low occurrence. Leaves are of a deep-green colour.
3	Low occurrence. Leaves are of a light-green colour.
5	Medium occurrence. Leaves are yellow with green of a deep-green colour main veins.
7	High occurrence. Leaves are yellow and less than 10% of them are necrotic.
9	Very high occurrence. Leaves are yellow, more than 10% of them are necrotic and some are dwarfed.

RESULTS AND DISCUSSION

In addition to the effects on the activities of the leaf apparatus, the lime-induced stress can negatively influence yields, mass and size of grapes as well as the fertility of individual buds. In controls, there were no symptoms of chlorosis during the whole study period.

On the first date of evaluation, which was performed on plants with a relatively small leaf area, the occurrence of chlorosis symptoms was higher than on the second date.

BAVARESCO *et al*. (2005) corroborated this fact and mentioned that calcareous soils showed a marked effect of the occurrence of chlorosis in young leaves. These symptoms could be observed above all in the middle of the growing season. The older leaves showed less pronounced symptoms of chlorosis.

Results obtained after the evaluation of the whole experiment are presented in Tab. II. The variance analysis demonstrated the existence of statistically significant differences between individual varieties. The subsequent testing was carried out using the Tukey test ($p < 0.01$).

II: *Results of evaluation of chlorosis in rootstock varieties and the evaluation by Tukey test at the significance level p < 0.01*

Variety	Control	1st evaluation	2nd evaluation	Mean
Kober 125 AA	1.00	2.20	1.80	2.00 ± 1.00 abc
Kober 5 BB	1.00	2.60	2.20	2.40 ± 0.55 bc
Teleki 5 C	1.00	3.20	2.60	2.90 ± 0.55 c
SO 4	1.00	1.80	1.40	1.60 ± 0.89 ab
Craciunel 2	1.00	1.80	1.00	1.40 ± 0.54 ab
Amos	1.00	5.40	4.20	4.80 ± 0.89 d
LE-K-1	1.00	5.40	4.60	5.00 ± 0.70 d
Fercal	1.00	1.00	1.00	1.00 ± 0.00 a

As far as the occurrence of chlorosis was concerned, the best results were obtained in the rootstock *Fercal*. Varieties *Craciunel 2, SO 4*, and *Kober 125 AA* can be classified as rootstocks with a low sensitivity to chlorosis and for that reason they are suitable for planting in sites with calcareous soils. On the other hand, however, varieties *Amos* and *LE-K-1* can be classified as rootstocks with only a medium resistance to this deficiency and for that reason they are less suitable for soils with a higher content of lime.

CHAUVET & REYNIER (1979) and SARACCO (1992) classified rootstocks *SO 4* and *Kober 5 BB* into the same group, i.e. among rootstocks wit a medium tolerance to chlorosis.

On the other hand, however, in the rootstock variety *SO 4* the occurrence of chlorosis was lower than *Kober 5 BB*.

CHAUVET a REYNIER (1979) corroborated that the rootstock variety *Fercal* highly resistant to chlorosis.

SOUHRN

Předběžné výsledky hodnocení rezistence podnoží pro révu vinnou k chloróze vyvolané vápníkem

Odolnost k chloróze vyvolané vápníkem je velmi významnou vlastností podnoží. Chloróza vyvolávaná vápnem ovlivňuje kvalitu a výnos hroznů. Hodnocení odolnosti k chloróze je proto významné pro pěstování révy vinné a šlechtění. Cílem práce je získat výsledky hodnocení odolnosti podnožových odrůd révy vinné k chloróze. Výsledkem byly statisticky významné rozdíly mezi podnožovými odrůdami. Nejvyšší odolnost ukázala podnož Fercal. Podnože registrované ve Státní odrůdové knize v České republice je možné seřadit v následujícím pořadí od nejodolnější k nejvíce citlivé: *Craciunel 2 – SO 4 – Kober 125 AA – Kober 5 BB – Teleki 5 C – Amos – LE-K-1*.

réva vinná, podnož, odolnost, vápno, chloróza

SUMMARY

From the viewpoint of the resistance to chlorosis, the rootstocks registered in the State Variety Book of the Czech Republic can be ranked from the most resistant to the most sensitive as follows: *Craciunel 2 – SO 4 – Kober 125 AA – Kober 5 BB – Teleki 5 C – Amos – LE-K-1*.
The obtained results are very important from the viewpoint of the use of rootstock varieties for propagation and growing of grapevine in the Czech Republic.

ACKNOWLEDGEMENT

My sincere thanks for support belong to Czech Republic Ministry of Agriculture. This publication arose as a part of research project QF 4141: Grape rootstock breeding with use of grape genetic resources and modern testing methods. This research project was solved within the framework of the Theme 3.1, Use of the Genetic resources in Modern Applications; Priority 3.1.4. Improvement of the Biological Potential of Plants and Animals.

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