

Multilingual Atlas of Seedless Table Grape Varieties: Presentation of its Origin, Value and Perspectives

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Abstract

Although each variety of grapevine can be consumed as fresh fruit, their consumption is joyful only in situations, that guarantee suitable morphological and structural characteristics of bunches and berries. Seedless grapes are generally preferred by consumers for fresh consumption. As the embryos resulting from seedless x seedless crosses are able to germinate from stenospermocarpic ovules cultured on artificial medium *in vitro*, the development of new seedless selections utilizing stenospermocarpy has been recognized as a key factor in grape breeding programs throughout the world. In addition to timing of culture, maternal genotype has proved to be very important and significantly influencing the success of culture. Focusing on these characteristics, this interactive atlas presents a survey about bunches, berry size, berry structure and seeds of selected 56, mainly seedless varieties. The search function makes possible not only fast orientation, but comparison between two varieties, too. The atlas is further coupled with interactive correlations.

Introduction

The common objectives of breeding programs worldwide are to produce locally adapted varieties with better eating quality, to extend the ripening season through early and late ripening varieties and to reach varieties with increased tolerance to biotic and abiotic stress conditions. Among specific traits, the first place is reserved for seedlessness (Perl et al., 2000).

In grapevine, two types of seedlessness are recognized. Along to parthenocarpy, which exhibits small berry size and has not been used for creating selections with large berries, stenospermocarpy were described. Stenospermocarpic seedlessness is based on the abortion of endosperm and/or embryo and subsequently of the whole seeds themselves soon after fertilization. It derives from the 'Sultanina' variety and its berry colour and berry shape variations, e.g. 'Kishmish rozovyi', 'Kishmish chornyi', 'Thompson seedless' etc., and enables larger berry size and weight compared to parthenocarpic seedlessness and has been widely used in breeding programs.

Traditional breeding programs are based on hybridization of seed containing genotypes with seedless ones. However, the number of seedless offspring obtained in this crosses is low. Furthermore, as seedlessness is only one character out of several important characters required for a new variety, the selection process requires great amounts of initial material.

Recently, seedless x seedless crosses using embryo rescue technique allowed higher portions of seedless genotypes (Bouquet and Danglot, 1996). In addition to timing of culture, maternal genotype has proved to be very important and significantly influencing the success

of culture. (Garcia et al., 2000; Ponce et al., 2000). Therefore, the knowledge of uvological characteristics of seedless genotypes is of great importance.

Focusing on uvological characteristics, this interactive atlas presents a survey about bunches, berry size, berry structure and seeds of selected 56, mainly seedless varieties.

Material and Methods

The examination of varieties was partially based on gene pools located at the Faculty of Horticulture in Lednice, Czech Republic and mainly at PD Strekov, led by Dr. Korpás sen. in Southern Slovakia. The varieties investigated herein were mainly bred at the Research Institute for Viticulture and Enology, Bratislava, Slovak Republic or in other Central European countries. Several world renowned varieties were sampled at the Research Institute for Viticulture and Enology in Pécs, Hungary or obtained from markets in the winter months. Further, genotypes with increased tolerance were sampled in collections, led by Mr. Glos, Břeclav, Czech Republic and Dr. Sipos, Budapest, Hungary, respectively.

For each variety, representative bunches, berries and seeds were taken into consideration, photographed and weighted.

Results and Discussion

The Multilingual Atlas of Seedless Table Grape Varieties was created as a web site in languages HTML and Javascript. It is available in five languages: Hungarian, Czech, Slovak, German and English; and presents a survey about bunches, berry size, berry structure and seeds of selected 56, mainly seedless varieties. As an example, the figures show the studied characteristics in 'Jupiter' (Korpás, 2006). The search function makes possible not only fast orientation, but comparison between two varieties, too. The atlas is further coupled with interactive correlations.

Based on seed weight and berry weight characteristics, the examined varieties could be arranged into distinct groups. As the seedless trait originates from 'Sultanina', a small berried variety, relatively high amount of varieties grouped to very low seed weight combined with small size of berries. These varieties should be used as male genotypes.

In contrast, varieties with small to medium berry size and high seed weight also exist and form a second group. If these varieties do not contain important traits such as tolerance to biotic or abiotic factors, they should be eliminated in breeding programs searching for large berried seedless varieties. Indeed, many genotypes coming from tolerant x susceptible seedless crosses grouped into this group. However, two backcrosses with seedless varieties could give acceptable results as seen in 'BV 16-16-3'.

The third group consisting of large berried varieties with high seed weight is consistent with the observations that the large berry size is promoted by seed development. In this group, varieties with hard as well as soft seed traces exist, respectively. In the case of soft seeds, e.g. 'Venusha', they utilisation is recommended as female parents through *in vitro* embryo culture. Even genotypes with a quite regular endosperm development belong to this group, e.g. 'Neptuun' (Korpás and Hradilík, 2007). Hard stenospermocarpic seeds are not desirable because of high polyphenol content making *in vitro* culture more complicate.

The fourth group with large berries and small seed traces represents the goal of seedless table grape breeding programs. According to the existing results, two varieties should be taken into account: 'Edro bezseme' and 'Elma'.

Conclusions

As indicated, the stenospermocarpic seedless character in grapevine is a complex phenomenon and much care is needed in choice of parents in a breeding program.

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Literature

- Bouquet, A. and Danglot, Y. 1996. Inheritance of seedlessness in grapevine (*Vitis vinifera* L.). *Vitis* 35: 35-42.
- Korpás, A. 2006. Atlas of seedless table grape varieties. CD-ROM. Version 1.0.
- Korpás, A. and Hradilík, J. 2007. Possibilities of the utilisation of antigibberellins in seedless table grape breeding. *Acta Hort.* (in press).
- García, E., Martínez, A., García de la Celera, E., Pérez, L.J., Cenis, J. and Carreño, J. 2000. *In vitro* culture of ovules and embryos of grape for the obtention of new seedless table grape cultivars. *Acta Hort.* 528: 663-666.
- Perl, A., Sahar, N., Spiegel-Roy, P., Gavish, S., Elyasi, R., Orr, E and Bazak, H. 2000. Conventional and biotechnological approaches in breeding seedless table grapes. *Acta Hort.* 528: 607-612.
- Ponce, M.T., Agüero, C.B., Gregori, M.T. and Tizio, R. 2000. Factors affecting the development of stenospermic grape (*Vitis vinifera*) embryos cultured *in vitro*. *Acta Hort.* 528: 667-671.

Figures

