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Selection of Resistance to Phylloxera (*Daktulosphaira Vitifoliae Fitch*) Of Vines In Bulgaria (*Review*)

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Abstract

The results from studies of Bulgarian scientists for obtaining wine and table grapes varieties resistant to low winter temperatures, fungal diseases and pests by the method of interspecies sexual hybridization, including studies in laboratory and field conditions concerning the response of varieties of *Vitis vinifera* L. and the newly selected interspecies varieties and hybrids to root and leaf form of vine phylloxera (*Daktulosphaira vitifoliae* Fitch) are presented.

Keywords: Vine, interspecies hybridization, resistant varieties, phylloxera

The spread of phylloxera in the middle of the XIX century caused a real disaster to European viticulture. Only for a few decades, that insect was able almost completely to destroy the plantations where vine species were grown. The invasion of the pest completely changed the way of vines cultivation in the old continent (Pouget, 1990).

Phylloxera (*Daktulosphaira vitifoliae* Fitch. *Hemiptera: Phylloxeridae*) was found in 1854 in the USA by Asa Fitch, who call it *Pemphigus vitifolii* (**КИСКИН**, 1977). In Europe it was transmitted through vine propagation material. In Bulgaria it was first discovered in 1894 in the northwest part (in the region of Vidin), from where it quickly spread throughout the country.

For overcoming the devastating phylloxera crisis American vine species resistant to phylloxera were introduced on which European vine (*Vitis vinifera* L.) was grafted. That set the beginning of interspecies hybridization of vine for the selection of new varieties with increased resistance to phylloxera too. Intensive researches were undertaken in almost all developed vine-growing countries. A number of scientists (Götz, 1956; Husfeld, 1963; Boubals, 1966; Strebler, 1975; Hofman, 1957; Nedov, 1977; Chebotar, 1978, etc.) were involved in studies of the reasons for the vine resistance to phylloxera.

In Bulgaria, the method of interspecies sexual hybridization had also practical application for selecting wine and table grape varieties resistant to low winter temperatures, fungal diseases and pests. Attempts for creating resistant varieties were made by Z. Zankov in 1955/56 in the experimental field of Department of Viticulture at the Faculty of Agronomy of the Higher Agricultural Institute-Sofia, however due to the limited number of carried out hybrid combinations he did not obtain more serious theoretical or practical results. Professor Mincho Kondarev in 1970-ies – 1980-ies also held a series of crosses to create varieties with increased resistance to low winter temperatures and mildew. As a result, he selected and established a new variety Kondarev with increased resistance to low winter temperatures and mildew (Kondarev 1984).

The Institute of Viticulture and Enology had an extensive program in this field as for this purpose interspecies hybrids of Seiv Villar and *Vitis amurensis* (M a x i m) R u p r., crossed with *V. vinifera* L. species were mainly used. The obtained hybrid forms in F_1 showed good agro-biological and economic features, resistance to fungal diseases and increased cold tolerance. Thirteen new original varieties with increased resistance to low winter temperatures and mildew were approved by the State Variety Commission. Five white wine varieties – Pomoriiski Biser (Ivanov, Y., et al. 1984); Srebrostrui (Ivanov, Y., et al. 1984); Misket Kailashki (Valchev, V., et al., 1984); Dunavski Lazur (Valchev, V., et al., 1984) and Slava (Valchev, V., et al., 1992). Five red wine varieties – Mizia (Valchev, V., et al., 1984); Plevenski Kolorit (Valchev, V., et al., 1984); Nikopol Mavroud (Valchev, V., et al., 1984); Storgozia (Ivanov, Y., et al. 1984) and Dunavska Gamza (Ivanov, Y., et al. 1984). Two varieties with double use – for fresh consumption

and for making white wines - Naslada (Valchev, V., et al., 1984) and the Druzhba (Ivanov, Y., et al., 1984). One black table grape variety - Lyubimets (Valchev, V. and M. Ivanov, 1996). Most of these varieties were successfully introduced on thousands of acres in the vine-growing practice. In 2009 the Executive Agency Plant Variety Testing, Approbation and Seed Control approved two new table grape white interspecies varieties – Plevenski Favorit and Garant, two red wine varieties - Trapezitza and Kailashki Rubin and a white wine grape variety – Plevenska Rosa listed in Schedule B of the official variety list of Bulgaria.

Valchev et al. (1989) carried out studies to determine the resistance to phylloxera of the newly-selected interspecies varieties and hybrids. They set an experiment in a section heavily infested with phylloxera and phytopathogenic organisms. The object of the study were the newly-created interspecies varieties - Druzhba and Naslada; white wine varieties – Misket Kailashki, Dunavski Lazur, Srebrostrui and Pomoriiski Biser; the red wine varieties – Storgozia, Dunavska Gamza, Mizia, Nikopol Mavroud, Plevenski Kolorit and Plevenska Rosa. For controls they used Rkatziteli and Bouquet (*V. vinifera* L.) and CB 12375 - parental varieties. The authors classified the investigated varieties into 4 groups depending on the degree of resistance: highly susceptible to phylloxera and to the agents of decay processes (score 5) were Druzhba, Srebrostrui, Mizia, Dunavska Gamza and Nikopol Mavroud varieties; susceptible (score 4) were Naslada, Misket Kailashki, Dunavski Lazur and Storgozia varieties; relatively tolerant to decay processes (score 3.5) – Plevenski Kolorit and Pomoriiski Biser varieties. According to the authors these varieties had an intermediate position compared to the control varieties, but were more close to CB 12375 (with resistance score 3). The highest resistance to phylloxera and agents of decay processes (score 2) was recorded in Plevenska Rosa variety. A correlation between resistance to phylloxera, root decay and the growth rate of the individual studied varieties was found.

Lyubenova and Ivanov (2011) were also involved in work on the problem of the vine response to phylloxera. In 1998 they established a special section with a strong infectious background of phylloxera, where rooted cuttings of 12 grape varieties and two rootstocks were planted: Rupestris du Lo - pure American type (control), Berlandieri x Riparia CO4 - Americo-American type (control); the interspecies varieties – Plevenska Rosa (pink, wine), CB 12375 (white, wine), Bako 1 (white, wine), Lyubimets (black, table grapes), Druzhba (white, table grapes), Augustine (white, table grapes), Plevenski Favorit (white, table grapes), Kailashki Rubin (black, wine), Slava (white, wine), Bolgar (white, table grapes), Dimiat (white, wine) and Misket Hamburgski (black, table grapes) from *Vitis vinivera* L. The classification was according to 5-score scale of Nedov (1977) for evaluation of the resistance to phylloxera after inoculation. It was found that the highest degree of resistance to root phylloxera (score 1) and decay processes had the rootstocks and the interspecies varieties Plevenska Rosa and Bako 1. The correlation between the resistance to root phylloxera, root decay and the vine growth in different varieties was confirmed. The interspecies varieties selected in IVE - Slava, Plevenski Favorit and Kailashki Rubin were tolerant to phylloxera (score 3) and resistant to the agents of decay processes. Susceptible to phylloxera (score 4) and decay processes were Bolgar, Dimiat, Misket Hamburgski, Druzhba and Lyubimets varieties while Augustine variety was highly susceptible.

The same group of varieties was tested for the response to root phylloxera under laboratory conditions (Lyubenova et al. 1998). The methodology of Pouget (1975) was applied, according to which depending on the resistance to phylloxera vines were divided into five classes – immune, highly resistant, resistant, susceptible and highly susceptible. It was found that highly resistant to phylloxera were the rootstocks Rupestris du Lo and Berlandieri x Riparia CO4. Plevenska Rosa, CB 12375, Bako 1, Plevenski Favorit, Slava and Kailashki Rubin varieties were resistant to phylloxera. Bolgar, Dimiat, Misket Hamburgski, Druzhba and Lyubimets were susceptible.

Ivanov et al. (2013) published results of studies related to the response to leaf form of phylloxera of 6 interspecies table grape varieties. The degree of resistance was determined by the 5-score scale of Verderevski et al. (1975). Data from their study showed that the susceptible varieties were Plevenski Favorit, Vostorg and Frumoasa Alba while Lyubimets, Garant and Druzhba were highly resistant to leaf phylloxera.

In conclusion the experience of the global viticultural science including Bulgarian had shown that the use of the basic methods of classical selection for obtaining resistant varieties proved to be the most resultant and the most cost-effective. Human health and environment protection from pollution necessitates the need of thorough selection and genetic researches for obtaining vines resistant to low temperatures, fungal diseases and phylloxera, equal in grapes quality of the varieties cultivated so far. The obtained results

are promising, justifying the future high achievements in this area.

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