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Fertility Variation of Prokupac Cultivar Under Influence of Different Rootstocks

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Abstract

The examination was carried out in a vineyard of "Radmilovac"- Experimental field of the Faculty of Agriculture in Belgrade. The aim of the research was to detect the effects of three rootstocks (K 5BB, SO4 and Š 41B) on Prokupac fertility. The paper presents the results of four years tests that showed variation of different fertility parameters depending on the rootstock. Rootstock K 5BB had the highest impact on the number of developed shoots per vine (14.1), number of productive shoots per vine (12) and the highest percent of developed shoots per vine (96%). Higher percentage of productive shoots was recorded for rootstock SO4 (93.7%). In comparison to other two rootstocks (5BB K and Š 41B) on the same rootstock, higher values were recorded for the following parameters: inflorescences number per bud (1.5), inflorescences number per developed shoot (1.6) and number of inflorescences per productive shoot (1.7). Š 41B rootstock influenced cluster number per vine (20.5) and cluster mass (172.9 g).

Key words: Prokupac, rootstock, K 5BB, SO_4, Š 41B

Introduction

Prokupac is autochthonous Serbian black wine variety with an undetermined exact origin. It is assumed to be spread in the area surrounding Prokuplje and Aleksandrovac (Župa). It is often found under the synonyms: Kameničarka, Rekovačka crnka, Nikodimka, Rskavac, Prokupka and Niševka. It is characterized with strong vigor and yielding capacity which manifests as a well provided or low fertility soil. Prokupac shoots are developed and strong with standing growth. Prokupac bunch is medium large, with cylindrical or medium -compact conical form. Berries are medium large, round or slightly snippy with a thick and dark blue epidermis. Prokupac can be grown at lower training systems without post system. Yielding varieties whereat should be emphasized that the lowest buds on a shoot are with good fertility. For Prokupac is appropriate short pruning on which provides excellent yield. Some Prokupac varieties

is characterized by the increased resistance to Botrytis cinerea. Prokupac wine is refreshing and well red colored (Zirojević, 1964; Avramov et al. 2001; Žunić & Garić, 2010). Marković et al. (2007, 2012b, 2012c) has allocated 25 Prokupac clones which are in testing process on experimental field of Belgrade Faculty of Agriculture-Radmilovac.

Research by Marković (2001, 2012a) showed that some of fertility Prokupac parameters varied under the influence of different rootstocks on which is Prokupac grafted. Selection of the appropriate rootstock is essential for successful growing of some grapes cultivars and also for production of appropriate wine quality. Rootstock influence on most agribiological, uvological and technological properties on grown cultivars is directly related to cultivar vigor, fertility, yield and grapes quality (Lavrencic et al., 2004; Marković, 2012). Ferroni et al. (1995) found on varieties Chardonnay and Trebbiano Toscano, which are grown on their own roots and grafted to rootstock K 5BB that the increased vigor and fertility of varieties Trebiano Toscano had a greater impact on rootstock K 5BB compared to Chardonnay which showed no statistical significance in both combinations. Devigorating rootstocks usually limit and may improve fruit quality. Fruit yield generally shows a weak negative correlation with quality as measured by sugar content. The specific yield in relation to quality of any rootstock influence varies considerably (Jackson, 2008).

Materials and methods

The research was carried out during four research years in the vineyard on "Radmilovac"- Experimental field of the Faculty of Agriculture in Belgrade. The aim of this research was to detect the effects of three rootstocks (K 5BB, SO4 and Š 41B) on Prokupac fertility parameters. During the research period at ten vine per rootstock combination was detected the following parameters: number of remaining buds at pruning, number of developed shoots per vine, percentage of developed shoots per vine, number of shoots per vine, % of productive shoots, number of inflorescences per bud, inflorescence number per developed shoot, inflorescences number per productive shoot, clusters number per vine and cluster mass.

Number of developed shoots per vine, number of productive shoots per vine, number of inflorescences per developed shoot and inflorescences number per productive shoot were determined by counting of shoots and inflorescences number during flowering time while the clusters number per vine and cluster mass was determined at the harvest. Others mentioned parameters in paper were determined by calculation.

Results and discussion

In the first research year the values related to the number of developed shoots showed minor differences between the rootstocks. On rootstocks SO4 and Š-41B was recorded almost identical percentage of developed shoots (93.6% and 93.7%), while for the rootstock K 5BB was recorded lower percentage (92.8%). The largest percentage

of shoots was recorded on rootstock SO4 (91.1%), followed by rootstocks K 5BB (90.1%) and the lowest on rootstock Š-41B (89.9%). Rootstock SO4 influenced in the highest percent inflorescences number per bud at which is developed 1.61 inflorescence while rootstock Š-41B and K 5BB (1.43 and 1.18). Similar tendencies were observed in determining of inflorescences number per developed shoot and inflorescences number per productive shoot (Table 1). The largest clusters number was recorded on rootstock SO4 (15.8) and Š-41B (15.0) while on rootstock K 5BB was recorded smaller clusters number (11.3). On cluster mass greatest influence had rootstock SO4 which had the measured mass of 168.8 g.

During the second year most of the parameters showed noticeable variation with higher values for parameters such as: number of developed shoot, % of developed shoots per vine, number of productive shoots per vine, % of productive shoot, inflorescences number per bud, cluster number per vine and clusters mass. For the number of inflorescences per developed shoot and inflorescences number per productive shoot were recorded slightly lower values compared to the first year of observation. Rootstock K 5BB had the greatest impact on number of developed shoots per vine (13.7) and number of productive shoots per vine (12.2) while at other parameters as in the first year of study the greatest influence showed rootstock SO4. K 5BB rootstock in combination with other two rootstocks caused lowest values for: % of productive shoots (89.05%), inflorescences number per bud (1.06), inflorescences number per developed shoot (1.21), inflorescences number per productive shoot (1.30), clusters number of per vine (15.2) and clusters mass (150.3 g).

In Table 2. are shown the values of fertility parameters for the third and fourth year of research. In the third year of research number of remaining buds at pruning was similar. In average at pruning was left 13.6 buds. Number of developed shoots per vine did not vary significantly with much greater variation influenced by rootstock SO4 at which recorded a small number of developed shoots. In relation to previous two years in the third year of the research rootstock SO4 showed less impact on percent of developed shoot per vine (92.5%). As in previous year, trend that was that in most cases rootstock SO4 affected percent of productive shoots (96.5%), inflorescences number per vine (1.52), inflorescences number per developed shoot (1.54), inflorescences number per productive shoot (1.60) and clusters number per vine (22.2). Rootstocks K 5BB by fertility parameter was just behind SO4 rootstock, while the rootstock Š-41B for most of these parameters showed significantly lower values.

Values of examined fertility parameters in the fourth year showed the same tendency of increase and decrease on the same rootstocks as in the third year. Also, comparing the results of the third and fourth years of the same rootstock it is more noticeable for those parameter values in the fourth year of study.

Tab. 1. The values of the parameters for I and II research year
Vrijednosti parametara za I i II godinu istraživanja

Parameter *Parametar*	I research year *I godina istraživanja*			II research year *II godina istraživanja*		
	K 5BB	SO4	Š-41B	K 5BB	SO4	Š-41B
Number of remaining buds at pruning *Broj ostavljenih okaca nakon orezivanja*	9.8	9.6	9.5	14.3	12.8	13.7
LSD $_{0.05\text{-}0.01}$	1.399-2.568			3.268-5.994		
Developed shoot per vine *Razvijeni lastari po čokotu*	9.1	9.0	8.9	13.7	12.4	13.0
LSD $_{0.05\text{-}0.01}$	1.272-2.336			3.296-6.051		
% of developed shoot per vine *% razvijenih lastara po čokotu*	92.8	93.7	93.6	95.8	96.8	94.9
Number of productive shoots per vine *Broj rodnih lastara po čokotu*	8.2	8.2	8.0	12.2	11.3	12.0
LSD $_{0.05\text{-}0.01}$	2.234-4.102			3.533-6.487		
% of productive shoots per vine *% rodnih lastara po čokotu*	90.1	91.1	89.9	89.05	91.2	92.3
Inflorescences number per bud *Broj cvasti po okcu*	1.18	1.61	1.43	1.06	1.35	1.21
LSD $_{0.05\text{-}0.01}$	0.261-0.479			0.168-0.309		
Inflorescences number per developed shoot *Broj cvasti po razvijenom čokotu*	1.25	1.83	1.69	1.21	1.39	1.31
LSD $_{0.05\text{-}0.01}$	0.231-0.425			0.320-0.588		
Inflorescences number per productive shoot *Broj cvasti po rodnom lastaru*	1.42	2.00	1.92	1.30	1.43	1.40
LSD $_{0.05\text{-}0.01}$	0.564-1.036			0.318-0.584		
Clusters number per vine *Broj grozdova po čokotu*	11.3	15.8	15.0	15.2	17.4	16.6
LSD $_{0.05\text{-}0.01}$	3.182-5.841			3.203-5.879		
Cluster mass *Masa grozda*	162.8	168.8	159.8	150.3	170.1	171.1
LSD $_{0.05\text{-}0.01}$	10.712-19.663			27.617-50.695		

Tab. 2. The values of the parameters for III and IV research year
Vrijednosti parametara za III i IV godinu istraživanja

Parameter *Parametar*	III research year *III godina istraživanja*			IV research year *IV godina istraživanja*		
	K 5BB	SO4	Š-41B	K 5BB	SO4	Š-41B
Number of remaining buds at pruning *Broj ostavljenih okaca nakon rezidbe*	13.9	13.4	13.7	18.2	18.2	15.0
LSD $_{0.05\text{-}0.01}$	4.909-8.504			2.010-2.715		
Developed shoot per vine *Razvijeni lastari po čokotu*	13.3	12.4	13.1	18.0	14.7	14.7
LSD $_{0.05\text{-}0.01}$	3.074-5.642			2.615-2.721		
% of developed shoot per vine *% razvijenih pupoljaka po čokotu*	95.7	92.5	95.6	100.0	80.3	98.0
Number of productive shoots per vine *Broj rodnih lastara po čokotu*	12.6	12.0	10.2	15.5	14.1	13.7
LSD $_{0.05\text{-}0.01}$	3.337-6.126			2.845-3.841		
% of productive shoots per vine *% rodnih lastara po čokotu*	94.7	96.5	77.9	92.3	95.9	93.2
Inflorescences number per bud *Broj cvasti po okcu*	1.38	1.52	1.27	1.44	1.57	1.40
LSD $_{0.05\text{-}0.01}$	0.119-0.218			0.203-0.374		
Inflorescences number per developed shoot *Broj cvasti po razvijenom lastaru*	1.40	1.54	1.31	1.69	1.60	1.59
LSD $_{0.05\text{-}0.01}$	0.198-0.350			0.162-0.219		
Inflorescences number per productive shoot *Broj cvasti po rodnom lastaru*	1.42	1.60	1.36	1.72	1.63	1.72
LSD $_{0.05\text{-}0.01}$	0.304-0.558			0.145-0.196		
Clusters number per vine *Broj cvasti po čokotu*	17.7	22.2	21.7	28.5	21.8	28.8
LSD $_{0.05\text{-}0.01}$	11.324-20.788			7.800-10.617		
Cluster mass *Masa grozda*	229.8	175.6	211.9	136.5	151.0	148.8
LSD $_{0.05\text{-}0.01}$	19.906-36.540			14.317-26.541		

After analyzing rootstocks influence on fertility parameters separately over years, can be analyzed by the same parameters as average values for the four-year period (table 3). K 5BB rootstock showed the highest effect on the number of developed shoots per plant (13.5), % developed shoots per vine (96.0%) and number of productive shoots per vine (12.0). SO4 on % of productive shoots (93. 7%), number of inflorescences per bud (1.5), number of inflorescences per developed shoot (1.6), number of inflorescences per productive shoot (1.7) and Š-41B on cluster number per vine (20.5) and cluster mass (172.9 g). Results of average values for the four-year period are shown in graph 1.

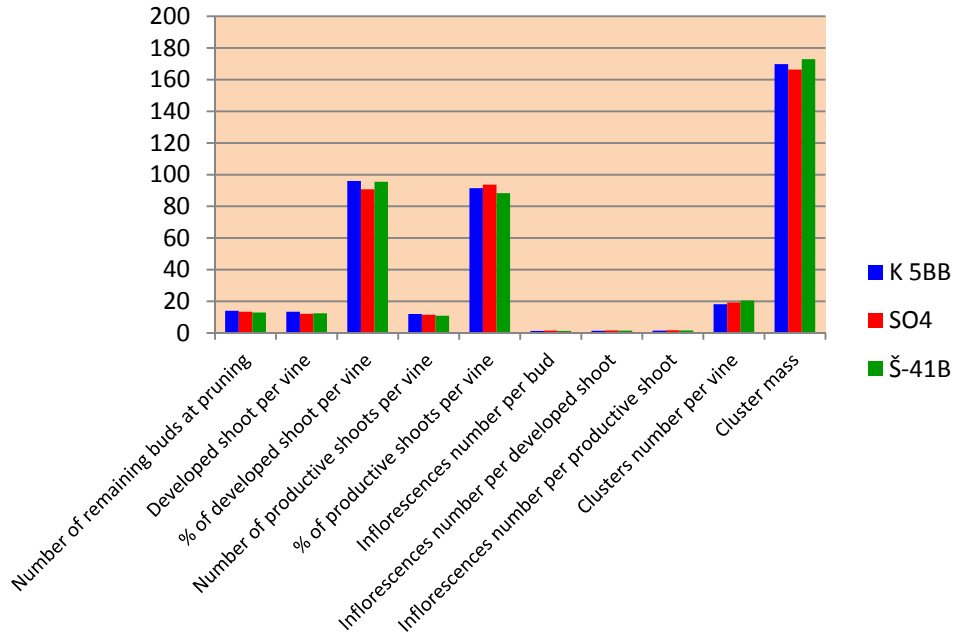
Tab. 3. The average values of fertility parameters for four-year research period
Prosječne vrijednosti parametara radnosti za četvorogodišnji period

Parameter *Parametar*	K 5BB	SO4	Š-41B
Number of remaining buds at pruning *Broj ostavljenih pupoljaka nakon rezidbe*	14.1	13.5	12.9
Developed shoot per vine *Razvijeni lastari po čokotu*	13.5	12.1	12.4
% of developed shoot per vine *% razvijenih lastara po čokotu*	96.0	90.8	95.5
Number of productive shoots per vine *Broj rodnih lastara po čokotu*	12.0	11.5	10.9
% of productive shoots per vine *% rodnih lastara po čokotu*	91.5	93.7	88.3
Inflorescences number per bud *Broj cvasti po okcu*	1.3	1.5	1.3
Inflorescences number per developed shoot *Broj cvasti po razvijenom lastaru*	1.4	1.6	1.5
Inflorescences number per productive shoot *Broj cvasti po rodnom lastaru*	1.5	1.7	1.6
Clusters number per vine *Broj grozdova po čokotu*	18.2	19.3	20.5
Cluster mass *Masa grozda*	169.8	166.4	172.9

Conclusion

Based on the four year research period can be performed following conclusions:

- Fertility parameters varied over a wide range depending on rootstock on which it was grown Prokupac;
- K 5BB rootstock showed the highest effect on the number of developed shoots per vine, % developed shoots per plant and number of shoots per vine;
- Rootstock SO4 had the biggest influence on % of productive shoots, number of inflorescences per bud, inflorescence number per developed shoot and number of inflorescences per productive shoot;
- Š-41B rootstock influenced cluster number per vine and cluster mass.



Graph. 1. Fertility variation in four year period
Varijacija rodnosti u četvorogodišnjem periodu

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Variranje rodnosti sorte Prokupac pod uticajem različitih loznih podloga

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Sažetak

Ispitivanja su obavljena u kolekcionom vinogradu Oglednog dobra "Radmilovac" Poljoprivrednog fakulteta u Beogradu, pri čemu je ispitivan uticaj tri lozne podloge (K 5BB, SO4 i Š 41B) na rodnost sorte Prokupca. U radu su prikazani rezultati četvorogodišnjeg ispitivanja koji su pokazali variranje parametara rodnosti u zavisnosti od lozne podloge. Lozna podloga K 5BB imala je najveći uticaj na broj razvijenih lastara po čokotu (14,1), broj rodnih lastara po čokotu (12), kao i na % razvijenih lastara po čokotu (96%). Veći procentualni udeo rodnih lastara zabeležen je na loznoj podlozi SO4 (93,7%). Na istoj podlozi zabeležene su veće vrednosti u odnosu na ostale podloge K 5BB i Š 41B za sledeće parametre: broj cvasti po okcu (1,5), broj cvasti po razvijenom lastaru (1,6) i broj cvasti po rodnom lastaru (1,7). Podloga Š 41B imala je najveći uticaj na broj grozdova po čokotu (20,5) i na masu grozda (172,9 gr).

Ključne reči: Prokupac, lozna podloga, K 5BB, SO4, Š 41B

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