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znanstveni rad

UTJECAJ UZGOJNOG OBLIKA NA PRINOS I KVALITETU GROŽĐA SORTE CABERNET SAUVIGNON U AGROEKOLOŠKIM UVJETIMA ISTARSKOG POLUOTOKA

scientific paper

THE INFLUENCE OF TRAINING SYSTEM ON YIELD AND QUALITY OF CABERNET SAUVIGNON IN AGRO-ECOLOGICAL CONDITIONS OF ISTRIA

SAŽETAK

Sa obnovom rada Instituta za poljoprivredu i turizam u Poreču, krajem 1980, počinju i sistematska proučavanja utjecaja uzgojnih oblika na prinos i kvalitetu grožđa. Početkom 1990 na imanju Instuta posađen je eksperimentalni vinograd sa sortom Cabernet Sauvignon sa slijedećim uzgojnim oblicima: dvostruki redovi (Fillari binati), niski kordonac, lira, guyot i GDC (Geneva double curtain). U ovom radu prezentirani su rezultati tri berbe - 7. listopada 1999, 18. rujna 2000 i 24. rujna 2001 godine. U vinogradu je posađen klon R5 koji je cijepljen na podlogu SO4. Za procjenu utjecaja uzgojnog oblika na prinos i kvalitetu grožđa obrađeni su slijedeći parametri: prinos grožđa/trsu, prinos/ha, prosječna masa grozda, broj grozdova/trsu i primarni parametri kvalitet grožđa kao što su količina šećera, količina ukupnih kiselina i pH vrijednost mošta. Uzgojni oblik kordonac niski pokazao je najpovoljniji utjecaj na visinu prinosa grožđa i sa najvišom količinom šećera u moštu i zadovoljavajućom količinom ukupnih kiselina. Uzgojni oblici guyot, lira i GDC također su postigli zadovoljavajuće rezultate po pitanju visine prinosa i kvalitete grožđa. Dobiveni rezultati pokazuju kako se pri izboru uzgojnog oblika za sortu Cabernet Sauvignon, za agroekološke uvijete Istre mogu koristi

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oblici kordonac niski, guyot, lira i GDC. Međutim, sam izbor uzgojnog oblika, značajno ovisi i o ostalim faktorima, pa se stoga uzgojni oblici lira i GDC mogu samo uvjetno preporučiti za uzgoj vinove loze u Istri jer zahtjevaju posebne oblike mehanizacije za rad, koji trenutno nisu dostupni na tržištu opreme u Hrvatskoj.

SUMMARY

With the restoration of the scientific studies at the Institute for agriculture and tourism, at the end of the 1980s, systematic studying of training systems started. At the beginning of the 1990s an experimental plantation of training systems has been set on the Institute's grounds amongst which Fillari binati, low cordon, Lira, Guyot and GDC on varieties Cabernet sauvignon. Serving the needs of the research, we have analyzed the results of three harvests, dated 7th Oct. 1999, 18th Sept. 2000 and 24th Sept. 2001. The clone R5 of Cabernet Sauvignon has been grafted on the SO4 rootstock. The investigated were yield parameters as yield/vine, yield/hectare, average cluster weight and number of cluster/vine and quality parameters as soluble solids, acid content, pH. The worst result in this research has shown training system Filari binati. Cordon has shown the best yield results, the best yield per hectare and the highest soluble solids in grapes together with optimal level of acids. Guyot, Lira and G.D.C have also shown satisfactory results, concerning yield per hectare as well as grape quality. The results of our research suggest that Cordon, Guyot, Lira and G.D.C can be successfully used in viticulture in Istria. The choice of training system will certainly depend on many variables, such as the size and location of the vineyard, availability and training degree of manpower, existing equipment and machinery, type of wine-production etc. Main problem with the introduction of new training systems, Lira and G.D.C to Istria is certainly lack of specific equipment and machinery on market.

INTRODUCTION

The choice of training system is of significant importance for successful wine growing. In Istria, traditional training system used to be "Istrian" which, depending on the skill of the winegrower, achieved better or worse yield results. Istrian training system is a system of low expansion (6-10 buds per vine), it has only one cane and it is without spur. With gathering momentum of viticulture in Istria, in the second half of the last century new, quality varieties have been introduced such as Cabernet Sauvignon, Merlot, White Pinot, Black Pinot, Chardonnay and other. Together with the new varieties, new training systems have been introduced; those of high expansion, most frequently two or three armed Guyot and Sylvoz Cordon. With the restoration of the scientific studies at the Institute for agriculture and tourism, at the end of the 1980s, systematic studying of training systems started. At the beginning of the 1990s an experimental plantation of training systems has been set on the Institute's grounds amongst which Fillari binati, low cordon, Lira, Guyot and others on three varieties- Cabernet sauvignon, Chardonnay and Istrian Malvasia

Many studies on the influence of training system on the characteristics of Cabernet Sauvignon have already been published but due to the specific agro-climatic conditions in Istria, their results aren't applicable without verification. Consequently, Ough and Nagaoka (1984) reported that different amount of bud load per vine, for Cabernet Sauvignon in the region of Napa Valley, California (the U.S.A.), had a significant influence on the yield and grape quality (quantity of sugar and acid and pH level). They add that micro-location within the Napa Valley also had a considerable influence on the quantity of aromatic ingredients.

Bravdo et all. (1985) reported that the influence of yield has been significant for the grape quality of Cabernet Sauvignon in the region of Andulama in Israel.

The first results of our studies (Cargnello et al. 1996, Peršurić et al. 1998, 1999) show that training system has a considerable effect upon the yield quantity, as on the sugar quantity on the Cabernet Sauvignon variety.

MATERIAL AND METHODS

The research was set on the plantation of training systems on the Institute's grounds. Serving the needs of the research, we have analyzed the results of three harvests, dated 7th Oct. 1999, 18th Sept. 2000 and 24th Sept. 2001. The clone R5 of Cabernet Sauvignon has been grafted on the SO4 rootstock.

Training systems are as follows:

1. Filari binati (Double rows), spacing is 3.60 x 1.00 m 2.137 vines/hectare with pair planting, training system is cordon with short cutting, with 60 cm trunk height
2. Low Cordon, spacing is 0.90 x 1.00 m (4.500 vines/hectare), with 60 cm trunk height
3. Guyot, spacing 2.70 x 1.00 m (3.704 vines/hectare), with 90 cm trunk height
4. Lira, spacing 3.60 x 1.00 m (2.778 vines/hectare) with 70 cm trunk height
5. GDC, spacing 3.60 x 1.00 m (2.778 vines/hectare), with 160 cm trunk height

Serving the need of the research, we have analyzed the following yield parameters; yield per vine, average cluster weight and number of clusters per vine. The quality parameters analyzed were as follows: soluble solids, acidity and pH at the time of harvesting. The soluble solid has been determined with the help the Klosterneurger must scale; the total amount of acid has been established by the NaOH neutralization method with brom timol blue as indicator. The experiment has been set in three repetitions with 5 vines per repetition. Average readings were compared to ANOVA test by the Student-Newman-Keulse method for comparing average readings, for $p \leq 0.05$ rank.

RESULTS AND DISCUSSION

1. Climate conditions

Figure 1 Temperature dynamics in vegetation period in 1999, 2000 and 2001

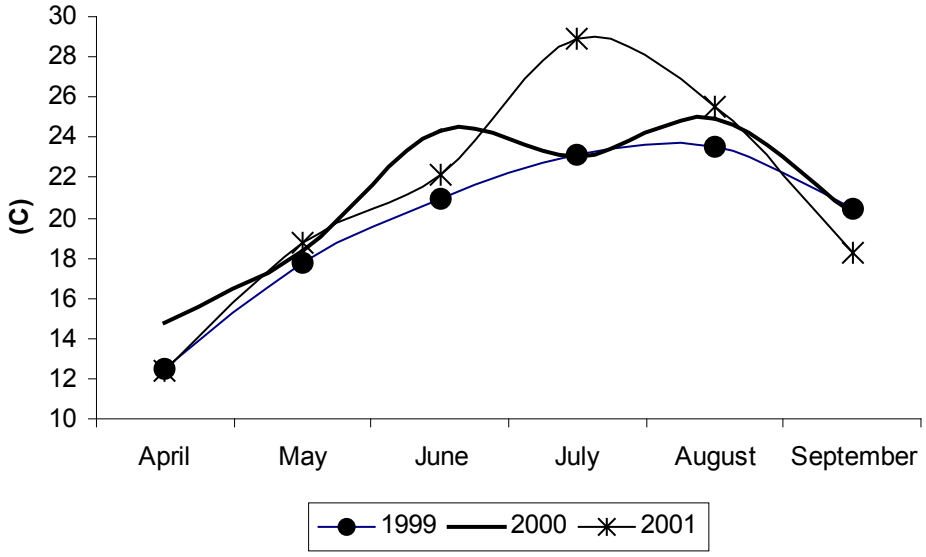
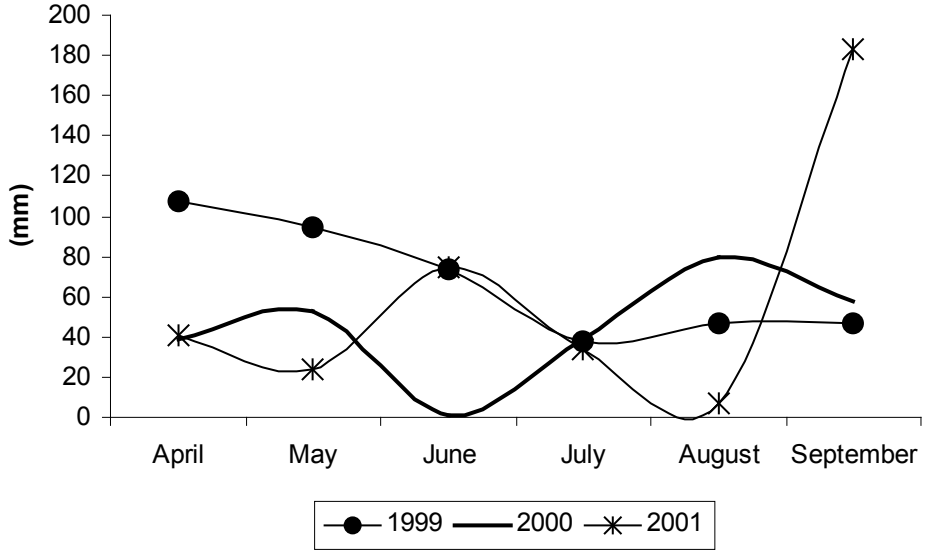


Figure 2 Rainfall dynamics in vegetation period in 1999, 2000 and 2001



According to climatic data from tables 1 and 2, 1999 has been the most suitable year

for cultivation and growing grapes because there were no distinctive climatic variations. In that year, we have also achieved the highest yield and quality of grapes. 2001 has been the worst year for vine growing. In that year, temperature variations have been prominent with extremely high average monthly temperature of 27.6 °C in July. In August, the average rainfall quantity has been very low. In September, just before the harvest, high amounts of rainfall have been recorded, which had an unfavorable effect on the grape quality.

2. Grape yield

Table 1. Statistical analysis of yield parameters

	Yield/vine	Yield/ha	Average cluster weight	Number of clusters/ vaine
Factors				
Year (A)	ns	ns	**	*
Training system (B)	**	***	**	*
Interaction				
A x B	ns	ns	ns	ns

a) *, **, ***, ns; Significant at p[0.05, 0.01, 0.001 or not significant, respectively

Table 2. Influence of year on yield parameters

	Yield/vine (g)	Yield/ha (t)	Average cluster weight (g)	Number of clusters/ vine
1999	3 282.9 a	11.89 a	113.39 b	27.88 a
2000	3 584.1 a	14.18 a	133.96 ab	28.44 a
2001	2 926.2 a	11.09 a	150.29 a	20.13 b
significance	ns	ns	**	*

a) *, **, ***, ns; Significant at p[0.05, 0.01, 0.001 or not significant, respectively

Table 3. Influence of training system on yield parameters

	Yield/vine (g)	*Yield/ha (t)*	*Average cluster weight (g)*	*Number of clusters/ vine*
Filari binati	3 102.3 a	6.62 c	147.60 a	21.86 ab
Low Cordon	1 832.2 b	20.31 a	102.60 b	18.64 b
Guyot	3 661.7 a	13.56 b	152.16 a	25.24 ab
Lira	3 769.1 a	10.46 bc	142.22 a	27.93 ab
GDC	3 956.4 a	10.99 bc	118.15 ab	33.73 a
significance	**	***	**	*

a) *, **, ***, ns; Significant at p[0.05, 0.01, 0.001 or not significant, respectively

The year had a significant influence on average grape weight, whereas there were no changes in yield per vine in either of three years in question. The highest average cluster weight has been measured in 2001 even though that's been a climatically unfavorable year, with very small amount of rainfall in August.

The training system had, as we had expected, a considerable influence on all the yield parameters. The highest yield per vine has been noticed with high expansion training systems, such as Lira and GDC (p[0.001) but it's interesting that Guyot is in the same rank. Lower yield per vine with low cordon could be justified by lower weight of an average grape, which is almost 50% lower than with other training systems. The highest number of clusters per vine has been measured on GDC training system (p[0.05), which is at the same time the system with the highest expansion. Opposite to the yield per vine values, low cordon has achieved the highest yield per surface unit. 8.1 t/hectare yields are enabled by the thickness of planting- 4500 vines/hectare.

3. Grape quality

Table 4. Statistical analysis of grape quality parameters

	Soluble solids	*Acids*	*pH*
Factors			
Year(A)	**	***	***
Training system(B)	*	ns	ns
Interaction			
A x B	Ns	ns	**

a) *, **, ***, ns; Significant at p[0.05, 0.01, 0.001 or not significant, respectively

Table 5. Influence of year on grape quality parameters

	Soluble solids (° Kl)	Acids (g/L)	pH
1999	19.10 a	7.38 b	3.18 b
2000	17.31 b	8.24 a	3.02 c
2001	18.01 b	6.67 c	3.25 a
significance	**	***	***

a) *, **, ***, ns; Significant at p[0.05, 0.01, 0.001 or not significant, respectively

Because of its climatic variations, the year is a factor that considerably influences all grape quality parameters, which this research proves. In 1999, we have measured the highest amount of sugar in grapes, whereas the lowest amount of sugar and acids has been noticed in 2001.

Table 6. Influence of training system on grape quality parameters

	Soluble solids (° Kl)	Acids (g/L)	pH
Filari binati	18.35 ab	7.24 a	3.16 ab
Low cordon	19.17 a	7.09 a	3.16 ab
Guyot	18.06 b	7.36 a	3.10 b
Lira	17.58 b	7.73 a	3.20 a
GDC	17.50 b	7.74 a	3.15 ab
significance	*	ns	**

a) *, **, ***, ns; Significant at p[0.05, 0.01, 0.001 or not significant, respectively

Because of its climatic variations, the year is a factor that considerably influences all grape quality parameters, which this research proves. In 1999, we have measured the highest amount of sugar in grapes, whereas the lowest amount of sugar and acids has been noticed in 2001.

As confirmed in earlier research, that when yield increases grape quality decreases, similar pattern has been noticed in our research, too. Low cordon is a training system that had significantly the lowest yield per hectare and the highest amount of sugar. With the amount of acids, there were no significant discrepancies between the training systems, whereas the differences in pH values were less marked.

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CONCLUSION

The worst result in this research has shown training system Filari binati. Low cordon has shown the best yield results, the best yield per hectare and the highest soluble solids in grapes together with optimal level of acids. Guyot, Lira and G.D.C have also shown satisfactory results, concerning yield per hectare as well as grape quality.

The results of our research suggest that low cordon, Guyot, Lira and G.D.C can be successfully used in viticulture in Istria. The choice of training system will certainly depend on many variables, such as the size and location of the vineyard, availability and training degree of manpower, existing equipment and machinery, type of wine-production etc. Main problem with the introduction of new training systems, Lira and G.D.C to Istria is certainly lack of specific equipment and machinery on market.

LITERATURE

1. *Bravdo B., Hepner Y., Loinger C., Cohen S., Tabacman H. (1985) Effect of crop level and crop load on growth, yield, must and wine composition, and quality of Cabernet sauvignon, Am. J. Enol. Vitic. 36(2) 125-131*
2. *Cargnello G., Peršurić Đ., Milotić A., Licul R., Lovat L. (1996) Nouveaux modeles de viticulture experimentes en Istrie, Croatie, G.E.S.C.O., Budapest, Hungary, 21-23*
3. *Cargnello G., Peršurić Đ., Dragan P. (1999) New results of research into some new training system in Istria, Croatia, G.E.S.C.O., Sicily, Italy, 441-447*
4. *Ough C.S, Nagaoka R. (1984) Effect of cluster thining and vineyard yields on grape and wine composition and wine quality of Cabernet sauvignon, Am. J. Enol. Vitic. 35(1)30-34*
5. *Peršurić Đ., Dragan P., Cargnello G. (1998) First results of research of yields and grape quality on different new training system in Istria, Croatia, G.E.S.C.O., Changins, Suisse(CH), 191-194*