STUDY ON THE PRECOCITY INDEXES DURING THE ANNUAL GROWTH CYCLE OF GRAPEVINE, IN BLAJ WINE-GROWING CENTER, TÂRNAVE VINEYARD

STUDIU ASUPRA INDICILOR DE PRECOCITATE AI CICLULUI VEGETIV IN CENTRUL VITICOL BLAJ, PODGORIA TÂRNAVE

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Abstract. *In the experience placed at SCDDV Blaj has been pursued the unfolding of the main phenophases at the grape varieties: Astra, Blasius, Selena and Fetească regal, in climate conditions of the years 2009 and 2010. Precocity index of the vegetation cycle was calculated using Barbeau's formula (1998). In the two years, to the varieties: Astra, Blasius and Selena the vegetation start was earlier than at Fetească regală, variety enshrined in Târnave Vineyard. It was estalished a close link between the vegetation phases and the amount of useful temperatures. Precocity of vegetation cycle was influenced by the flowering moment. On average, in 2010 it was found a precocity of vegetative cycle (iPcy = 100.00) compared to 2009 (iPcy = 99.98), although the climatic condition in 2009 were more favourable for vine culture than 2010. Between precocity indexes of veraison and precocity of vegetative cycle was established in 2009 a significant positive correlation (r = 0.98*) and a negative nesemnifcativă correlation in 2010 (r =- 0.93).*

Key words: grapevine, precocity index of the annul cycle, floraison, veraison

Rezumat. *În experienţa amplasată la S.C.D.D.V Blaj s-a urmărit desfăşurarea principalelor fenofaze la soiurile: Astra, Blasius, Selena şi Fetească regală, în condiţiile climatice ale anilor 2009 şi 2010. Folosind formula lui Barbeau, 1998, s-a calculat indicele de precocitate al ciclului vegetativ. În cei doi ani, Astra, Blasius şi Selena au intrat în vegetaţie mai repede decât Fetească regală, soi consacrat în Podgoria Târnave. Între fazele de vegetaţie şi suma temperaturilor utile s-a stabilit o corelaţie semnificativ pozitivă. Precocitatea ciclului de vegetaţie a fost influenţată de momentul înfloritului. În medie, s-a constat o precocitate a ciclului vegetativ în anul 2010 (iPcy = 100.00) faţă de cel din anul 2009 (iPcy = 99.98), chiar dacă condiţiile climatice din anul 2009 au fost mai favorabile culturii viţei de vie decât în 2010. Între indicele de precocitate a pârgii şi cel al ciclului vegetativ s-a stabilit o corelaţie pozitiv semnificativă în 2009 (r=0.98*) şi una negativă nesemnifcativă în 2010 (r=-0.93).*

Cuvinte cheie: viţă de vie, indice de precocitate, înflorire, pârgă

INTRODUCTION

In septentrional viticulture, precocity of the annual cycle of vegetation is very important for grapes, especially for the harvest quality (Asselin et al., 2001). In regions of northern limit of the vine growing, the amount of temperatures and sun exposure

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during the vegetation are favorable, but also, it can occur periods of high humidity through veraison and grapes ripening (Barbeau et al., 1998).

Knowing the precocity of annual cycle of vine is necessary to ensuring a proper grapes ripening, in the most favorable conditions of the year. Phenological phases: budburst, flowering, veraison and grapes ripening, are indicators of precocity of the vine cycle. The dates of these phases are linked between them, but between flowering and veraions, is established the closest connection. The rest of the phenophases is best correlated with budburst; this phase depends not only on climate and soil, but also to the winter temperatures and with the pruning moment (Jones et al., 2000).

Mostly flowering, veraison and grapes ripening are influenced by climatic factors. According to Barbeau et al. (1998), precocity is a genetic characteristic of varieties. Morlat (2001) and Carbonneau et al. (1992) showed that the budburst precocity is influnced by active temperatures (above 10°C) for seven consecutive days. Flowering, veraison and grapes ripening are positive correlated with temperature and negatively correlated with precipitation (Jones et al., 2000). Van Leeuwen et al., 2008 revealed a positive correlation between phenological stages and useful temperatures (Winkler index).

MATERIAL AND METHOD

The research conducted at S.C.D.V.V. Blaj have been pursued the unfolding of phenological phases in the climatic conditions of the years 2009 and 2010. Grapevine varieties studied were Astra Blasius, Selena and Fetească regală.

The plantation was established in 2001, with planting distances of 2.00 m between rows and 1.20 m between vines on row. Training system was Guyot with periodic replacement cordons, pruned on spurs and canes, with a load of 20 buds/m².

The observations and measurements were made on 30 block vines of each variety and phenological stages have been noted using the Baggiolioni code. In 2009, budburst was monitored in 8, 11, 15 and 18 April, the flowering in 4, 8 and 12 June, the veraison, since July 25 until August 10 every two days and then at grapes ripening, every five days until harvest. In 2010, due to winter climatic conditions, the start into vegetation was later to all varieties comparing to 2009, so, budburst was monitored on 15, 19 and 22 of April, the flowering in 2, 4, 7, 10 of June, veraison every two days between 30 July to 15 August, and then at grapes ripening to every five days until harvest.

In budburst phase were counted the buds in stage C. The middle budburst was considered when more than 50% of buds were in stage C. The flowering was estimated visually to every inflorecences on each vine. It were note from 1 to 5, depending on the degree of flowering: 1: 0-10%, 2: 10-30%, 3: 30-50% 4: 50-80%, 5: 80-100%. Flowering percentage was calculated using the Bodin's formula (2003):

$$\textbf{Flowering} = \frac{(n<10\%)x1+(n<30\%)x2+(n<50\%)x3+(n<80\%)x4+(n>80\%)x5}{\textbf{Total number of inflorescences}}$$

The middle flowering was considered when 50% of inflorecences were flowered. Veraison phase was difficult to pursue because the grapes were white varieties. For a better assessment was combined the visual and tactile scoring. Thus, the grape berries riped had a light green color, soft, with translucent skin. To calculate the veraison percentage, each cluster observed, was noted from 1 to 5 in this way: 1: 0-10%; 2: 10-30%; 3: 30-50%; 4: 50-80%; 5: 80-100%. Percentage of veraison was calculated using the Bodin's formula (2003):

$$\% \text{ Veraison} = \frac{(n<10\%)x1+(n<30\%)x2+(n<50\%)x3+(n<80\%x4)+(n>80\%)x5}{\text{Total number of clusters}}$$

Based on the veraison percentage was calculated the veraison middle. Barbeau et al., (1998) have proposed the following indices: the flowering precocity index (iPf), the veraison precocity index (iPv) and the index of precocity of the annual vegetation cycle (iPcy). Thus indices show the potential of the grapevine variety, of the wine-growing region, etc.

$$iPf = 100*[1 + (fm - fi) / fm]$$

$$iPv = 100*[1 + (vm - vi) / vm]$$

$$iPcy = iPf + 100*[(vm - fm) - (vi - fi) / (vm - fm)]$$

where: fm = flowering middle; fi = flowering at variety;
vm = veraison middle; vi = veraison at variety

Statistical analysis of data was made using Duncan test, variance analysis and correlation between variables (Ardelean, 2007).

RESULTS AND DISCUSIONS

Blaj wine-growing center has a long grapevine tradition. The unfolding of the grapevine phenophases is influenced by climatic conditions. In general, at Blaj, vines budburst takes palce during the first decade of April. In 2010, due to the lower daily mean temperatures, budburst was delayed with 3-4 days compared to the previous year. In 2010 on the flowering period, the mean temperatures were higher than the annual average and were lower in 2009. The same situation was during veraison period. During the grapes ripening, in both years, the temperatures were below the annual average. In 2010 it can see the temperature variations, which have disrupted the normal unfolding of growing phases (fig. 1).

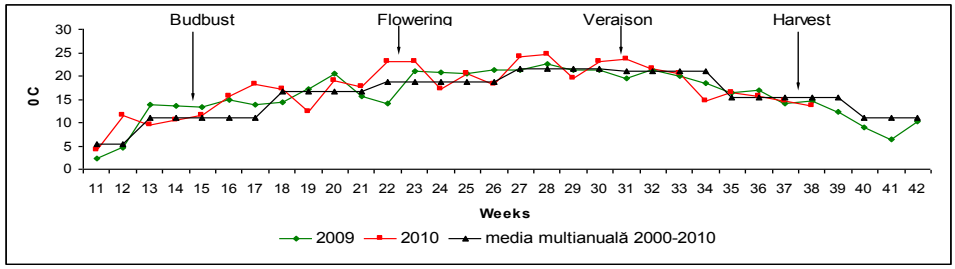

Fig. 1 - Average temperature during the main phonological phases

Regarding the rainfall level, 2009 was characterized as a droughty year and year 2010 as a rainy one. In the 2009, it can observed two periods in which precipitation have been below the annual average that are immediately after the budburst and then after the veraison, period when is favored the sugars accumulation (fig. 2).

In 2010, the plentiful rainfalls during flowering and before veraison, the phenophases are delayed with 2-3 days compared to last year. Ussually, in climatic conditions of Blaj, vines budburst is during the first half of April. In 2010, budburst was delayed compared to 2009 to all studied varieties (fig. 3).

In 2009, the earliest variety was Astra, followed by Selena, at significant difference and the latest were the other two varieties, Blasius and Fetească regală.

In next year, 2010, Selena had the earliest budburst, while the other varieties were significantly later, with no statistically differences between them.

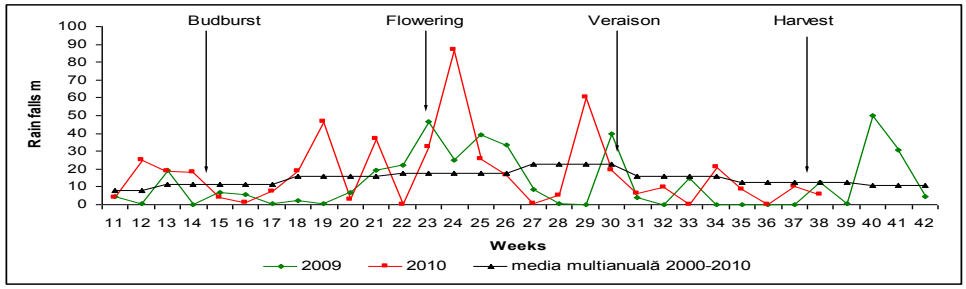

Fig. 2 - Total rainfalls during the main grapevine phenophases

Usually, in Blaj, grapevines flowering take place during the first decade of June. From figure 4, it can be observed the varieties difference to flowering, but between years, the differences were very small.

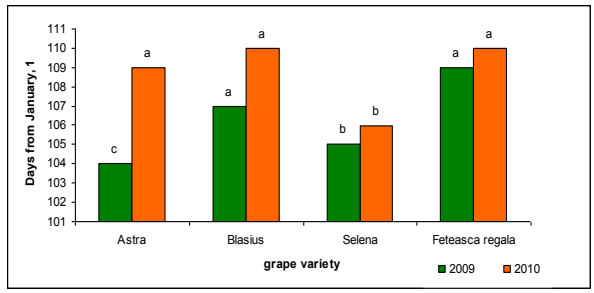

Fig. 3 - Budburst middle – days after January, 1st , 2009 and 2010

In 2009, there was an earlyer flowering for Astra variety, but statistically equal to that of Selena variety. Fetească regală and Blasius had been flowering later with 1-2 days, than previous varieties.

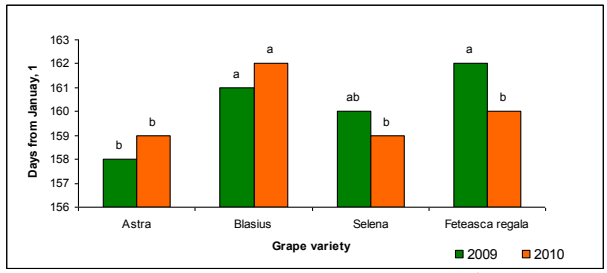

Fig. 4 - Flowering middle – days after January 1st, 2009 and 2010

In 2010, the earliest flowering was on Astra and Selena, followed by Fetească regală, statistically equal, and Blasius variety was the latest. It can see that, Selena and Fetească regală, had a late flowering in 2009, compared to 2010. Climatic conditions influenced the most the veraison phase, especially by the rainfalls. From figure 5, it can notice a delay of 5-6 days to veraison in 2010, comparing to previous year.

In 2009, the start of veraison was to Selena, followed by Astra, at significant difference. The latest veraison was on Fetească regală and Blasius varieties.

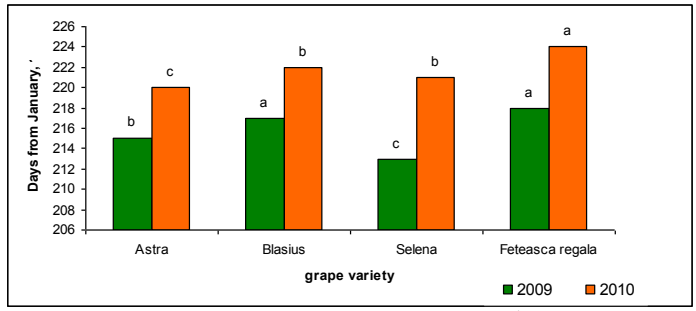

Fig. 5 - Veraison middle – days after January 1st, 2009 and 2010

In 2010, the earlist veraison was on Astra, followed by Blasius and Selena, and the latest was on Fetească regală. It can observe that Selena and Fetească regală varieties had an earlier veraison, even if they had a late flowering, in 2009. As other authors have highlighted (Carbonneau et al., 1992; Van Leeuwen et al., 2008) phenological phases deployment is greatly influenced by the sum of useful temperatures, establishing distinct significant positive correlation(r = 0.95).

Based on the precocity indices of flowering and of veraison were calculated the precocity indices of vegetative cycle. According to Barbeau, 1998, iPcy values less than 100 means a delay of the cycle of vegetation, and values higher than 100 show a precocious cycle. Between studied years, have been observed the differences of precocity. Thus, Astra and Blasius varieties have better used the climatic conditions of 2010, with the precocity indices of the vegetativ cycle over 100 compared to 2009 when these values were below 100. Instead, in both years, Selena had an earlier vegetation, registering the folowing iPcy values: 104.66 in 2009 and 100.23 in 2010. Fetească regală had a late vegetative cycle in both years (98.01 in 2009 and 96.41 in 2010) (table 1).

Table 1

Precocity indices of the annual cycle of vegetation

Variety/Year	2009	2010
Astra	98.67 ± 1.00	101.82 ± 1.13
Blasius	98.63 ± 0.86	101.53 ± 0.95
Selena	104.66 ± 0.88	100.23 ± 1.08
Fetească regală	98.01 ± 0.89	96.41 ± 1.14
Experience average	99.98 ± 0.55	100.00 ± 0.56

Table 2

Correlations between the precocity indices

Year	iPf/iPv	iPf/iPcy	iPv/iPcy
2009	- 0,88	- 0,79	0,98*
2010	0,97*	0,96*	- 0,93

On average, there is a precocity of vegetativ cycle in 2010 (iPcy = 100.00) compared to 2009 (iPcy = 99.98). To see a better the connection between the three indices different correlations were made between them.

Overall, in 2009, iPf had no effect on iPv (r = -0.88) and iPcy (r = -0.79), but iPv had a significant correlatin with iPcy (r = 0.98) (table 2).

CONCLUSIONS

1. Climatic conditions have influenced the unfolding of the main grapevine phenophases.

2. In both studied years, the varieties Astra, Blasius and Selena have an earlier start in vegetation than Fetească regală, grape variety enshrined in Târnave Vineyard.

3. On average, it was found a precocious vegetative cycle in 2010 (iPcy = 100.00) compared to 2009 (iPcy = 99.98), although climatic conditions in 2009 were more favorable than in 2010.

4. In 2009 between veraison precocity index and precocity index of annual cycle has been established a significant positive correlation (r = 0.98*) and significant negative correlation (r = -0.93) in 2010.

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