

OBSERVATIONS REGARDING YIELD PHENOPHASES OF SOME DISEASES GENETIC RESISTANT APPLE CULTIVARS, IN THE CONDITIONS OF BISTRITA REGION

OBSERVAȚII PRIVIND FENOFAZELE DE FRUCTIFICARE A UNOR SOIURI DE MĂR CU REZISTENȚĂ GENETICĂ LA BOLI ÎN CONDIȚIILE DE LA BISTRITA

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Abstract. *Observations regarding yield phenophases and temperatures influence on starting and unfolding of these processes were made during 2006 - 2008, at the cultivars Auriu de Bistrita, Florina, Generos, Aura, Bistritean and Salva. The obtained data showed the correlation existing between the temperatures and the phenology of fructification organs, thus the bud burst and flowering start only than when the sum of the registered active temperatures surpasses the necessary minimum for the starting of these phenophases. Flowering interval of the studied cultivars overlap for a period of 4-6 days, this observation being very important in choosing the right pollinators and knowing the average number of the days from flowering until harvest. This method permits the estimation of fruits maturation for harvesting.*

Key words: cultivars, phenophase, temperature, flowering

Rezumat. *Observațiile privind fenofazele de fructificare și influența temperaturii în declanșarea și desfășurarea acestora au fost efectuate în perioada anilor 2006 - 2008, la soiurile Auriu de Bistrița, Florina, Generos, Aura, Bistrițean și Salva. Datele obținute au demonstrat corelația care există între temperatură și fenologia organelor de fructificare, astfel că umflarea mugurilor, dez mugurirea, înfloritul nu încep decât în acel moment când suma temperaturilor active înregistrate depășește minimul necesar pentru începerea fenofazei respective. Soiurile studiate își suprapun perioada de înflorire pe o durată de 4 - 6 zile, având însemnătate pentru alegerea corectă a polenizatorilor, iar cunoașterea numărului mediu de zile de la înflorit la recoltare, este o metodă care permite aprecierea maturității de recoltare a fructelor acestor soiuri.*

Cuvinte cheie: soiuri, fenofaze, temperatura, înflorit

INTRODUCTION

The establishment of a fruit plantation must take into account the meteorological factors (minimum and maximum temperatures, the frequency of frosts, pluviometric regime) and also differentiated technology elements, in terms of growth and development features of recommended varieties for each particular area.

Available studies in this region have shown that there are correlations between the climate elements and growth processes - fruit development and production.

As the main climatic factor, temperature acts on trees throughout the year, but temperature during flowering is critical on the fruit production. Also ensuring optimum fluid regime during the vegetation period, correlated with an appropriate agricultural technique, influences positively the process of fruit bud differentiation, shoot growth, production parameters, especially in the summer when evapotranspiration reach the highest intensity.

MATERIAL AND METHOD

The experience was located in a research plot created in 2000, belonging to S.C.D.P Bistrita and planted with varieties of Auriu de Bistrita, Generos, Florina, Idared, Aura, Bistrițean, Salva, William's Pride.

Observations regarding fructification phenophases were made during 2006 - 2008 (years 6 to 8 after planting), for the varieties Auriu de Bistrita, Florina, Generos, Aura, Bistrițean and Salva, using the method of stationary study.

The varieties studied were grafted onto M9 and M26 rootstocks.

To calculate the temperature required to trigger major fructification phenophases, the sum of active parameters were used as evaluation parameter, by adding temperatures higher then the thermal threshold (8°C).

The beginning of flowering was estimated in dates at the opening of 10% of the flowers. End of flowering, as well in dates at the fall down of 75 -80% of the petals, and the flowering period in days from the start until the end of flowering.

RESULTS AND DISCUSSIONS

1. Dates of the major growth and fructification phenophases

The data presented in Table 1 show that there are slight date differences between varieties, regarding the onset of the first vegetative and fructification phenophases, and the gaps between years are correlated with the development of temperatures before the installation of the stable thermal threshold (8°C).

Auriu de Bistrita, although it is considered an autumn variety, starts in the vegetation the latest, the Golden Delicios genitore having a determining role in this regard. Varieties Aura and Bistrițean begin their vegetation the fastest, followed by varieties Generos, Salva and Florina in this particular order.

The studied varieties have a calendar development of the first growth and fructification phenophases, very close to each other, the differences falling within 5 days maximum. Graphic representation, using the average of the analyzed 3 years, borders the mentioned varieties in the category of those with nearly simultaneously development of the phenophases in the range of bud swelling – flowering (fig. 1).

Significant differences occur in the range of flowering - early maturation of fruits- falling of the leaves, where the genotypic character is crucial in carrying out of the specific phenophases and also regarding the length of the vegetation period. Fruit maturation begins with Auriu de Bistrita and Aura, around

September 15, continuing with varieties Bistrițean and Salva about 4 days later. Generos and Florina varieties, which are considered winter varieties, reach harvest maturity in the conditions from Bistrita in the last decade of September (Generos variety) and the first decade of October (Florina variety). End of vegetation frequently occurs within the third decade of October - the first decade of November.

2. The influence of temperature in triggering and conducting of phenophases

Along with other factors (exposition, nature of soil, rainfall, duration of sunshine), air and soil temperature plays a decisive role in crossing the phenophases, especially flowering and fruit binding, both because it satisfies the heat necessity for the activation of biostimulators with the role of getting the buds out of the state of rest, as well as the satisfaction of heat needs to start vegetation and achieving the biological threshold of the species (8°C), required for the swelling of fruit buds.

The data presented in Table 2 shows that from the registration of the biological threshold until the swelling of the flower buds it is necessary a sum of active temperatures (Σta), 63.7°C for the Auriu de Bistrița variety, 58.1°C for the Florina variety, 49.5°C for Generos, 46.8°C for Aura, 46.8°C for Bistrițean and 49.5°C for Salva.

Active temperatures sum required to trigger flowering, is in average 308.7°C for Auriu de Bistrița which blooms with about 2 days later than other varieties of the group where the sum of active temperatures is between 227.8°C for the Aura variety and to 245.6°C for the Florina variety.

Daily average temperatures during flowering have fluctuated between $10 - 13,5^{\circ}\text{C}$, close to the biological optimum of the species ($15 - 17^{\circ}\text{C}$) and the number of days from onset of thermal threshold at the flowering was also influenced by the evolution of heat, also before and after installation of the heat threshold of between 41 to 46 days in 2008 and between 29 -38 days in 2006 and 2007.

The early or late characteristic of the variety stands out by comparing the number of days from flowering to harvest in conjunction with active temperature sum in the same period.

Although it blooms last of the studied varieties, the variety Auriu de Bistrița, presents in all years the shortest period of vegetation, reaching harvest maturity at 132.6 days from flowering, accumulating on average in 2376.4°C Σta . At 4 to 6 days later, follow the group formed from the varieties Aura, Salva and Bistrițean which accumulate between $2404.3 - 2441.1^{\circ}\text{C}$ Σta .

Generos variety is at the limit of transition between autumn and winter varieties, for the harvest maturity being necessary an average number of 145.3 days with accumulation 2484°C Σta , and Florina variety distinguishes as a typical winter variety, having the longest vegetation period between 156 to 158 days from flowering.

Tabel 1

Flowering characteristics of some apple varieties in Bistrița area according to climatic parameters in the period 2004 – 2008

Year	Stable thermal threshold installation date(8 °C)	Flowering onset date	Global temperature sum January-March (°C)	Relative average air humidity (thermal threshold-flowering (%))	Days until flowering, after thermal threshold
2006	27.03	25.04-28.04	- 189.7	77	29 - 32
2007	19.03	22.04-26.04	+ 340.9	55	34 - 38
2008	15.03	25.04-30.04	+ 166.0	69	41 - 46

Years 2007 -2008, had an unusual thermal evolution towards multi-annual average of the area, registering positive average temperatures throughout the period before the installation of thermal threshold. In these conditions it was expected the earlier onset of flowering compared to previous years, but this happened only in 2007, when flowering began with about 10 days earlier than the same period in 2006.

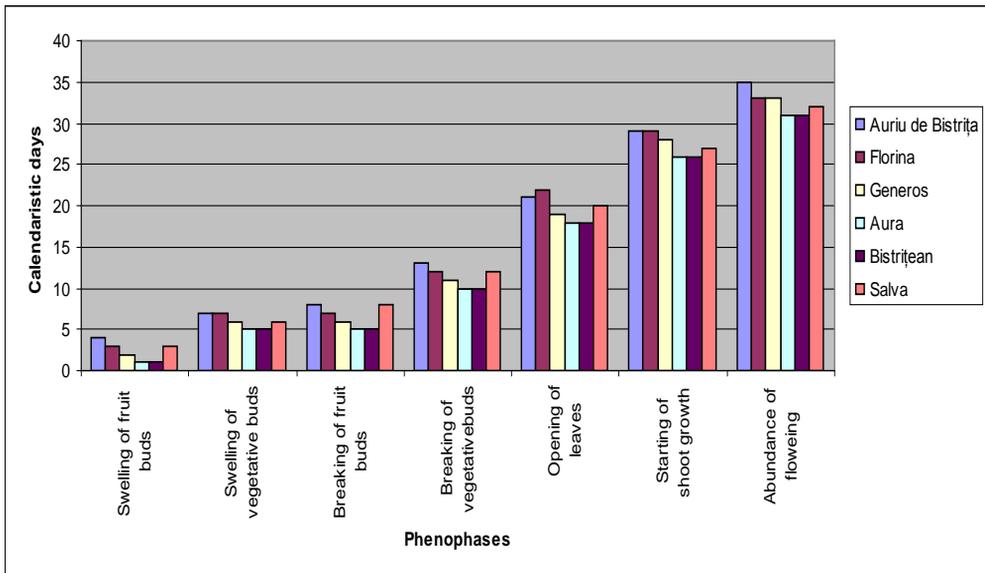


Fig. 1. Multi-annual average data on the onset of growth and fructification phenophases

Table 2

The influence of the temperature upon starting of some fructification phenophases

Variety	Year	Stable thermal threshold installation date 8°C	Active temperature sum		Days until flowering after thermal threshold	Σ t.a from flowering to harvest	Nr. of days from flowering to harvest
			Bud swelling	Starting of flowering			
Auriu de Bistrița	2006	27.03	65.3	373.2	32	2288.8	134
	2007	19.03	68.1	289.9	38	2435.4	131
	2008	15.03	57.9	263.0	46	2405.1	133
	Average		63.7	308.7	38.6	2376.4	132.6
Florina	2006	27.03	65.3	232.6	29	2645.4	158
	2007	19.03	59.8	252.1	35	2688.3	156
	2008	15.03	49.4	252.2	45	2644.1	157
	Average		58.1	245.6	36.3	2659.2	157
Generos	2006	27.03	56.1	246.6	30	2480.9	146
	2007	19.03	51.6	265.0	36	2522.5	144
	2008	15.03	40.9	243.1	44	2448.7	146
	Average		49.5	251.5	36.6	2484.0	145.3
Aura	2006	27.03	48.1	232.6	29	2346.3	139
	2007	19.03	51.6	242.2	34	2424.7	136
	2008	15.03	40.9	208.7	41	2441.9	137
	Average		46.8	227.8	34.6	2404.3	137.3
Bistrițean	2006	27.03	48.1	232.6	29	2383.7	139
	2007	19.03	51.6	252.1	35	2456.5	139
	2008	15.03	40.9	232.2	43	2483.1	140
	Average		46.8	238.9	35.66	2441.1	139.3
Salva	2006	27.03	56.1	232.6	29	2395.7	141
	2007	19.03	51.6	265.0	36	2436.4	136
	2008	15.03	40.9	243.1	44	2460.2	138
	Average		49.5	246.9	36.3	2430.7	138.3

CONCLUSIONS

1. Even if the weather observations, do not have a high degree of representativeness, because of the small number of years analyzed, the conclusion is that apple develops its biological processes with different intensities, after a characteristic rhythm as a result of adaptation to the periodicity of the climatic conditions and the onset of flowering period is a result of the cumulative action of genetical, meteorological, physiological and nutritional factors.

2. Calendar differences between varieties due to the triggering of flowering phenophases, reinforce the claim that this is genotypic controlled, but in terms of the multi-annual situation, it is also relevant the dependence on weather conditions, and mainly temperature.

3. The period of the onset and duration of flowering is important for proper choice of the pollinators. The growers option to include in the zonal range of varieties of one or more from the described varieties, in combination with other species, must take into account that the terms of flowering from the varieties of each neighboring group overlap with total 4 to 5 days and 2 to 3 days by mass flowering of the trees.

4. Knowing the number of days from flowering to harvest maturity in conjunction with the specific demands of the variety regarding the air temperature expressed in the sum of active temperatures, enable a method for estimating the date of fruit harvesting, in order to prepare the fruit harvesting company.

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