

# RASPBERRY FLOWERS TO ORGANOGENESIS IN CLIMATIC CONDITIONS FROM NORTHEASTERN ROMANIA

## ORGANOGENEZA FLORALĂ LA ZMEUR ÎN CONDIȚIILE CLIMATICE DIN NE-UL ROMÂNIEI

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**Abstract.** *Research on the dormant bud so f raspberry fruit focused on determining the period of transition from vegetative to reproductive phase and development of floral elements in climatic conditions from north eastern Romania in years 2008, 2009, 2010. The results show remark able differences from year to year reflecting the cumulative action of climatic factors and hereditary varieties.*

**Key words:** raspberry, bud, organogenesis

**Rezumat.** *Cercetările privind repausul vegetativ la mugurii de rod de zmeur au vizat stabilirea perioadei de tranziție de la faza vegetativă la cea reproductivă, precum și evoluția dezvoltării elementelor florale în condițiile ecologice din NE-ul României în anii 2008, 2009, 2010. Rezultatele obținute demonstrează diferențe remarcabile de la un an la altul, ceea ce reflectă acțiunea cumulativă a factorilor climatici și ereditari ai soiurilor.*

**Cuvinte cheie:** zmeur, mugure, organogeneză

### INTRODUCTION

Phenophase flowering is preceded by differentiation of flower buds which includes two stages: floral induction and morphological differentiation. In the first stage, called by some authors (Ağaoğlu, 1999, quoted by Eydurán S. P. and Ağaoğlu Y. S., 2011) and "physiological differentiation phase") to create the conditions needed to change the direction of development of vegetative buds, from the formative stage at the flower buds (Istrate M., 2007). In the second phase floral elements are developed. Beginning, evolution of floral organogenesis process is different for each variety. The time of growth and development of flower buds is unevenly, with different intensities, depending on climatic conditions (egg temperature), species and agriculture measures applied (Mănescu C. et al, 1989). Floral induction can take place or not, before endodormancy, while the growth of floral elements may continue throughout the rest period (Takeda and Wisniewski, 1989). Floral organogenesis knowledge is very important for to identify of varieties with better adaptability to a certain area of culture and also for the application of agriculture measures before the onset of differentiation stage.

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## MATERIAL AND METHOD

**Plant material:** In this study we investigated Veten and Willamette raspberry varieties, planting of Fruit Research Station of UASVM Iasi. We collected 10-20 axillary buds (at 3-4 weeks intervals from August to April during the years 2008-2009 and 2009-2010) from the top of the floricanes branches with the same length, and were fixed and stored in FAA. The buds were sectioned with manual microtome. Necrosis buds were not taken into account. Bud stages of development were established by analyzing the stereomicroscope MOTIC and described by Mathers and Wood and M. Robertson, 1957 (quoted by S. Peral Atila Ağaoğlu and Y. Sabit, 2006):

Table 1

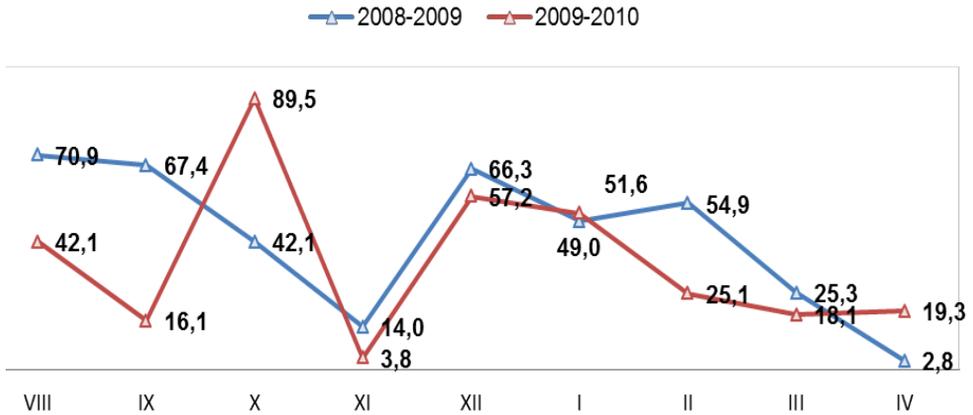
Stage development of *Rubus idaeus* L. bud

Stage	Description
1	There is no division in growing cone. Primer bud is in vegetative bud phase, growing cone is surrounded by leaf formations
2	inflorescence axis
3	broadened apex with sepal primordia;
4	three-lobed sepal primordia;
5	petal primordia;
6	dome-shaped receptacle;
7	stamen primordia
8	pistil primordia on bottom-half of receptacle
9	pistil primordia cover most of receptacle;
10	anther sacs on stamen and stylar and stigmatic tissues on pistil primordia, respectively.

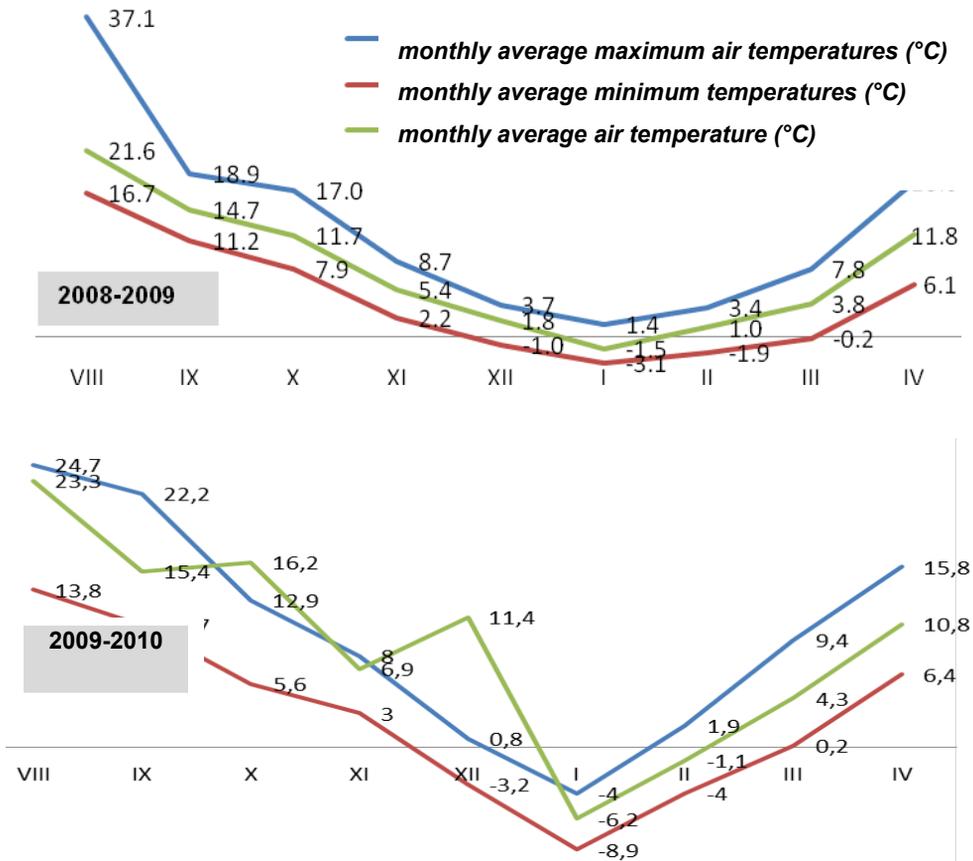
**Daily climate data** were taken from the Research and Development Station for Viticulture and Vinification from Iasi (lat. 47°2' N), near of Fruit Research Station of U.S.A.M.V. Iasi, Romania.

## RESULTS AND DISCUSSIONS

**Climatic conditions.** Average monthly maximum and minimum air temperature and rainfall (mm) recorded at the nearest weather station (Research and Development Station for Viticulture and Vinification), are shown in figure 1. and 2. The data obtained in 2008 reveals a high temperature in August (37.1°C, monthly average maximum, 20.3°C, monthly average) and precipitation over the normal limit (70.9 mm to 40.4 mm). The second decade of March delimits heat unit accumulation (base 5°C).



**Fig. 1** - Average monthly of precipitation (mm) recorded in lassy between August 2008 – April 2009 and August 2009 – April 2010



**Fig. 2** - Average air temperature (°C) recorded in lassy between August 2008 – April 2009 and August 2009 – April 2010

Veten and Willamette are two raspberries varieties which fructifying on two years branches (*floricane*) in summer. Buds formed on the first year branches are vegetative. In the second year this buds turn into generative bud (flower buds).

Analysis of sectioned buds showed differences between the two varieties in terms of floral organogenesis (table 2).

Table 2

**Bud developmental stages for Willamette and Veten in climatic conditions from north-eastern Romania between August 2008 – April 2009 and August 2009 – April 2010**

Variety	Bud developmental stages									
	2008-2009									
	1 Aug.	26 Sep.	10 Oct.	29 Oct.	25 Nov.	19 Dec.	27 Jan.	26 Feb.	15 Mar.	
Willamette	1.0 <sup>a</sup>	1.0 <sup>a</sup>	1.8 <sup>a</sup>	3.8 <sup>a</sup>	5.1 <sup>a</sup>	6.0 <sup>a</sup>	7.7 <sup>b</sup>	7.6 <sup>a</sup>	9.5 <sup>a</sup>	
Veten	1.0 <sup>a</sup>	1.0 <sup>a</sup>	1.1 <sup>b</sup>	3.3 <sup>a</sup>	5.0 <sup>a</sup>	5.6 <sup>b</sup>	7.4 <sup>a</sup>	7.5 <sup>a</sup>	9.1 <sup>a</sup>	
	2009-2010									
	1 Aug.	28 Sep.	10 Oct.	29 Oct.	30 Nov.	29 Dec.	2 Feb.	28 Feb.	15 Mar.	
Willamette	1.0 <sup>a</sup>	1.0 <sup>a</sup>	1.6 <sup>a</sup>	3.2 <sup>a</sup>	5.4 <sup>b</sup>	5.9 <sup>b</sup>	6.3 <sup>a</sup>	7.8 <sup>a</sup>	9.6 <sup>a</sup>	
Veten	1.0 <sup>a</sup>	1.0 <sup>a</sup>	1.3 <sup>a</sup>	3.0 <sup>a</sup>	5.2 <sup>a</sup>	5.7 <sup>a</sup>	6.0 <sup>a</sup>	7.6 <sup>a</sup>	9.2 <sup>a</sup>	

\*Mean separation within columns by Duncan's multiple range test,  $P \leq 0.05$ . See Table 1 for key descriptors of bud developmental stages.

In 2008, during August and September the both of raspberries varieties (Willamette and Veten) are still in vegetative stage (Stage 1). The primary terminal apex is still protected of the leaf primordia and some lateral apex. Floral induction process begins during the first half of October through the swelling and elongation of the terminal apex. (Stage 2, figure 3).



**Fig. 3 - Stage 2: growing cone**

In the ending of October, on the elongated apex appear the first floral primordia, usually five sepals primordia (Stage 3).

Petal primordia (Stage 4) of the terminal flower primordia by the differentiation between sepals primordia, in November later. Also there is increase in size of receptacles. That same month, until ending, flowers primordia axillary are bazipetal differentiated. It should be noted that by this time of floral organogenesis, the average air temperature has not dropped below 5°C. During the winter there is a very slow growth of inflorescence axis.

Stamen primordia (Stage 7) develop at the bottom of sepal primordia in January, followed by the differentiation of anther.

In March, on the receptacle which becomes tronconical, occurs in an acropetal and spiral sense, differentiate on of carpel primordia.

The results of this study demonstrate that the climatic factors have an effect on the rate at which the differentiation of floral organs occurred in buds.

Low temperatures in December 2009 (monthly average temperature was - 6.2°C) and January 2010 may be considered causes of falls in the value rate of development of buds. It should also be noted that low temperatures during this period are accompanied by low level of precipitation. The important role of temperature in the process of organogenesis is highlighted by the fact that in February 2010 there was a greater number of buds in the stage 8 of development, compared with 2009.

## **CONCLUSIONS**

1. Floral organogenesis process at the two varieties of raspberry occurred on dates very close. These studies about of raspberry flowers to organogenesis in climatic conditions from north-eastern Romania indicate that

temperature plays a major role in determining the extent of bud differentiation during winter.

2. Analysis of the effect of low temperatures during the dormancy period and the increase of temperature at early spring on the development of raspberry buds could lead to the development of climate models useful for predicting low chilling requirement to obtain an optimal crop.

## REFERENCES

1. **Atila S. Peral, Aġaoġlu Y. Sabit**, 2006 - *On a Research of Raspberry and Blackberry's Bud Structure and Fruitful*. Research Journal of Agriculture and Biological Sciences, 2(5), p: 218-222.
2. **Eyduran S. P., Aġaoġlu Y. S.**, 2011 - *Determination of bud structure and floral development periods of some raspberry cultivars in Ankara (ayaş) conditions*. The Journal of Animal & Plant Sciences, 21(1): 2011, p: 48-56, ISSN: 1018-7081
3. **Istrate M.**, 2007 -*Pomicultură generală*. Editura Ion Ionescu de la Brad, Iași.
4. **Mănescu C., Baci E., Cosmin S.**, 1989, *Controlul biologic în pomicultură și viticultură*, Editura Ceres, București
5. **Takeda F., Wisniewski M.**, 1989 - *Organogenesis and patterns of floral bud development in two eastern thornless blackberry cultivars*, J. Amer. Soc. Hort. Sci. 114:528–531.