Sweet Cherry (*Prunus avium* L.) and Peach (*Prunus persica* L.) Phenological Growth Stages According to BBCH Scale

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Abstract

This study gives a detailed description of the stages of stone fruits growth (*Prunus avium* L. and *Prunus persica* L.), according to the BBCH (Biologische Bundesanstalt, Bundessortenamt und Chemische Industrie) scale, in the environmental conditions of Cluj-Napoca area. Phenological data were collected from 4 years old trees of *Prunus avium* L. and *Prunus persica* L. cultivars. The development stage of each organ was recorded during two growing seasons (2015-2016). Comparing the results it can be observed that there are some differences between cultivars development during two growing seasons, fact that influences the correct timing of orchard management.

Keywords: BBCH scale, climate change, phenology, stone fruits

Introduction

In the last decades, observing and understanding plant phenology has an important role in the context of climate change. Phenological transformations and fruit set problems are recognized in many fruit growing areas as a result of global warming effect on plant reproduction (Hedhly *et al.*, 2009; Hedhly, 2011). Stone fruits, as sweet cherry and peach, are known as well adapted species in temperate regions with mild winters. Recent interest concentrate on expanding the range of ripening times in order to get profitable fruit offseason (Fadón, 2015). Changes in the timing of the phenophases of fruit trees have a great economical importance because it has a direct impact on fruit production (Chmielewski, 2004), fact that shows the importance of recognizing fruit trees phenology. The main purpose of studying phenology is to determine the periodicity in the life-cycle events of crops and to use the findings in agronomical management (Wei *et al.*, 2013). Bleiholder *et al.* developed in 1989 a two-digit decimal coding system for angiosperms, the

BBCH-scale. The extended BBCH scale is a system for uniform encoding of plants phenologically growth stages (Meier, 1997).

Aims and objectives

The aim of this study is to present and detail descriptions of phenological growth stages of stone fruits, *Prunus avium* L. and *Prunus persica* L., according to the BBCH code, in the environmental conditions of Cluj-Napoca area, and to contribute to the standardization of phenology research regarding sweet cherry and peach.

Materials and methods

The study was carried out on the experimental station of the University of Agricultural Sciences and Veterinary Medicine from Cluj-Napoca (Romania). Cluj-Napoca city has a continental climate, characterized by warm and dry summers and cold winters.

Data were collected from 4 years old healthy trees, irrigated and fertilized, of *Prunus avium* L. cvs. 'Karina', 'Summit', 'Sunburst' and

Tab. 1. Phenological growth stages of *Prunus avium* L., 'Karina' variety and *Prunus persica* L., 'Champion' variety according to BBCH code

Phenological stages	Photo ID of 'Karina' variety	Photo ID of 'Champion' variety	BBCH code
Dormancy	A1	A1	00
Beginning of bud swelling	A2	A2	01
First leaves unfolded	C	B2	11
First leaves fully expanded	D1	-	19
Inflorescence enclosed	B	-	54
Single flower buds visible	B	A3	55
Most flowers with petals forming a hollow ball	C	-	59
Full flowering	-	B2	65
End of flowering	D1	C	69
Sepals beginning to fall	D2	D	72
Fruit about half final size	E	E	75
Fruit about 80% of final size	F	-	78
Beginning of fruit colouring	G	F	81

Fig.1. Phenological growth stages of cherry (*Prunus avium* L.) according to the BBCH scale, Karina variety **Fig.2.** Phenological growth stages of peach (*Prunus persica* L.) according to the BBCH scale, Champion variety

Prunus persica L. cvs. 'Champion', 'Suncrest', 'Wassemberger'. The cultivars have been randomly selected. Observations of the phenological stages were made weekly, during two growing seasons (2015-2016). Photographs of each stage were taken to illustrate the reproductive development of stone fruits and to compare the cultivars between them to check the probable differences between them in their development during the growing seasons. Eight main growth stages are described for bud, leaf, shoot development, inflorescence emergence, flowering, fruit development and fruit maturity. Principal growth stage begin with bud development (stage 0) and end with maturity of fruit and seed (stage 8). Vegetative growth it is described by bud development (stage 0), leaf

development (stage 1) and shoot development (stage 2). The next two stages are describing inflorescence emergence (stage 5) and flowering (stage 6). The last two growth stages are related to fruit development (stage 7) and fruit maturity and seed (stage 8).

Results and discussion

Phenological growth stages embrace the entire year cycle of *Prunus avium* L. (Fig.1) and *Prunus persica* L. (Fig.2), starting with stage 0 (bud development) and ending with stage 8 (fruit maturity). Eight growth stages of the BBCH scale from a total of ten are covered in case of both species (Tab.1).

Tab. 2. Comparison of phenological stages between *Prunus avium* L. and *Prunus persica* L. cultivars, in two growing seasons (2015-2016)

Sweet cherry and peach varieties	Year 2015					
	Bud development	Leaf development	Inflorescence emergence	Flowering	Fruit development	Fruit maturity
'Karina'	23.03	20.04	20.04	30.04	05.05	07.07
'Summit'	23.03	14.04	20.04	30.04	05.05	02.07
'Sunburst'	23.03	20.04	20.04	30.04	05.05	02.07
'Champion'	28.03	14.04	20.04	30.04	05.05	23.08
'Suncrest'	23.03	14.04	14.04	30.04	05.05	19.07
'Wasseberger'	28.03	14.04	20.04	30.04	05.05	28.07
	Year 2016					
	Bud development	Leaf development	Inflorescence emergence	Flowering	Fruit development	Fruit maturity
'Karina'	17.03	13.04	07.04	13.04	27.04	29.06
'Summit'	17.03	07.04	07.04	13.04	27.04	08.06
'Sunburst'	17.03	13.04	07.04	13.04	27.04	08.06
'Champion'	24.03	07.04	07.04	13.04	27.04	18.08
'Suncrest'	17.03	07.04	24.03	31.03	27.04	14.07
'Wasseberger'	24.03	07.04	07.04	13.04	27.04	20.07

The results regarding the differences between *Prunus avium* L. and *Prunus persica* L. cultivars are presented in Tab. 2.

Conclusion

The phenological enlargement of stone fruits could improve the quality of fruits by providing informations about evolution of the cultivars, disease and pest management, irrigation, flower thinning, fertilizer effectiveness under the environmental conditions of Cluj-Napoca region. An accurate understanding of fruit trees phenological role it is essential for orchard management and could determin adaptation of species and cultivars to specific conditions. The results obtained also contribute to the standardization of phenology research regarding sweet cherry and peach.

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