

# STUDY ON THE BEHAVIOR OF CERTAIN APPLE VARIETIES WITH GENETIC RESISTENCE TO DISEASES LOCATED IN THE HUSI FRUIT BASIN

## STUDIU PRIVIND COMPORTAREA UNOR SOIURI DE MĂR CU REZISTENȚĂ GENETICĂ LA BOLI ÎN BAZINUL POMICOL HUȘI

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**Abstract.** A study was conducted during 2010-2011 on the apple disease resistance varieties in the environmental conditions of the east-northern part of the Romania. During the experimentation period, observations and determinations were made regarding the following aspects: tree growth vigour (trunk section area, crown volume of trees); phenophases of the fruiting organs, the fructification specific, the amount of biomass removed by the fructification pruning, fruit production obtained and the productivity index. Data regarding the growth vigour of the trees (expressed as trunk sectional area) highlights the highest growth vigour of Florina and Romus 1 varieties ( $10.32 \text{ cm}^2$  and  $9.39 \text{ cm}^2$  respectively), Romus 2 ( $7.11 \text{ cm}^2$ ) having the lowest vigour of all the varieties. Early flowering for apple varieties which were included in the study was registered between 21 and 25 IV and during the flowering period was between 9 and 12 days. In terms of productivity, the varieties Florina (43.4 t/ha), Romus 1 (37.6 t/ha) and Pionier (34.1 t/ha) were remarkable, being are recommendable for the soil and climatic conditions in the Husi area.

**Key words:** apple, varieties with genetic resistance to diseases, stem, crown, shoots, fruit branches, production.

**Rezumat.** În perioada 2010-2011 s-a efectuat un studiu privind comportarea soiurilor de măr cu rezistență la boli în condițiile ecologice din NE României. În perioada de experimentare s-au făcut observații și determinări privind: vigoarea de creștere a pomilor (suprafața secțiunii trunchiului, volumul coroanei pomilor); fenofazele organelor de fructificare, specificul de fructificare; cantitatea de biomasă eliminată la tăierile de fructificare; producția de fructe obținută și indicele de productivitate. Datele privind vigoarea de creștere a pomilor (exprimată prin suprafața secțiunii trunchiului) scot în evidență vigoarea mare de creștere a soiurilor Florina și Romus 1 ( $10.32 \text{ cm}^2$ , respectiv  $9.39 \text{ cm}^2$ ) iar vigoarea cea mai scăzută la soiul Romus 2 ( $\text{cm}^2$ ). Începutul înfloritului la soiurile luate în studiu s-a înregistrat între 21 și 25 IV, iar durata înfloritului a fost de 9-12 zile. Sub aspectul productivității s-au remarcat soiurile Florina (43,4 t/ha), Romus 1 (37,6 t/ha) și Pionier (34,1 t/ha), care sunt recomandate pentru condițiile pedoclimatice din zona Huși.

**Cuvinte cheie:** măr, soiuri rezistență genetică la boli, trunchi, coroană, lăstari, ramuri de rod, producție.

## INTRODUCTION

Given the damages due to apple scab and powdery mildew to the main apple varieties grown in the north-eastern part of the country (Bođi I., Cârdei E., 1998), it was necessary to introduce apple varieties with genetic resistance to scab

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and mildew vulnerability, obtained either in the country and abroad (Branîște N. et al., 1989; Istrate M., Rominger E., 1992). The assortment's improvement is even more stringent as it is known that the pest control substances are energy consuming, which makes them very expensive and usually imported. Studying and then introducing the resistant varieties in the culture are leading, ultimately, to a considerable reduction in the number of treatments and respectively to the reduction of the environmental pollution. The research objectives aim at introducing in the culture the apple varieties resistant to scab and mildew, which meet the requirements for productivity and fruit quality and which have the proper suitability for intensive and super-intensive cultivation.

## MATERIAL AND METHOD

The research was conducted during 2010-2011 in the pomological collection of the D. Cantemir Agricultural College Husi. The biological material used included four apple varieties with resistance to disease: Romus 1, Romus 2, Pionier and Florina. The experimental plantation was established in 2002, with trees grafted on MM106 rootstock, planted at a distance of 4 x 3 m and led under a layered palmata shape with oblique branches. The soil maintenance system was through the worked field. The phytosanitary treatments were applied only for pest control. During the experimentation period observations and determinations were made for the following parameters: the tree growth vigour (trunk section area, crown volume of trees); phenophases of fruiting organs, the specific of fructification, the amount of biomass removed in the process of fructification pruning, fruit production obtained and the productivity index.

## RESULTS AND DISCUSSIONS

The phenophases of the fruiting organs are specific to the biology of each species of fruit and the onset time and duration are closely related to the climatic conditions of each year (table 1).

*Table 1*

**Conducting phenophases for the fructification of 4 apple varieties with resistance to diseases in 2010-2011 period**

Varieties	Unbudding	Flowering		Duration of flowering days	Date of the harvest	No. days from bloom to harvest
		Beginning	End			
Romus 1	05.04-12.04	25.04-21.04	05.05-30.04	10-9	20.07-14.07	75-75
Romus 2	05.04-12.04	25.04-21.04	05.05-30.04	10-9	20.07-14.07	75-75
Pionier	08.04-14.04	26.04-22.04	06.05-01.05	11-10	22.09-16.09	138-138
Florina	10.04-15.04	27.04-22.04	07.05-01.05	12-10	14.10-07.10	160-160

The onset of flowering to the apple varieties taken into the study was registered between 21 and 25 IV and the flowering duration was between 9 and 12 days. There is a gap in flowering between the years of study, with 4-5 days earlier in 2010, but between the varieties, differences were insignificant, respectively 1-2 days. The flowering period overlapped for all varieties, ensuring favourable conditions for cross pollination. The number of days from the end of the flowering period to harvest consisted of 75 days for Romus 1 and Romus 2 varieties, 138 days for Pionier and 160 days for Florina varieties. In the climatic conditions specific to Husi fruit growing basin, fruits

ripening begins with the Romus 1 and 2 (during the second decade of July), which are summer varieties; Pionier (the second decade of September) – autumn varieties and Florina (the first decade of October)- autumn-winter varieties. Knowledge of the biological features of apple varieties allows the application of differentiated technologies of culture, depending on climatic zone, soil type, the vigour and type of fructification, the crown shape and the planting distances.

Data on the growth vigour of the trees (expressed as trunk sectional area) highlight the highest vigour of growth of Florina and Romus 1 varieties (10.32 cm<sup>2</sup> and 9.39 cm<sup>2</sup>, respectively) and, the vigour of the Romus 2 variety (7.11 cm<sup>2</sup>) being the lowest one (table 2).

*Table 2*

**Biometric data of trees, number and average length of annual increase before the trees fruition pruning**

Varieties	Tree height (H) m	Trunk sectional area (cm <sup>2</sup> )	Crown diameter		Crown volume		Number of annual branches	Average length of annual increases (cm)
			D (m)	d (m)	m <sup>3</sup> / tree	m <sup>3</sup> /ha		
Romus 1	3,17	9,39	2,54	1,55	5,28	4400	130	56
Romus 2	2,36	7,11	2,22	1,05	2,36	1971	68	43
Pionier	3,11	8,72	3,05	1,43	6,00	5002	166	56
Florina	3,17	10,32	3,15	1,49	7,11	5927	180	53

In the IX year after planting, the Pionier and Florina varieties realized the highest crown volume values (6.0 and 7.11 m<sup>3</sup>/ tree). The lowest crown volume values were obtained by the Romus 2 variety (2.36 m<sup>3</sup>/ tree). For some varieties (Pionier and Florina) the distance between trees in the case of using the layered, oblique arms palmetta was maximum in order to ensure an optimum space for nutrition; the interference area of neighbouring trees was of only 0.15 to 1.20 mm. The average length of annual increases ranged between 43 and 56 cm and highlights the existence of a favourable balance between growth and fruiting, which ensures a constant fructification every year.

*Table 3*

**The amount of biomass removed during the pruning and garnish degree of the crown after the completion of pruning**

Varieties	of branches eliminated at the cutting	frame of the branches	Number of fruit formation				Annual number of branches			
			Spur buds	Spur with flower buds	Shoots with vegetative buds	Vegetative shoots with flower bud on top	remaining uncut branches left on trees	shortened to 1 / 3 of the length	shortened to 1 / 2 of the length	shortened to 2 / 3 of the length
Romus 1	3,0	1,3	44	9	55	66	47,5	8,25	12	11,75
Romus 2	1,2	0,7	19	5	16	30	13,75	3,5	7,25	3,75
Pionier	4,0	1,4	46	14	20	49	22,75	3,75	16,25	13,75
Florina	4,7	1,5	18	21	17	74	43,75	4,75	12,5	10,75

Analyzing data on the amount of biomass removed once with the pruning highlights the high values obtained by the Pioneer and Florina varieties (4.03 and 4.7 kg / tree), the lowest value being the one for the Romus 2 variety (0.72 kg / tree) (table 3). Data on the length of three-five years branches, number and type of fruit formations, the shortening intensity of the annual branches, highlight the fructification specific of the varieties included in the study. The Romus 1, Romus 2 and Pioneer varieties have the characteristics type III of fructification (standard), while the Florina variety presents the type IV fructification.

The average yield obtained in 2010-2011 (the eighth and ninth years after planting) ranged from 21.1 t / ha (Romus 2) and 43.4 t / ha (Florina). The Romus 1 variety also stands out through its productivity (37.6 t / ha) (table 4). The productivity index scored the highest values for Pioneer (0.47 kg/cm<sup>2</sup> trunk section area) and Florina (0.55 kg/cm<sup>2</sup>) varieties and the lowest values for the Romus 2 variety (0.35 kg/cm<sup>2</sup>).

Table 4

**Fruit production obtained and the productivity index for 4 apple varieties**

Varieties	Trunk sectional area (cm <sup>2</sup> )	Productivity index (kg/ cm <sup>2</sup> )	The fruit production	
			kg/tree	t/ha
Romus 1	9,39	0.43	4,5	37,6
Romus 2	7,11	0.35	2,5	21,1
Pionier	8,72	0.47	4,1	34,1
Florina	10,32	0.55	5,2	43,4

## CONCLUSIONS

1. The soil and climatic conditions in Husi fruit growing basin are particularly favourable for the apple culture.

2. Data on the trees growth vigour (expressed as trunk sectional area) highlights the high vigour of growth for Florina and Romus varieties 1 (10.32 cm<sup>2</sup> 9.39 cm<sup>2</sup>, respectively) and the lowest vigour for Romus 2 variety (7.11 cm<sup>2</sup>).

3. The onset of flowering for the apple varieties taken into the study was registered between 21 and 25 IV and the flowering duration was between 9 and 12 days.

4. In terms of productivity, the Florina (43.4 t / ha), Romus 1 (37.6 t / ha) and Pioneer (34.1 t / ha) varieties were notable, which are also suitable for the soil and climatic conditions of the Husi area.

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