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Behaviour of old apple tree varieties (*Malus domestica* BORKH) from Timis County

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Abstract The cultivated apple tree (*Malus domestica* Borkh) is part of the Rosaceae family, the subfamily Pomoideae. It is a fruit species that is of particular importance because it provides, together with banana and orange trees, most of the fruit production worldwide [15;16]. The current tendency, in the consumption of fruits, undesirable in physiological aspect but imposed by other factors, is that of increasing the proportion of the fruits in processed form, in comparison with the fresh ones. In our country, for now, the structure of fruit consumption is 77% fresh and 23% processed (of which 21% preserved, 0.5% frozen and 1.5% dried)[9;22]. Cociu V. (1990) cites the existence, in the pomological collections, of more than 943 indigenous varieties and types, of which 118 are apples. In this paper we analyzed the behaviour of 4 dominant varieties from the old assortment (White Calvil, Renet de Canada, Beautiful of Boskoop, Masanschi) and 1 local biotype: Ţigăneşti, present in the yards of several citizens from Caransebeş and Lugoj, Timiş County, area from which we had the possibility to collect biological material, analysing some morphological characteristics of the fruits under the conditions of 2018 (large diameter, small diameter, height, weight, dry matter). Thus, in the climatic conditions of the year 2018, we could observe that the average weight of the fruits in the studied varieties and biotype was between 69.82 g and 198.87 g, with an average of the experience of 131.06 g. The highest weight of the fruit was registered in the Beautiful of Boskoop variety, the difference to the control being very distinctly positive and the smallest value in the Ţigăneşti biotype, the difference to the control being very significantly negative.

Key words

apple, biotype, diameter, weight, shape

In culture, the apple was introduced from ancient times, first in China and India, where it then spread to other regions of the globe, judging by the charred apples found in the lake dwellings of Switzerland, by the apple carvings found in the pyramids of Egypt and other ancient monuments.

In the modern era, studies on the biology and technology of apple cultivation are amplified, this becoming the main fruit species. Genetic improvement research has been amplified so that over 10,000 varieties of apple are known worldwide [23].

Apple production in our country [24] has had great fluctuations over the years, its evolution being influenced by numerous factors, including the climatic ones.

Studying the worldwide trends regarding the diversification of the assortment and the adaptation to the social-economic requirements, the research intensified its activity of improvement.

Over the years, both the surface and the structure of the varieties have changed; there are several distinct stages, some of growth, others of decrease.

The apple assortment in our country is divided into three groups, namely: summer varieties, autumn varieties and winter varieties..

Material and Method

The selected varieties are part of the old varieties cultivated around Caransebeş - Lugoj Municipality, but also in the villages in the immediate vicinity, from mature trees that can be found in household gardens.

In this paper we have tracked the behavior of 4 dominant varieties from the old assortment (White Calvil, Renet de Canada, Beautiful of Boskoop, Masanschi) and 1 local biotype: Ţigăneşti, present in the courts of several citizens from Caransebeş and Lugoj, Timiş County, area from which we had the possibility to collect biological material, observing some morphological characteristics of the fruits under

the conditions of 2018 (large diameter, small diameter, height, weight, dry matter).
The variety identification was done by the expeditionary method, present in the yards of several citizens from Caransebeş and Lugoj. The trees studied are 50-60 years old and are grafted on the wild. The trees identified were individually tagged and tracked in several aspects, identifying and describing the genetic forms existing in the studied area and noting them according to the name known by the cultivators.
Regarding the biometric aspects, fruit samples (25 fruits for each variety) were collected from different parts of the tree crown, on which the following determinations were made: large diameter, small diameter, height of the fruit and dry matter. The large diameter, the small diameter and the height were measured with the callipers and the averages, the error of the average, the coefficient of variability and the significance of the differences compared to the control were calculated.
The dry matter was made with the help of the refractometer and we established the % of the dry matter. The % of sugars [11] was calculated based on the formula: % = (Nx4,25)/4-2,5.
The weight of the fruits [21; 17] was determined by weighing them. In the case of these indicators, the data obtained were statistically processed using the method of analysis of variance [1]; the control used was represented by the average of the varieties.

Results and Discussions

Regarding the large diameter of the fruit in the varieties studied in 2018 (table 1), we observed that the large diameter is between 81.69 mm in the variety Renet of Canada, the difference to the control being very distinctly positive, and 61.02 mm in Ţigăneşti, the difference to the witness being very significant negative.

Table 1.

Fruit large diameter, in 2018

Variety	Large diameter (mm)	Relative value (%)	Difference to control (mm)	Significance
CALVIL	70,02	100,78	0,54	-
MASANSCHI	62,35	86,86	-9,14	00
ŢIGĂNEŞTI	61,02	84,94	-10,48	000
RENET DE CANADA	81,69	114,69	10,21	XXX
BEAUTIFUL OF BOSKOOP	80,35	112,77	8,88	XX
Average of varieties	71,49	100,00	0	Control

LSD 5% = 5.66 mm
LSD 1% = 7.65 mm
LSD 0.1% = 10.18 mm

The small diameter of the fruit (table 2) is between 78.02 mm in the Beautiful of Boskoop variety and 57.69 mm in the Ţigăneşti biotype. Thus the beautiful variety of Boskoop is very significant positive.

Table 2.

Fruit small diameter, in 2018

Variety	Large diameter (mm)	Relative value (%)	Difference to control (mm)	Significance
CALVIL	69,35	101,11	0,74	-
MASANSCHI	60,02	87,10	-8,61	00
ŢIGĂNEŞTI	57,69	83,59	-10,94	000
RENET DE CANADA	77,01	112,62	8,41	XX
BEAUTIFUL OF BOSKOOP	78,02	115,63	10,41	XXX
Average of varieties	68,62	100,00	0	Control

LSD 5% = 5.30 mm
LSD 1% = 7.16 mm
LSD 0.1% = 9.53 mm

The height of the fruit is between 62.69 mm in the variety Renet de Canada and Beautiful of Boskoop, of 60.69 mm, and 50.02 mm in the Masanschi variety (table 3). From a statistical point of view, they did not present any significance because the values were close to those of the control.

Table 3.

Fruit height in 2018

Variety	Height (mm)	Relative value (%)	Difference to control (mm)	Significance
CALVIL	56,01	99,89	-0,08	-
MASANSCHI	50,02	88,79	-6,08	-
ŢIGĂNEŞTI	51,02	90,64	-5,08	-
RENET DE CANADA	62,69	112,22	6,61	-
BEAUTIFUL OF BOSKOOP	60,69	108,52	4,61	-
Average of varieties	56,09	100,00	0	Control

LSD 5% = 6.92 mm
LSD 1% = 9.35 mm
LSD 0.1% = 12.45 mm

The average weight of the fruits, table 4, was between 69.82 g in the Ţigăneşti biotype and 198.87 g, with the average of the experience 131.06 g. Thus, the highest weight of the fruit was recorded in the variety Beautiful of Boskoop (198.87 g), and the difference to the control is very distinctly positive. The smallest value is in the Ţigăneşti biotype, the difference to the control being very significant negative.

Table 4.

Fruit weight in the varieties and biotypes studied, in 2018

Variety	Fruit weight (g)	Relative value (%)	Difference to control (g)	Significance
CALVIL	121,70	92,74	-9,37	-
MASANSCHI	87,87	66,53	-43,19	00
ŢIGĂNEŞTI	69,82	52,54	-61,24	000
RENET DE CANADA	178,08	135,66	46,02	XX
BEAUTIFUL OF BOSKOOP	198,87	152,55	67,81	XXX
Average of varieties	131,06	100,00	0	Control

LSD 5% = 30.88 g
LSD 1% = 41.73 g
LSD 0,1% = 55.59 g

In Table 5, we may observe that the dry matter has values between 15.92 in the Masanschi variety, and the difference to the control is distinctly negative, and 20.62 in the variety Beautiful of Boskoop, the difference to the control being very positive; the average of the experiment is 17,67.

Table 5.

Fruit dry matter in the varieties and biotypes studied, in 2018

Variety	Dry matter	Relative value (%)	Difference to control	Significance
CALVIL	17,99	103,01	0,32	-
MASANSCHI	15,92	88,81	-1,76	00
ŢIGĂNEŞTI	16,85	94,77	-0,83	-
RENET DE CANADA	18,32	104,14	0,66	-
BEAUTIFUL OF BOSKOOP	20,62	118,83	2,96	XXX
Average of varieties	17,67	100,00	0	Control

LSD 5% = 1,26%
LSD 1% = 1,70%
LSD 0.1% = 2,27%

Conclusions

From the obtained results we can draw the following conclusions:

• Regarding the large diameter of the fruit in the varieties and biotypes studied, in 2018, we may conclude that its highest value was registered in the variety Renet of Canada, the difference to the control of the experience is very distinctly positive.

• The highest fruit height was registered for the fruits of the varieties Renet of Canada (62.69 mm) and Beautiful of Boskoop 60.69 mm.

• Thus, in 2018, we may observe that the average weight of the fruits in the varieties and biotype studied was between 69.82 g and 198.87 g, with an average of the experiment of 131.06 g. The highest fruit weight was registered in the variety Beautiful of Boskoop, the difference to the control being very distinctly positive, and the smallest value in the Ţigăneşti biotype, the difference to the control being very significantly negative.

The results of the experience lead to the conclusion that the fruits of the Tigăneşti biotype fall into the *"middle group"* and the fruits of the other varieties into the *"above-middle group"*.

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