PRELIMINARY RESEARCH CONCERNING DEFORMATION RESISTENCE OF FRUITS AT NEW SWEET CHERRY CULTIVARS CREATED AT FRUIT GROWING DEVELOPMENT STATION IAŞI – ROMANIA

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The knowledge of deformation rezistence of sweet cherries is very important for a good choice of means and methods of their package, storage and transportation, for fresh consumption on national market or for export. In this paper, the authors present the measurement results about fruits deformation, made on 8 new sweet cherry cultivars homologated at SCDP Iaşi in 1996 – 2006: Cetăţuia, Cătălina, Maria, Golia, Ştefan, Bucium, Iaşirom and Tereza. These was harvested in two maturation stages (before optimum ripening date and full maturation stage), and have registered the fruit deformation under 500 g and 1000 g using an originally device achieved at Fruit Growing Development Station Iaşi – Romania. This mechanical device to measure the resistance of the fruit at deformation can be used for different variants of weights applied over the fruit for diverse fruit-growing species or grapes. The fruit deformation is determined by the difference between the initial position indicated by a needle on a marked scale in millimeters and the position resulted after the fruit deformation under different weight. We noticed the greatest resistance to deformation was registered by the cultivars Bucium, which was harvested before optimum ripening date and Golia, which was harvested in full maturation stage. The smallest resistance to deformation was registered by the cultivar Tereza (which was harvested before optimum ripening date) and cultivar Maria (which was harvested in the full maturity phase). The determinations effectuated represent just a preliminary study and helped us calculate the averages and the difference towards averages for ulterior statistical analysis.

Keywords*: sweet cherry, fruit firmness, fruit quality, fruit deformation, elasticity.*

The continuous improvement of means and methods of packing, storage, transport and distribution for the fresh fruits intended for the internal consumption or exportation and the progress made in the field of industrialization rely on the detailed knowledge of the physical and technological features of fruits.

The knowledge of the fruit resistance to deformation is important so as to better understand these means and represents a permanent preoccupation for research both at the national and international level [1, 2, 3]. At the same time the resistance to deformation shows the degree of elasticity of tissues and indicates the affiliation of the cherry cultivars to the group of the *Bigarreau* type.

In this paper, authors propose a mechanic device to measure the resistance of the fruit to deformation that may be used for different variants of weights applied over the fruit for diverse fruit-growing species or grapes.

The fruit deformation is determined by the difference between the initial position indicated by a needle on a marked scale in millimeters and the position resulted after the fruit deformation. We effectuated determinations for 8 new cultivars of cherries in two phases of harvest, the ripening phase and the full maturity phase.

MATERIALS AND METHODS

For the experiment we used the fruits harvested in mellowness stage or the full maturity stage for 8 sweet cherry cultivars homologated at SCDP Iaşi in 1996 – 2006: Cetăţuia, Cătălina, Maria, Golia, Ştefan, Bucium, Iaşirom and Tereza. The samples made of 100 fruits were harvested in the ripening phase for the cultivars Ştefan, Bucium, Tereza and Iaşirom and in the full maturity phase for the cultivars Cetăţuia, Cătălina, Maria and Golia. The cultivars are in two contest cultures with trees grafted on franc and *mahaleb*, planted at distances of 5 x 4 m, disposed on a free fan-shaped espalier without a supporting system. The farm practices applied were the ones specific to the sweet cherry culture.

We made observations and determinations on the date of the flowery end, the date when the ripening began, the date of full maturity and the resistance of fruits to deformation. To measure the resistance of the fruit to deformation we made up the following device (*fig. 1*):

Fig.1. **Device for determination of the deformation resistance of fruits** (original)

On a metallic stand there is a rod that moves vertically within a metallic tube. At the superior part of the rod there is a pan on which we put weights and at the inferior part of the rod there is a pressure plate and an indicating needle. The fruit is introduced under this pressure plate and on the pan we put the weight. The deformation of the fruit was determined by the difference between the initial position indicated by a needle on a marked scale in millimeters and the position resulted after the fruit deformation. We made determinations for the samples submitted to deformation under weights of 500 g and 1000 g, in 5 repetitions on cultivar (as variant).

The determinations effectuated represent a preliminary study and helped us calculate the averages and the difference towards the average for the subsequent statistic analysis.

RESULTS AND DISCUSSIONS

Cultivars harvested in the full maturity stage. When applying a weight of 500 g over the fruit we obtained a deformation ranging between 2.21 mm by the cultivar Cătălina and 4.24 mm by the cultivar Maria (*tab. 1*).

When applying a weight of 1000 g over the fruit we obtained a deformation ranging between 7.5 mm and 10.42 mm, the cultivar Golia being the most resistant with a deformation of only 7.5 mm, whereas the cultivar Maria registered again the greatest deformation (10.42 mm) (*tab. 2*). Nevertheless, these data regarding the fruit deformation, at the analyzed cultivars, are not statistical significant ones, related to the average value of cultivars, excepting the cultivar Maria, at which the deformation of the fruit (under a 1000 g weight) was distinct significant (*tab. 2*).

Table 1

The average of deformation on fruits fewer than 500 g weight to cultivars harvested in full maturity stage (mm)

Variant	Fruits average deformation (mm) in 5 repetitions	Difference towards average	Significance
Average deformation	**2.96**	-	-
Catalina	2.206	-0.754	-
Cetatuia	2.634	-0.326	-
Golia	2.76	-0.2	-
Maria	4.24	1.28	-
DL 5% = 3.05 mm. DL 1% = 4.28 mm, DL 0.1% = 6.05 mm			

Table 2

The average of deformation on fruits fewer than 1000 g weight to cultivars harvested in full maturity stage (mm)

Variant	Fruits average deformation (mm) in 5 repetitions	DIFFERENCE FROM AVERAGE	Significance
Average deformation	**8.3**	-	-
Catalina	7.814	-0.489	-
Cetatuia	7.94	-0.36	-
Golia	7.5	-0.8	-
Maria	10.42	2.12	***
DL 5% = 1.05 mm, DL 1%=1.47 mm, DL 0.1% = 2.07 mm			

Cultivars harvested in the ripening phase. When applying a weight of 500 g over the fruit we obtained a deformation towards the initial size comprised within 1.02 mm, registered by the cultivar Ştefan, and 2.62 mm, registered by the cultivar Tereza.

When applying a weight of 1000 g over the fruit, the cultivar Bucium was the resistant one with a difference of only 1.94 mm, whereas Tereza cultivar registered again the greatest deformation (5.81 mm) (*tab. 3*).

Table 3

The average of deformation on fruits at cultivars harvested in the ripening phase (34 - 36 days after full blossom)

Cultivar	Fruits average deformation under 500 g weight (mm)	Fruits average deformation under 1000 g weight (mm)
Tereza	2.62	5.81
Bucium	1.12	1.94
Iaşirom	1.26	5.07
Ştefan	1.02	2.47

CONCLUSIONS

1. The device made up at SCDP Iasi represents a very simple solution, as usage and construction, to determine the resistance to deformation for different fruit-growing species or grapes.

2. As compared to the empiric determinations (tasting, palpation, crushing between fingers) [3; 4], this device helps determine precisely the fruit characteristics in terms of firmness, elasticity and tissue compactness.

3. Though the data obtained confirm the previous observations related to the quality of the cultivars under study, we could measure more exactly and compare precisely every cultivar.

4. The subsequent studies, as compared to this testing, will be able to supply statistic data where the repeatability of results will not be possible to be contested.

5. From the determinations effectuated in the ripening phase, we noticed that the greatest resistance to deformation was registered by the cultivar Bucium, and the smallest by the cultivar Tereza.

6. From the determinations effectuated in the full maturity phase, we noticed that the greatest resistance to deformation was registered by the cultivar Golia, and the smallest by the cultivar Maria.

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