SOME COMPATIBILITY ASPECTS OF PEAR VARIETIES ENGRAFTED ON DIFERENT ROOTSTOCKS

UNELE COMPATIBILITĂȚI LA SOIURI DE PĂR ALTOITE PE DIFERIȚI PORTALTOI

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Abstract. *Our experiments followed some aspects like: the enzymatic activity of the catalasas and peroxidasas; nitrogen and assimilating pigments contents at the scion and rootstock level with the purpose of establishing a correlation between those specific biochemical parameters and their influences upon the compatibility between scions and rootstocks at some pear varieties engrafted on Cydonia oblonga and Pirus sativa rootstocks. The results highlighted a correlation between enzymatic activity and engrafting affinity. Also, the nitrogen and assimilating pigments contents can be taken into consideration for establishing the level of compatibility on graft combinations.*

Rezumat. *Experimentele noastre au vizat unele aspecte precum: activitatea enzimatica a catalazei si peroxidazei; cantitateade azot total si pigmenti asimilatori la altoi si portaltoi in vederea stabilirii unor corelatii intre acesti parametri biochimici si influetnta lor asupra compatibilitatii dintre altoi si portaltoi la unele soiuri de par altoite pe Cydonia oblonga si păr franc (Pirus sativa). Rezultatele obtinute au evidentiat existenta unei corelatii intre activitatea enzimatica si compatibilitatea la altoire. De asemenea, continutul de azot total si pigmnenti asimilatori pot fi luati in calcul la stabilirea gradului de compatibilitate la altoire.*

MATERIAL AND METHODS

For our researches we used two varieties of pear (Contesa de Paris and Triumf) which were engrafted on a known rootstock as incompatible – *Cydonia oblonga* BN 70 and on a compatible rootstock – *Pirus sativa* as a control

At the same time in order to avoid the occurred modifications by the engrafting process, we made the engrafting on the franc rootstocks themselves.

Here we present the results of biochemical analyses that we performed regarding catalasas and peroxidasas activities which were achieved through the idiometric method; the determination of the total nitrogen content through the Kjeldahl method; as well as the determination of the quantity of assimilating pigments using the UV-VIS method.

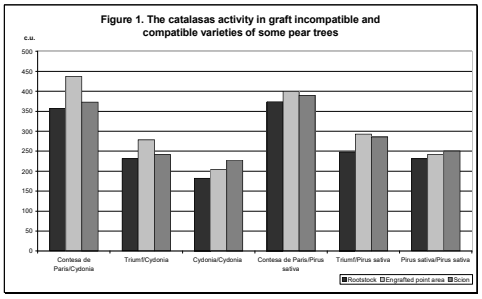
RESULTS AND DISSCUSIONS

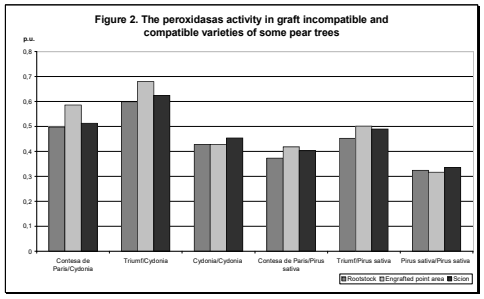
The catalasas and peroxidasas are enzymes which suffer quite high fluctuations along the cell differentiating and re-differentiating process, after which a series of toxic products are generated type of peroxides, which are

neutralized by these two enzymes. The engrafting process, in itself, represents a major artificial intervention, followed by modifications in the anatomy, physiology and biochemistry of the fruit trees. Due to the physiological stress, induced by the engrafting process, the fruit trees undergo a series of transformation on the cellular and molecular level meant to reestablish the functional balance of its cells, tissues and organs.

Analyzing the data presented in the figures 1 and 2 we can remark the fact that the activity of the catalasas and peroxidasas was bigger at the same engrafted varieties on incompatibles rootstocks (Contesa de Paris/*Cydonia oblonga* BN70, Triumf/*Cydonia oblonga* BN70) when compared to the compatible rootstocks (Contesa de Paris/*Pirus sativa*, Triumf/*Pirus sativa*).

It is interesting the fact that although the engrafted varieties on compatible rootstocks have a catalasas and peroxidasas activity much below the level of the engrafted varieties on incompatible rootstocks, these, yet present an enzymatic activity however bigger compared to the rootstocks on engrafted themselves (*Cydonia oblonga* BN70/*Cydonia oblonga* BN70, *Pirus sativa*/*Pirus sativa*).





Therefore, following the performed analysis we can assert the following thing: a bigger difference of the respiratory enzymes activity (catalasas, peroxidasas) in the engrafted varieties on a rootstock, when compared to the one of the rootstock engrafted on itself, indicate a smaller degree of variety affinity for the rootstock.

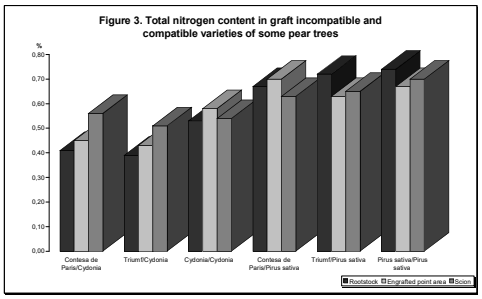
Another truth which imposes itself, due to the results of the achieved experiences is the one according to which, although the variety is compatible with the rootstock (Contesa de Paris/*Pirus sativa*, Triumf/*Pirus sativa*), however it presents some differences if compared to the rootstock engrafted on itself (*Cydonia oblonga* BN70/*Cydonia oblonga* BN70, *Pirus sativa*/*Pirus sativa*). So, we can not discuss about a total (100%) affinity between scion and rootstock.

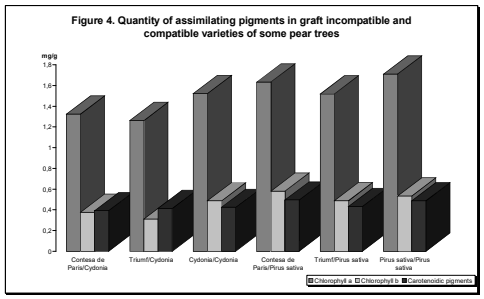
Regarding the activity of the catalasas and peroxidasas around the engrafting point, no significant differences were noticed with an interpretative role in the studied matter.

Knowing the biological importance of the nitrogen in plants, we attempted to see which is the dynamics of this element in the case of the varieties engrafted on a compatible and incompatible rootstocks.

As shown in figure 3 in the varieties incompatible with the rootstocks (Contesa de Paris/*Cydonia oblonga* BN70, Triumf/*Cydonia oblonga* BN70) the nitrogen quantity is clearly bigger in scion (2 cm above the engrafting point) however, in the case of the compatible varieties (Contesa de Paris/*Pirus sativa*, Triumf/*Pirus sativa*), and of the rootstocks engrafted on themselves (*Cydonia oblonga* BN70/*Cydonia oblonga* BN70, *Pirus sativa*/*Pirus sativa*), the situation is exactly opposite. The nitrogen quantity is bigger in rootstock than in scion. It is well known the fact that the nitrogen enters the plants through roots, wherefrom, together with the raw sap it is transported to the aerial organs and leaves, where it is used in the synthesis of various organic compounds, which then migrate by the elaborated sap, to the inferior organs and the plant roots.

The retention of the nitrogen (included in organic combinations) above the engrafting point, in case of the varieties incompatible with the rootstock, make us believe that on this level there are barriers of an anatomo-morphological order, hindering the migration of the organic compounds through the elaborated sap to the roots. Therefore, the rootstock and its roots will suffer a chronic lack of active physiological substances generating the lowering of the rootstock vigor, and finally its death.





Naturally, a bigger quantity of assimilating pigments existent in the tree leaves (especially in the young ones, during their first year of vegetation) can support a higher intensity of the photosynthesis generating the energy and the substratum necessary to the plants growing and their development.

Following the analysis of our results (figure 4) we notice that in the varieties incompatible with the rootstock (Contesa de Paris/*Cydonia oblonga* BN70, Triumf/*Cydonia oblonga* BN70), the quantity of assimilating pigments is significantly lower (about 20%) than in the varieties compatible with the rootstocks (*Cydonia oblonga* BN70/*Cydonia oblonga* BN70, *Pirus sativa*/*Pirus sativa*).

G.V. Shishcanu (1973), in the speciality literature mentions that due to some deficiencies in nitrogen, phosphorus, potassium in some apple varieties, the photosynthesis intensity was reduced up to 10,8% – 28,6% during the day, compared to the varieties which had a balanced mineral nutrition.

Therefore we conclude one more time that in case of the varieties incompatible with the rootstock, due to a heavier circulation of the elaborated sap

on the level of the engrafting point, the nutrients get to the roots in insufficient quantities, generating their functional disequilibrium reflected upon the absorption capacity of the mineral elements necessary to the photosynthetic apparatus.

CONCLUSIONS

- The high level of the respiratory enzymes activity (catalasas, peroxidasas), in the area of the engrafting point at the varieties incompatible with the rootstock shows the existence of physiological stress at this level.

- The retention of the nitrogen above the engrafting point, in case of the varieties incompatible with rootstock, indicate the existence of a barrier of an anatomo-physiological order on this level, hindering the migration of the organic compounds through the elaborated sap to the roots.

- The reduced quantity of assimilating pigments at the varieties incompatible with the rootstock is determined by the installing of a functional disequilibrium of the roots affecting the process of the tree mineral nutrition, due to hardening of the organic and inorganic compounds migration at the level of the engrafting point.

REFERENCES

1. **Cheng L., Dong S., Guak, S. and Fuchigami, L.H., 2001** - *Effects of nitrogen fertigation on reserve nitrogen and carbohydrate status and regrowth performance of pear nursery plants.* Acta Horticulturae 564: 51-62.
2. **Faust M., 1989 -** Physiology of temperate zone fruit trees. John Wiley & Sons, New York: 338
3. **Frahry G. and Schopfer P., 1998** - *Hydrogen peroxid production by roots and its stimulation by exogenous NADH.* Physiologia Plantarum **103**. p. 395-404.
4. **Shishcanu G.V.**, **1973** - *Fotosintez yabloni.* Izdatelistvo “Stiinta” Chisinau. p. 185-192.
5. **Tromp J., 1983** - Nutrient reserves in roots of fruit trees, in particular carbohydrates and nitrogen. Plant and Soil 71: 401-413.