INFLUENCE OF SOME ECOLOGICAL PRODUCTS ON ANATOMO-MORPHOLOGICAL CHANGES IN GRAFTING COALESCENCE AT PEAR AND PLUM FRUIT TREES

EFECTUL UNOR PREPARATE ECOLOGICE ASUPRA MODIFICĂRILOR ANATOMO-MORFOLOGICE ÎN PROCESUL DE PRINDERE LA ALTOIRE LA SPECIILE PĂR ŞI PRUN

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Abstract: *The aim of this paper to evidence the effect of some ecological products on grafting success and anatomo - morphological changes which appear during the coalescence of grafting partners. The experiences were made in didactical farm field belonging U.S.A.M.V. Iasi, in 2008-2010. Rootstocks of pear (Pyrus sativa and Cydonia oblonga) and plum (Prunus domestica and Prunus cerasifera) were grafted with cultivars having different graft compatibility degrees. During the grafting process, an ecological product P2 (offered by I.C.D.B "Bios" Cluj) was applied above and below the grafting union area. After three weeks, on the treated variants, microscopically sections through the grafted point showed a stimulation of calusogenesis processes and a better tissue differentiation.*

Key words: ecological products, incompatibility, grafting, conductive vassels

Rezumat: *În lucrarea de faţă ne propunem să evidenţiem rolul unor preparate ecologice asupra procesului de prindere la altoire şi modificările de ordin anatomo - morfologic ce apar în procesul de sudare şi vascularizare a celor doi parteneri. Experienţele au fost efectuate în cadrul fermei didactice a U.S.A.M.V. Iaşi, în perioada 2008-2010. Portaltoi din speciile păr (Pyrus sativa şi Cydonia oblonga) şi prun (Prunus domestica şi Prunus cerasifera) au fost altoiţi cu soiuri ce prezintă diferite grade de compatibilitate la altoire. În timpul altoirii a fost efectuat un tratament cu produsul ecologic P2 furnizat de I.C.D.B. " Bios" Cluj. Secţiunile microscopice prin punctul de altoire au demonstrat stimularea procesului de calusogeneză şi de diferenţiere a vaselor conducătoare sub acţiunea tratamentului cu produsul P1.*

Cuvinte cheie: preparate ecologice, incompatibilitate, altoire, vase conducatoare

INTRODUCTION

In ecological fruit tree growing the accent is put on substances witch are used as biostimulators to improve root growth and due to this increase the

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crop as well as increasing featuring degree at some cultivars. Beside that some substances have a healing effect ad are used in orchards for a faster healing of trees after winter or mechanical lesions or after annual pruning.

Because grafting is one of the most important method of fruit tree planting material producing, one of research direction in this field is diminution as much as possible of incompatibility phenomenon between some cultivars and their rootstocks used for their characteristics and adaptability for a specific climatic area.

In this direction many researches were made, in the aim of determination of incompatibility causes (Herrero, 1951; Mosse, 1962), and for diminution of this effect by creating of new compatible cultivars or by grafting on intermediary compatible rootstock.

This paper is part of a grater study which has as aim the elaboration of some ecological products for increasing graft compatibility and a further better development of plants. In these studies two ecological products P1 and P2 were tested, and the best results were obtained when P2 product was used. For this reason we tried to test influence of product P2 on grafting success and anatomo-morphological changes which may appear in grafting area at some pear and plum varieties with different compatibility degrees.

MATERIAL AND METHOD

Experiments were organized in didactical farm of USAMV Iasi. Biological material was represent by pear rootstock (*Cydonia oblonga* and *Pyrus sativa)* and plum roostock (*Prunus domestica* and *Prunus cerasifera*) which were grafted with pear cultivars Cure and Comptesse de Paris and plum cultivars Stanley and Tuleu gras. As control we used cultivars grafted on *Pyrus sativa* and *Cydonia oblonga* (compatible variants). Grafting were made in August and immediately after grafting a treatment with P2 product offered by ICDB Bios.

Samples were collected at 4 weeks after grafting and for anatomical section semiautomat microtome SLEE MAINZ CUT 6062 and optic microscope MOTIC B SERIES were used. Observations were made using 4x and 10x objective and images were capture with Motic Image Plus soft.

RESULTS AND DISCUSSIONS

The union of the vascular elements of stock and scion following grafting is thought to be the critical event in the formation of a compatible graft (Yeoman, 1984). The differentiation of connecting vascular tissue is preceded by a proliferation of parenchymatous callus from both components of the graft. Callus formation takes approximately 2-3 weeks and after that a new cambial tissue will differentiate which will generate a new xylem and a new phloem, vascularisation being complete after approximately 6-8 weeks (Soule, 1971; Moore, 1981; 1982;1983).

If partners are incompatible, parenchymatous cells will from the two surfaces generates cambium and felogen which will form suber and will

isolate scion and rootstock leading on grafting failure. Between these two extreme cases (compatibility and incompatibility) there are multiple situations in which initially a coalescence process take place, but, in time, the new fruit tree will manifest a low compatibility degree with various symptoms: presence of undifferentiated cell tissue on suture line of the two partners, contortion of vascular tissue, discontinuity of wood and bark, appearance of woody bridges between the partners etc.

For analysing redifferentiation capacity of parenchymatous tissue samples for anatomo-morphological observations were take at 4 weeks after grafting, this moment being the one when, at compatible combinations, the neoformations of vascular tissues must start, or in case of incompatible combinations it can be observed the suberification of the cambial tissue or other disturbances of vessels formation

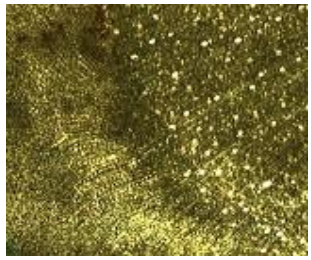
When pear cultivar were grafted on *Pyrus sativa*, a very intense cell proliferation has been observed, parenchymatous cell tissue occupied the entire space between rootstock and scion without tissue suberification, so that water and mineral substances could be uptake without difficulty.

In both variants (compatible and incompatible scions grafted on *Pyrus sativa*) callus has been formed on entire surface of cut tissues, fact which suggest that application of P2 product did not have a visible influence on cell proliferation process, but it has been observed that vessels neoformation process was quicker.

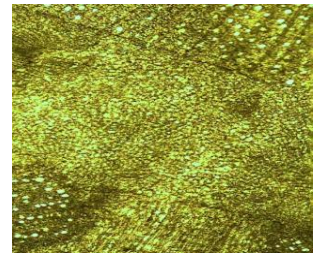
At 4 weeks after grafting on treated variant it can be observe xylemic vessel formation, but on untreated variant this process wasn't started yet.

When grafting was made on *Cydonia oblonga*, at 4 weeks after grafting it could be observe parenchymatous tissue formation but without starting of cell differentiation process. At untreated variants of variety Comptesse de Paris grafted on *Cydonia oblonga*, woody vessels of the scion and rootstock were separated by a brown parenchymatous suberyfied tissue which block water and nutritive substances circulation, leading to formation of some necrotic zones in grafting point. Treatment application leaded to a diminution of suberification degree so that on treated variant new formed callus is more homogenous and necrosis was observed only in isolated points. Neoformation of conductive vessels was not observed at these variants (fig.1).

At plum varieties observations evidenced a quicker formation of the callus, so that at only 2 weeks after grafting space between those two partners was completely occupied by callus consistent, whereas, on pear trees callus consistence was still friable. As well as pear cultivars, it has been observed that on variants grafted on *Prunus sativa* treated with P2 redifferentiation process has already start, new conductive vessels being observed, in contrast with untreated variants at which redifferentiation didn't start yet (fig. 2).



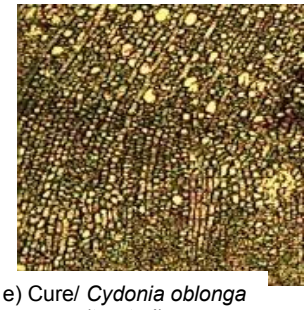
a) Cure / *Pyrus sativa* (treated)



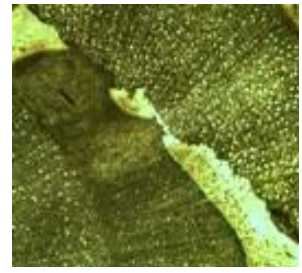
b) Cure / *Pyrus sativa* (untreated)

c) Comptesse de Paris / *Pyrus sativa* (treated)

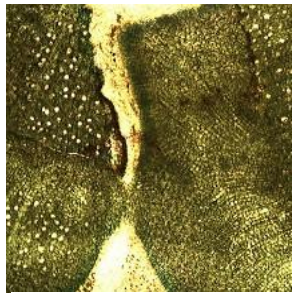
d) Comptesse de Paris / *Pyrus sativa* (untreated)



e) Cure/ *Cydonia oblonga* (treated)



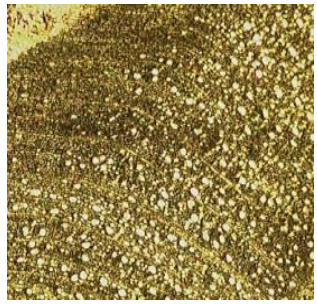
f) Cure/ *Cydonia oblonga* (untreated)



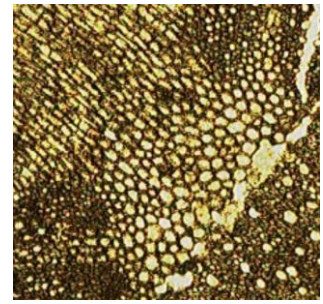
g) Comptesse de Paris/ *Cydonia oblonga*) (treated)

h) Comptesse de Paris/ *Cydonia oblonga*) (untreated)

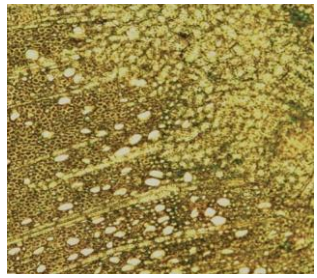
Fig. 1 (a-h) – Anatomical sections through grafted point at pear



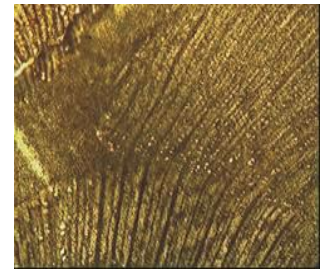
a) Stanley / *Prunus Sativa* (treated)



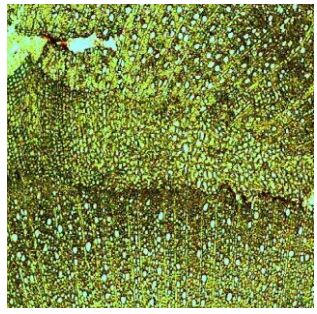
b) Stanley / *Prunus Sativa* (untreated)



c) Tuleu gras / *Prunus sativa* (treated)



d) Tuleu gras / *Prunus sativa* (untreated)



e) Stanley/*Prunus cerasifera* (treated)

f) Stanley/*Prunus cerasifera* (untreated)

g) Tuleu gras / *Prunus cerasifera* (treated)

h) Tuleu gras / *Prunus cerasifera* (untreated)

Fig. 2 (a-h) - Anatomical sections through grafted point at plum

In case of grafting on *Prunus cerasifera* incompatibility symptoms were remarked both at incompatible variety Tuleu gras and Stanley. On Tuleu gras/*Prunus cerasifera* it was observed a suberification of parenchymatous tissues of both rootstock and scion with a pregnant tendency of isolation of the partners whereas at Stanley a fine line of suber only at rootstock level. (fig. 2)

Under the influence of P2 treatment frequency of these modifications has diminuend so that in case of Stanley variety anatomical sections showed only deviations of conductive vessels without any other abnormal aspects which may suggest difficulties in vascularisation processes on suture line.

In case of Tuleu gras cultivar, suberification was partially, being observed homogenuous parenchyma which assure partners adherence and water and mineral supply fact which permits a satisfy vascularisation of grafted area.

CONCLUSIONS

1. At pear specie, after application of treatment with P2 product it has been observed a diminution of suberification degree of dedifferentiated tissues

2. At plum varieties grafted on *Prunus sativa* it has been observed an acceleration of conductive vessels formation after product P2 was applied. When grafting was made on *Prunus cerasifera* tissues suberification was observed in a lower proportion on the treated variants in opposite with those untreated.

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REFERENCES

1. **Herrero J**., **1951 -** *Studies of compatible and incompatible graft combinations with special reference to hardy fruit trees*. J. Hortic. Sci. 26:186--237.
2. **Moore R**., **1981** - *Graft compatibility/incompatibility in higher plants. What's new in plant physiology*. Vol. 12(4): 13-16.
3. **Moore R**., **1982** - *Further evidence for cell wall depositon during graft formation*. Ann. Bot., 50:599-604.
4. **Moore R**., **1983 -** *Studies of vegetative compatibility-in compatibility in higher plants. IV. The development of tensile strength in a compatible and an incompatible graft*. Amer. J. Bot., 70(2): 226-231.
5. **Mosse B.**, **1962** - *Graft incompatibility in fruit trees*. Technical Communication No. 28, Commonwealth Bureau of Horticulture and Plantation Crops, East Malling, Maidstone, Kent, U.K., 36 p.
6. **Soule J., 1971** - *Anatomy of the bud union in mango (Magnifera indica L.)*. J. Amer. Soc. Hort. Sci., 96(3): 380-383.
7. **Yeoman M. M., 1984** - *Cellular recognition systems in grafting. In: Cellular Interactions*, *Encyclopedia of Plant Physiology* (Ed. by H. F. Linskens & J. Heslop-Harrison), pp. 453-472. Springer-Verlag, Berlin.