AN HISTOLOGICAL INVESTIGATION OF GRAFT UNION IN SOME PLUM VARIETIES GRAFTED ON PIXY ROOTSTOCK

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ABSTRACT

Using clone rootstock is very important for reducing the size and shortening juvenile period of trees. Pixy (P. İnstititia) commonly used in fruitculture has %50 dwarfing. This research is carried out to determine the graft compatibility of Papaz, Yalova Can (*P.cerasifera*), and Formosa (*P.japonica*) plums which are grafted pixy rootstock in 2005-06 years.. In one-month horizontal sections it is determined that a limited but satisfactory callus tissue emerges. It is determined that necrotic layers, which are scattered and get brown as a result of enzymatic reactions, are localized in the callus tissue. It's observed in every sample that the new cambium differantiation, which has the second importance in the procedure of grafting, takes places successfully in the callus tissue produced by the rootstock and scion. Vascular tissue development takes place properly in every combination. In all combinations, examined tissues are well devoloped and combinations are compatible. Combinations should be observed in field conditions for incompatibility, which may occur in succeeding years.
Keywords: Pixy, Plum,Grafting

Pixy Üzerine Aşılı Bazı Erik Çeşitlerinde Aşı Kaynaşmasının Histolojik Olarak İncelenmesi

Özet

Klon anaçları kullanımı modern meyveciliğin en önemli zorunlulularından biridir ve bodur anaçlar ağaçların boynunun ve gençlik kısırlığı döneminin kısaltılmasında çok önemlidir. Meyvecilikte kullanılan Pixy anacı %50 bodurlaştırıcı etkiye sahiptir. Bu araştırma pixy (P. Instititia) üzerine aşılı Papaz, Yalova Can (*P.cerasifera*) ve Formosa (*P.japonica*) eriklerinde aşı kaynaşmasının gelişimini histolojik olarak izlemek amacıyla 2005–2006 yıllarında yürütülmüştür. Bütün aşı kombinasyonlarının örneklerinde alınan kesitlerde, anaç tarafından sınırlı fakat yeterli miktarda kallus dokusu oluşumu gözlenmiştir. Kallus dokusunun aşının yanlarında bulunan hava ceplerinde sınırlı ve zayıf bir gelişme gösterdiği gözlenmiştir. Kallus dokusu içinde enzimatik reaksiyonlar sonucu kararmış halde ve dağınık yapıda nekrotik dokular yer almaktadır. Bütün örneklerde, aşılamanın ikinci önemli safhası olan kambiyal devamlılığın anaç ve çeşit tarafından üretilen kallus dokusu içinde başarılı bir şekilde gerçekleştiği görülmüştür. Vasküler dokuların oluşumu bütün kombinasyonlarda açıkça görülmektedir. Bütün kombinasyonlarda, incelenen dokuların iyi bir gelişme gösterdiği görülmüştür. Bütün kombinasyonlar histolojik incelemelerde uyuşur bulunmuştur ancak ileride ortaya çıkabilecek gecikmiş uyuşmazlık durumunu tespit edebilmek için kombinasyonların arazi şartlarında da takip edilmesi gereklidir.
Anahtar kelimeler: Pixy, Erik, Aşı

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Introduction

Nowadays, plants produced from seeds are commonly used as the rootstock in the production of nursery plants. In this way of production, many differences occur in the development of nursery plants owing to genetic heterogeneity of rootstocks. There are some problems such as overheight and long juvenile period, which can take 3 or 5 years in the fruit gardens. Using dwarfing rootstocks is very important in controlling the height of the trees and shortening juvenile period. (Hartmann and Kester,1983; Grzyb and Starek 1998; Kankaya et al 1999).

Pixy (P.instititia) clone rootstocks, which is commonly used in fruitculture due to it's %50 dwarfing, could be used as a clonal rootstock for plums as well as for apricot and peach (Wertheim 1990, Knowleds et al 1994, Vachun 1995, Grzyb and Starek 1998, Kankaya et al 1999).

The weak development of this rootstock, which has been commonly used in Turkey in recent years, may cause some problems during the process of graft combination and forming vascular system, but these are not known exactly. After grafting, waiting for a long time and doing macroscopic observations to observe the combining process can lead to time, money and effort loss. Studying graft combination histologically in the sections prepared from the samples taken from the plant after a short time from grafting gives us information in the short time whether the combination would be succesfull or not and the process related to the combination.

By studying sections preperad from graft samples, we have the opportunity to see the development of callus tissue, the position of necrotic layers, cambial differentiation, cambial continuity. By the observing the development of vascular tissues we may say whether the combination is compatible or not and graft combination process take place in good conditions (Moore 1981, 1983,1984). So it is important to observe pixy rootstock's graft combination development with the plums such as Papaz (priest), Formosa and Yalova Can which are grown widely and demanded in domestic and foreign markets. It will make contribution to nursery plant production to observe graft combination process which may directly affect nursery plant production performance on Papaz, Yalova Can (*P.cerasifera)* and Formosa (*P.japonica)* plums which are in the different genus.

Material and Method

This research was carried out between 2005 and 2006 in Adnan Menderes University, Sultanhisar Vocational College in Aydin province in order to determine the graft combination of Papaz, Formosa and Yalova Can plums which are grafted Pixy rootstock. Pixy rootstocks were produced from cuttings taken from trees growing in Adnan Menderes University, Faculty of Agriculture, Department of Horticulture. Buds for grafting were obtained from the one year old shoots of 11 years-old Papaz, Formosa and Yalova Can plum trees which are grown in the some institution's collection garden.

In every combination 50 grafts were applied by using "T budding" grafting method on rootstocks. Begining from the date of grafting, graft samples were taken with one month interval periods. The samples are cut 1cm below the place of graft and kept in the %70 ethylalcohol. Samples were cut 25 microne thickness by using microtome. The samples were examined by Olympus digital microscope Mic-D and colored by using digital coloring property of microscope. In this study, callus development, the structure of necrotic layers, cambial differentiation, cambial continiouity and vascular tissues forming and development were examined.

Results and Discussion

Callus development is one of the most important stages of grafting. Callus emerges from meristematic cambium, parenchymatic alive cortex buds and scions and young xylem and phloem cells as a result of wounding.

It is possible that callus tissue is weak when the rootstock is dwarf. In this situation the callus tissue has less opportunity to pass the water from rootstock to bud. If the callus which is produced by weak rootstock is weaker than the one which is produced by bud, it is more possible that the grafting is not successful. In this of situation, the rootstock's and bud's newly-developed cambiums joining each other in the callus tissues gets more difficult.

(Unal,1984; Unal and Ozcagıran,1986; Watanabe and Nakazotomi,1990; Tekintas,1991; Polat and Kaksa,1992;Tekintas and Dolgun,1996; Kankaya et al. 1999).

In the light of these evaluations, Papaz, Formosa and Yalova Can which are grafted on pixy rootstock are examined carefully. In every combination's one month horizontal sections it is determined that a limited but satisfactory callus tissue emerges from rootstock (Fig 1,2,3). It's observed that limited callus tissue develops and it is weak in the air pockets at the sides of grafts where it exist excessively. Necrotic layers, which are scattered and get brown as a result of enzymatic reactions, are localized in the callus tissue.

It's observed in every sample that the new cambium differantiation, which has the second importance in the procedure of grafting, takes places successfully in the callus tissue produced by the bud and scion. It's determined that the stage of new cambium development take place successfully. Vascular tissue developed properly in every combination. It's observed that the tissues which belong to strong bud and rootstock don't create any adverse effect (Fig 4,5,6). In all combinations, examined tissues are well devoloped and combinations are compatible.

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Fig.1.

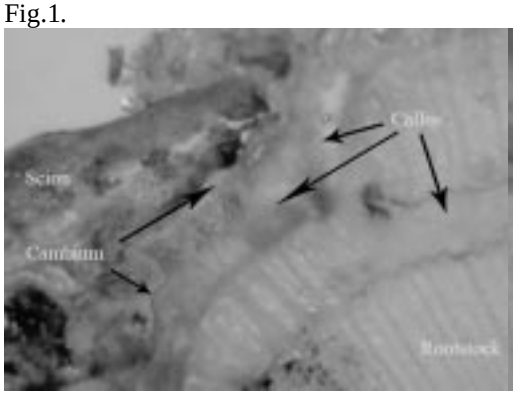
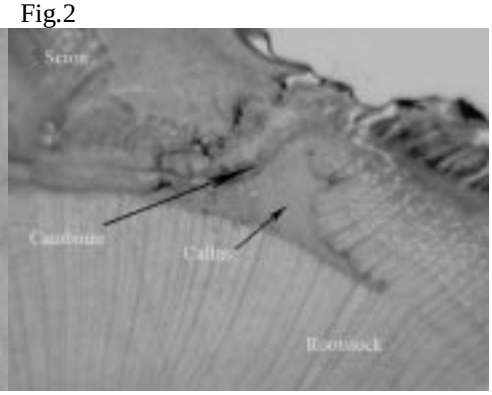


Fig.2



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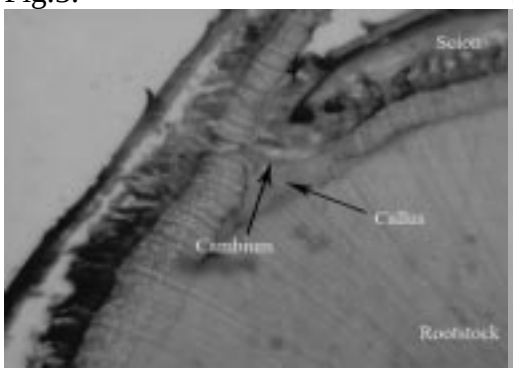

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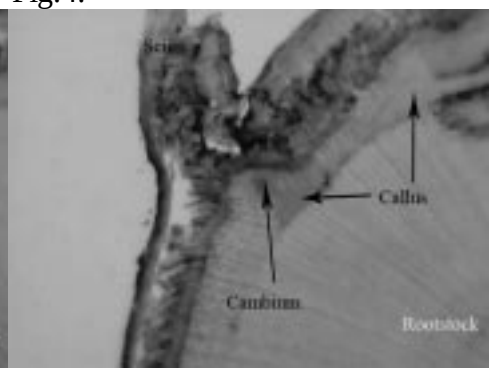

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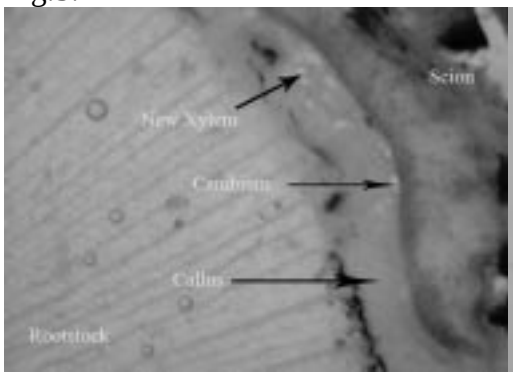

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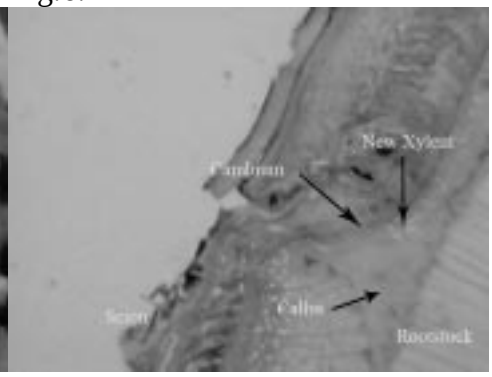

Fig.1. Cross section of 1 month old Pixy/Papaz graft combination.
Fig.2. Cross section of 1 month old Pixy/Formosa graft combination.
Fig.3. Cross section of 1 month old Pixy/Yalova Can graft combination.
Fig.4. Cross section of 5 months old Pixy/Papaz graft combination.
Fig.5. Cross section of 5 months old Pixy/Formosa graft combination
Fig.6. Cross section of 5 months old Pixy/Yalova Can graft combination

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