THE EFFECT OF CROWN GALL ON TREE GROWTH AND PRODUCTIVITY AND THE SUCCESS OF SURGICAL REMOVAL OF GALLS FROM THREE YEAR OLD CHANDLER TREES ON PARADOX ROOTSTOCK

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ABSTRACT

A study conducted in 1997 evaluating trunk cross sectional growth of crown gall infected trees showed that the trees with crown gall infecting more than seventy five percent of the circumference of the trunk were visibly stunted and showed a severe reduction in trunk growth from 1996-1997. Because surgical removal of galls of this proportion would require girdling nearly one hundred percent of the trunk’s circumference, these trees were replaced. Trees with galls infecting less than seventy five percent of the trunk circumference had no reduction in trunk cross sectional growth.

In 1998, from trees that had galls successfully removed (those with less than seventy five percent of the trunk infected) there was no statistical difference from trees that were never infected by crown gall in terms of yield or trunk growth. Growth and yield of infected trees in which galls were not surgically removed were also not significantly different from uninfected trees. While the growth and yield of these 3 year old trees on Paradox rootstock was not significantly reduced by crown gall infection in 1998, the long term effects on yield, growth, and longevity of the orchard needs to be examined.

The success of surgically removing galls was very good in cases where the area infected with crown gall was completely exposed and the gall was completely extracted. One hundred percent of galls that were not completely exposed and isolated from the surrounding soil had re-growth and had to be treated a second time. Surgical removal was not successful where the gall was not fully exposed whether they were treated with Gallex or a silicon based wetting agent added to a ten percent bleach solution. Crown gall infection must be completely isolated from healthy tissue and extracted for successful treatment.

OBJECTIVES

One goal of this study is to determine the effect of crown gall infection on growth and yield of Chandler walnuts on paradox rootstock where the galls were successfully surgically removed. Another goal is to examine the effect of crown gall infection on growth and yield of three year old “76-80” walnut trees on paradox rootstock in which the galls were left untreated. The degree of success of surgically removing the galls with
a silicon based wetting agent added to a ten percent bleach solution and with Gallex is the third goal of this study.

PROCEDURES

All trees on Paradox rootstock were examined for crown gall infection in 1997 in this five acre variety trial. Trees were grouped into four categories: 1) no crown gall infection 2) crown gall infection up to 25 percent of the trunk circumference 3) crown gall infection up to 50 percent of the trunk circumference 4) crown gall infection up to 75 percent of the trunk circumference. Yield and percent growth were measured as pounds of nuts per tree and percent increase in trunk cross sectional area (TCSA) from 1997 to 1998, respectively. “76-80” trees were left untreated. Three single tree replicates in each category were evaluated. Chandler trees on Paradox were treated. Four single tree replicates in each category were evaluated. Galls were isolated from surrounding healthy tissue, extracted, then some were treated with Gallex and others with a silicon based wetting agent (Breakthru) added to a ten percent bleach solution. Trees were then evaluated three months after treatment and trees with re-growth of crown gall were treated again. Two months after the second treatment all trees were reevaluated.

RESULTS

In 1998, the trees with crown gall girdling up to seventy five percent of the trunk circumference were not statistically different from trees that were not infected by crown gall in terms of yield and trunk growth (Figures 1 and 2). While the growth and yield of these 3 year old trees on Paradox rootstock was not significantly effected by crown gall infection in 1998, the long term effects on yield, growth, and longevity of the orchard are not known. To answer this question, measurements will continue for a number of years.

The success of surgically removing galls was very good in cases where the area infected with crown gall was completely exposed before the gall was extracted. One hundred percent of galls that were not completely exposed and isolated from the surrounding soil had re-growth and had to be treated a second time (Figure 3). Surgical removal was not successful where the gall was not fully exposed whether they were treated with Gallex or a silicon based wetting agent added to a ten percent bleach solution. For successful surgical removal of galls, the entire gall should be exposed and removed, along with at least a one inch margin of uninfected tissue around the gall. When this was done, the silicon wetting agent/bleach treatment provided equal results to the more expensive Gallex treatment (Figures 3 and 4). Gallex did not penetrate entirely through gall tissue. In several cases this resulted in survival and re-growth of galls. Crown gall infection must be completely isolated from healthy tissue and extracted for successfully treatment.
Crown gall infection did not significantly affect growth or yield of these three year old walnut trees on Paradox rootstock whether the gall was surgically removed or not. The long term effect of not treating crown gall infection is not fully known but severe infection may affect the longevity of an orchard. It is suspected that untreated crown gall infection could make trees more susceptible to root or crown rots. For successful surgical removal of galls, the entire gall should be exposed and removed, along with at least a one inch margin of uninfected tissue around the gall. When this was done, the silicon wetting agent/bleach treatment provided equal results to the more expensive Gallex treatment.

**Figure 1. Yield and % Increase in TCSA One Year After Successful Gall Surgery**

**Figure 2. Yield and % Increase in TCSA on Trees With No Galls or Galls of Various Sizes Which Were left Untreated**
Figure 3. Crown Gall Surgery on Totally Exposed and Not Totally Exposed Galls

![Bar graph showing % Success for Totally Exposed Galls and Unexposed Galls at 3 Months Later and 2 Months After Retreatment.]

Figure 4. Crown Gall Surgery Using Standard "Gallex Procedure" vs. Complete Removal and Surface Sterilization

![Bar graph showing % Success for Gallex Procedure and Removal + Surface Sterilization.]