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Project No. 86-V2 - Almond Diseases
Biological Control of Crown Gall
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Objectives: (1) Determine which strains of crown gall are not controlled by the biocontrol K-84 strain in relation to specific rootstocks. (2) Determine the effect of temperature and concentrations of K-84 on control. (3) Determine length of time after wound inoculation with pathogenic crown gall strains that still enables K-84 to be effective with delayed applications. (4) Develop new biocontrol strains by either using other bacteria or by dearming virulence factors in currently pathogenic strains. The latter then may be antagonistic to virulent strains.

Interpretive Summary: The use of K-84 (Galltrol) to biologically control crown gall on many commercial crops has been highly successful. However, on some occasions the results have not been satisfactory because of the occurrence of resistant strains. Fortunately, there is no evidence yet that resistance is a problem with almond stock. Poor crown gall control of almonds is likely the result of improper usage of K-84. Experiments with other plant species showed that timing and the temperature during application was highly important for efficacious results. K-84 successfully controlled crown gall on various test plants in greenhouse studies even when applied 48 hours after wounded plants were inoculated with crown gall strains. However, this occurred only when temperatures were 60° F and less. At higher temperatures, K-84 must be applied within hours after a plant is wounded and exposed to crown gall bacteria. These results have direct application to how almonds and other susceptible rootstocks must be treated in nurseries and in orchards.

Two extensive field plots were established in January 1986. The first includes Nemaguard and Lovell rootstocks which have been inoculated with various strains of the crown gall bacterium and also strains of the antagonistic K-84 bacterium. The goal of this field plot is to determine how the two interact on different rootstocks and whether the interaction will lead to control or disease development. The second trial utilizes plum rootstocks and is designed to determine the correct timing for application of the antagonistic K-84 bacterium for effective control. There was extensive phytophthora crown and root rot in these trials which were dug in February 1987; however, it appears that based on the findings, past control failures are due to applying the antagonist too late after digging, rather than the

presence of resistant crown gall strains. A follow-up trial is planned. Both the greenhouse studies and these trials indicate that at higher temperatures, plants must be treated with antagonists within 48 hours of wounding such as caused by harvesting in nurseries or by root pruning.