# PRE-PLANT CROPPING AND FALLOWING EFFECTS ON SEVERITY OF PRUNUS REPLANT DISEASE

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**Introduction.** Almond, peach, and other commercially cultivated *Prunus* species are subject to replant disease (RD) when planted without precautions at orchard sites previously devoted to a closely related crop. Pre-plant fumigation can prevent RD, but recent research suggests that cultural approaches, including pre-plant fallowing or culture of certain cover crops, can help avoid certain replant problems. In addition, it seems likely that long-term cropping history and RD specificity could affect risk of RD on *Prunus* species at particular field sites, but little information is available to predict these effects. We determined effects of short-term fallow and cover crop treatments as well as long-term cropping history on severity of RD on Nemaguard peach.

**Materials and Methods.** To assess short-term cropping effects, a cover crop/fallow experiment was conducted in microplots (0.6 m diameter, 1.2 m tall). In April 2002 the microplots were installed near Parlier, CA and filled with non-fumigated soil collected from 0 to 0.8 m depth in nearby RD-affected peach plots. The soil in the microplots was settled by irrigation. Eight different pre-plant treatments were imposed on the microplots, beginning in June 2002 (Table 1). Sudan grass foliage and corn cobs were removed from the microplots to represent commercial harvests. The sudan and corn residues were chopped up and incorporated into the soil on 5 November 2002. The wheat residue was incorporated into the soil on 20 March 2003. Nitrogen fertilizer was added in equal amount to all microplots. Each of the microplots was planted with four Nemaguard peach seedlings on 6 May 2003. Effects of the pre-plant treatments are being assessed according to growth and health of the replanted peach seedlings.

To assess long-term cropping effects and possible cross specificity between grape and peach RD, soil was collected from three separate peach and grape blocks near Parlier, CA. A factorial greenhouse pot experiment, including pre-plant soil treatments of no fumigation (control) or MB:Pic fumigation and planting with Nemaguard peach or Cariganne grape for each soil was conducted in a greenhouse. Effects of cropping history were assessed according to resulting root health and vegetative growth of the test plants.

**Results and Discussion.** As of 5 August 2003, Nemaguard peach seedlings planted without pre-plant fumigation after removal of the almond trees on Nemaguard peach rootstock were significantly smaller than those planted after pre-plant fumigation (whether preceded by fallow or almond on peach) or after culture with wheat cultivar Penewawa (Fig. 1). According to 95% confidence intervals, the other treatments did not improve peach seedling performance significantly, compared to the Almond/peach, non-fumigated treatment. A more conclusive evaluation of the pre-plant treatments will be completed in the fall, and a repeat experiment is underway. The results indicate that certain short-term crop rotations may be used to help prevent replant disease on Nemaguard peach rootstock.

In the long-term cropping / cross specificity greenhouse tests, relatively high percentages of root cortex necrosis occurred on grape and peach root systems grown in non-fumigated soil from grape and peach sites, respectively (data not shown). Comparatively less root damage occurred on peach when it was grown in non-fumigated grape soil. Grape cuttings sustained moderate root damage in non-fumigated peach as well as non-fumigated grape soil, but severity of the damage was slightly less in peach than in grape soil. Repeat experiments in a field setting are needed to conclusively test effects of crop specificity and long-term cropping history on *Prunus* RD.

**Table 1.** Treatment summary, short-term cover crop / fallow experiment[1]

| Treatment name | "Summer/fall" crop (6/17 to 11/5/02) | Pre-plant fumigation treatment (11/22/02) | "Fall/winter" crop (9/24/02 to 3/20/03) |
|---|---|---|---|
| Ald./peach, non-fumigated | Almond/Nemaguard peach[2] | None | None |
| Ald./peach, fumigated | Almond/Nemaguard peach | MB:Pic[3] | None |
| Fallow, non-fumigated | None, dry fallow | None | None |
| Fallow, fumigated | None, dry fallow | MB:Pic | None |
| Corn, non-fumigated | Corn | None | None |
| Sudan, non-fumigated | Piper sudan grass | None | None |
| Wheat, non-fumigated | None, dry fallow | None | Wheat |
| Sudan, wheat; non-fumigated | Piper sudan grass | None | Wheat |

[1]Each treatment was imposed on 5 replicate microplots in a randomized complete block design.
[2]Almond grafted on Nemaguard peach rootstock, planted as potted commercial tree.
[3]Methyl bromide / chloropicrin mixture (50:50) 400 lb per acre (applied with microinjection system at 12 to 18" depth and covered with VIF film).

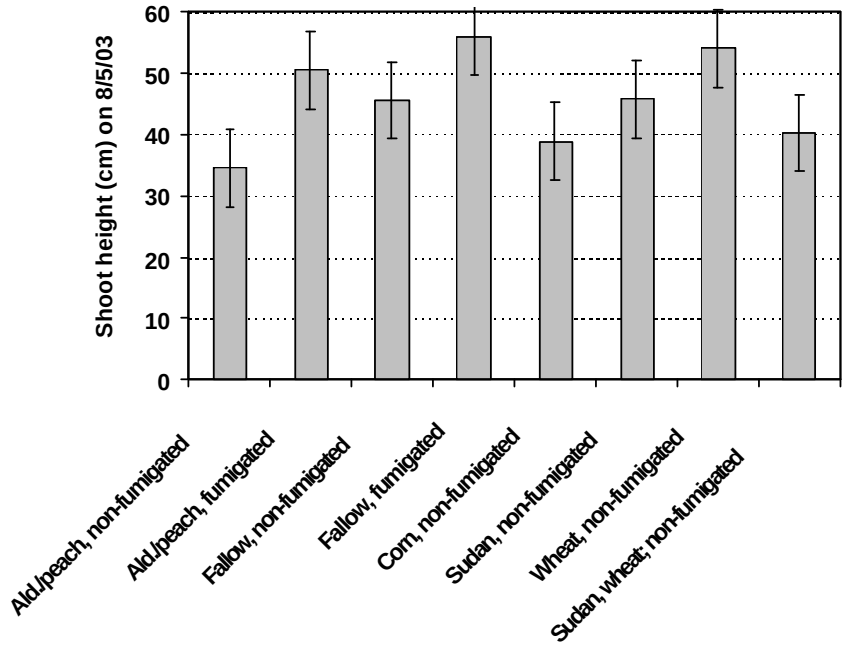


**Fig. 1.** Growth of Nemaguard peach seedlings following fallow and cover-crop rotations, compared to that directly following almond/peach culture, with and without pre-plant fumigation.

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