MINIMIZING PEACH REPLANT PROBLEMS

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SYMPTOMS AND CAUSES OF REPLANT PROBLEMS

When a peach orchard is removed, it is frequently necessary to get a new orchard back into production as soon as possible. Successful peach growers may have a limited amount of land and sites that are optimal for growing peaches, characterized by good soil, established irrigation system and/or wind machines, minimal frost/freeze conditions, and close proximity to their packinghouse or market. However, when immediately replanting an "old" orchard site there is a great potential for serious problems in establishing productive trees. Replant problems, when most severe, result in significant tree death very early in the life of the orchard. Although economically devastating, the problem is readily identified and mandates that the orchard be removed. In less severe replant situations, trees may grow slowly and have low vigor, fail to thrive, and slowly come into production with small crop loads and poor fruit quality. It is this situation that in many cases results in greater economic losses over a longer period and makes management decisions very difficult. Since fruit is being harvested, the problem(s) may be difficult to pinpoint unless the grower maintains good records and can document that the input is greater than the return. Because of the potential for replant problems and economic loss, it is essential for growers to understand the problems and to make sound management and business decisions in order to minimize or prevent them. This chapter will cover replant problems excluding peach tree short life (PTSL) which is discussed in detail in a separate chapter.

Replant problems can be difficult to diagnose and are generally a complex of interacting factors. However, in order to identify what the grower can do to minimize replant problems, the factors can generally be grouped into three broad categories, biotic, physical, or chemical. Biotic problems arise from an increase or change in the microbial complex in the soil. This includes both beneficial and pathogenic soil microbes such as nematodes, fungi, and bacteria; these are covered in other chapters in this book. Perennial weed infestations can also be a problem in replanted orchards being carried over from the previous orchard. Many perennial weeds will compete with the newly set trees for moisture and nutrients and may also release compounds in the soil which inhibit tree growth. In addition, many perennial broadleaf weeds serve as secondary hosts for viruses and other pathogens of peaches. If an orchard is to be replanted immediately, perennial weeds should be controlled in the old orchard before removal with appropriate herbicides for the problem weeds. This is because most perennial weed problems could best be managed with products not labeled for use in newly established or bearing peach orchards.

Physical replant problems generally result from an inadequate soil type, such as a heavy clay or poor soil structure, both resulting in poor water drainage providing an environment conducive for root pathogens. Peach trees are very prone to "wet feet" where the trees are suffocated and die from a lack of oxygen. When trees are actively growing, soil saturated for 3 days will result in severe tree injury or death. Understanding the water drainage pattern of the orchard site is essential, and in many cases the situation can be remedied with raising the tree row (planting on a bed) and/or tiling and draining a field. In less severe situations, poorly drained soils can result in a greater incidence of fungal root rot problems.

Replant problems may also be due to chemical factors. In some orchards that have been maintained for many years, there can be a build up of chemical residues in the soil that inhibit young tree growth and establishment. An example is the continued use of the same herbicides for many years. There is a potential for some classes of herbicides to remain in the soil for several years and to affect new tree establishment. Another problem is that peach roots have been reported to release cyanide compounds into the soil that may interfere with new tree growth and establishment. This has not been documented in the Southeast, but must be considered a potential problem.

REPLANT STRATEGIES

The discussion below identifies some of the practices to consider when replanting an orchard. Considering and addressing each of these areas is recommended to minimize the potential for replant problems and to maximize orchard productivity and profitability. However, realizing the economic constraints on growers, there will be situations where

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Trees should be removed as soon as possible after the last crop is harvested. Removal of the tree and as much as possible of the root system is essential. The old roots, although dead, can harbor many plant pathogens such as root-rotting fungi. After tree removal, taking soil samples for nutrient analysis is essential. Optimally, two sets of samples should be taken, one from the surface 8 inches and the second from the 9 to 18-inch zone. Peach trees develop roots primarily in the surface 18 inches and it is best to correct soil pH and nutrient deficiencies in this entire zone before planting; this may take several years. Once the recommended lime and nutrients are applied, deep and complete tillage is recommended. Subsoiling the orchard is recommended to break up compacted layers as well as to incorporate the soil amendments deep in the soil. This is crucial in replanting trees in rows offset from the old orchard where the drive rows may have compacted soil from the previous lanes of equipment traffic. Subsoiling should be conducted along the planned tree rows and also in the perpendicular direction with the subsoil furrows meeting where the trees will be planted. If the area is prone to a hardpan, subsoiling the entire site will promote root growth.

The ideal practice when replanting an orchard is to use cover crops for a 3 to 4-year period prior to replanting to peaches. This reduces pest and pathogen populations in the soil and can correct soil nutrient deficiencies. During this period, cover crops will also add organic matter to the soil, resulting in improved soil structure and soil microbial activity. The best cover crops to use are grasses, small grains, or sudan/sudex mixtures for incorporation, and those that do not support nematode populations such as root knot nematodes. Much work on cover crops was done at the USDA research station at Byron and is covered in the section on PTSL. Cover cropping for several years is beneficial in that it allows the grower an opportunity to correct soil pH and nutrient problems through the soil profile to a depth of 16 to 18 inches, which will be the area of the root zone for the tree. The use of cover crops, whether harvested or incorporated, in addition to increasing the organic matter of the soil may provide some economic return if the crop is harvested. In either case it is best to plant the entire field to a small grain crop as soon as possible after the site has been cleared and the lime and nutrient amendments have been added and incorporated to minimize the amount of erosion by wind or water.

In the year before planting the trees, soil samples should be taken for a nematode assay to determine the suitability of the site for peaches or the need for soil fumigation. If the site is on heavier soils or has been out of peaches for several years, there is a high probability that fumigation may not be necessary. If an old orchard was just removed and the site is sandy, there is a very high probability that fumigation will be necessary in order to even consider replanting peaches. In situations where fumigation is necessary, it is important to consider the cost of fumigation. The ideal would be to fumigate the entire field, but this may not be the most cost-effective option. In work being done at North Carolina State University, the question of preplant fumigation in a very "hot" replant site is being addressed. Trees were planted improperly, just the opposite of what has been described above, with and without fumigation. Where the soil was fumigated prior to planting, a strip centered on the tree row was treated along each row to be planted. After the seventh year, the trees were 25% larger, survival increased by more than 30%, and the cumulative yield was 30% greater than from trees planted in non-fumigated soil. In subsequent follow-up studies just initiated, the width of the fumigated strip is only 12 ft. Thus, the cost of the fumigation is reduced to a manageable amount, somewhere around $220/acre. Early indications are that the fumigated strips are adequate to get the orchard established and productive early in its life; this seems to be adequate compared with fumigating the entire field. It also allows the grower to use the higher rates recommended on the label for the strip whereas when fields are completely fumigated, lower rates are generally used.

Trees should not be planted until the fumigant has completely dissipated from the soil. Planting before the fumigant has dissipated will result in severe tree injury or death. The length of time it takes for the fumigant to dissipate from the soil will vary with soil type, soil moisture, and soil temperature after fumigation. In North Carolina, a minimum of 6 weeks is recommended on light, sandy soils and generally 12 weeks are encouraged between fumigation and planting. Before planting, it is advisable to kill the cover crop in a 6-ft strip along the middle of the row with a contact herbicide.

Planting high-quality trees will also reduce the potential for replant problems. Purchase trees from a reputable source or nursery; the trees should preferably be tested to be virus-free and true-to-type. If PTSL is a concern, then consider using Guardian rootstock. In work done in North Carolina, the extra expense for Guardian rootstock, approximately $100/acre, resulted in trees that were significantly larger and had a significantly greater yield through the seventh leaf.

However, the use of Guardian rootstock should not be considered a substitute for fumigation where nematode populations are a problem. Finally, peach trees should be planted as early as possible during the dormant season to allow for root growth during the winter to establish the root system as early as possible.