

Herbicide Screening in Fruit and Nut Tree Nurseries

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The nursery industry is very important to the agricultural economy of California. Nurseries in the state produce over 60% of the fruit and nut trees for replanting each year. In 2003, 133 California operations combined had \$138 million in wholesale sales of fruit and nut tree planting stock – a value that is multiplied in the state by retailers and exporters. Fruit and nut tree nursery production practices vary among growers, regions, and tree species; however, production cycles usually follow a similar schedule. Generally, a rootstock is fall planted in the field as seed or cuttings and scion is grafted or budded onto the rootstock in the next spring or fall. After one to three years in the field, trees are harvested from the field and sold as bareroot planting stock in California, across the U.S., and around the world.

Producers of field grown tree nursery stock currently rely on soil fumigation for broad spectrum control of a variety of soil borne pests including parasitic nematodes, disease pathogens, and weeds. For more than 50 years, methyl bromide has been widely used for soil fumigation in high value vegetable and nursery crops but is currently being phased out because of adverse environmental impacts. Intensive research efforts have identified several fumigant treatments that effectively control nematodes and pathogens. However, none of the currently registered and available chemical alternatives has the same spectrum of activity and efficacy as methyl bromide.

Weed control in fruit and nut tree nurseries continues to be a major problem for producers in the Central Valley. Competition from weeds can decrease crop productivity and interfere with field operations (i.e. budding, grafting and pruning) and harvest operations. Soil fumigation alone (even with methyl bromide), often does not provide and maintain a consistently high level of weed control over a multi-year crop cycle. Some weed species are not well controlled by fumigants due to their biological (impermeable seed coat, dormancy) and ecological (airborne invasion, large seed bank) characteristics, or due to environmental conditions (dry soil). This problem likely will be compounded by use of alternative fumigants (e.g. 1,3-dichloropropene) that may provide good control of nematode and pathogens but do not always provide acceptable weed control. Most tree nursery production systems currently rely on a combination of preplant soil fumigation, preemergence herbicides, and extensive tillage and hand labor during the growing season for acceptable weed control.

Broad spectrum herbicides (i.e. glyphosate) and tillage are used to control germinated weeds prior to crop planting. Many growers also use broadcast or band applications of a residual herbicide applied after planting but before the crop emerges to extend effective weed control into

the growing season. Currently, preemergence herbicide choices are limited by number of registered materials and by crop safety concerns. Commonly used products include: oryzalin, trifluralin, pendimethalin, and isoxaben. Relatively few herbicides are available for application during the growing season or as directed or dormant applications between growing seasons of a two- or three-year crop cycle. Some herbicides can harm young trees by reducing emergence or by injuring the root growth (stunting or malformations) or the above-ground growth (meristem damage, stem malformations, stunting, chlorosis, or death). Because nursery-grown trees are sold as bareroot stock, any root or stem damage is unacceptable to the buyers and those plants are not marketable.

Tillage can provide effective weed control between rows of nursery crops but fail to control weeds close to or within the crop rows. Efforts to till close to the crop row can lead to an increase in mechanical damage to the crop resulting in more unmarketable plants. Frequent tillage during the growing season is expensive in terms of fuel usage and is associated with negative environmental impacts from airborne dust and decrease in soil tilth. Hand labor can provide weed control within the crop row but can result in mechanical crop damage, requires access to a large labor force, and is becoming more expensive and subject to greater worker safety regulations.

Herbicides are likely to become a more important part of weed management in tree nurseries as labor and fuel costs rise. Application of a foundation herbicide at planting followed by a spring application of another PRE or POST herbicide may extend residual weed control further into the summer and provide control of difficult weeds in tree nurseries. Identification of herbicides and herbicide application techniques that provide effective, non-phytotoxic weed control in field nurseries will provide growers with additional options to effectively and economically produce planting materials using an integrated pest management strategy.