Citrus Stumps Sprout Control

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To assess the effectiveness of Remedy Ultra® (triclopyr), two studies were conducted during 2008–10 to control citrus stump sprouting after HLB-infected tree removal. The first study (2008–09, Arcadia) examined various application rates of Remedy (25%, 50%, and 75% mixed with diesel fuel) whereas, the second study (2009–10, Arcadia and Lake Placid) looked at the impact of delaying application of Remedy on the control of sprout formation. During the first study, 12 of the 15 (80%) untreated stumps sprouted. Sprouts were noted over the study period with 0, 5, 3, 1 and 3 of the 15 stumps sprouting initially at approximately 30, 60, 90, 120, and 150 d after tree removal, respectively. All treated stumps, regardless of the treatment rate, remained sprout free during the study period. For the second study, treatments of Remedy were applied at 25% or 50% solution mixed with diesel fuel at time of clipping, 24, 48, and 72 h later and compared to untreated controls. At Lake Placid, 7 (100%) untreated stumps sprouting by 150 d after tree removal. Four stumps within the 56 treated stumps had root sprouts but not from the treated stump. Remedy Ultra was slightly less effective in controlling sprouts when applied at the 25% Remedy/75% diesel than at the 50% rate. Delaying application and using the lower herbicide concentration rate also had a slight negative impact on sprout control. At Arcadia, 86% of the untreated stumps sprouted within 90 d of clipping with only one treated stump sprouting. These studies support the use of Remedy Ultra as an effective tool in controlling sprout formation and the importance of timely application to stumps, within 72 h of clipping, for sprout control.

Florida citrus growers have historically lost between 3% to 4% (Muraro et al., 2005) of the trees on an annual basis due to various pests and diseases (Tucker, 2006). Since 2006, numerous citrus growers have been combating Huanglongbing (HLB) or citrus greening with tree removal to reduce inoculum levels within their groves (Bransky et al., 2009). When combining historical tree losses and those removed due to HLB, tree removal has dramatically increased in recent years. Removal and replacement of declining trees is essential to maximizing long-term productivity of the grove (Jackson, 1999). After shearing the tree, the remaining stump is treated with a systemic herbicide in an attempt to kill the stump and prevent sprout formation. Recommended products for control of citrus sprouts have previously been limited to various formulations of glyphosate (Futch and Singh, 2009). Recommended stump control products included Weedone® CB (Knapp et al., 1987) and methyl bromide (Knapp, 1990). Both Weedone CB and methyl bromide were deleted from the annual Florida Citrus Pest Management Guide by 2004. Glyphosate was added to the recommended control products in 2002. Warnings in the annual pest management guide and product label note the potential for the herbicide to translocate to adjacent trees via root grafting (Futch and Singh, 2009).

Today’s prevailing tree removal method is by “shearing” or “clipping” the tree off above the soil line as compared to pushing the entire tree which results in removing the majority of the root system from the ground. Clipping as a tree removal method leaves the entire root system undisturbed and intact in the soil. Futch et al. (2008) have identified the perceived advantages and disadvantage of each removal method and found that the removal method does not affect the performance of the reset trees. The control of vegetative regrowth or sprouts from the remaining stump or root system is important to the growth of the replanted tree (Noling et al., 1994). If citrus trees were positive for HLB at the time of tree removal, sprouts developing from these remaining citrus tree stumps have been shown to be a significant source of HLB inoculum (Futch et al., 2009).

Noling et al. (1994) stated that sprout formation is clearly influenced by removal method. When herbicides were not applied to stumps after clipping, total sprout numbers were over 40 times higher on clipped trees as compared with pushing the entire tree with removal of roots from the ground.

The objectives of these studies were to determine the appropriate rates of Remedy Ultra (triclopyr) to apply to citrus stumps for sprout control and if delaying herbicide application would have an impact on subsequent sprout development.

Materials and Methods

To assess the effectiveness of Remedy Ultra, two studies were conducted during 2008–10 to determine appropriate rates and timing of applications to control citrus stump sprouting. The first study was conducted near Arcadia in a typical flatwood site and examined various application rates (25%, 50%, and 75% Remedy mixed with diesel fuel). The second study was conducted in two locations, one near Lake Placid which was a typical ridge site and another near Arcadia. Both sites examined the impact of delaying application of the herbicide on the control of sprout formation. Treatments of Remedy Ultra were applied at 25% or 50% solution mixed in diesel fuel at time of clipping, 24, 48, and 72 h later. Both studies were conducted as randomized complete-block
designs with 15 replications in the first study and 7 in the second study. Stumps were treated with a spray volume that consisted of approximately 1 to 2 fluid oz of spray solution per stump applied with a compression pump sprayer. Larger stumps received more spray volume than smaller stumps. Efforts were made to direct the spray to the outer stump area to thoroughly wet the cambium area and minimize any runoff of spray solution to the nearby soil surface. In all studies, observations were made on 30-d intervals over an 8-month period after clipping or shearing the tree.

At all locations, the rootstock used in the planting varied based upon grower preference over time as tree age was highly variable. Tree age was as young as 5 years old and others as old as 40 plus years. Rootstock noted in the blocks included: rough lemon, sour orange, Carrizo citrange and Swingle citrumelo.

**Results**

During the first year, 12 of the 15 (80%) untreated stumps sprouted and none of the treated stumps at any treatment rate sprouted. Sprouts were noted on untreated stumps over the study period with 0, 5, 3, 1, and 3 of the 15 stumps sprouting initially at approximately 30, 60, 90, 120, and 150 d after tree removal, respectively (Fig. 1). The number of sprouts per stump ranged from 2 to 26 and averaged 8 per stump at the end of the study. All treated stumps, regardless of the treatment rate, remained sprout free during the study period.

During the second year, studies were conducted near Lake Placid and Arcadia with each treatment replicated 7 times. At the Lake Placid site, 2, 2, 1, 1, and 1 of the 7 (100%) stumps sprouted initially at 30, 60, 90, 120, and 150 d after tree removal, respectively (Fig. 2). At this site, 4 stumps within the 56 treated had root sprouts from roots rather than the treated stump. All of the root sprouts occurred on trees originally grown on rough lemon rootstock, whereas, none of the other rootstocks sprouted at this site. Remedy Ultra was slightly less effective in controlling sprouts when applied at the 25% Remedy/75% diesel than at the 50% rate, but only on rough lemon rootstock. At the Arcadia site, 5 of the 7 untreated stumps sprouted at 60 d after removal with one additional untreated stump sprouting by 90 d. All treated stumps, regardless of the treatment rate, remained sprout free during the study period.

**Fig. 1.** Cumulative number of stumps sprouting from newly clipped citrus trees, at Arcadia during first year of the study. Treatments consisted of an untreated control, Remedy at 25% or 50% mixed with diesel and applied at time of clipping, 24, 48, or 72 h after clipping. One to 2 oz of spray solution was applied to each selected stump to treat the stump and minimize run off to the soil surface. All treated stumps, regardless of the treatment rate, remained sprout free during the study period.

**Fig. 2.** Cumulative number of stumps from newly clipped citrus trees, sprouting after treatment at Lake Placid. Treatments consisted of an untreated control, Remedy at 25% or 50% mixed with diesel and applied at time of clipping, 24, 48, or 72 h after clipping. One to 2 oz of spray solution was applied to each selected stump to treat the stump and minimize run off to the soil surface. At 150 DAT, 4 treated stumps sprouted and consisted of 1 stump in each of the treatments containing 25% and 50% Remedy applied at 48 h after clipping in addition to the 2 stumps that sprouted where 25% Remedy was applied at the time of clipping (0 h). At 180 DAT, 2 additional stumps sprouted and consisted of 1 untreated stump and 1 receiving the 25% Remedy treatment at 24 h after clipping.

**Fig. 3.** Cumulative number of stumps from newly clipped citrus trees, sprouting after treatment at Arcadia. Treatments consisted of an untreated control, Remedy at 25% or 50% mixed with diesel and applied at time of clipping, 24, 48, or 72 h after clipping. One to 2 oz of spray solution was applied to each selected stump to treat the stump and minimize run off to the soil surface. Five of the 7 untreated stumps sprouted at 60 d after removal with one additional untreated stump sprouting by 90 d. All treated stumps, regardless of the treatment rate, remained sprout free during the study period.
Rootstock and trunk diameter had an impact on root and/or stump sprouting. Larger trunk diameter supported greater sprouting frequency as compared to smaller trunks. Additionally, rootstocks such as rough lemon and Cleopatra mandarin were more prone to sprouting than other rootstocks like sour orange. This sprouting difference among rootstocks was also previously reported by Noling (1994).

Historically, some herbicides used for stump treatment have caused injury to adjacent healthy trees by translocation of materials via root grafting to the healthy trees. In these earlier reports, resets planted nearby treated citrus stumps were damaged when excessive materials were applied to the soil surface or moved off treated stumps by rain or irrigation. In this study at both sites, no problems were associated with Remedy Ultra damaging adjacent trees.

Literature Cited


