Investigating the Effects of Glufosinate (Rely) on Young Almond Trees

Project No.: **11-HORT12-Hanson**

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Objectives:

As a part of a research and extension program directed toward weed control in orchard and vineyard crops, this proposal has two primary objectives:

1. Determine if bark injury observed in young almond trees is due to glufosinate application.
2. Conduct preliminary research on factors contributing to this sporadically observed injury with the goal of developing mitigation techniques to minimize the injury while preserving this important weed management tool.

Interpretive Summary:

Problems with glyphosate-resistant weeds have prompted many almond growers to use alternative (or additional) herbicides for post emergence weed control in the tree rows. Glufosinate (Rely branded herbicides) have become one of the primary herbicides active ingredients used for this purpose because of its activity on broadleaf and grass weeds. However, almond growers and pest control advisors have expressed concern about occasional trunk and bark injury following applications of glufosinate (Rely) herbicides. Research is underway to confirm that this injury is due to the glufosinate application, and understand factors contributing to this sporadically observed injury. Preliminary work in 2011 confirmed that trunk gumming on young trees can be caused by exposure to glufosinate and that there is a significant rate response. There was no clear correlation between tankmix partners or surfactant loads in the preliminary study. Two test orchards were established in 2011 and will be treated with glufosinate treatments in 2012 and 2013 to follow up on these results. A laboratory study was also initiated to evaluate glufosinate update and translocation following bark exposure to radiolabled glufosinate.

Each year, almond growers in California spend a considerable amount of management effort and financial resources to manage weeds on the orchard floor. Many growers use an integrated weed management approach that includes mechanical weed control in the middles (tillage and/or mowing) combined with strip herbicide applications within the

tree rows. However, the vast majority of California's approximately 800,000 acres of almonds are treated at least once each year with a broad spectrum "burn down" herbicide such as glyphosate, paraquat, or glufosinate. These herbicides do not have any inherent selectivity in almond – their safety to the crop is based upon applications directed below the foliage, minimal exposure to green bark (often through the use of milk cartons during early establishment years), and the use of other application techniques to minimize tree exposure. However, each year almond growers and pesticide consultants and researchers observe cases of injury due to drift, misapplication, or unknown causes.

Because of the increasing problems with glyphosate resistant weeds and the desire to minimize selection pressure for more resistant biotypes, use of glufosinate in almonds has increased substantially in recent years. In the period since Rely was registered in almond, PCA's, researchers, and University extension personnel have received a number of calls about injury to young (2-4 yr-old) almond suspected to be related to glufosinate applications. The injury symptoms most often noted is gummosis or gum balls on the lower trunks but other symptoms including tip die-back have also been alleged. It is important to note that reports of injury suspected to be from Rely are fairly rare and often sporadic within the same orchard. Thus far, evidence has been largely anecdotal because these symptoms have been somewhat difficult to recreate in the field.

With funding from the Bayer Crop Science and the Almond Board of California, this research was initiated to provide almond growers and industry advisors more information on the causes and long-term effects of tree injury occasionally associated with glufosinate treatments

Materials and Methods:

A trial was initiated in a second leaf almond orchard near Parlier, CA and two new experimental orchards were planted near Davis and Arbuckle CA in spring 2011 for 2012 treatments. Treatments were applied August 11, 2011 at the Parlier site to evaluate several potential contributing factors to the injury symptoms:

1. Rates (1x vs. 4x)
2. Spray solution concentration (10 vs. 20 vs. 40 GPA sprayer calibration)
3. Formulation (Rely 200 vs. Rely 280)
4. Surfactants (AMS vs. MSO vs. NIS vs. Sil-Wet)
5. Tank mix (Rely alone vs. Rely plus Goal 2XL or plus glyphosate)
6. Previous trunk injury (knife scoring or sand paper injury, or tight wrapping)
7. Root exposure only (drench of 1x and 2x treatments in 5 gal water in basins)

Results and Discussion:

Preliminary results from 2011 suggest that trunk exposure to glufosinate can result in localized lesions (**Figure 1**). There does not appear to be a strong correlation to glufosinate formulation; however, a strong rate response was observed (**Figure 2**).

Two experimental orchards were established in 2011 for crop injury experiments in 2012 and 2013. These trees orchards will be treated with glufosinate and other herbicides in mid-summer 2012 and again in 2013 and injury evaluations will continue through 2013.

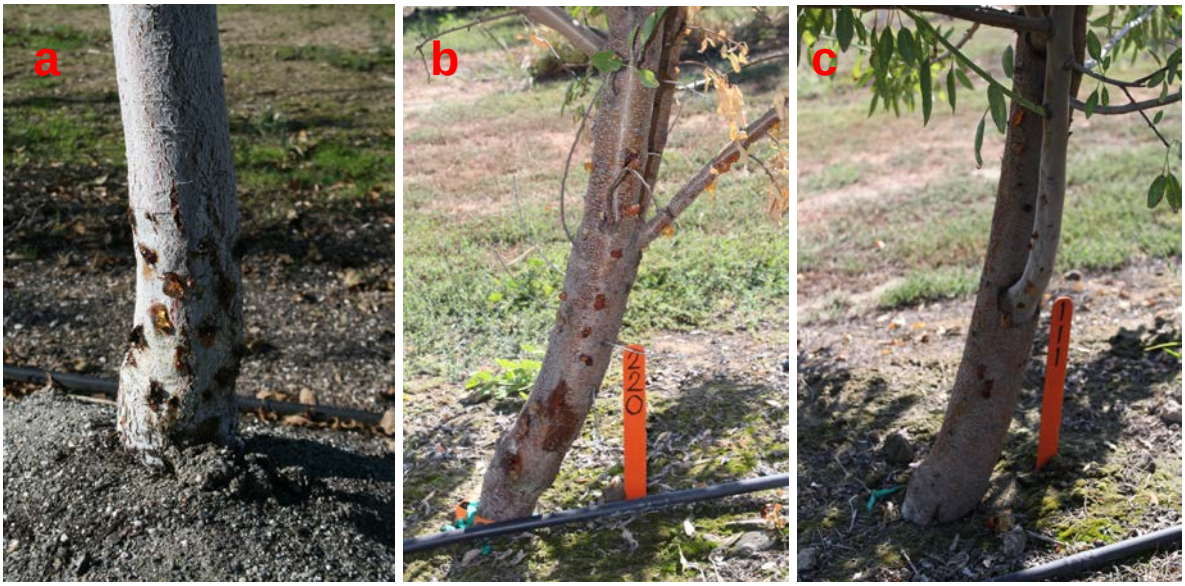

Figure 1: Trunk injury alleged to be related to glufosinate: in a commercial orchard near Arbuckle in 2010 (a); similar injury caused in a field trial near Parlier, CA in 2011 from a 4x treatment of Rely 280 (b); and Rely 280 plus Goal 2XL (c).

Research Effort Recent Publications:

Hanson et al. 2011. Investigating the effects of glufosinate on young almond trees. Research progress report and poster presentation. 2011 Almond Conference, Modesto CA

References Cited:

None

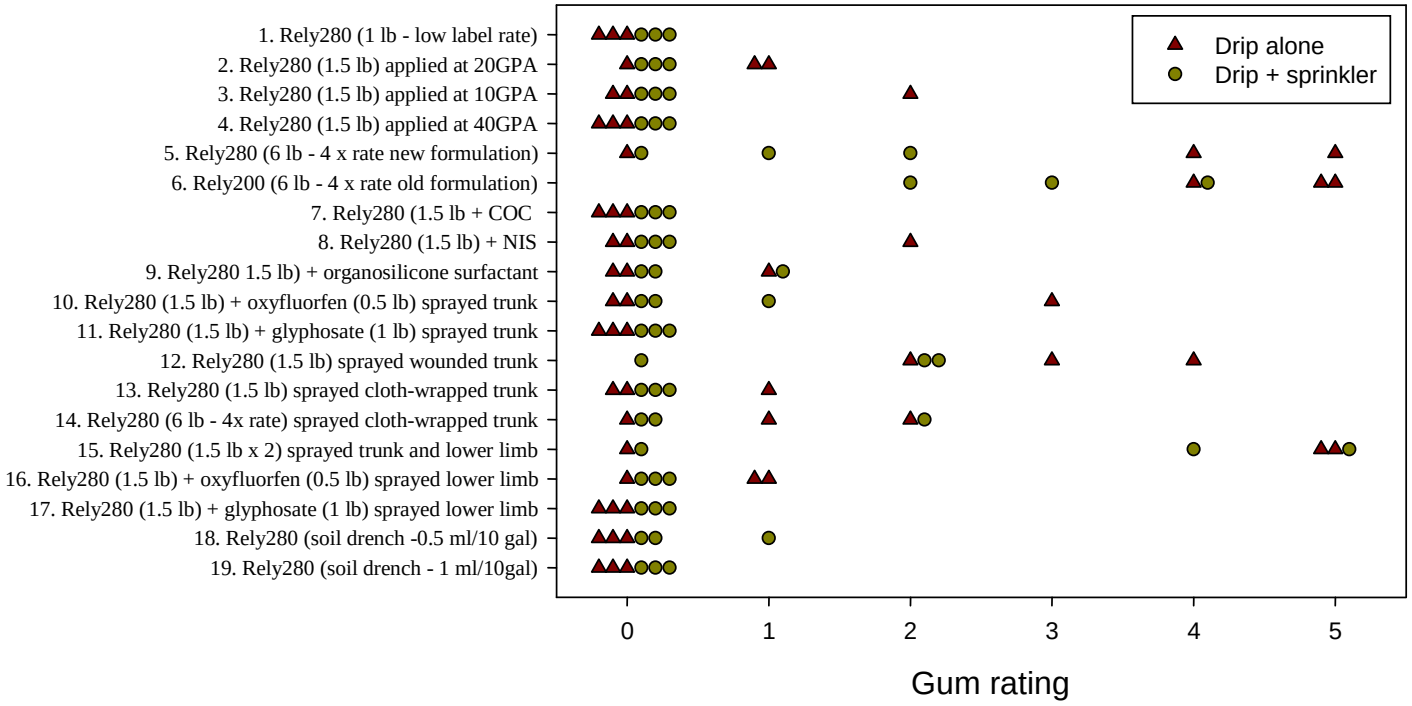

Figure 2. Trunk injury (gumming) was rated on a 0-5 scale six weeks after treatment with various glufosinate combinations in a trial near Parlier. Unless otherwise noted, Rely 280 was applied directly to the lower 18 inches of the trunk at 1.5 lb ai/A (high label rate) in 20 GPA water with ammonium sulfate at 10 lb/100 gal spray solution. Six trees were sprayed with each treatment. Following treatment half were irrigated with drip tubing and half were irrigated with drip tubing plus microsprinklers that wetted the treated trunk.