Is Glyphosate Injury to Roundup Ready Alfalfa Possible? Steve Orloff*[1] and Rob Wilson[2]. [1]University of California Cooperative Extension, Siskiyou County, CA, USA, [2]University of California Intermountain Research and Extension Center, Tulelake, CA, USA.
*Corresponding author: sborloff@ucanr.edu

Roundup Ready (RR) alfalfa has become a popular weed management strategy for alfalfa producers in western states. Considerable research was conducted before and shortly after its commercial release to evaluate its value in terms of weed control and crop safety. The research showed properly timed applications of glyphosate provided excellent weed control with essentially no perceptible crop injury, which was further confirmed by grower experience in commercial fields. However, during the spring of 2014 and 2015, we observed significant crop injury in RR alfalfa fields in the Scott Valley (Intermountain area of Northern California). Logical potential causes for the poor growth such as spray-tank contamination, a bad batch of glyphosate, or non-herbicide related management practices were systematically ruled out, and the theory was developed that cold temperatures after an application of glyphosate was the cause. Yield was monitored in three commercial fields in the Scott Valley in 2015 by harvesting three treated and untreated areas in the affected RR alfalfa fields with a plot harvester and averaging the yield. A first cutting yield reduction up to 0.8 tons/acre was observed (alfalfa recovered by second cutting). Replicated field experiments were conducted in the spring and fall of 2015 to further evaluate the theory that cold temperatures following an application of glyphosate to RR alfalfa can cause injury. Alfalfa was treated with 22 and 44 ounces of Roundup PowerMax per acre prior to cold temperatures. In the spring trial a reduction in height was observed as well as a yield reduction of 0.3 and 0.4 tons/acre for the 22 and 44 ounce rates of Roundup, respectively. Injury did not carry over into second cutting. Four additional trials were conducted in the fall of 2015 where alfalfa was treated on weekly intervals at the same rates as above from mid-September through October. Within a week after treatment, the same injury symptoms that were observed in the spring were found in some of the trials. The tips of affected shoots drooped in a typical "shepherd's crook" and eventually turned neurotic. Later as the temperatures dropped further, some of the plants in treated plots turned chlorotic.

Research results and field observations to date suggests that the injury is related to the degree and number of frosts after application, the height of the alfalfa (taller alfalfa being more prone to injury), and stand age (injury was has not been observed in seedling alfalfa and fields established for over a year appear to be more prone to injury). Research is ongoing and will be expanded to better understand the conditions that lead to injury so that it can be avoided in the future and to understand the biochemical mechanism responsible for cell injury. These results do not question the value of the RR technology in cold climates, but rather demonstrate the need for further research to identify management practices (such as application timing) that should be employed to avoid damage in the future.