Simazine Degradation Rates in Central Valley Soils with Annual or No Simazine Use Histories

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Microbial degradation is the most important mechanism of herbicide dissipation in the soil environment. In some cases, microbial communities can become dominated by species with the ability to rapidly metabolize the molecule following repeated applications of the herbicide (or related herbicides). This enhanced biodegradation can greatly decrease the half-life of the herbicide and result in reduced residual weed control efficacy. Studies have shown that simazine may be subject to enhanced biodegradation in some areas of the world. Simazine is a commonly used preemergent herbicide in Central Valley vineyards and orchards, valued for its relatively low cost and long residual activity. It is important for growers to know if simazine is subject to enhanced biodegradation in the Central Valley as it may impact their weed control strategies. This study compares the simazine degradation rate and relative weed control in two vineyard soils, one treated annually with simazine (adapted) and one with no recent simazine use (non-adapted). In greenhouse and field experiments, simazine was applied to each soil and soil samples were taken at regular intervals for 49 and 224 days respectively to assess the simazine concentration. In both the greenhouse and field, the simazine degradation rate was faster in the adapted soil. In the greenhouse experiment, the adapted soil had significantly lower simazine concentrations than the non-adapted soil in samples taken 14 to 49 days after treatment (DAT). In the field experiment, simazine concentration was significantly lower in the adapted field only at 112 DAT. In addition, biomass for wheat planted in the greenhouse experiment and weed counts in the field experiments were used to assess the efficacy of the simazine treatments. In the greenhouse, there was no significant difference in wheat biomass between the two soils; however, plants grown in both soils were significantly smaller than their respective controls which suggested that an efficacious concentration remained at 49 DAT. In the field, the non-adapted site had better weed control than the adapted site at 56, 112, 168 and 224 DAT although this was only statistically significant at 112 DAT. Preliminary data from these experiments indicates that enhanced biodegradation of simazine does occur in Central Valley vineyards and may impact efficacy. Additional research is ongoing to verify the microbial contribution to enhanced biodegradation and to compare the simazine degradation rates from additional fields with varying simazine use history.