Evaluating the effect of glyphosate dose and temperature on glyphosate-resistant *Echinochloa colona*

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**Introduction**

- *Echinochloa colona* (junglerice) is a summer annual grass that has been ranked among the world’s top ten worst.

- Currently, herbicide-resistant weeds are one of the most crucial and rapidly changing weed management issue facing California orchard and vineyard cropping systems.

- Previous research identified several different target site mutations causing ~4x level of resistance.

- Non-target-site mechanisms also provide resistance to glyphosate in other species suggesting that growth response to environmental stochasticity may vary among glyphosate resistance (GR) biotypes.

- Summer-annual weeds differ from winter species with respect to growth and phenology and are also subject to dissimilar climate conditions.

**Objectives**

- This research focused on the interaction of glyphosate dose and temperature on the response of seven known GR and GS junglerice populations from California’s orchards and vineyards.

- Assess shikimic acid biosynthesis as a response to temperature and glyphosate dosage in the different junglerice populations.

- The overarching goal of this project is to help growers develop and implement a dynamic weed management plan to retain control of GR species.

**Methods**

- **Sampling.** Plants were derived from populations sampled from California’s central valley, ranging from Butte to Kern country (Fig 1).

- **Treatments.** Plants were treated at the three to four leaf stage with a range of glyphosate doses (0, 0.5, 1x) and transferred to controlled environment chambers set at 20°C, 30°C, or 40°C with metal halide lighting. Each biotype by glyphosate dose by temperature treatment combination was replicated five times.

- **Mortality and Growth Reduction.** Aboveground plant biomass was harvested, dried and weighed and mortality recorded 21 days after treatment.

- **Shikimic Acid Evaluation.** Shikimic acid accumulation was measured in plant tissues at 6, 24, 48 and 72 hours after treatment to determine relative inhibition of the target enzyme by glyphosate.

**Results**

- **Shikimic acid accumulation was used to assess the effect of glyphosate on its target site in the plant**

- **Results show lower accumulation of shikimic acid in GR than GS lines at different rates.**

**Conclusions**

- These results suggest temperature can influence glyphosate activity on GR junglerice, which may help explain the variability occasionally observed in the field.

- Ideal temperatures for applying post herbicides are between 20°C and 30°C. This work suggests the rate of control will be slower during cold weather.

- Higher rates can be used to overcome this reduced control if cold temperatures occur a few days before or if forecasted after application.

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**References**

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