

The Evaluation of Seedling Density on Endpoint Sensitivity in OECD Vegetative Vigor Plant Guideline Testing

Authors: A. Kirkwood, J. Schwalbe, C. Picard, N. Marchessault and R. Biever - Smithers, Wareham, Massachusetts

Abstract

The OECD non-target plant testing guideline contains unclear language regarding the number of plants per replicate to be used in testing in support of agrochemical registration. This could potentially result in various interpretations of plant density by regulators, registrants and testing laboratories. A common concern across stakeholders is the effects of density on endpoint sensitivity in testing to be used for risk assessment purposes. Smithers conducted a trial exposing eleven commonly used plant species at two different planting densities to a broad spectrum herbicide following standard OECD 227 vegetative vigor test methods. All plants were exposed to the same geometric series of application rates. The low density group was generally more sensitive across species but the EC_x values and related dose responses were comparable. The low density group had narrower confidence intervals for EC_x values but higher standard deviations likely driven by increased replication. There was a 2-4 times difference in EC_x values for the two density groups, which would be covered by the 5x safety factor used in EU herbicides risk assessments. The trials demonstrated that there were minor differences in the endpoint sensitivity across the two densities but that any differences would likely be mitigated in a risk assessment framework resulting in similar conclusions. Future work could include the examination of multiple planting densities as well as investigating chemicals with various modes of action.

Materials and Methods

- Exposures conducted generally following OECD 227 guideline
- Four monocots and seven dicots were exposed to a broad spectrum herbicide formulation in a standard geometric series of application rates

Plant Tested	Plants per Replicate (Replicates per Application Rate)	
	Low Density	High Density
Bean, Cabbage, Corn, Cucumber, Radish, Soybean, Sunflower, Tomato	2 (20)	4 (10)
Oat, Onion, Perennial Ryegrass	4 (10)	8 (5)

Table 1: Plants species used in exposure and description of density treatments. Both corn and cabbage were tested twice to clarify effects and demonstrate repeatability.

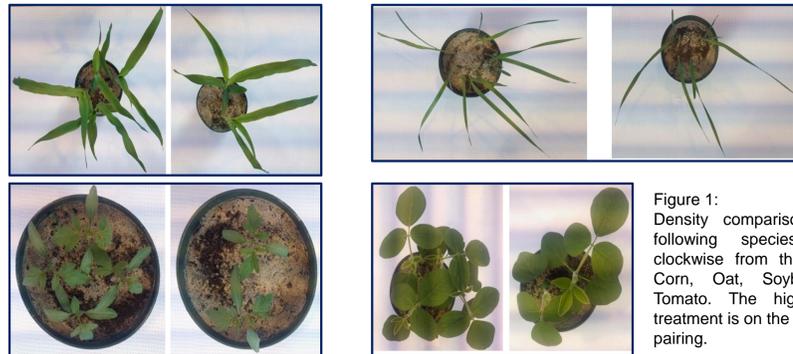


Figure 1: Density comparison in the following species moving clockwise from the top left: Corn, Oat, Soybean and Tomato. The high density treatment is on the left in each pairing.

Vegetative vigor trials suggest minor density-dependent differences in EC_x sensitivity

Contact Ashlee Kirkwood or Christian Picard at infoERS@smithers.com to download the full length presentation or for more information.

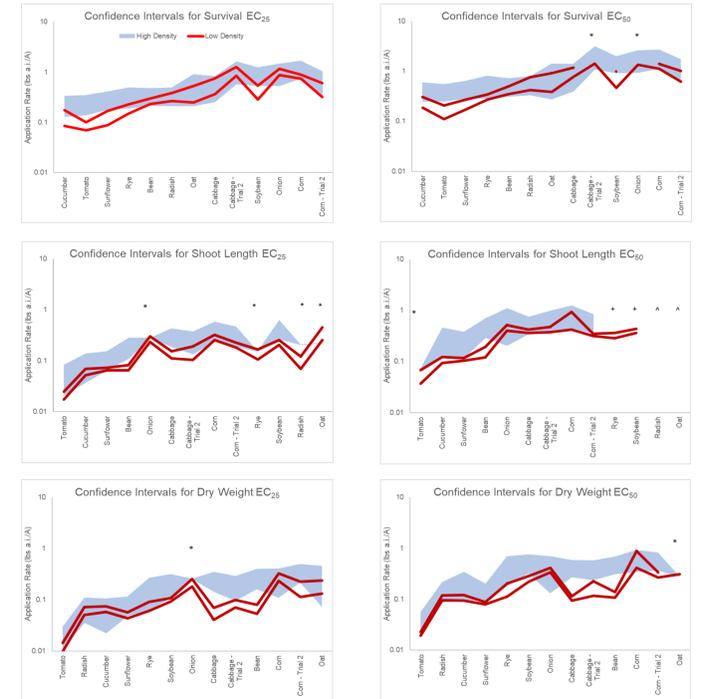


Figure 2: Confidence interval comparison between the two density treatments for standard endpoints.
 * A 95% confidence interval was undetermined for the referenced density group.
 + $EC_{50} > 0.50$ lb ai/A for the high density group.
 ^ $EC_{50} > 0.50$ lb ai/A for both density groups.



Figure 3: Rye and bean dry weight dose response curves for each density treatment. Error bars represent standard deviations.

Conclusions

- Lower density treatment was generally more sensitive with narrower confidence intervals but higher standard deviations
- Differences in sensitivity were within a range that would likely be mitigated in a risk assessment framework resulting in similar conclusions