

Arizona Iceberg Lettuce Research Council

Final Report

Project Title: Development of Sampling Procedures for Pesticide Analysis in Lettuce.

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Description of Project:

The AILRC has supported the establishment of a Pesticide Diagnostic Laboratory at the Yuma Agriculture Center to help meet the demand for precise and accurate information on the presence of pesticides in soil, water and plant tissue. This information is also needed to help diagnose problems in the field and support management decisions.

AILRC has supported the development of a Pesticide Diagnostic Laboratory to extract and detect herbicides used in lettuce. Methods have been perfected to extract these herbicides from plant tissue and soil and detect them using liquid chromatography.

A critical component in the accuracy of any test is how representative the sample is. Historically there have been no guidelines on how to sample lettuce for herbicide analysis. We know that the herbicides used in lettuce function differently in soil and plant tissue and that different sampling procedures are likely required for each one. How and where the herbicide moves in the plant tissue and soils, how it dissipates or is metabolized and the affect of environmental conditions and management practices on the herbicides all should be considered when developing a sampling protocol. The proper crop growth stage , sample size and storage requirements also may vary for each compound.

Normally plant tissue and soil are randomly collected in the field regardless of crop growth stage, application time or plant part collected. Samples are sometimes kept

cool and sometimes dried before sending to a laboratory. The purpose of this project was to establish the best procedures for collecting and preserving plant tissue and soil samples to be analyzed for the presence of herbicides.

Procedure

Trials will be conducted to determine how, when and where to sample lettuce for the presence of herbicides. Eight trials were conducted in the field at the Yuma Valley Agriculture Center, 3 were conducted in the greenhouse and two in the laboratory using from 1X to 12 X rates of Pronamide, Benefin and Bensulide. Both soil and plant tissue were analyzed. A modified QUECHERS solid phase extraction procedure was used to prepare our samples. A High Pressure/UV liquid chromatograph was used to detect the three herbicides in the plant tissue and soil.

Results

Between 0.1ppm and 3.0 ppm of the three herbicides were detected in the tissue and the levels were extremely variable. In contrast, between 3ppm and 150ppm of the herbicides were detected in the soil and this was very consistent. We found that the top 0.5 inch of soil was the best place to collect samples. A minimum soil sample size of 200 grams taken as a composite from at least 20 random locations across the subject field gave us the most consistent results.

Conclusions

The three lettuce herbicides that were tested, Pronamide, Benefin and Bensulide are all soil applied preemergence herbicides that work primarily by inhibiting root growth in developing seedlings. Only Pronamide moves much in the plant. Sampling the plant for detection of these herbicides produces variable and unrepresentative results because there is not much there. By contrast, all of these herbicides, except Pronamide, adhere strongly to the soil and break down very slowly. Significantly higher and more consistent levels of these herbicides are detected in a composite soil sample taken from 20 random locations across the subject area.