Dicamba Volatility Measurements – Results and Relations Between Vapor Concentration and Plant Injury

Alison MacInnes, TCM 2010

Dicamba review

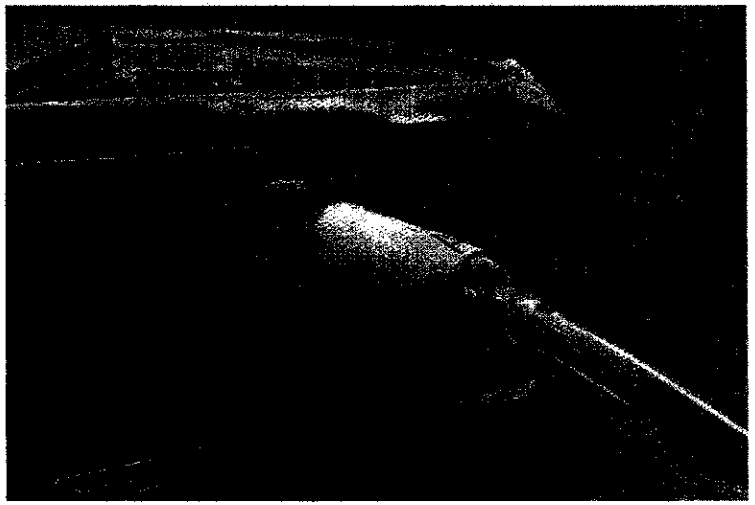
- Concern about off-site movement of Dicamba
  - Spray drift
  - Tank contamination
  - Active ingredient volatility
- Drift and contamination are issues for all herbicide formulations
- How real of an issue is volatility?

Dicamba Volatility Tests

- Laboratory tests
  - Centrifuge tube tests
  - Humidome tests
    - See Julie Webb and Alison MacInnes poster for methods
- Field tests
  - Stollte Farm tests
  - University of Tennessee tests
    - See Hannah Smith poster

Data Generated in the Humidome Test

- Direct measurement of Dicamba in the air
  - Monsanto is the only company directly measuring Dicamba
- Comparison of volatility from different surfaces
- Comparison of volatility at different temperatures
- Injury data on sensitive plants

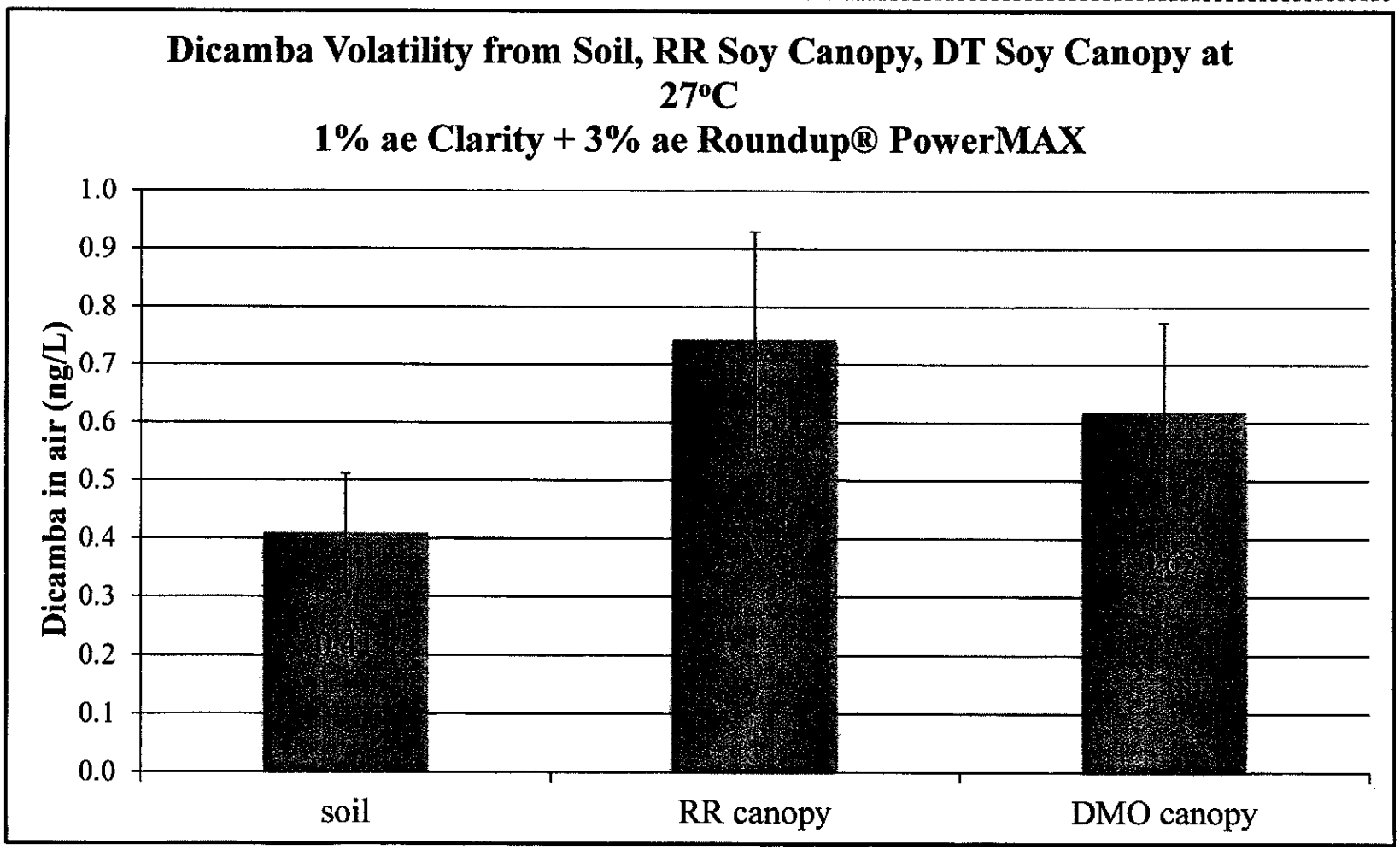


Factors that affect volatility

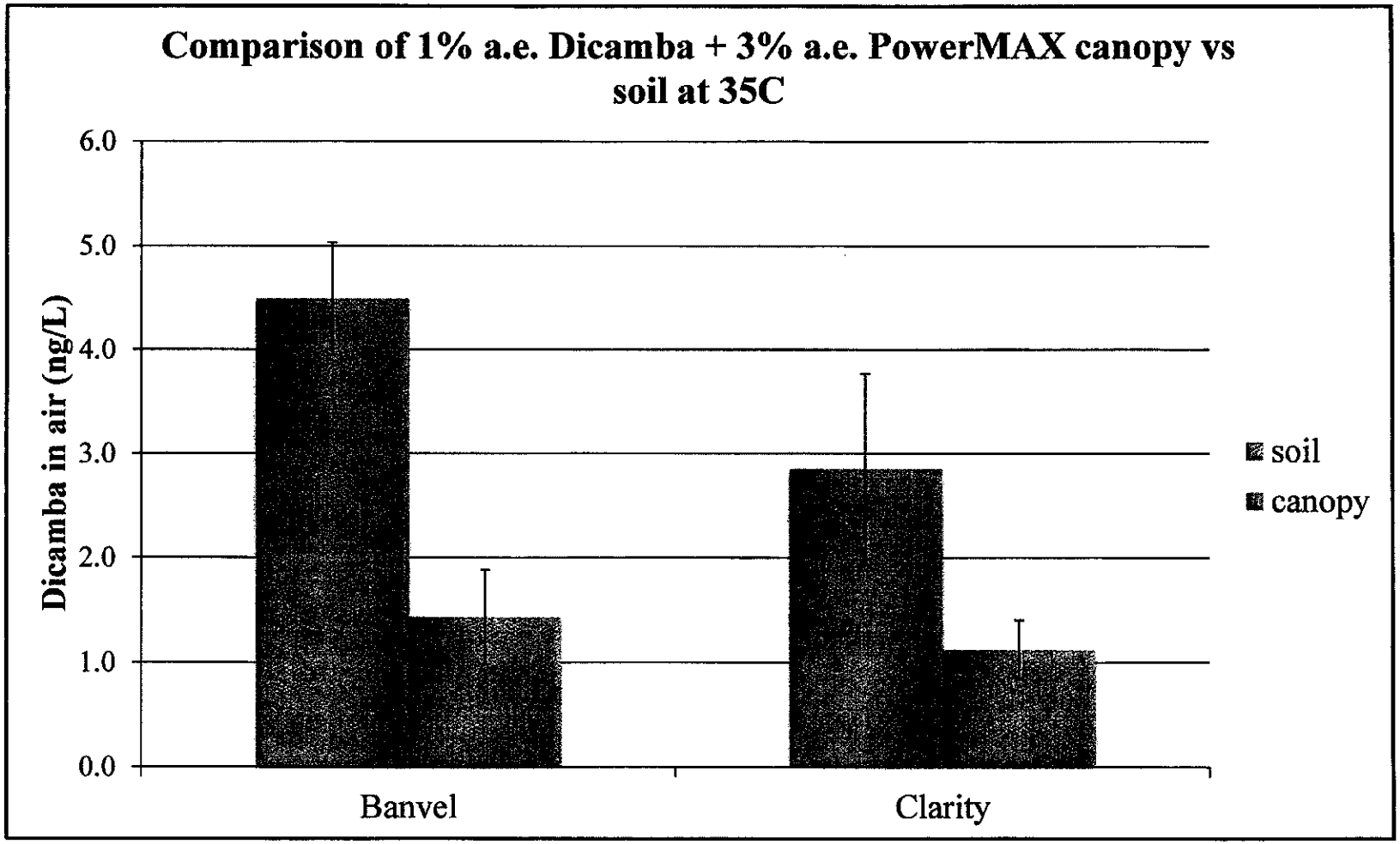
- Surface
  - Soil vs canopy
  - Type of soil
  - Moisture content of soil
- Temperature
  - Range of temperatures 27°C and 35°C
- Length of exposure
  - Injury related to length of exposure

Volatility from soybean canopy vs soil

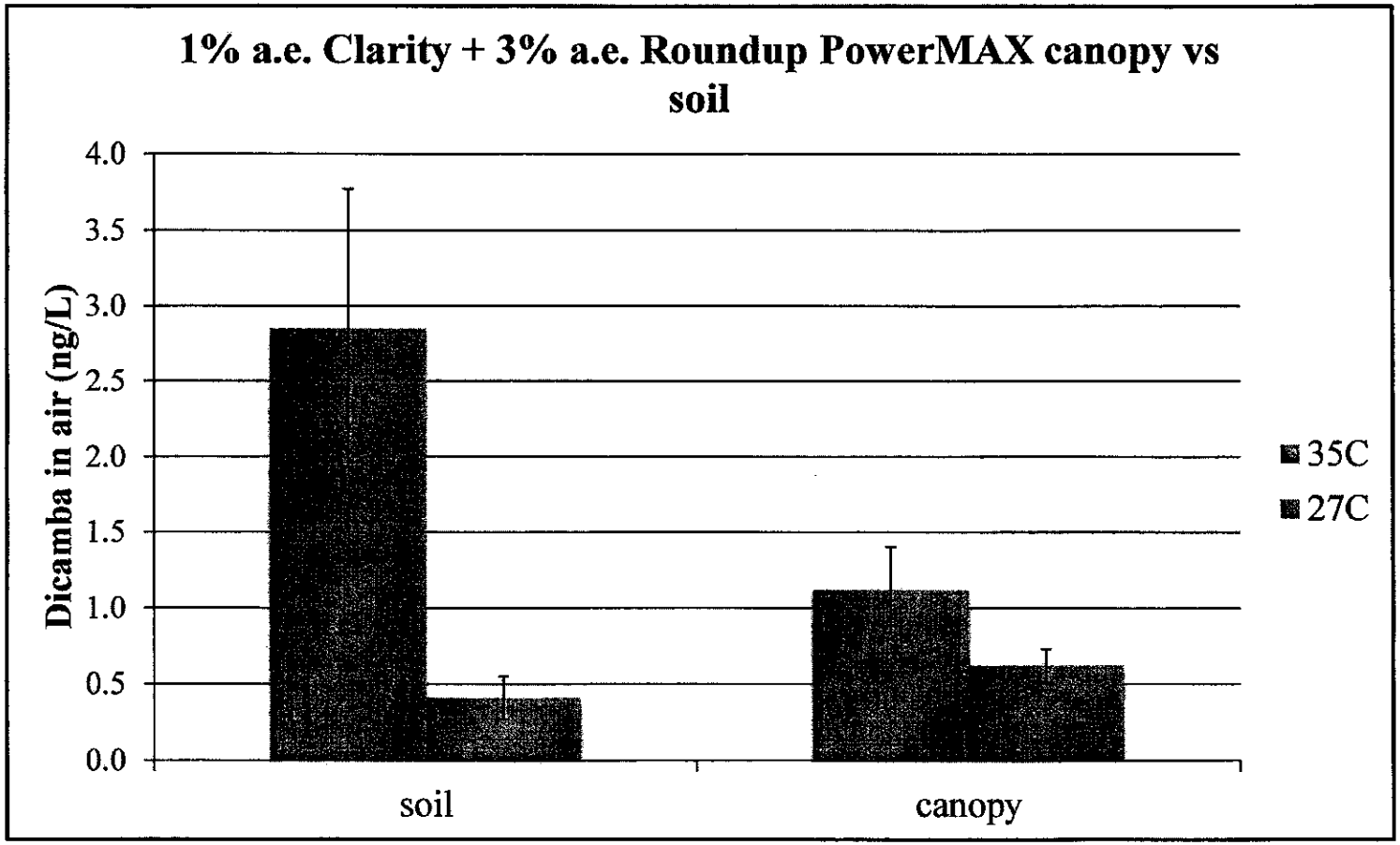
At 27°C more volatility is detected from a soybean canopy vs soil



At 35°C more volatility is detected from soil surface vs canopy

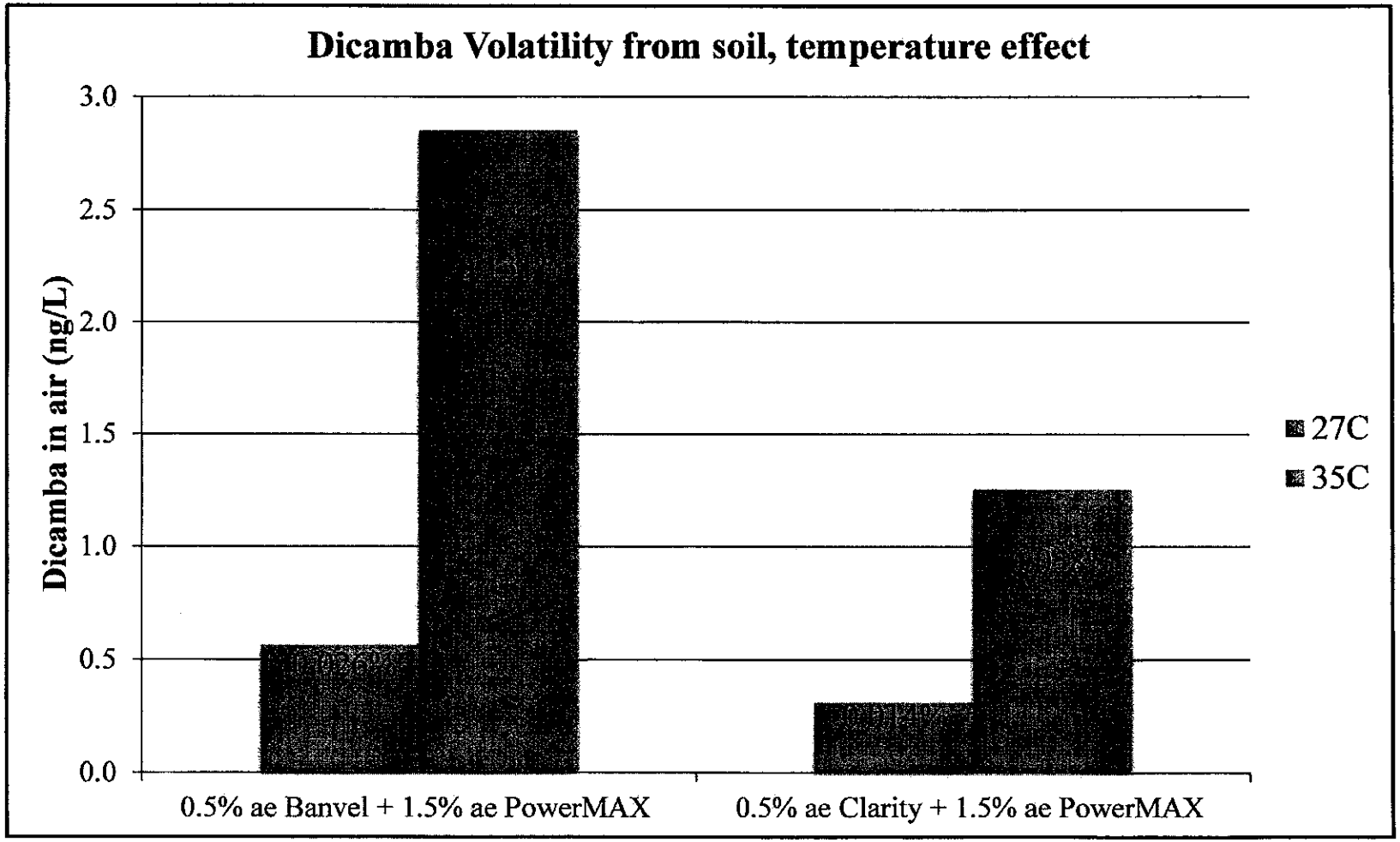


The effect of temperature on volatility



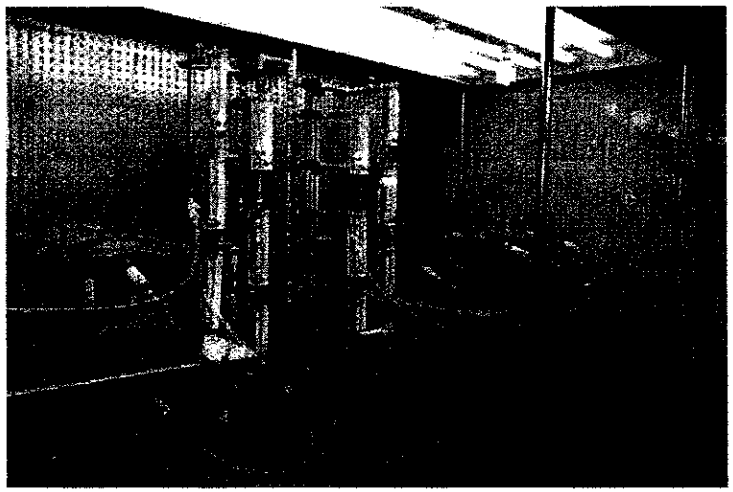
- 7x more volatility from soil vs 2x more volatility from canopy with the increase in temperature

Dicamba detected on PUF is small percentage of Dicamba applied



Closed System Test

- 20ml of Dicamba acid solutions placed in a Petri dish
- Soybeans placed in the humidome
- Placed in growth chamber at 35°C for 24 hours
- 1 volume of air removed through the PUF
- PUF extracted and analyzed by LC-MS
- 11 DAT injury data on soybeans



Soybean injury observed when levels of Dicamba were too low to detect by LC-MS

% wt Dicamba acid	Dicamba in air (ng/L)	11 DAT injury
0.5000%	161.9	68%
0.2500%	34.4	42%
0.1250%	12.3	33%
0.0625%	2.2	32%
0.0313%	1.8*	27%
0.0156%	*	25%
0.0078%	*	21%
0.0039%	*	16%

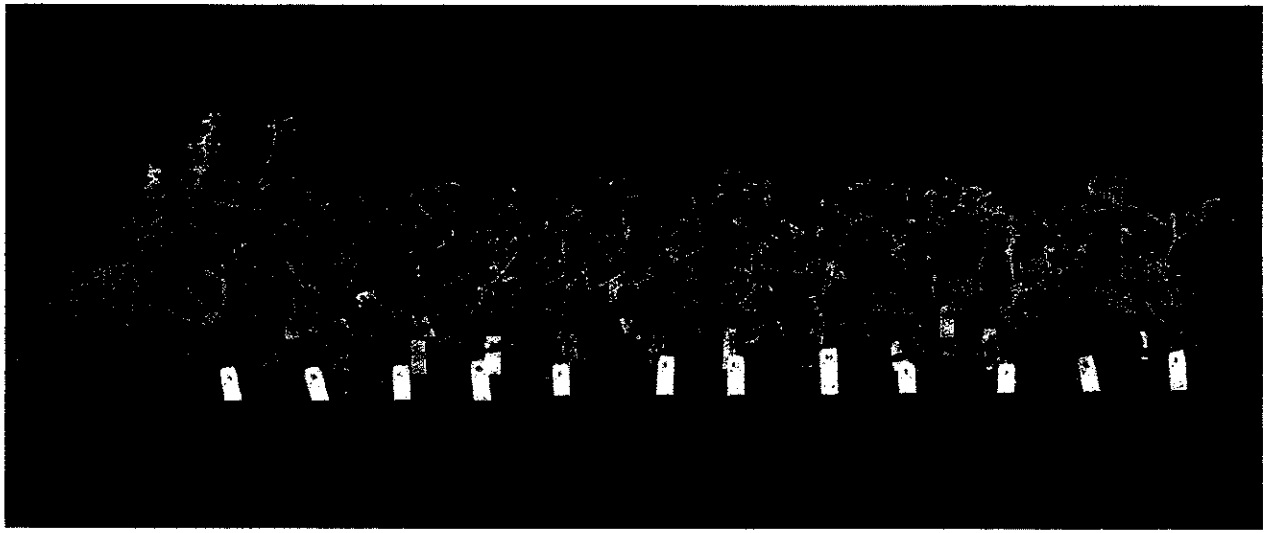
* At or below the level of detection on LC-MS

11 DAT injury to soybeans after a 24 hour exposure at 35°C in a closed system

Comparison of Volatility of Dicamba Formulations

- Dicamba formulation tank mixed with Roundup® PowerMAX™
- Tank mix sprayed onto 50/50 soil at 10 GPA
- Indicator plants placed onto soil, foil protecting the roots
- Humidome placed in growth chamber
- Air pulled through PUF at 2 LPM for 24 hours

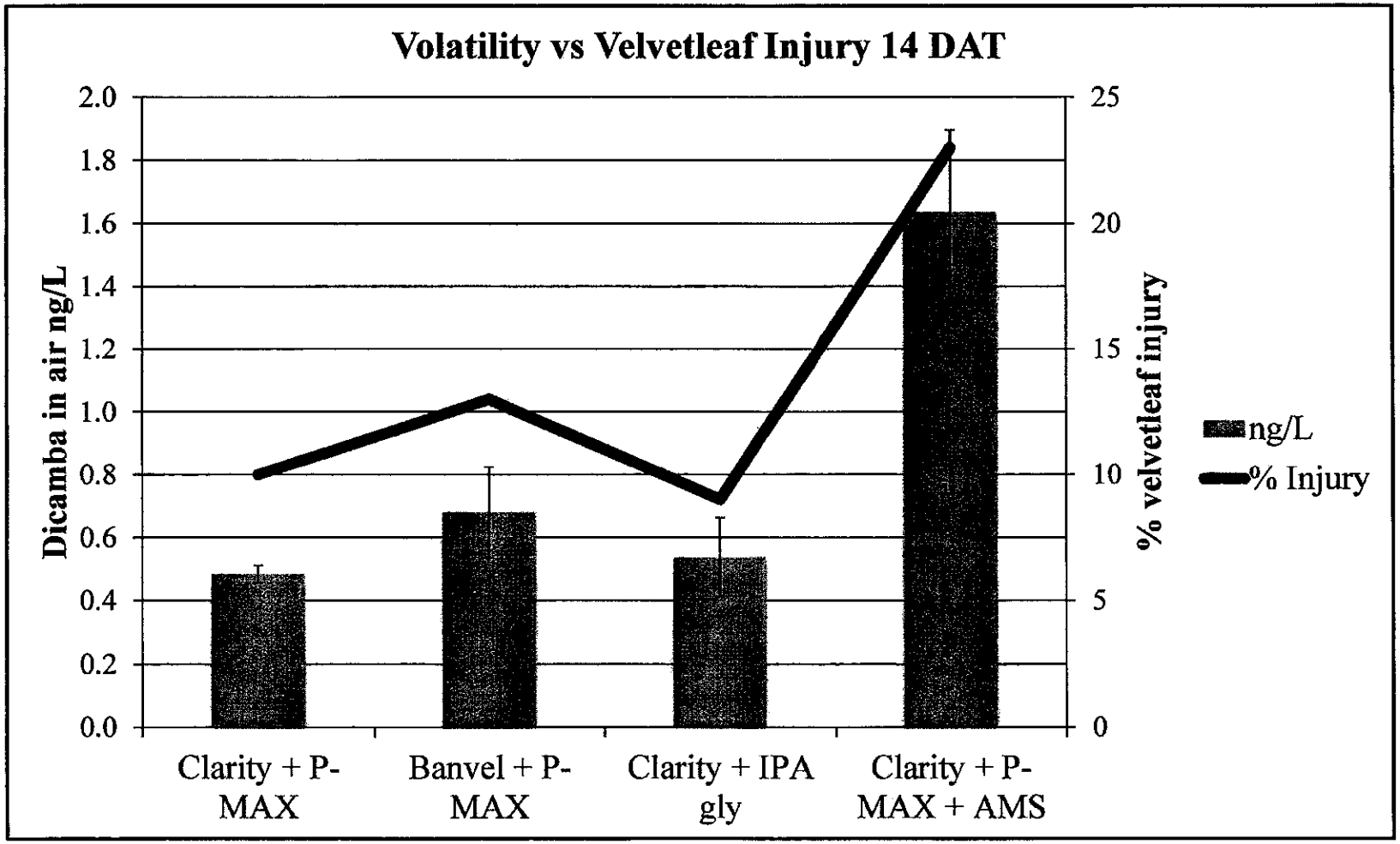
Injury in soybeans is independent of the level of Dicamba detected in the air



30% injury is observed in soybeans after 24 hour exposure to Dicamba formulations.

The level of Dicamba in the air is much higher at 35°C vs 27°C but the injury remains constant at 30%.

Velvetleaf plants show a dose response



Future plans in the humidomes

- Soil
  - Type
  - Moisture content
- Temperature
  - Range of temperatures
- DOE study
- Dicamba sensitive species
  - Tomatoes
  - Grapes
  - Peppers
  - Melons
    - Sensitivity at different temperatures, Dicamba concentrations, length of exposure

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