



# Effect of Moistures Stress on Tropical Spiderwort Response to Herbicides

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# Tropical spiderwort

## *Commelina benghalensis*



- noxious and invasive
- annual or perennial
- seeds and rhizomes
- above and below ground flowers
- 1,600 seeds/plant
- alternate host of southern root-knot nematode
- problem weed in other countries (*Holm's*)



# Objectives

- To determine how moisture stress affects:
  - Tropical spiderwort leaf morphology
  - Herbicide Uptake
  - Herbicide Response



# Moisture Stress







# Moisture Stress



100% Moisture



25% Moisture



# Leaf Characterization

- **Plant Material**
  - Greenhouse cuttings
  - 2 L plastic pots filled with Cecil sandy loam soil
  - Three moisture levels (25, 50 and 100% of field capacity)
  - Moisture stressed for three weeks
  - Fresh leaf samples collected





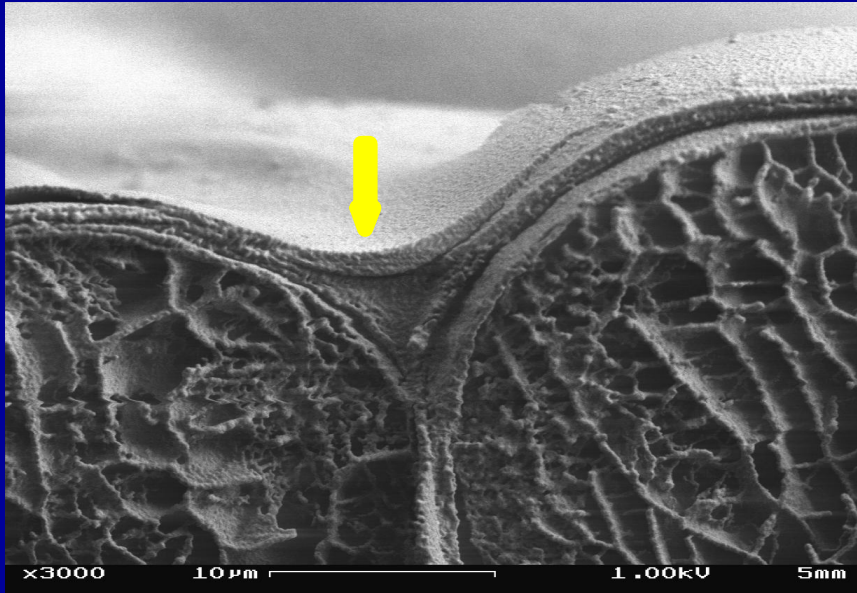
# Leaf Characterization

- Cuticle thickness and trichome frequency
  - Fresh leaf samples prepared for observation under a scanning electron microscope (SEM)
  - Photographs taken
  - Scale from photograph used for cuticle measurement and trichome count

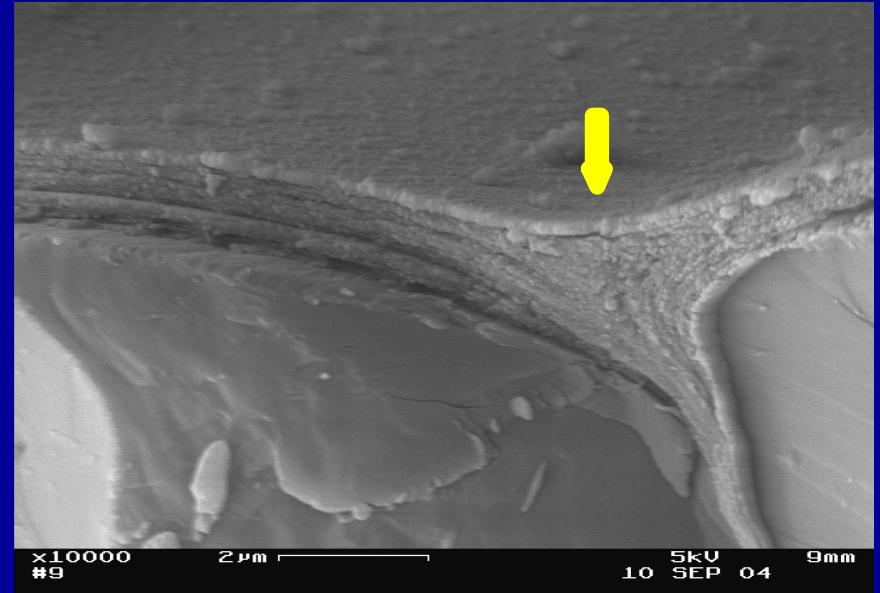


# Cuticle Thickness

- 25% Moisture



- 100% Moisture

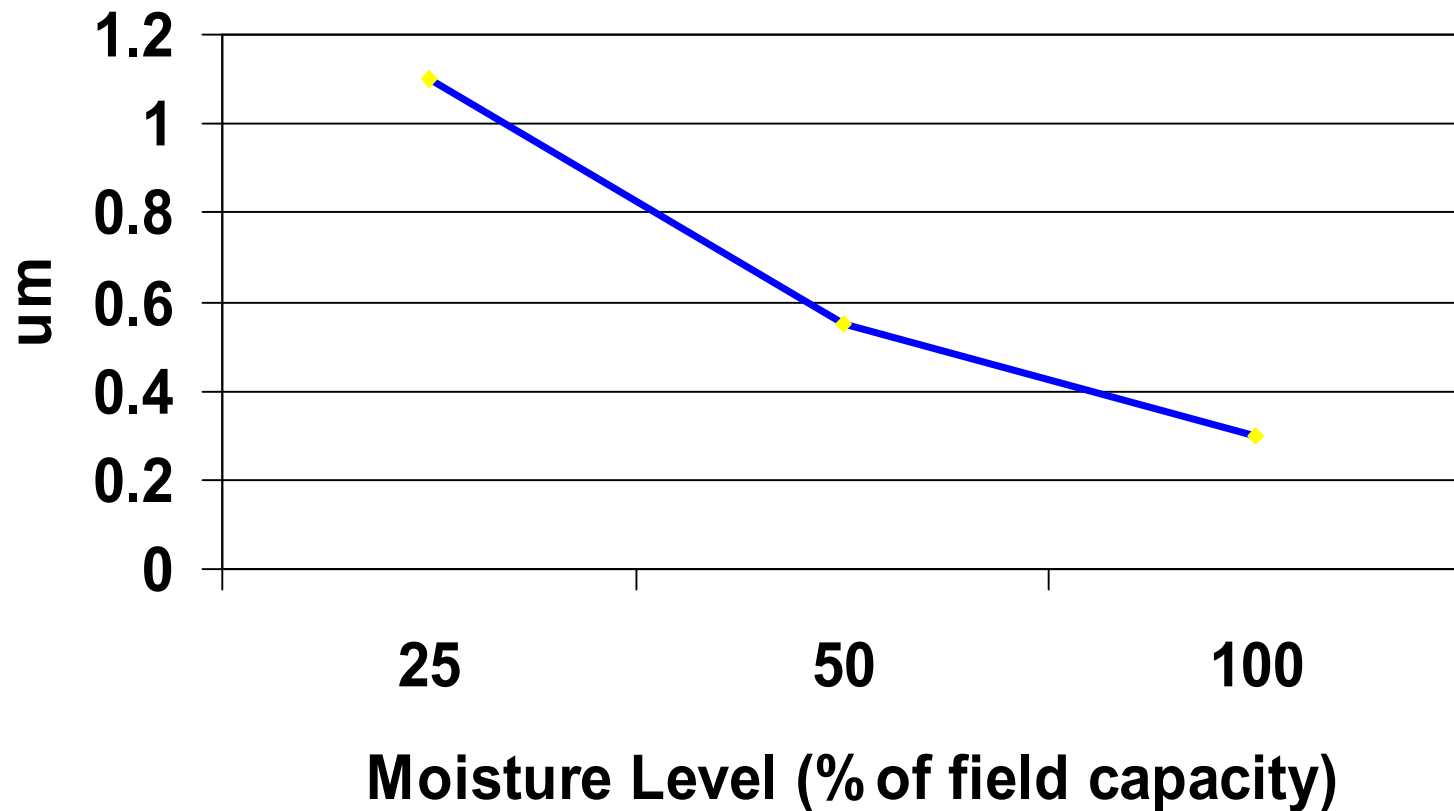






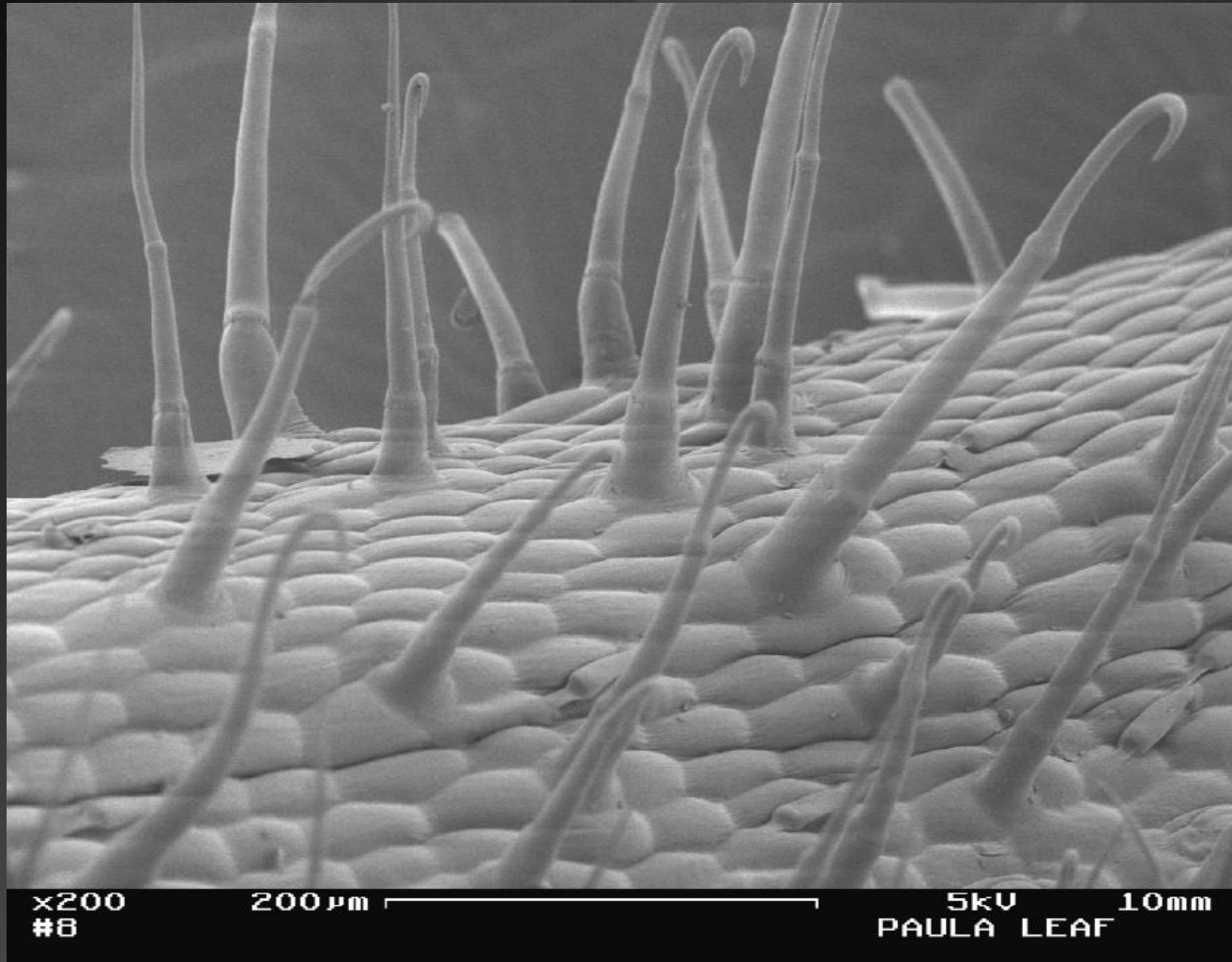
# Leaf Characterization

## Cuticle Thickness





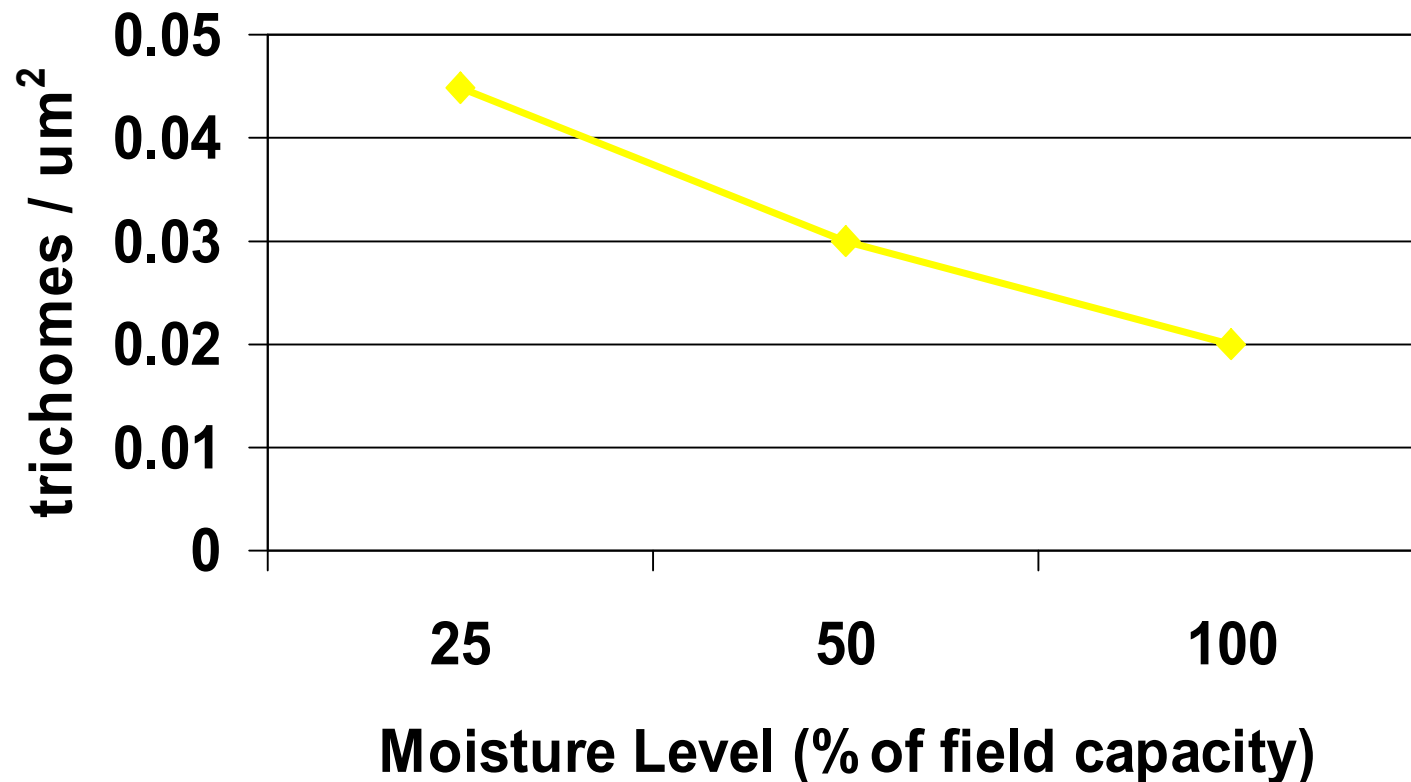
# Leaf Characterization





# Leaf Characterization

## Trichome Frequency





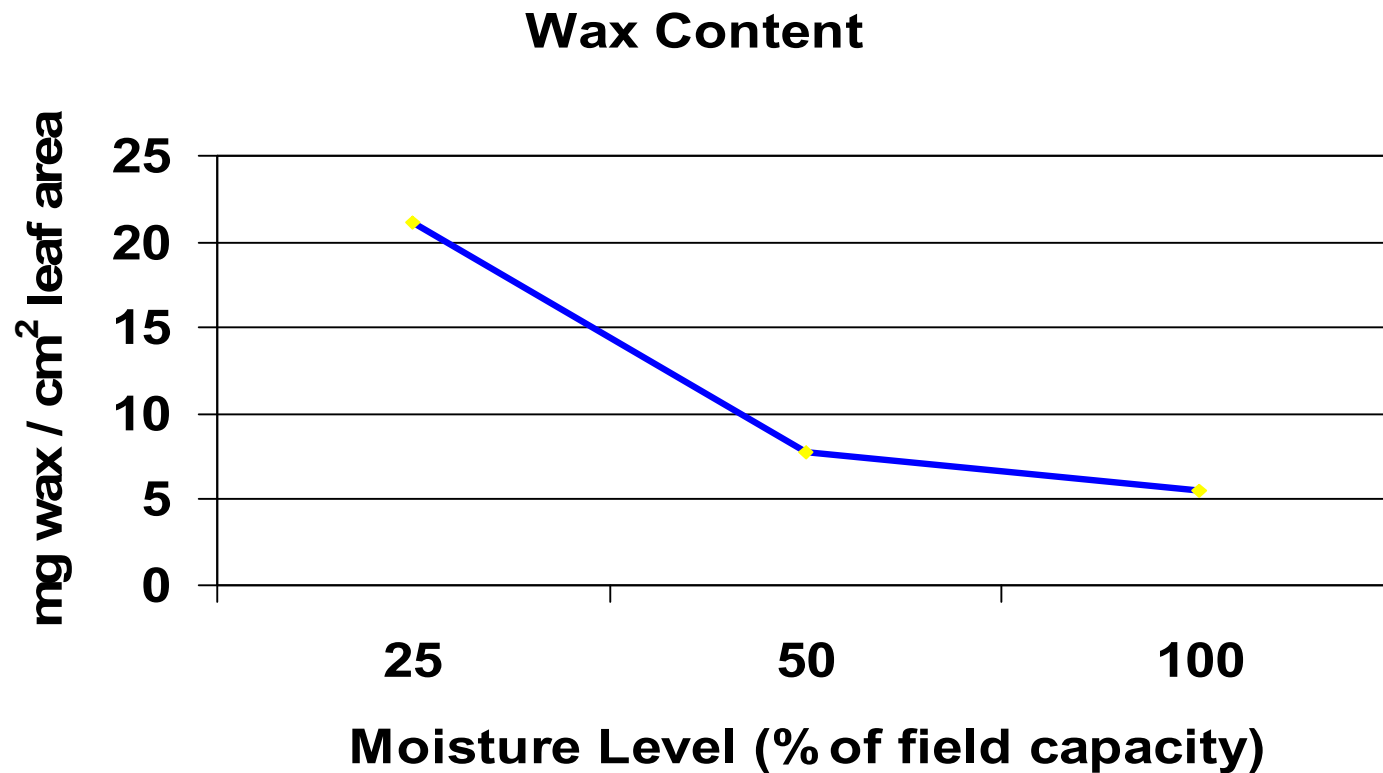
# Leaf Characterization

- Wax analysis
  - Plant material same as described earlier
  - Leaf area calculated
  - Fresh leaf samples dipped in chloroform
  - Chloroform filtered, evaporated
  - Residue weighed
  - Calculated amount of wax per leaf area





# Leaf Characterization





# Leaf Uptake



# Herbicidal Response

- Greenhouse bioassay
  - Cuttings transplanted into 200 ml styrofoam cups
  - Three moisture levels (25, 50 and 100% of field capacity)
  - Moisture stressed for one week
  - Sprayed with four non-zero rates
  - Evaluated injury and collected fresh weights
  - Determined ED<sub>50</sub> values





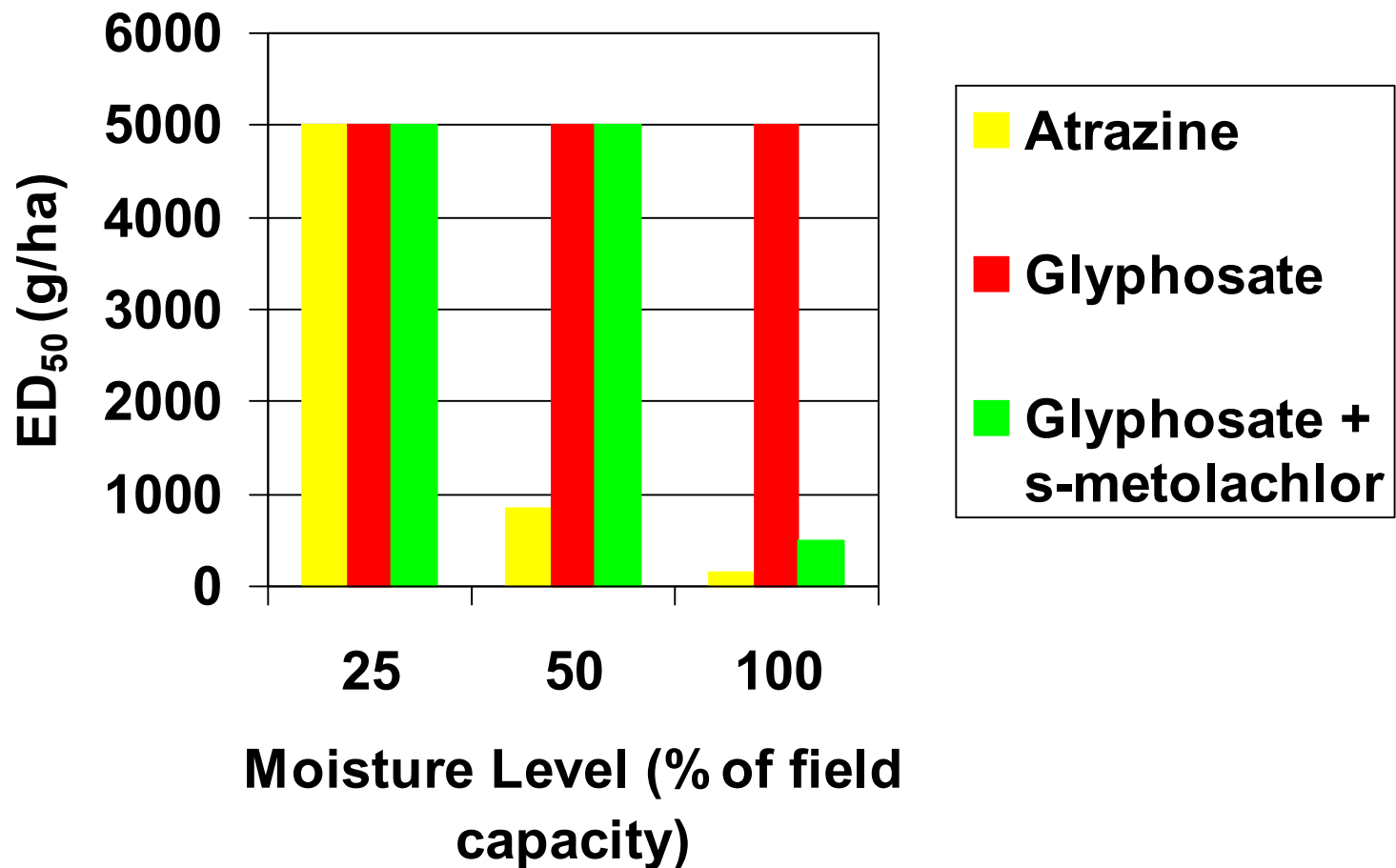


# Herbicidal Response

- Greenhouse bioassay herbicide list
  - 2,4-D
  - Diclosulam
  - Flumioxazin
  - Glufosinate
  - Imazapic
  - Sulfentrazone
  - Atrazine
  - Glyphosate
  - S-metolachlor
  - Glyphosate + s-metolachlor

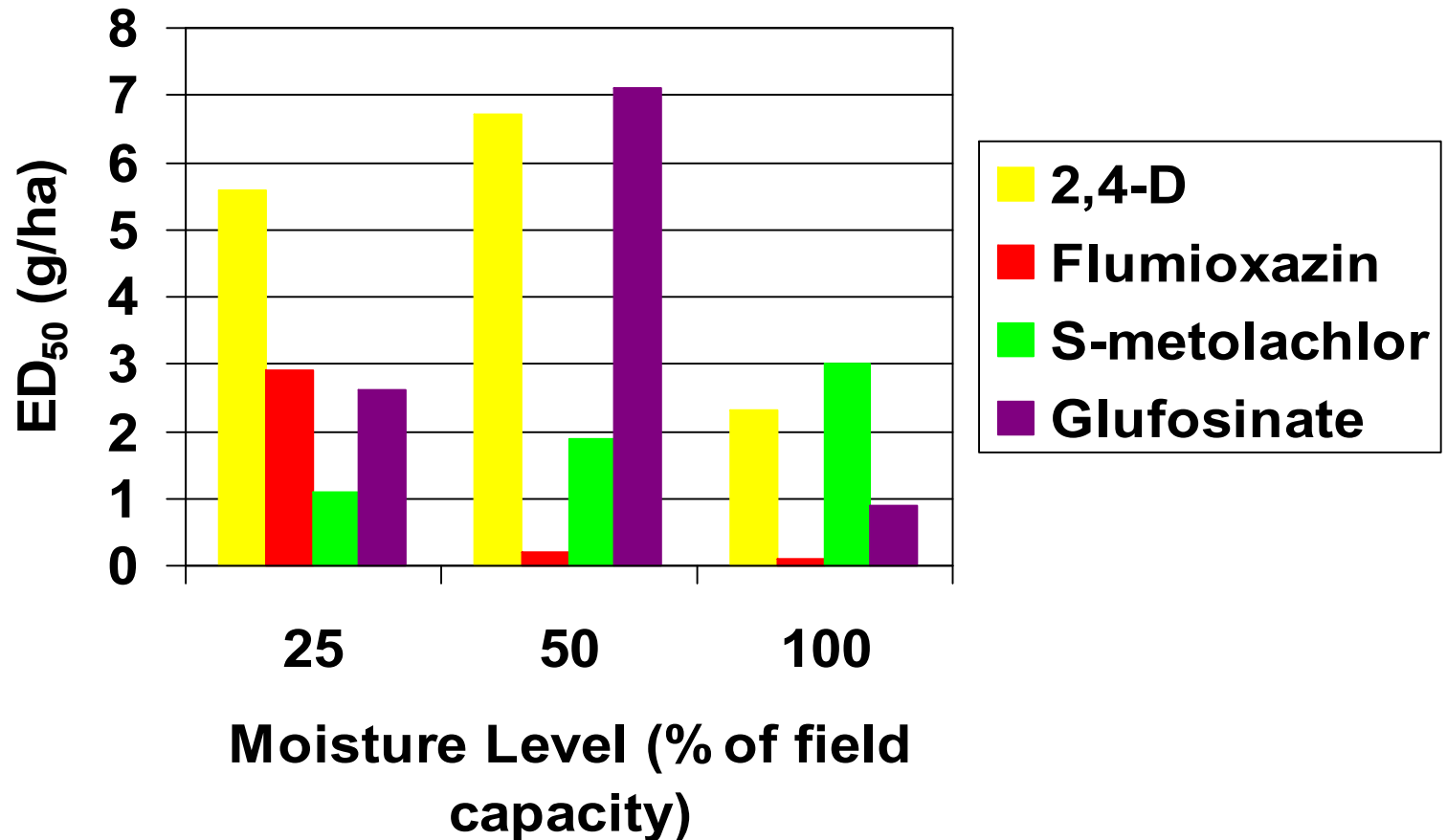


# Herbicidal Response



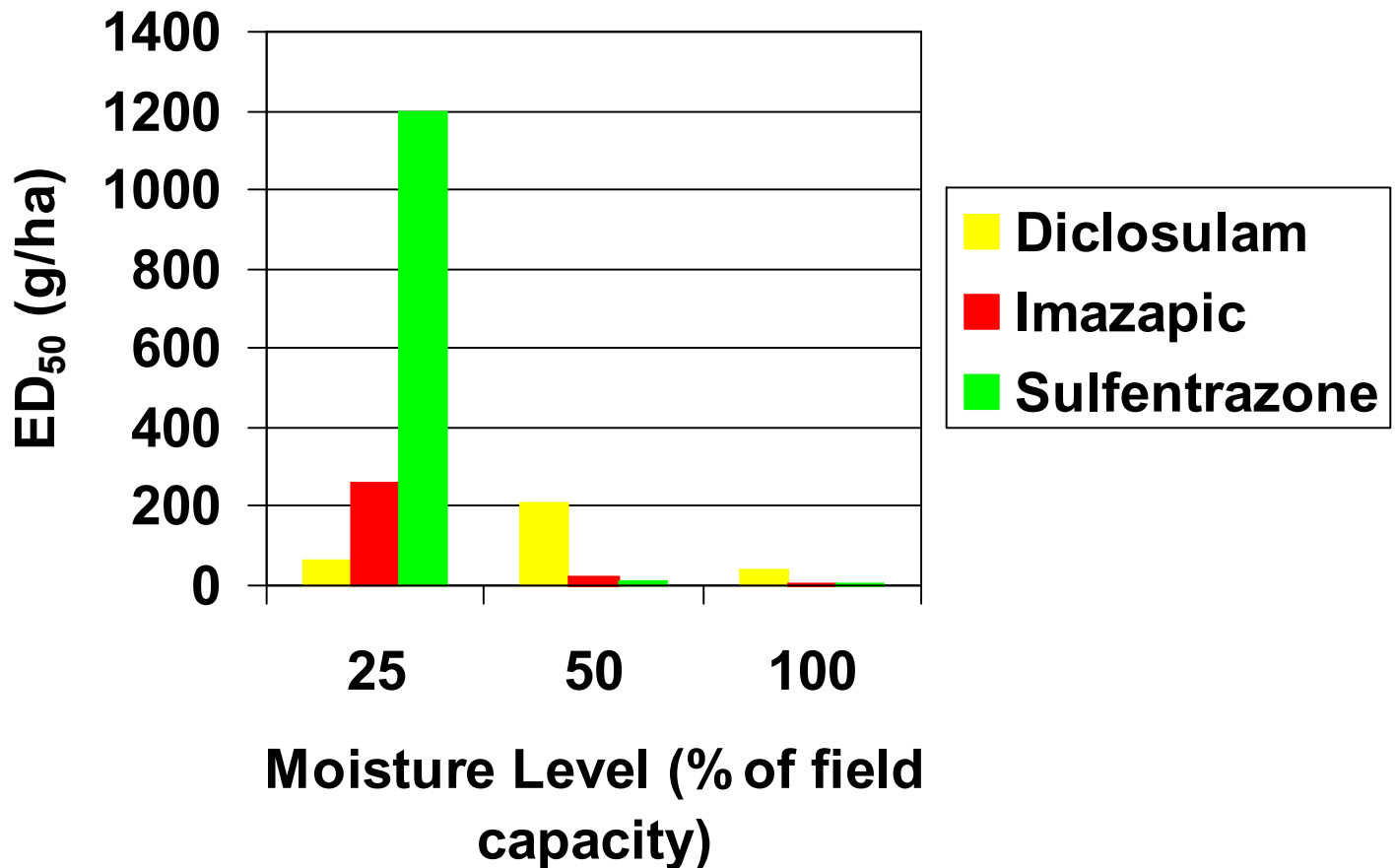


# Herbicidal Response





# Herbicidal Response







# Effect of Moisture Stress on Herbicide Activity

Herbicide	Change in ED <sub>50</sub> (%)
2,4-D	-60
Flumioxazin	-96
Glufosinate	-65
Imazapic	-98
Sulfentrazone	-99
Atrazine	-97
Glyphosate + Metolachlor	-90



# Herbicidal Response

- Foliar uptake
  - Plant material
  - Ten  $\mu$ l drops placed on upper leaf surface
  - Unabsorbed herbicide washed off
  - Determined amount of herbicide in wash
  - Percent uptake expressed as percent of applied herbicide

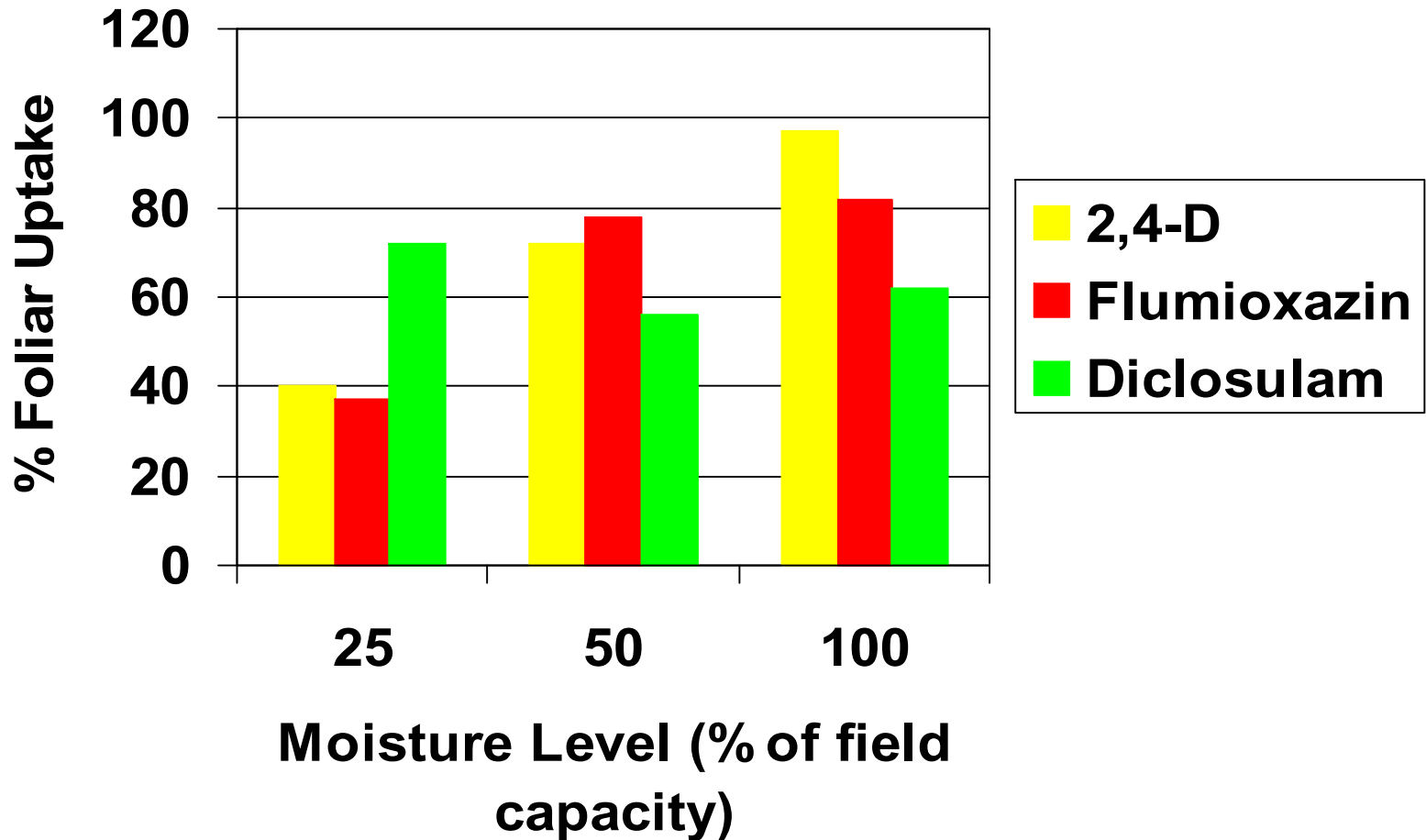


# Herbicide Response

- Foliar uptake herbicide list
  - 2,4-D
  - Diclosulam
  - Flumioxazin
  - Imazapic
  - Sulfentrazone
  - Atrazine
  - Glyphosate
  - S-metolachlor
  - $^{14}\text{C}$ -Glyphosate + s-metolachlor
  - $^{14}\text{C}$ -S-metolachlor + Glyphosate

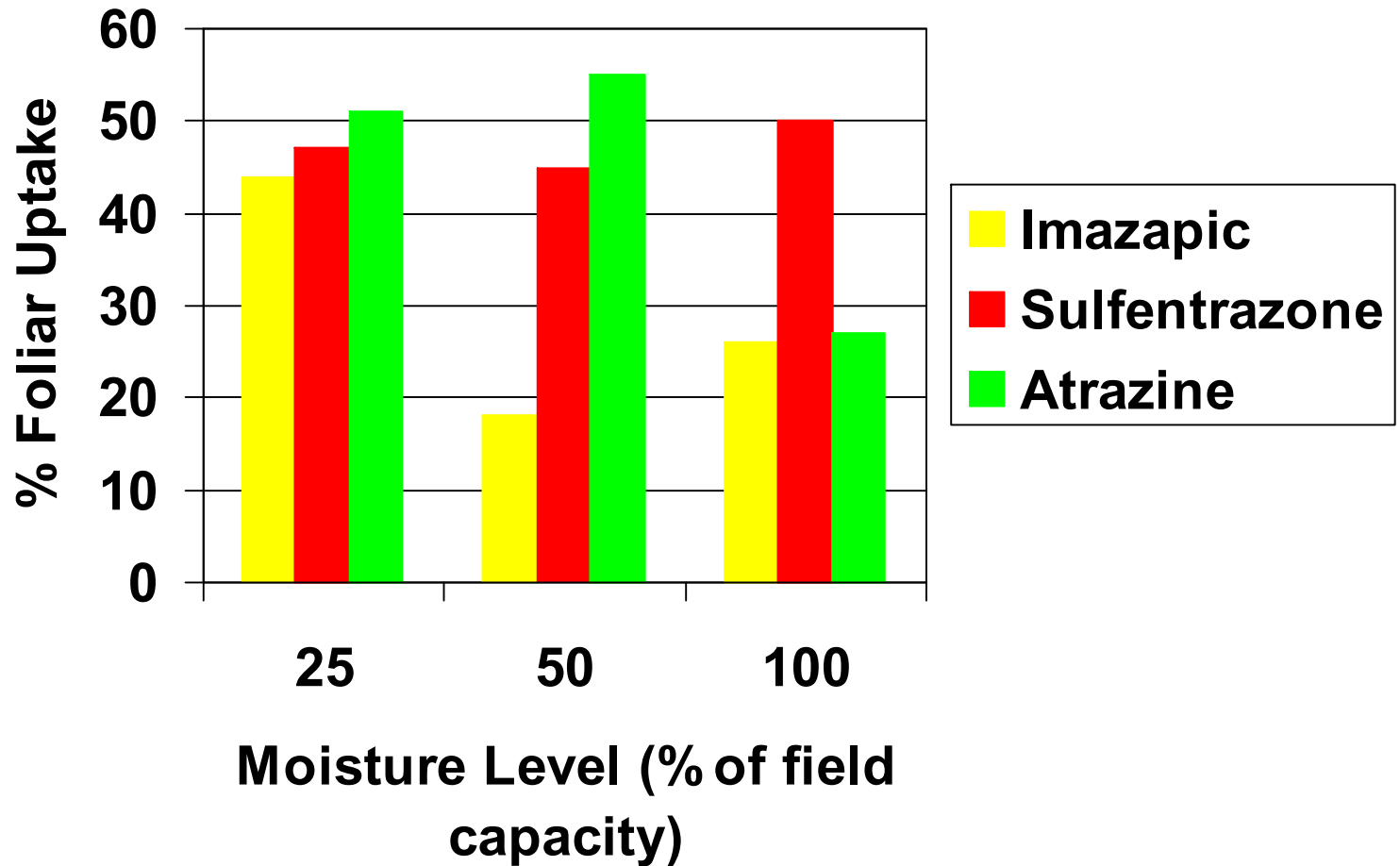


# Herbicidal Response



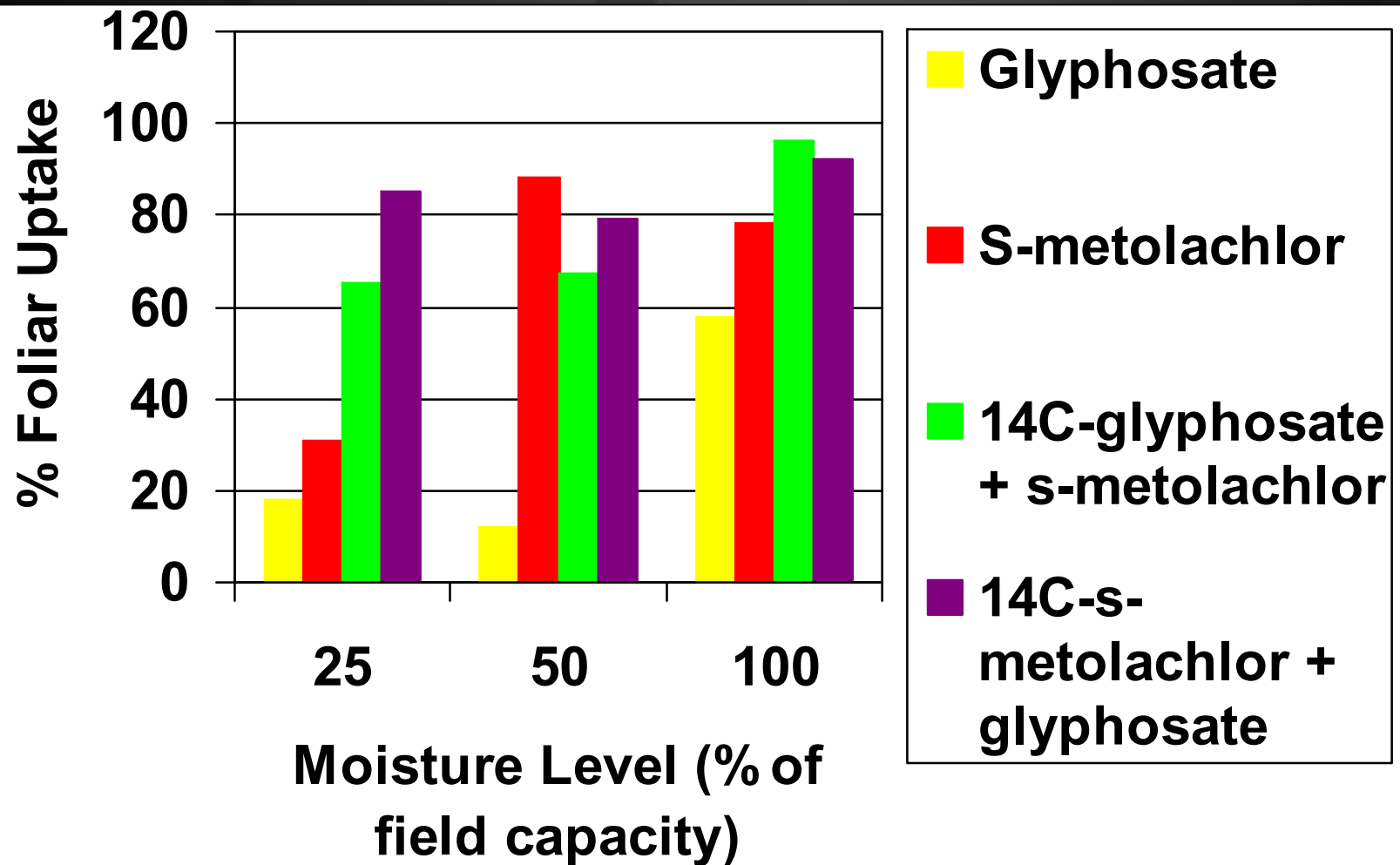


# Herbicidal Response





# Herbicidal Response







# Effect of Moisture Stress on Herbicide Uptake

Herbicide	Reduction in Uptake (%)
2,4-D	-59
Flumioxazin (Valor)	-55
Glyphosate	-69
Metolachlor (Dual)	-60
<sup>14</sup> C-Glyphosate + metolachlor	-33
<sup>14</sup> Metolachlor + glyphosate	-8



# Effect of Moisture on Herbicide Response



25% Moisture



100% Moisture



# Effect of Moisture Stress on Herbicide Uptake

- Moisture did not affect uptake of the following:
  - Diclosulam (Strongarm)
  - Imazapic (Cadre)
  - Sulfentrazone (Spartan)
  - Atrazine



# Effect of Moisture Stress on Herbicide Response

- Moisture did not affect response of tropical spiderwort to the following:
  - Diclosulam (Strongarm)
  - Glyphosate
  - Metolachlor (Dual)



# Summary

- Cuticle thickness, trichome frequency and wax content decrease with increasing moisture
- Some herbicides are affected by moisture changes
- S-metolachlor, imazapic, sulfentrazone, flumioxazin and atrazine ED<sub>50</sub> affected by moisture level



**Any Question??**