

# Evaluating Herbicide Bioassays

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# Herbicides and Crops

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## **Glyphosate (RR/GT)**

- Corn
- Soybean
- Alfalfa
- Canola

## **Glufosinate (Liberty)**

- Corn
- Soybean

## **Other**

- Soybean
  - STS
  - Dicamba (DMO)
  - 2,4-D (Enlist)
  - Balance
- 2,4-D (Enlist) Corn
- CoAXium Wheat

# Methods

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## Substrate imbibition

- moisten germination medium with diluted herbicide solution
- place seeds on moistened medium
- seeds exposed to herbicide throughout test duration

## Seed soak

- imbibe seeds with diluted herbicide solution
- place seeds on water-moistened medium
- seeds exposed to herbicide before test duration

# Seedling terminology

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- tolerant: seedling that demonstrates the presence of a genetic trait that confers resistance (or tolerance) to the herbicide
  - trait, trait (+), positive
  - have same characteristics as normal seedlings
- non-tolerant: seedling that does not demonstrate the presence of a genetic trait that confers resistance (or tolerance) to the herbicide
  - non-trait, non, trait (-), negative, susceptible
  - would appear normal in the absence of the herbicide
- wording: “a normal (herbicide) non-tolerant (common name) seedling”

# General non-trait seedling characteristics

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## monocot

- Inhibition of root and secondary root growth
- Shortened shoot and root growth
- Browning of mesocotyl tissue
- Lack of chlorophyll development
- Clear coleoptiles with stunted plumule leaf growth

## dicot

- Inhibition of secondary root growth and root hairs
- Shortened hypocotyl growth
- Browning of root and hypocotyl tissues and root tip
- Inhibition of unifoliate leaf development

# Roundup corn

- stunted stiff root with little, if any, secondary roots
- flattened shoot with little to no pigmentation





# Roundup soybean

- stunted, stiff, thickened, off-color root with little, if any, secondary roots
- shortened hypocotyl





# Roundup alfalfa

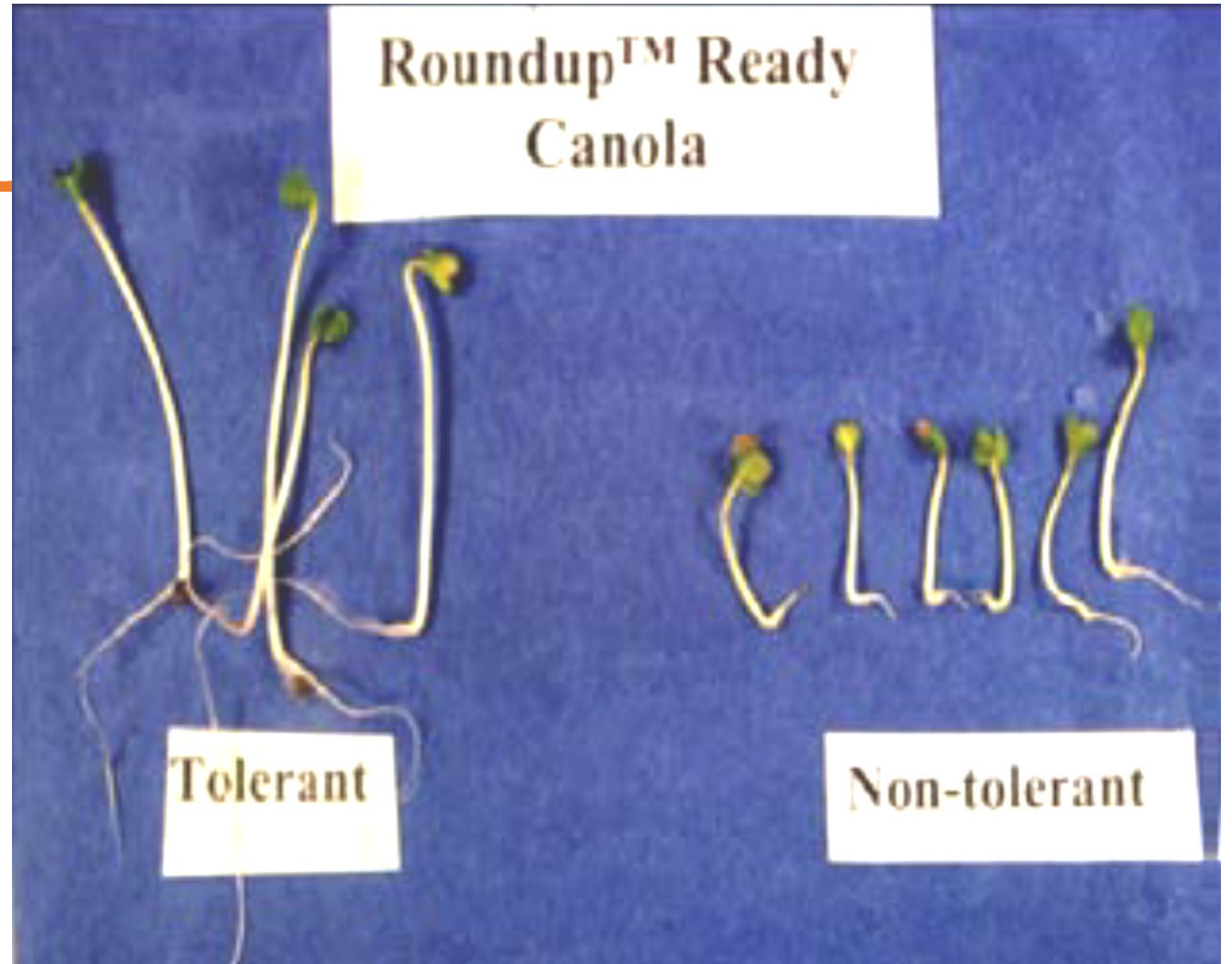
- stunted primary root, generally smooth with very little hair
- short hypocotyl
- both the root and hypocotyl have a thickened appearance





# Roundup canola

- stunted primary root, generally smooth with very little hair
- short hypocotyl
- both the root and hypocotyl have a thickened appearance



Non-Tolerant Seedling Study Guide

# Liberty corn

- short primary root
- shortened shoot growth with necrotic mesocotyl (“halo” effect)
- little shoot pigmentation





# Liberty soybean

- short, thickened, curved primary root with little to no secondary roots; may have lesion(s)
- inhibited primary leaf development
- shortened hypocotyl
- yellow pigmented cotyledons





# STS soybean

- crossed leaves that are stunted in growth
- roots unaffected



Non-Tolerant Seedling Study Guide





# Dicamba soybean

- short thickened root with splitting/deep lesions and stegosaurus spikes
- shortened hypocotyl







## 2,4-D soybean

- callusing and curling of hypocotyl and radical (primary root)
- leaves absent or strapped and elongated



# Balance soybean

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- pigment inhibition  
(bleaching on new growth)





## 2,4-D corn

- stunted stiff root with little, if any, secondary roots
- shortened, flattened shoot with little pigmentation and slight curvature
- necrotic mesocotyl



# CoAXium wheat

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- initial root and shoot emergence but extremely short growth (won't extend beyond the initial emergence from the seed)
- root and shoot are slim and weak

