Herbicide Modes and Action and Symptoms on Plants

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Herbicide Modes and Action and Symptoms on Plants

- Discuss various classes of herbicides and their modes of action
- Show examples of the types of symptoms that various herbicides cause on plants
  - From excess rate or inappropriate rate to certain soil types
  - From mistakes in application to the wrong crop
  - From carryover from prior applications, or inadequate soil preparation, etc.
  - From drift

Herbicide Modes and Action and Symptoms

- **Plant growth regulators**
  - **2,4D – hay, turf**
  - **dicamba (Banvel) - hay**
  - **triclopyr (Garlon) – turf, woody plant control**

Herbicide Modes and Action and Symptoms

- **Lipid and amino acid synthesis inhibitors**
  - **sethoxdim (Poast) – grass selective, does not affect broadleaf plants**
  - **cycloate (RoNeet) - spinach**
  - **EPTC (Eptam) – beans (effective on yellow nutsedge**
  - **bensulide (Prefar) – lettuce, cole crops, onions, cilantro, etc.**
  - **glyphosate (Roundup)**
  - **rimsulfuron (Matrix) - tomatoes**

Herbicide Modes and Action and Symptoms

- **Cell division and cell wall inhibitors**
  - **Pronamide (Kerb) – head lettuce**
  - **DCPA (Dacthal) – broccoli, onions**
  - **trifluralin (Treflan) – tomatoes, rapinni**
  - **s-metolachlor (Dual Magnum) – spinach, beans**
  - **Dimethenamid (Outlook) – onions (controls yellow nutsedge)**

Herbicide Modes and Action and Symptoms

- **Photosynthetic & pigment synthesis inhibitors**
  - **Oxyfluorfen (Goal) – cole crops**
  - **Paraquat (Gramaxone) – burn down, prior to planting**
  - **linuron (Lorox) – celery**
  - **prometryn (Caparol) – celery**
  - **simazine (Princep) – grapes**

Plant growth regulators

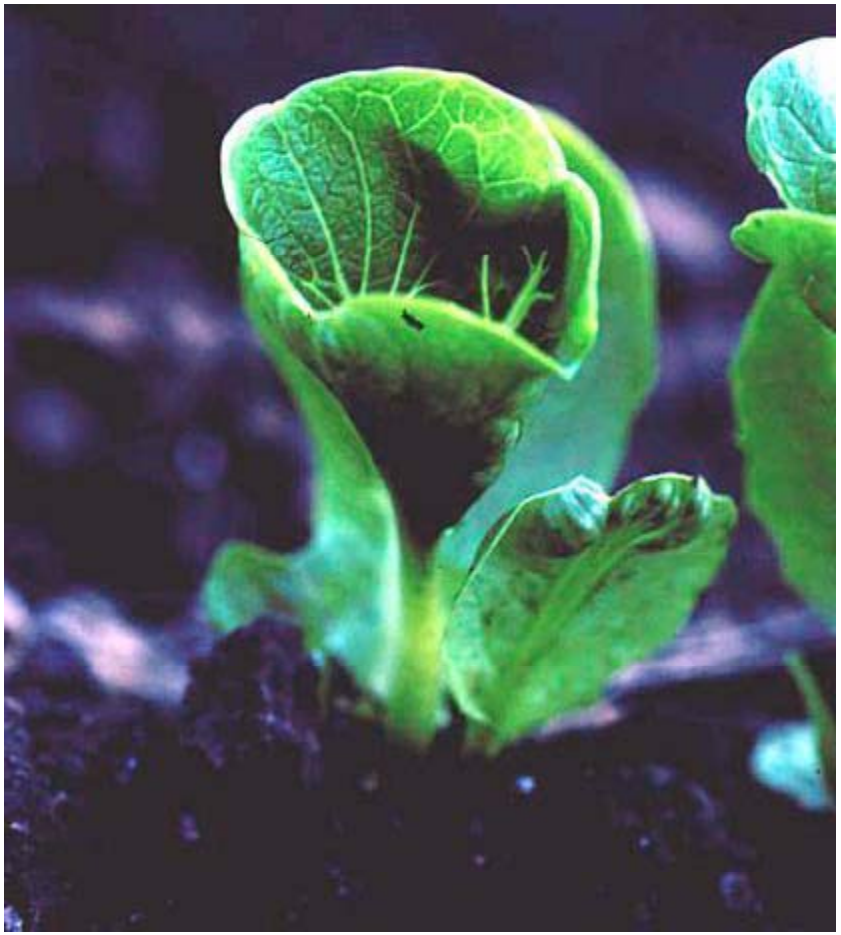
- **2,4D**
- **dicamba (Banvel) – hay**
- **triclopyr (Garlon) – turf, woody plants**
  - **Commonly used in turf to control broadleaf weeds (e.g. clover)**
  - **Issues mostly seen from home owners**
  - **Issues in agriculture not seen much in this area because this class of chemistry in totally incompatible with lettuce production (occasionally in Hollister – hay growing area)**

Plant growth regulators

- **2,4D**
- **dicamba (Banvel) – hay**
- **triclopyr (Garlon) – turf, woody plants**
  - **Symptoms often include:**
    - **exaggerated growth**
    - **twisting**
    - **deformity**
    - **straped shaped leaves**

Plant Growth Regulator Symptoms on Lettuce

Transline symptoms
Carryover in compost



Dicamba
Drift from hay

Probable Phenoxy Symptoms on Peppers

Plant Growth Regulator

carryover in potting soil

Plant Growth Regulator

carryover in potting soil

Lipid and amino acid synthesis inhibitors

- **Lipid and amino acid synthesis inhibitors**
  - **sethoxdim (Poast) – grass selective**
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  - **Glyphosate (Roundup)**
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Lipid and amino acid synthesis inhibitors

- **Lipid inhibition symptoms:**
  - **A wide variety of symptoms including deformity of leaves**
  - **stunting**
  - **shiny leaves (removal of cuticle)**
- **Amino acid inhibition symptoms:**
  - **Yellowing**
  - **deformity (strap shaped leaves)**

Lipid synthesis inhibitors

Prefar symptoms in winter are more severe than the summer

Burn on one side of root

deformed leaf

Thickening of leaf

deformed leaf

RoNeet Overdose on Spinach

too high a rate for soil type

RoNeet Overdose on Spinach

Note deformity of cotyledons, stunting and death

RoNeet carryover from an aborted spinach crop on lettuce, light soil (the lettuce grew out of these symptoms very well later in the season)

RoNeet Damage on Broccoli

note the lack of waxy cuticle

RoNeet Untreated

Untreated RoNeet

Amino Acid Synthesis Inhibitors

Roundup

Yellowing symptoms occur on the growing point of the plant

Glyphosa

Roundup

Symptoms on broccoli and artichoke

Roundup on Rose

Roundup Symptoms on Onion

note thickening of base of plant

Matrix on Lettuce

Amino acid inhibitor, symptoms similar to Round up

Cell division and cell wall inhibitors

- **Cell division and cell wall inhibitors**
  - **Pronamide (Kerb) – head lettuce**
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Cell division and cell wall inhibitors

- **Most of these materials are soil applied and affect the roots or are absorbed by the shoot as the plant emerges through the soil**
- **Common symptoms include:**
  - **Poor root growth**
  - **“clubbing of the root”**
  - **Stunting**
  - **Poor stand of plants**
  - **Can also cause deformity of the tops of the plants**

Poor root development with Kerb

Untreated

Classic haloing of cotyledons from Kerb on lettuce

usually seen in the early spring

Kerb affect on the roots of other crops

Spinach

Spinach

Broccoli

Accidental application of Dacthal on lettuce

Dual carryover on romaine

Dual Magnum overdose on Celery

Dual PPI on Celery

note poor emergence of the roots from the plug in the treated zone

Dual PPI on Celery

Dual Magnum over-the-top to Peppers

Outlook on carrot seedlings

severe stunting and poor growth

Standard weed program

Outlook

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Herbicide Modes and Action and Symptoms

- **Photosynthetic & pigment synthesis inhibitors**
- **Symptoms can be dramatic**
  - **Burned areas or spots on the plant**
  - **Yellowing**

Dramatic Examples of Photosynthetic Inhibitors

Command on Squash and Beets


Goal aerial drift
On lettuce


Paraquat aerial drift
on lettuce

Residues of goal in the soil and their impact on lettuce seedlings


No Damage


No Damage


Slight Damage

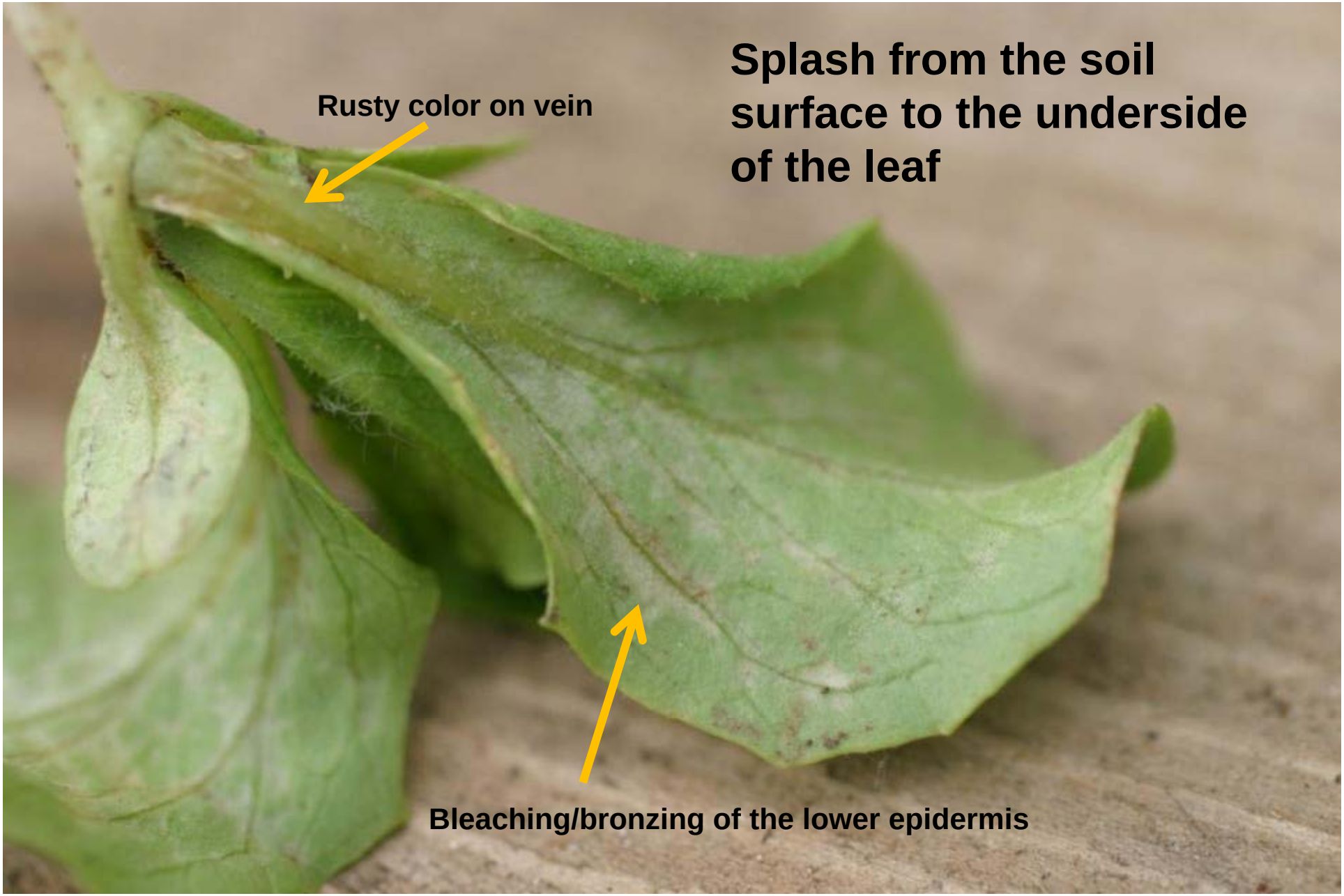

Slight Damage

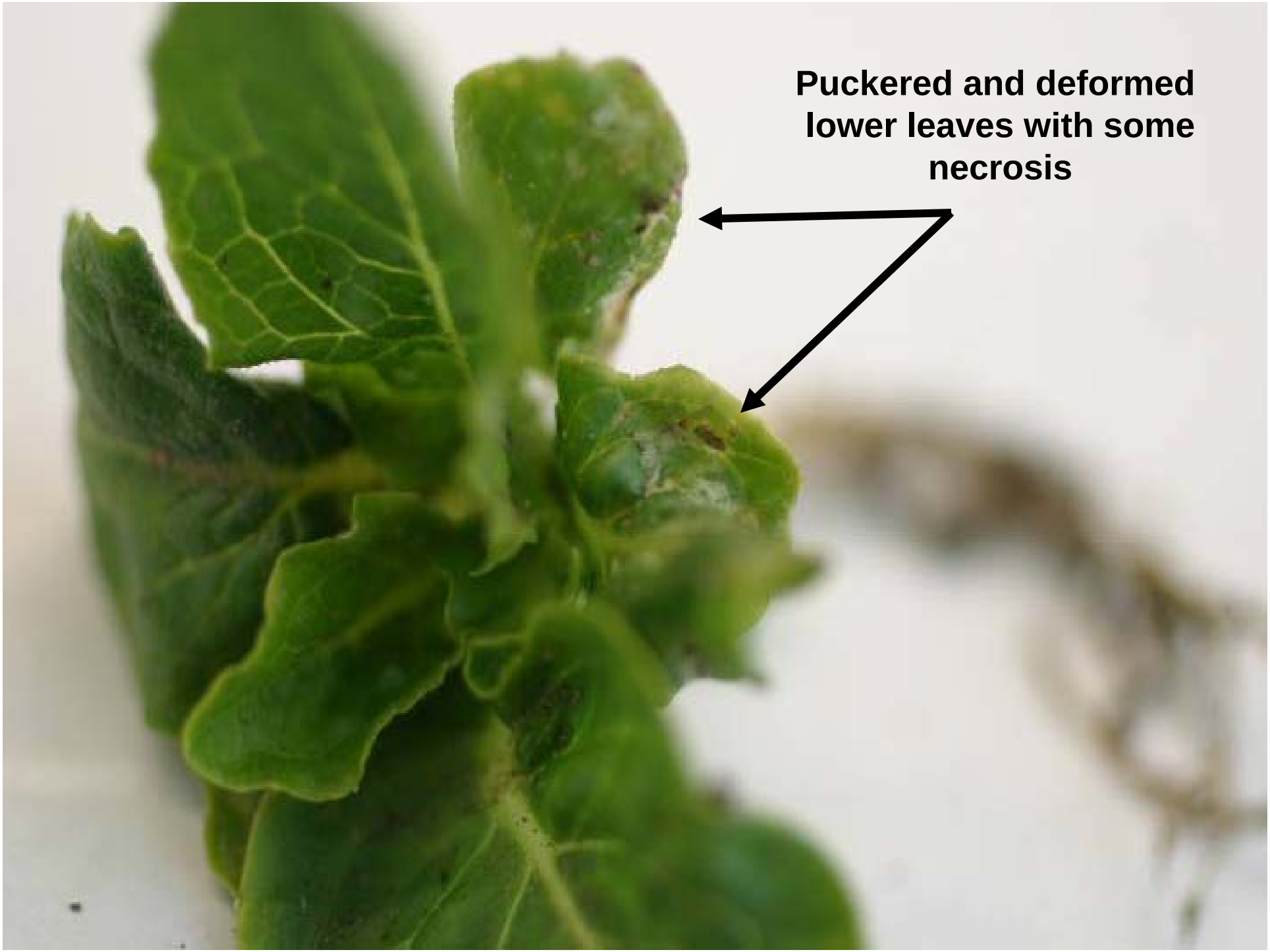

Increasing Damage

Moderate damage

Severe Damage


Splash from the soil surface to the underside of the leaf


Splash from the soil surface to the underside of the leaf
Rusty color on vein
Bleaching/bronzing of the lower epidermis


Puckered and deformed lower leaves with some necrosis

Affected seedlings can be stunted and set back

Typical sign of Goal residues on 80 inch wide beds winter applications of Goal cannot be worked at thoroughly as 40 inch wide beds and therefore the residues are not inactivated and can cause thinning out of the stand, particularly in the middle of the bed

Edge of bed looks good it is worked more aggressively

Middle of the bed is more difficult to thoroughly work and has more Issues with carryover


Classic burning at soil line

Affected leaves often form a loop

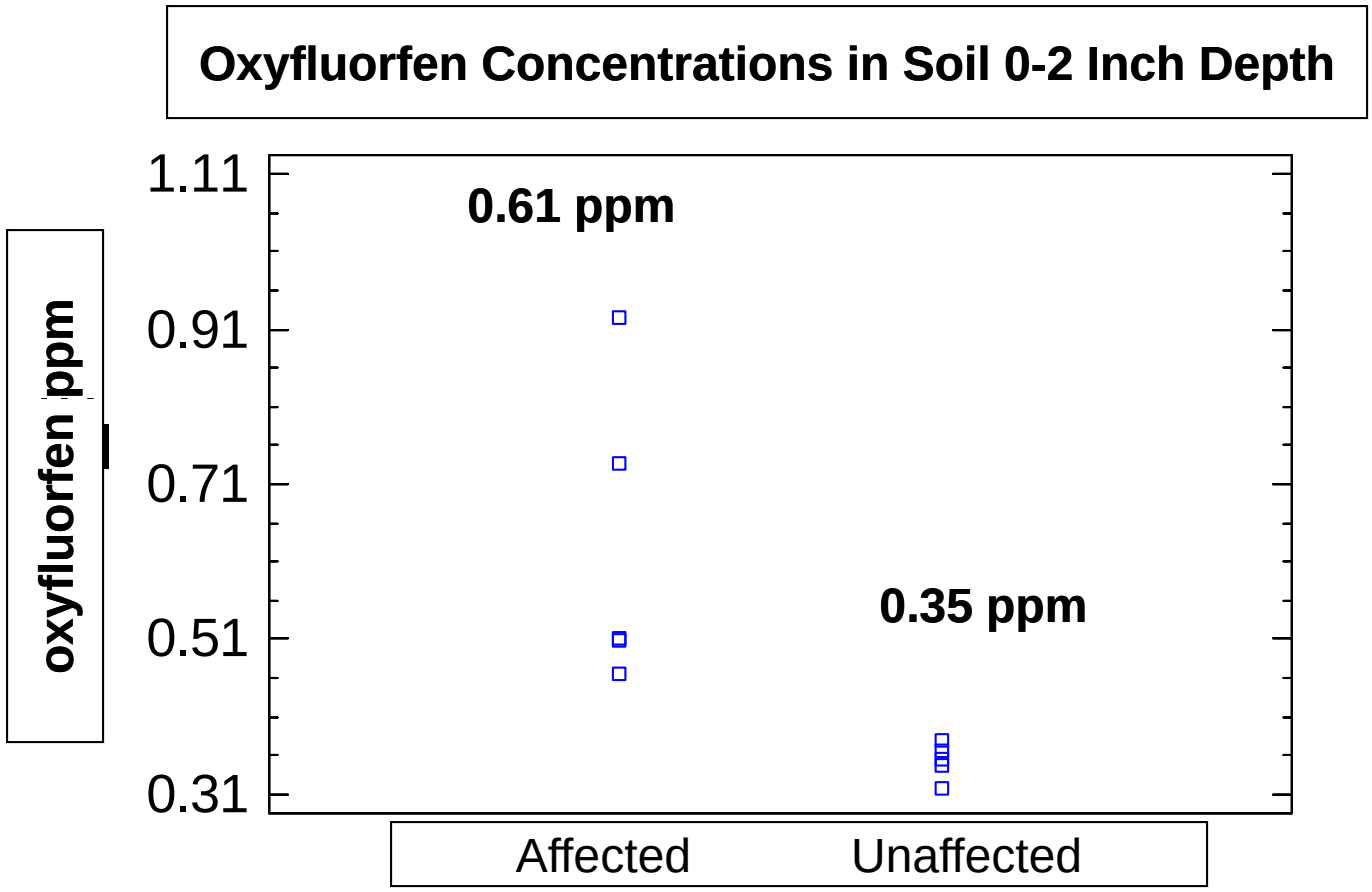
RoNeet Damage

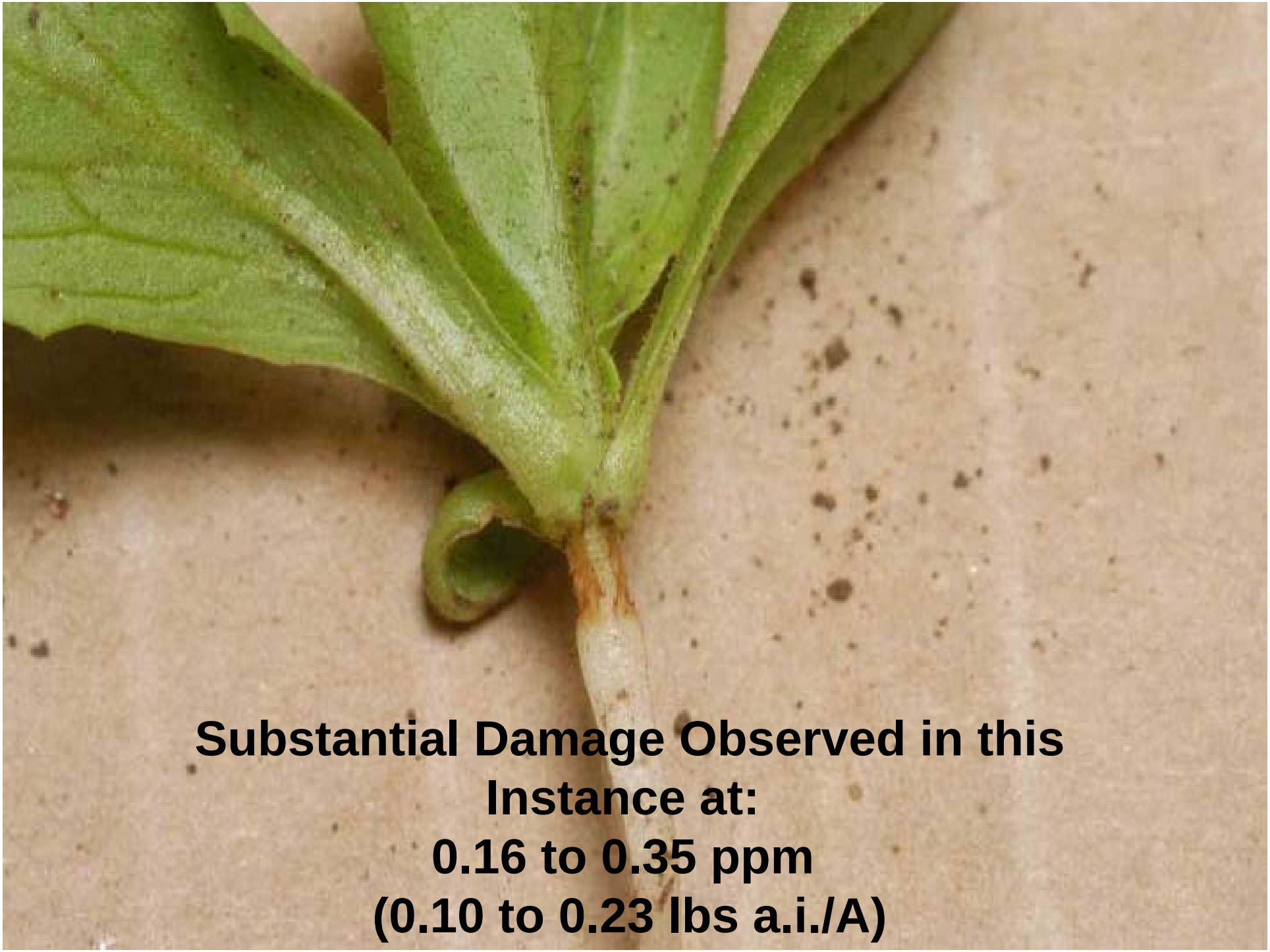
Sickle shaped and burned off at tips no burn at soil line

Goal Damage

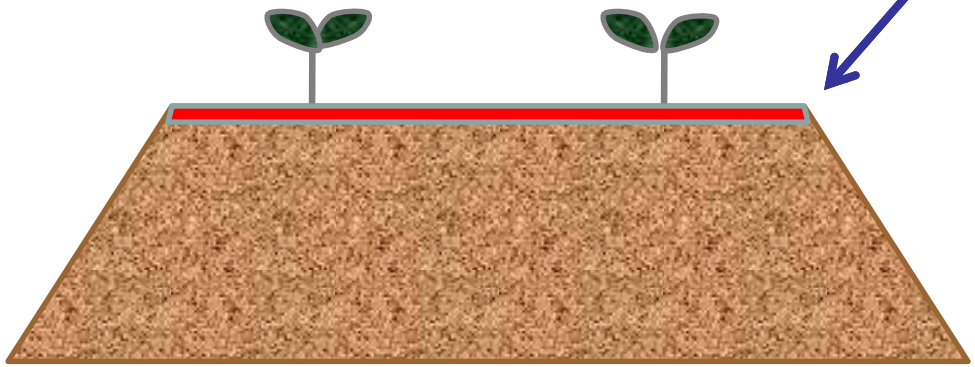
Can look similar to RoNeet but with burn at the soil line

Goal residues in the Soil and Symptoms on Spinach Plants

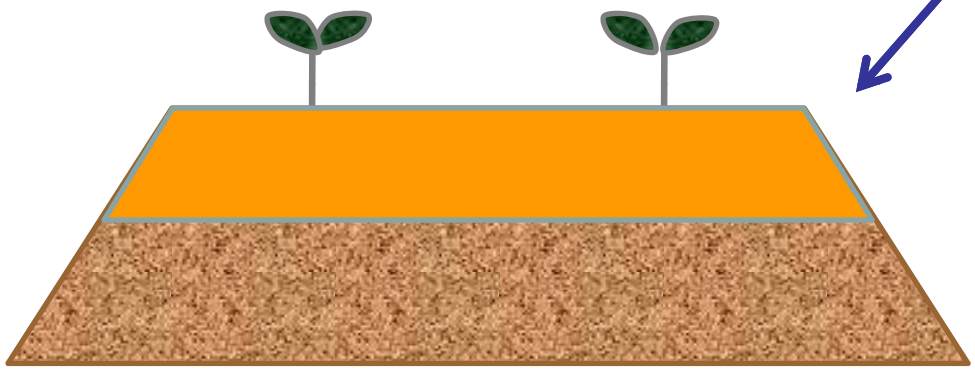



Substantial Damage Observed in this Instance at:
0.16 to 0.35 ppm
(0.10 to 0.23 lbs a.i./A)

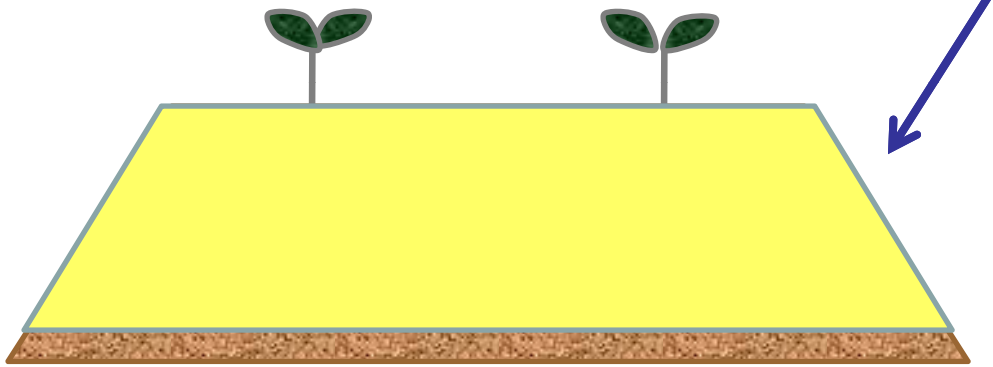
At application, 0.50 lb a.i./A of Goal is concentrated in the top 1/8 to ¼ inch



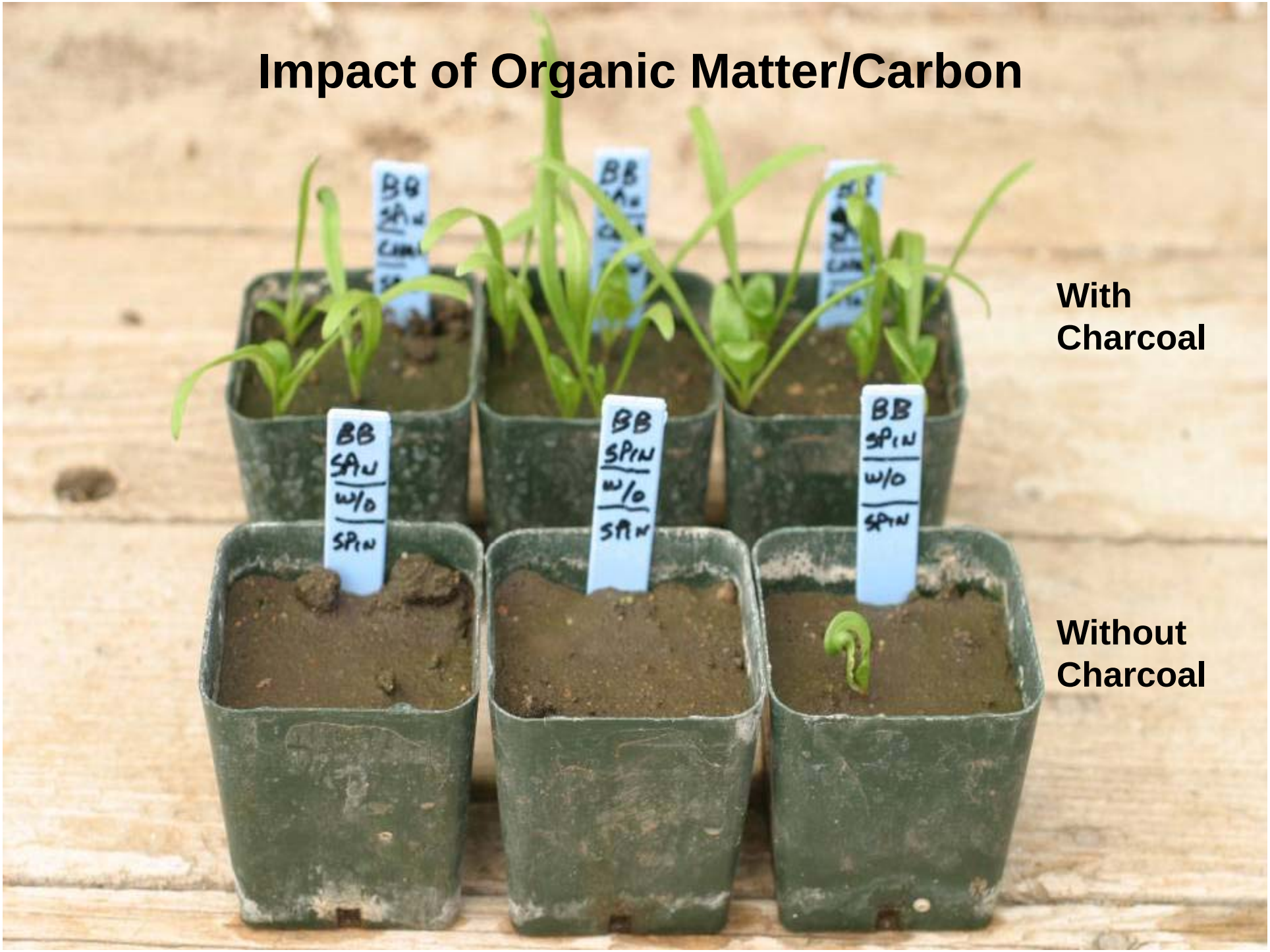
Incorporating Goal to 2 inches dilutes it by a factor of 8-16



Incorporating Goal to 4 inches dilutes it by a factor of 16 - 30



Impact of Organic Matter/Carbon



Use of Goal on Onions and Broccoli

with their thick waxy cuticles,
they shed the herbicide and are less
damaged than the weeds


Flag and 1st true leaf


2nd true leaf

Goal burn on onions

Goal 2XL

Goal Tender

1st true leaf

Goal Applied to Broccoli

Note burned areas on leaf