

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 is totally incompatible with lettuce production (occasionally in Hollister – hay growing area)**

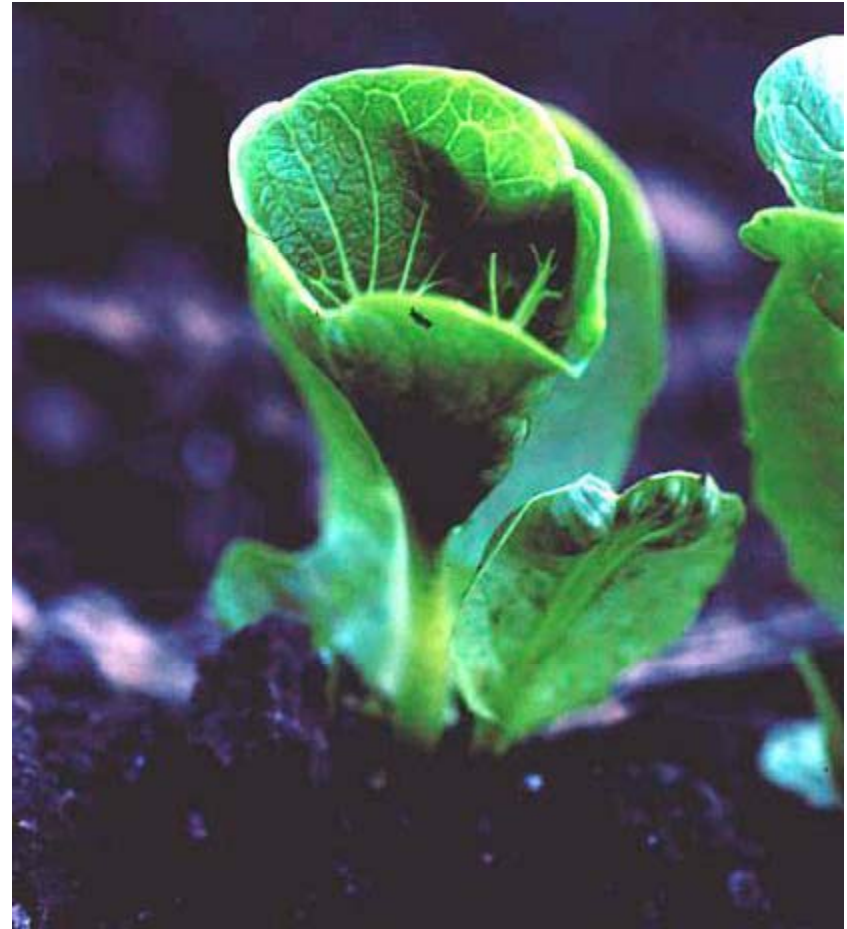
Plant growth regulators

- **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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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



Broccoli



Spinach

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



Increasing Damage



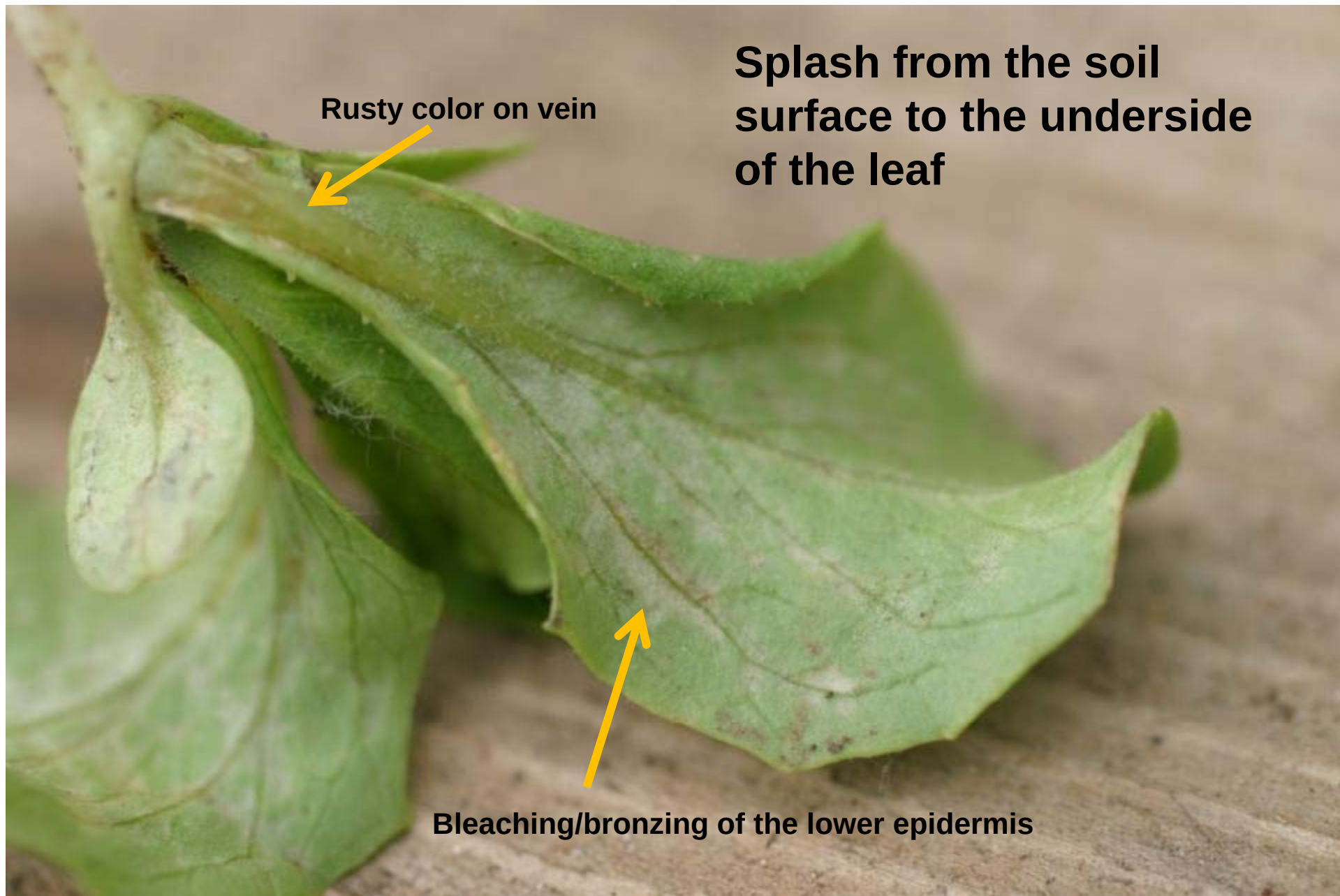
Moderate damage



Severe Damage



**Splash from the soil
surface to the underside
of the leaf**

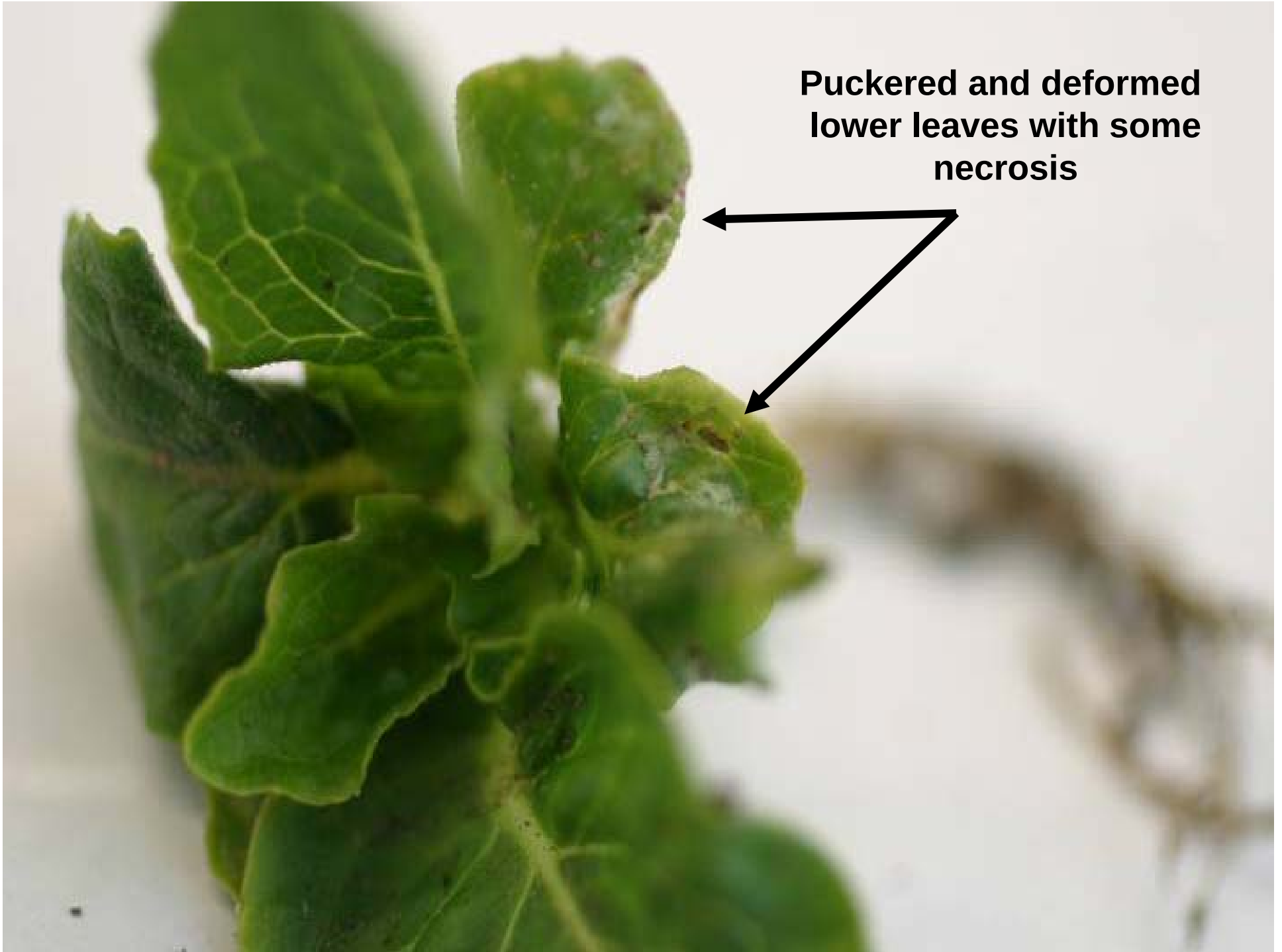


Rusty color on vein

**Splash from the soil
surface to the underside
of the leaf**

Bleaching/bronzing of the lower epidermis

**Puckered and deformed
lower leaves with some
necrosis**



Normal



moderate



severe



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



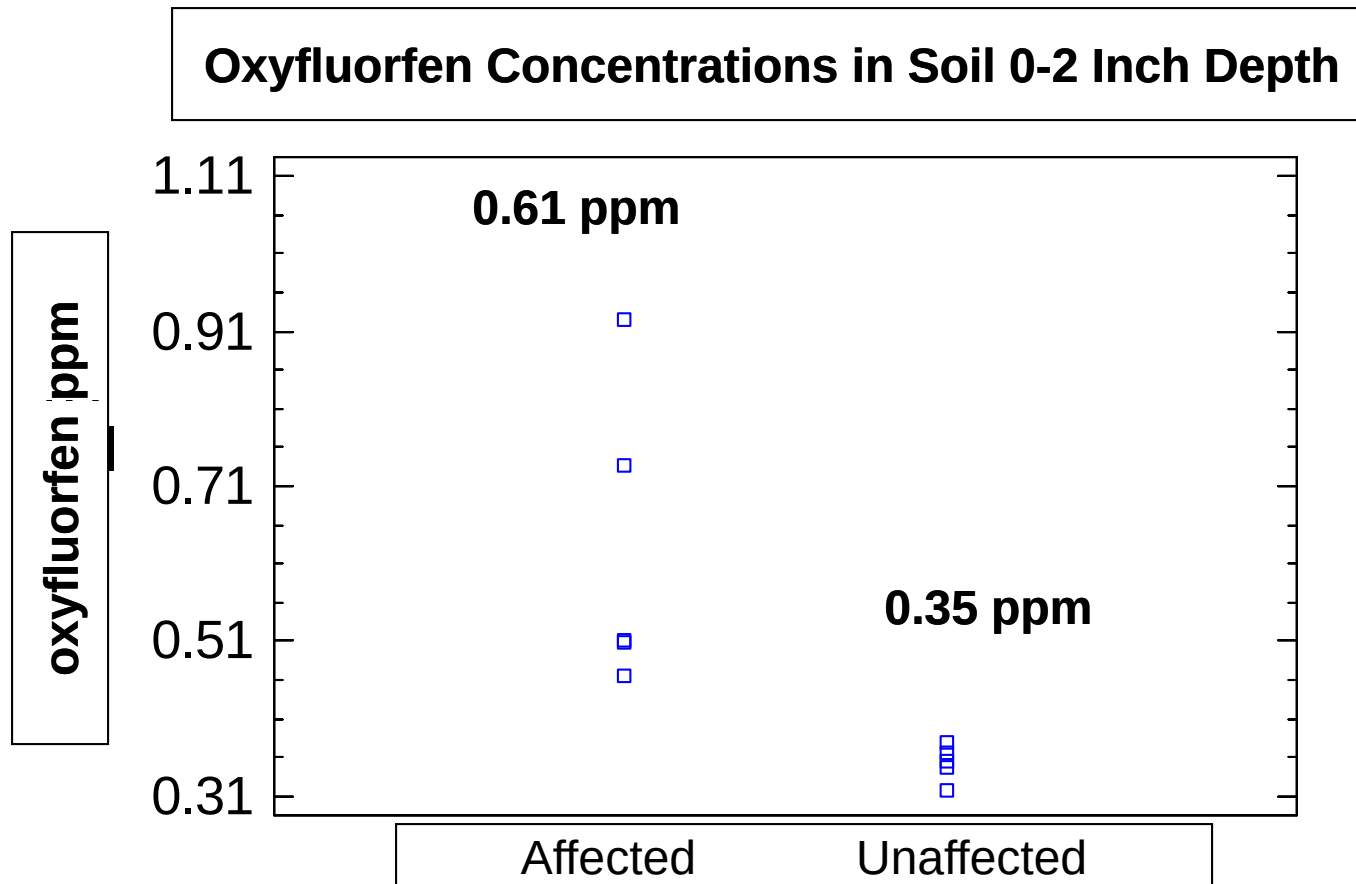
**Sickle shaped and
burned off at tips
no burn at soil line**

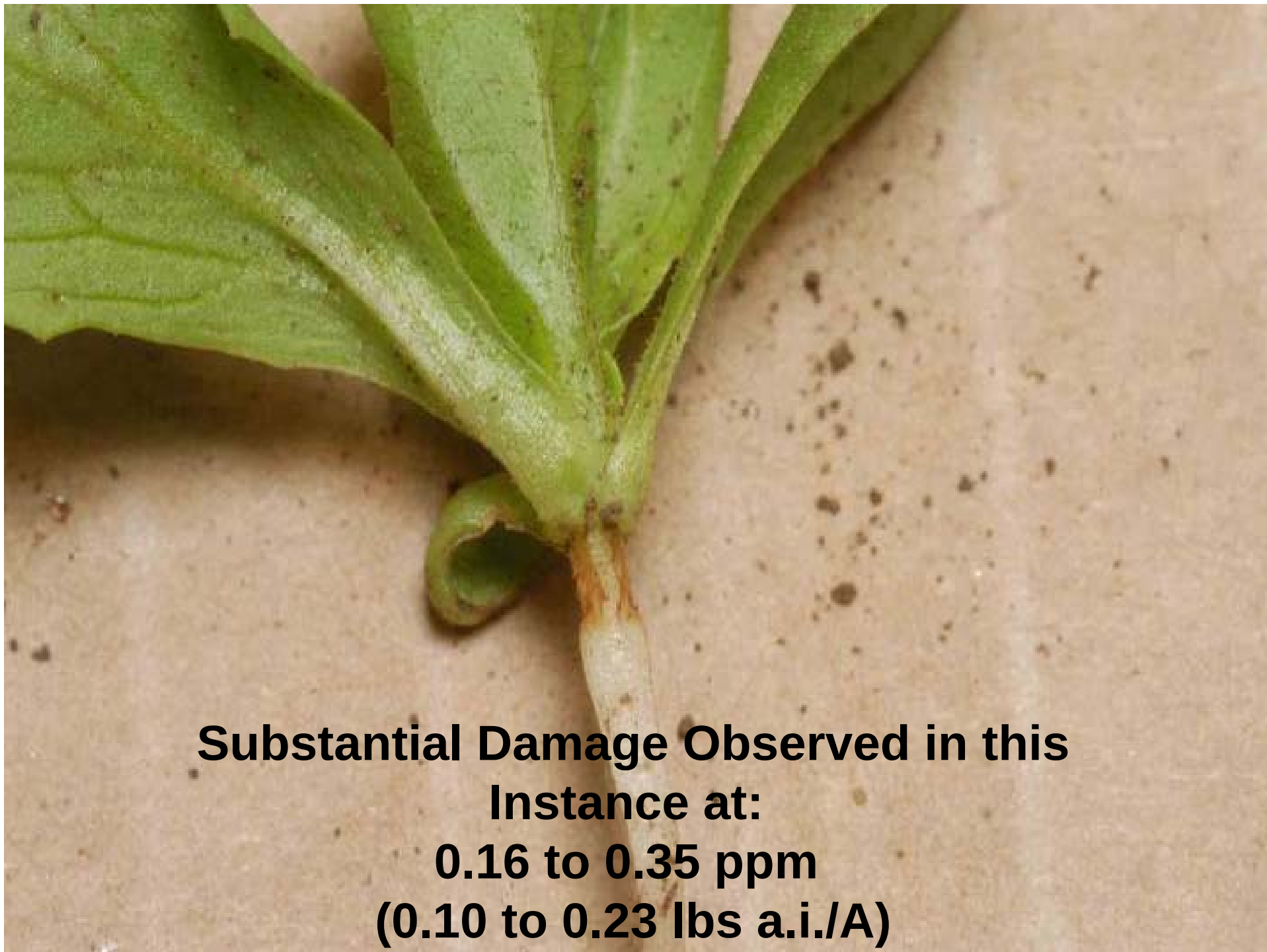
Goal Damage



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

Goal residues in the Soil and Symptoms on Spinach Plants

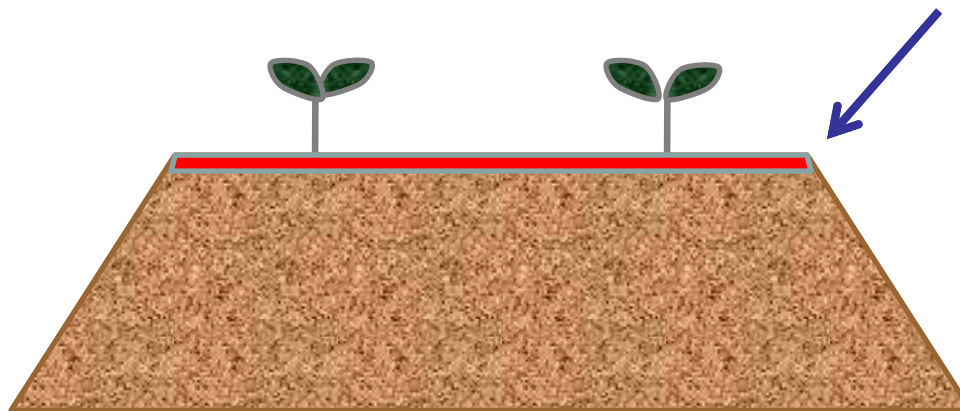




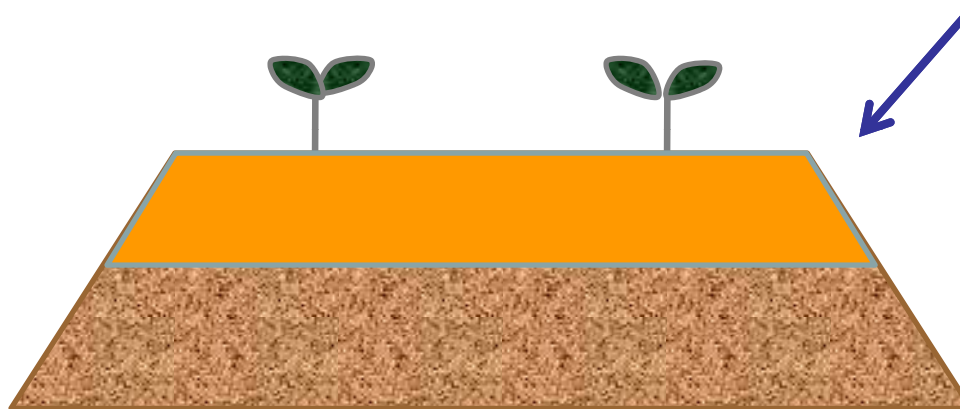
**Substantial Damage Observed in this
Instance at:**

**0.16 to 0.35 ppm
(0.10 to 0.23 lbs a.i./A)**

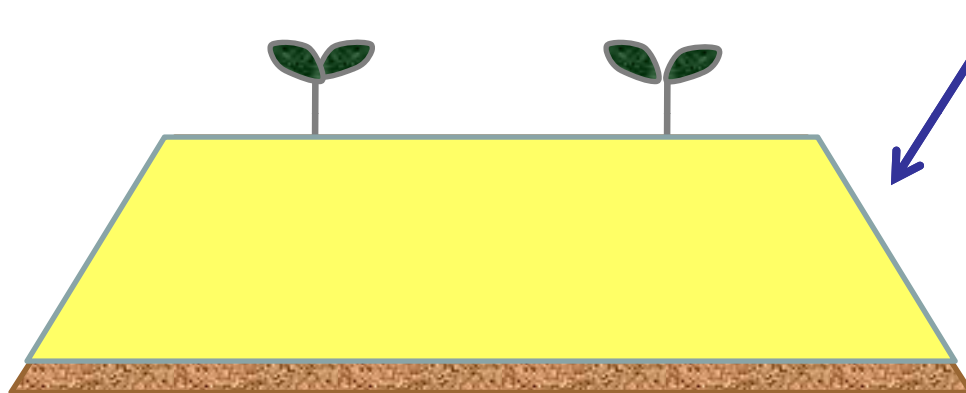
**At application, 0.50 lb
a.i./A of Goal is
concentrated in the
top 1/8 to 1/4 inch**



**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



**With
Charcoal**

**Without
Charcoal**

Use of Goal on Onions and Broccoli

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



Goal burn on onions



Goal 2XL



Goal Tender

1st true leaf



Goal Applied to Broccoli

Note burned areas on leaf

