

Understanding the Risk of Herbicide Drift to Horticultural Crops

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Definition of Drift

- Droplets containing the chemicals which are not deposited on the target area.
 - Droplets $< 150 \mu\text{m}$ in diameter are most prone to drift.
 - Diameter of human hair = $17 - 181 \mu\text{m}$.

University of Missouri Study

- 48% controlled by spray equipment.
- 32% controlled by low wind.

Low wind and proper equipment account
for 80% of drift potential



Causes of Drift

Spray Equipment



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Droplet Size

- A spray under pressure breaks up the solution into droplets of varying sizes.

The smaller the nozzle size and the greater the spray pressure, the smaller the droplets.



Nozzle Height

- The greater the distance a droplet has to travel between the nozzle tip and the crop, the greater the impact of wind has on it.

Do not spray at heights greater or smaller than the recommended height for the nozzle used.



Operating Speed

- Increased tractor speed will cause spray to be lifted back up and will increase chances of drifting of small droplets.

TeeJet Recommendation

Max speed of 10-13 mph.

As wind increases, reduce operating speed.



Causes of Drift Weather



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Soil Temperature

- High soil temperature (little crop cover) = hot air
- Hot air will stop downward travel of fine droplets.

Not a problem in early season sprays.



Wind Velocity

- Greatest impact on drift
- Increased wind causes increased drift.
- Early morning and early evening are usually the most calm.



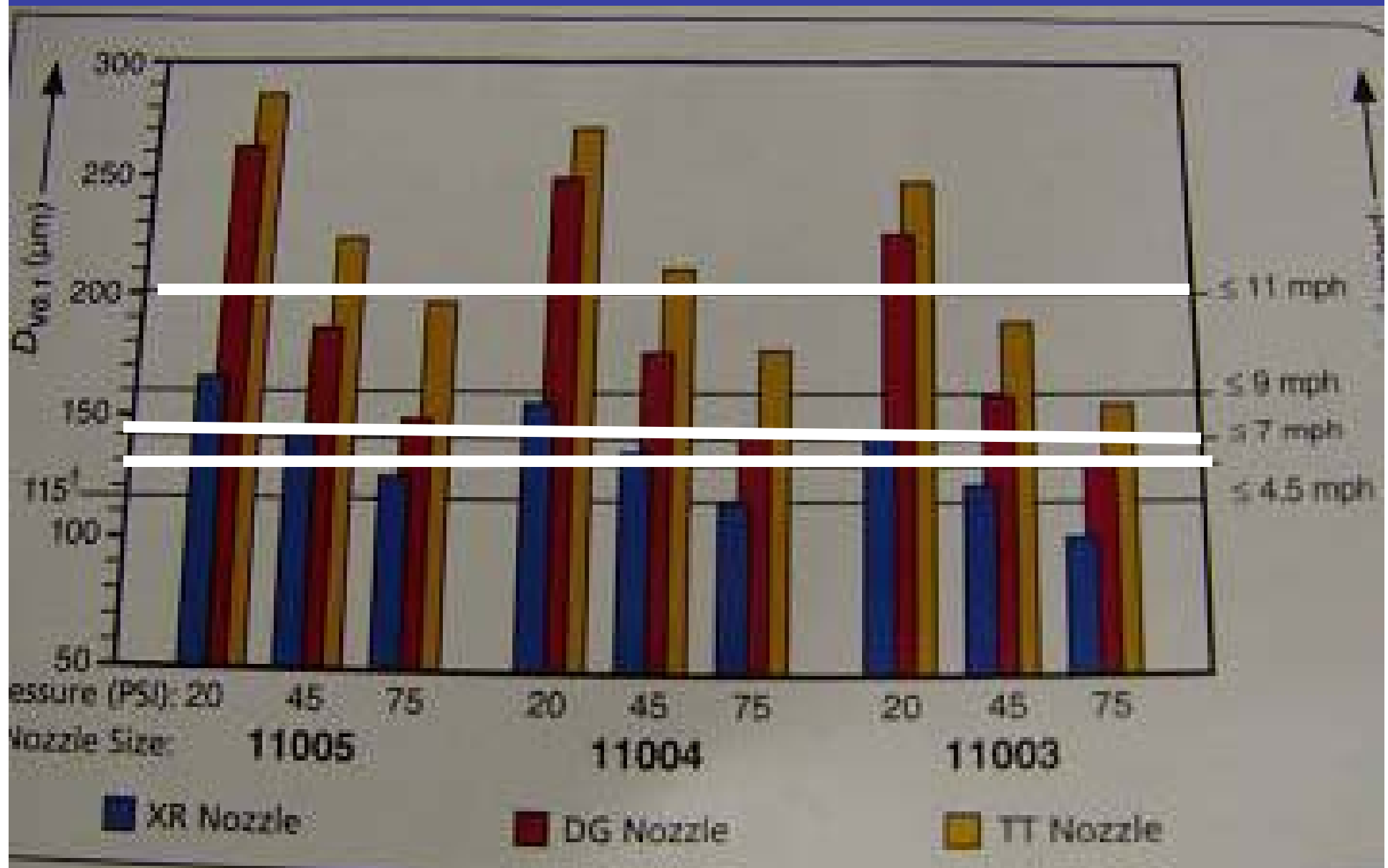
Wind Velocity

TeeJet Recommendations

- Low wind: spray at recommended nozzle pressures.
- Windy: reduce spray pressure AND increase droplet size (by increasing nozzle size).



Droplet Size vs. Spray Pressure



Wind Velocity and Drop Size

TeeJet Recommendations

- Up to 4.5 mph – Min. Drop Size 130 μm
- Up to 7 mph – Min. Drop Size 140 μm
- Up to 9 mph – Min. Drop Size 160 μm
- Up to 11 mph – Min. Drop Size 200 μm



From Chart Above

- If wind is up to 4.5 mph, DO NOT USE
 - XR 11005 at 75 psi
 - XR 11004 at 75 psi
 - XR 11003 at 45 and 75 psi
- If wind is up to 7 mph, DO NOT USE
 - XR 11005 at 75 psi (borderline)
 - XR 11004 at 45 and 75 psi
 - XR 11003 at 45 and 75 psi
 - DG11003 at 75 psi (borderline)



From Chart Above

- If wind is up to 11 mph, USE ONLY
 - TT 11003, 11004, 11005 at 20 psi
 - TT 11004, 11005 at 45 psi
 - DG 11003, 11004, 11005 at 20 psi



Air Temperature and Humidity

- Drift is highly likely if temperature $> 77^{\circ}\text{F}$ with low RH.

High temperature during spraying may require suspending spraying.



Agronomic Herbicides Used in Early Season Field Preparation

Extension Publication 'AGR-6'



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Some herbicides listed in AGR-6:

Atrazine: Pn Inhibitor: PRE, PO

2,4-D: Growth Regulator

Dicamba: Growth Regulator

Gramoxone: Non-Selective

Glyphosate: Non-Selective

Expert (Atr+Met+Gly): Burndown

FieldMaster (Atr+Acet+Gly): Burndown



Caution Statements



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Dicamba, 2,4-D

- Be cautious ... near sensitive .. crops, such as tobacco, soybean, vegetables, or ornamentals plants and avoid potential injury caused by spray drift.
- Do not apply if winds are over 5 mph.



Gramoxone, Glyphosate

- Be extremely cautious to prevent drift to desirable plants



Other Herbicides

- Beacon: To reduce drift, do not apply when winds are in excess of 10 mph.
- Callisto, Celebrity Plus: Take necessary precautions to reduce potential for spray drift.
- Marksman: To reduce drift, do not apply when winds are in excess of 5 mph.



No-Till Corn

Extension Publication 'AGR-100'



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- Corn should be planted **before May 10** in Western Kentucky and May 20 in Eastern Kentucky for top yield potential.
- A contact herbicide is necessary to kill the existing vegetation.
- A herbicide or herbicide combination with residual action is required to effectively control late-germinating weeds.



- In many years, it is necessary to use ... dicamba or 2,4D to reduce pressure from broadleaves and vines (weeds)...
- ... use an ample volume of spray mixture to provide thorough coverage of the vegetation. A minimum of 40 gallons of solution per acre is required for complete, uniform coverage.

What's Obvious to me ?

No mention of 'Grape' at all in
AGR-6 or AGR-100.

This is by no means a fault of the publications.

Obviously, they can't be all-inclusive.



What do the full labels say ?



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Clarity, 2,4-D Labels

- May cause injury to ... fruit trees, grapes, ornamentals ... tomatoes.
- These plants are most sensitive to Clarity during their development stage.



Beacon Label

- Grape, tomato: not mentioned
- Avoid all direct or indirect contact (such as spray drift) of Beacon with crops other than those recommended for treatment on this label, since injury may occur.



Callisto Label

- Grape, tomato: not mentioned
- Do not apply when weather conditions may cause drift to non-target areas.
- Drift may result in injury to adjacent crops and vegetations.



Celebrity Plus Label

- Grape, tomato: not mentioned
- Many crops are highly sensitive...
- All direct or indirect contact (such as spray drift) with crops other than field corn must be avoided.



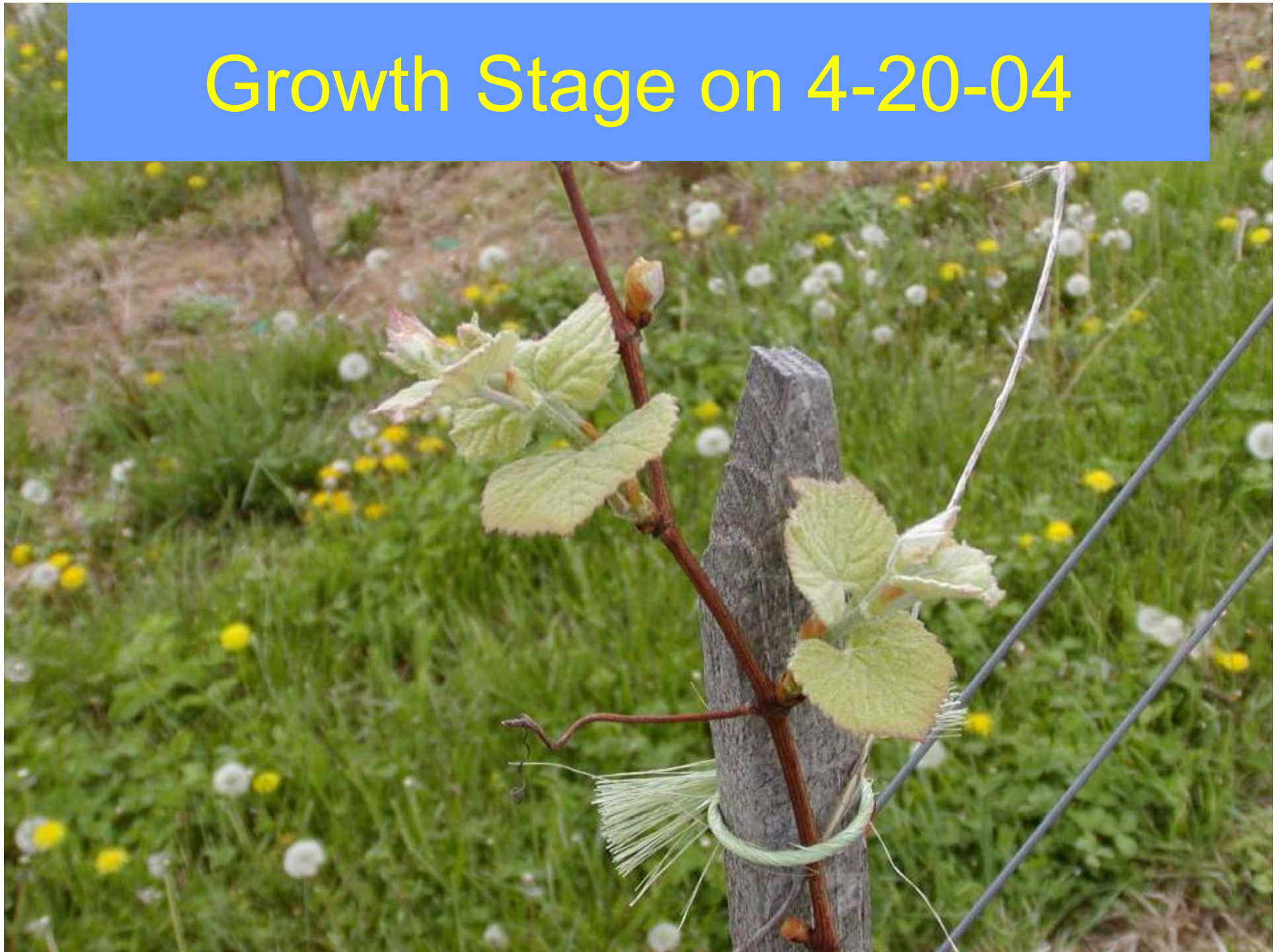
Case Study

Drift Injury ?



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Growth Stage on 4-20-04





What do you see here?

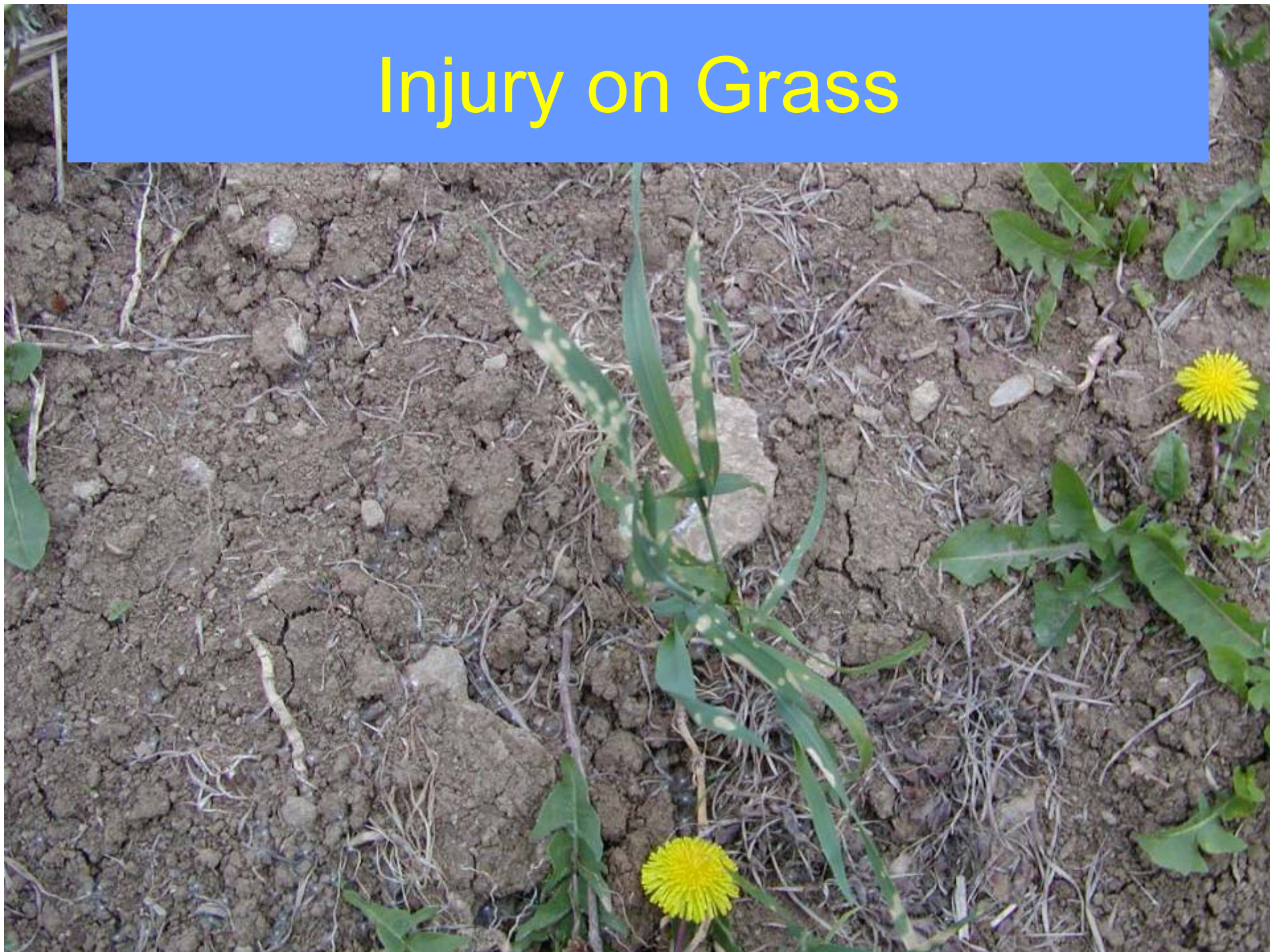


Closer Look at the Sprayed Field
in Background
Source of Drift ?

Injury on Alfalfa



Injury on Grass



Spray Information

- Neighbor is a commercial applicator.
- On windy days, he sprays his farm.
- Neighbor says he is using drift-retardants.
- Drift burn on grass, alfalfa 150-200 ft in row.
- Grape row end is 100 ft from fence and another 100 ft from sprayed area.



Injury Symptoms from Herbicide Drift



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2,4-D - Grape

2,4-D - Cantaloupe



2,4-D - Watermelon



Roundup - Grape



Roundup - Grape



Injury not caused by Herbicides



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Frost Damage



Potato Leaf Hopper



Sulfur Residue in Tank



Insecticide Injury - Tomato



Recommendations

- Calibrate equipment:
 - check output
 - clean nozzle and air intake (if available)
 - clean strainer
 - adjust boom height
- Regularly check wind speed (don't guess)



Recommendations

- Use Drift Guard (DG), Air Induction (AI), or Turbo TeeJet (TT) low drift nozzles.
- Don't go for the largest droplet size possible (best for low drift potential), because of reduced coverage and effectiveness.
- Keep a supply of various nozzle types on hand



Recommendations

- Spray early am when wind is still calm.
- Add drift retardant
- Drive at low speed (best if ≤ 5 mph)
- Use large spray volume (40-60 gpa)
- Use lowest pressure possible
- Have a copy of TeeJet Catalog and read it cover to cover.



Bottom Line

- We have the technology:
 - Drift retardants
 - Nozzles
 - Weather stations
 - More

“Why can’t we all just get along”



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