



Weed Management in Small Fruits, SRSFC County Extension Agent Training

Savannah International Convention Center, Savannah, GA, January 10-11, 2013

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the
Southern Region
small fruit consortium



WEED MANAGEMENT IN SMALL FRUITS

SRSFC SPONSORED COUNTY AGENT TRAINING

January 10-11, 2013

**Savannah International Convention and Trade Center
Savannah, Georgia**

**In cooperation with
2013 Southeast Regional Fruit
and
Vegetable Conference**

INDUSTRY SPONSORS

Syngenta

NovaSource

Gowan

AMVAC

DuPont

Weed Management in Small Fruits
SRSFC County Extension Agent Training

Room 203

Savannah International Convention Center, Savannah, GA

January 10-11, 2013

Thursday, January 10, 2013

Presiding-Allen Straw, VA Tech

8:00 a.m. Continental Breakfast Room 203, Convention Center

8:30 a.m. Welcome-Tom Monaco, Coordinator, SRSFC

8:40 a.m. Sprayer equipment calibration-Brian Nance, H&H Sprayers, Union County, NC

10:00 a.m. Hands on Sprayer calibration-parking lot of convention center

12:00 p.m. Sponsored Lunch, Room 203, Convention Center

Presiding-Allen Straw, VA Tech

1:00 p.m. Weed Management in Blueberries-Mark Czarnota, University of Georgia

2:00 p.m. Weed Management in Grapes-Wayne Mitchem, NC State Univ, Clemson Univ and Univ of GA.

3:00 p.m. Break

3:15 p.m. Weed Management in Caneberries-Wayne Mitchem, NC State Univ., Clemson Univ., and Univ of GA

4:00 p.m. Weed Management in Strawberries-Katie Jennings, NC State University

5:00 p.m. Adjourn

Friday, January 11, 2013

See <http://sregionalconference.com/documents/vegsessions.pdf>

Morning-Attend session 2,4-D / Dicamba Resistant Crop Technology and Protection of Sensitive Crops.

9:30 – 10:00 Culpepper: The need and benefits of 2,4-D or Dicamba weed management systems in resistant cotton/soybeans

10:00 – 10:30 (DOW AgroScience) Protecting the specialty grower while providing 2,4-D resistant technologies to the agronomic grower.

10:30 – 11:00 (Monsanto) Protecting the specialty grower while providing Dicamba resistant technologies to the agronomic grower.

Afternoon-Attend session on methyl bromide replacements

1) Stanley Culpepper will present update on his fumigation research and 2) US EPA will discuss regulations/buffers for soil fumigants. The session will be 1:30 to 2:55 on Friday.

the
Southern Region
small fruit consortium



History

- 1999 Meeting
- MOU 2000 NC State, Clemson, Univ of GA
- 2002 Univ of TN
- 2005 VA Tech
- 2008 Univ of Arkansas
- Six Member Institution
- Annual Budget \$210,000

Objectives

- Pool expertise
- County Agent Training
- Promote Research
- Education
- Web site

Grant Program

- Goal-provide funding for applied research and extension activities
- Competitive
- Seed Grants-maximum of \$5000
- Total amount awarded 2001-2012= \$1 million
- Reports posted on SRSFC website
- <http://www.smallfruits.org/SRSFCReserchFunding/index.htm>

County Extension Agent Training

- Enhance expertise in small fruit production
- Twenty two trainings since 1999
- A total of 550 agents from the member states have attended
- Scholarships awarded to cover cost of training, 4 to 5 per member state
- Events held in the member states

Blueberry Workshop June 2007



Muscadine Workshop 2006



Pruning Workshop 2006

Walterboro, South Carolina



Strawberry Training 2008

Charlotte, North Carolina



Blackberry Training 2009

Lincolnton, North Carolina



SRSFC Web Site

www.smallfruits.org

Web Master Brenda Willis UGA

- Hits per day 4,000
- Contents
 - SFN-published quarterly
 - IPM/Production Guides
 - Crops
 - County Agent Trainings
 - Research and Ext Grants

Other Activities

- Sponsorships of small fruit meetings/conferences
- Travel grants for county agents
- Support of state extension meetings
- Recruiting membership
- Partnering in Specialty Crops Grants
- Grant writing
- Publication sponsorships

USDA NIFA Award to SRSFC

- The SRSFC received the 2012 NIFA Partnership Award in Multi State efforts. Only one of these presented per year in the US
- Citation- "For successful regionalization focusing on improving the knowledge base and service to small fruit growers in the southern region of the United States"

January 10-11, 2013 Training

- Reimbursement questions?
- SE Regional Fruit and Veg Conference
- Evaluations

January 10-11, 2013 Training

- Organizers-Allen Straw, Tom Monaco, Wayne Mitchem

Corporate Sponsors

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Technology for Safe and Accurate Application





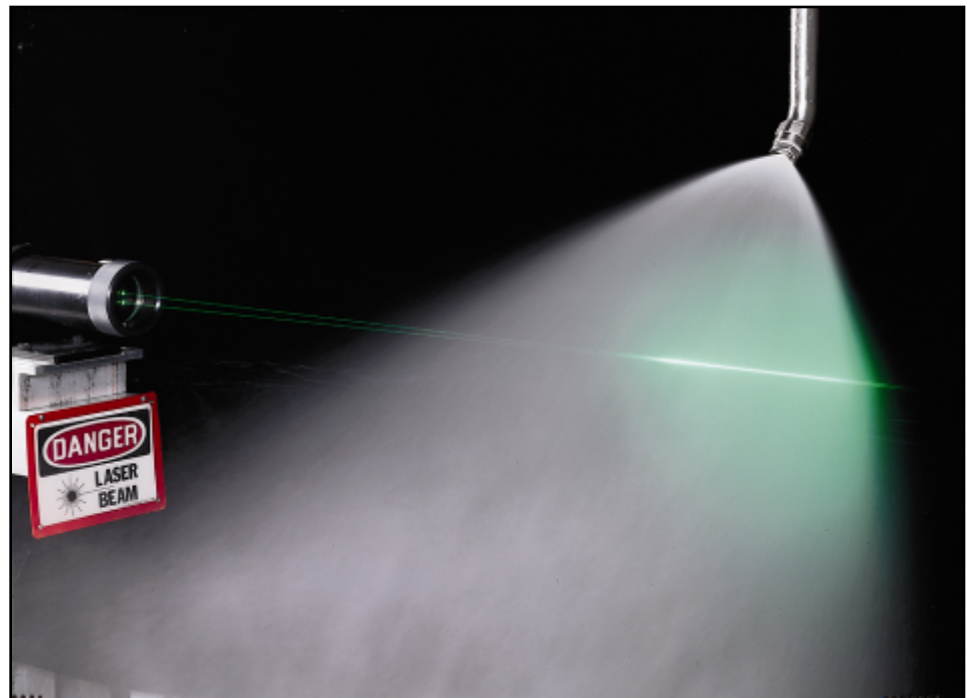
FUNCTIONS OF A SPRAY NOZZLE



1. Control the flow rate
2. Form droplets
3. Disperse droplets into specific patterns

DEFINING SPRAY DROPLETS

- For a given pressure, a spray tip will produce a range of droplet sizes
- Droplet size is measured in microns (micrometers)



COMPARISON OF MICRON SIZES (APPROXIMATE)

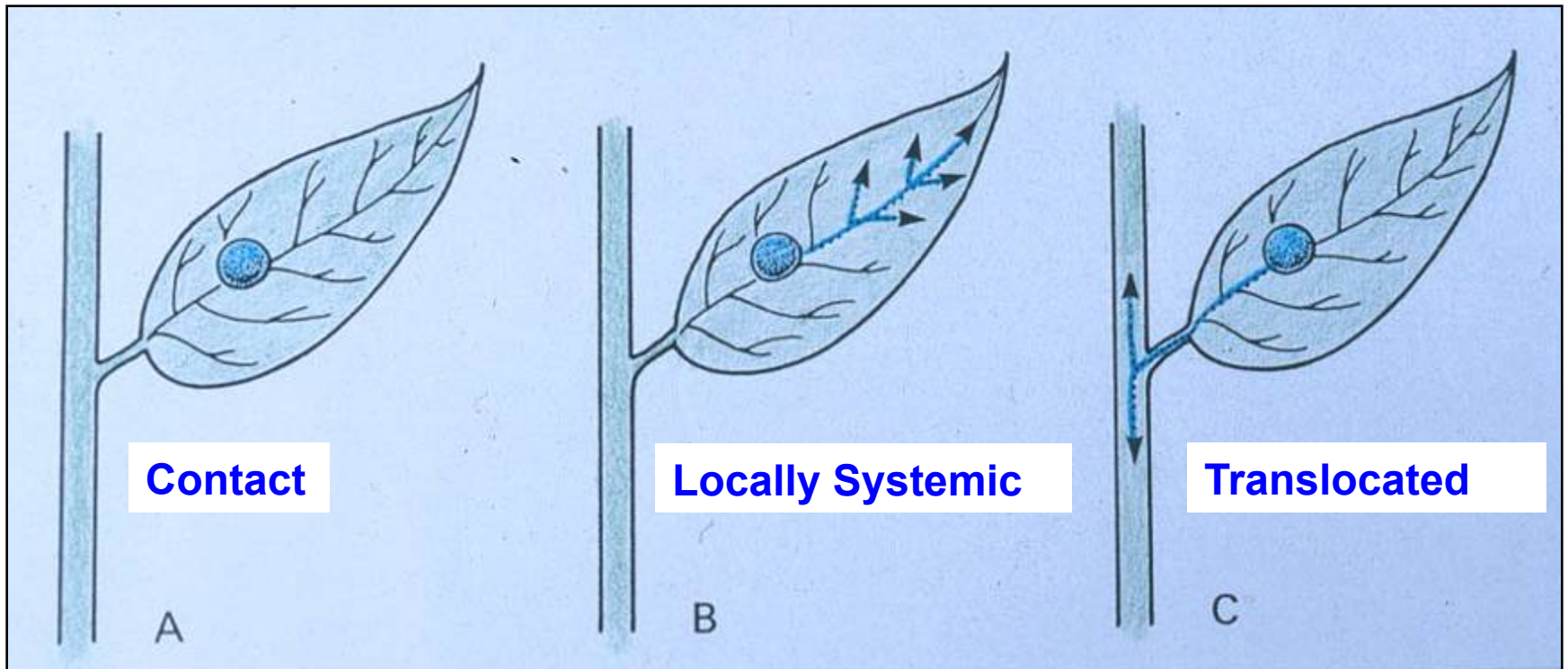
- 2000 μm
- 850 μm
- 420 μm
- 300 μm
- 150 μm
- 100 μm
- #2 Pencil lead
- paper clip
- staple
- toothbrush bristle
- sewing thread
- human hair



Cutting Droplet Size in Half Results in Eight Times the Number of Droplets



MODE OF ACTION IS A MAJOR FACTOR IN NOZZLE SELECTION



Droplet Size Categories


ASAE Standard S572.1*

Category	Symbol	Color Code	Approximate Dv0.5 (VMD)
Extremely Fine	XF	Purple	≈50
Very Fine	VF	Red	<136
Fine	F	Orange	136-177
Medium	M	Yellow	177-218
Coarse	C	Blue	218-349
Very Coarse	VC	Green	349-428
Extremely Coarse	XC	White	428-622
Ultra Coarse	UC	Black	>622


*Data extracted from American Society of Agricultural Engineers (ASAE) Standard S572. Data is an average of three laser measuring instruments (Malvern, PMS, and PDPA) and is based on the following droplet size studies:

- 1) Womac, A.R., R.A. Maynard, I.W.Kirk.1999. Measurement variations in reference sprays for nozzle classification, Transactions of the ASAE 42(3):609-616
- 2) Womac, A.R., 2000. Quality control of standardized reference spray nozzles, Transactions of the ASAE 43(1):47-56.


NOZZLE CLASSIFICATION

	PSI										
	15	20	25	30	35	40	50	60	70	80	90
TT11001	C	M	M	M	M	M	F	F	F	F	F
TT110015	C	C	M	M	M	M	M	M	F	F	F
TT11002	C	C	C	M	M	M	M	M	M	M	F
TT11003	VC	VC	C	C	C	C	M	M	M	M	M
TT11004	XC	VC	VC	C	C	C	C	C	M	M	M
TT11005	XC	VC	VC	VC	VC	C	C	C	C	M	M
TT11006	XC	XC	VC	VC	VC	C	C	C	C	C	M
TT11008	XC	XC	VC	VC	VC	VC	C	C	C	C	M


XR TeeJet® (XR) and XRC TeeJet® (XRC)

	PSI						
	15	20	25	30	40	50	60
XR8001	M	F	F	F	F	F	F
XR80015	M	M	M	F	F	F	F
XR8002	M	M	M	M	F	F	F
XR8003	M	M	M	M	M	M	F
XR8004	C	C	M	M	M	M	M
XR8005	C	C	C	C	M	M	M
XR8006	C	C	C	C	C	C	C
XR8008	VC	VC	VC	C	C	C	C
XR11001	F	F	F	F	F	VF	VF
XR110015	F	F	F	F	F	F	F
XR11002	M	F	F	F	F	F	F
XR11003	M	M	M	F	F	F	F
XR11004	M	M	M	M	M	F	F
XR11005	M	M	M	M	M	M	F
XR11006	C	C	M	M	M	M	M
XR11008	C	C	C	C	C	M	M

TwinJet®

	PSI				
	30	35	40	50	60
TJ60-11002	F	F	F	F	F
TJ60-11003	F	F	F	F	F
TJ60-11004	M	F	F	F	F
TJ60-11006	M	M	M	M	M
TJ60-11008	C	M	M	M	M
TJ60-11010	C	C	C	M	M

DG TwinJet®

	PSI				
	30	35	40	50	60
DGTJ60-110015	F	F	F	F	F
DGTJ60-11002	M	M	M	F	F
DGTJ60-11003	C	M	M	M	M
DGTJ60-11004	C	C	C	C	M
DGTJ60-11006	C	C	C	C	C
DGTJ60-11008	C	C	C	C	C

Droplet size classifications are based on BCPC specifications and in accordance with ASAE Standard S-572 at the date of printing. Classifications are subject to change.

VF	F	M	C	VC	XC
Very Fine	Fine	Medium	Coarse	Very Coarse	Extremely Coarse

DROPLET SIZE - LABEL



Ground Spray Equipment

Spray nozzles should be uniformly spaced, the same size and type, and should provide accurate and uniform application. **Use spray nozzles that provide medium to coarse droplet size** to provide good coverage and avoid drift. Good weed coverage is essential for optimum weed control. Boom height for broadcast over-the-top applications should be based on the height of the crop – at least 15 inches above the crop canopy.

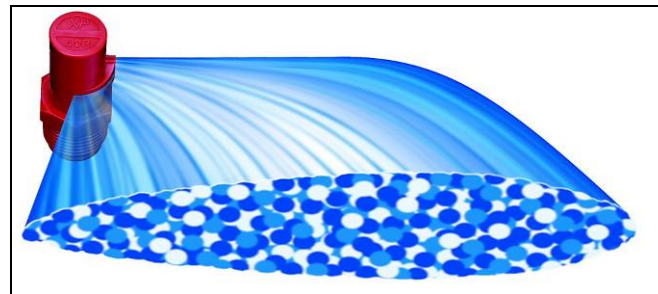
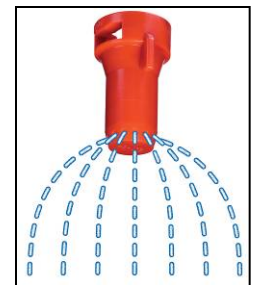
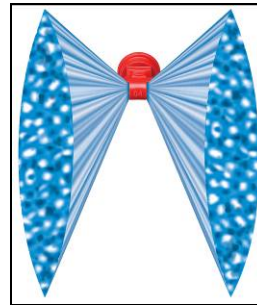
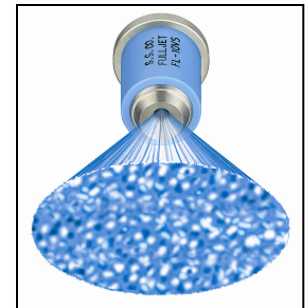
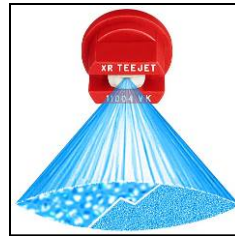
Apply in a spray volume of 10-30 gals./A. Use a pump that can maintain a pressure of at least 35-40 psi at the nozzles and provide proper agitation within the tank to keep the product dispersed. Lower pressures may be used with extended range or drift reduction nozzles. When weed foliage is dense, use a minimum of 20 gals.

Flat fan nozzles of 80° or 110° are recommended for optimum postemergence coverage. Do not use floodjet nozzles or controlled droplet application equipment for postemergence applications.

Nozzles may be angled forward 45° to enhance penetration of the crop and provide better coverage. Ensure that all in-line strainer and nozzle screens in the sprayer are 50-mesh or coarser.

NOZZLE PATTERNS & TYPES

- FLAT FAN
- TWIN FAN
- HOLLOW CONE
- FULL CONE
- SOLID STREAM
- BOOMLESS



OBJECTIVE IS TO OBTAIN THE
LOWEST CV (COEFFICIENT OF VARIATION)
ALONG THE BOOM

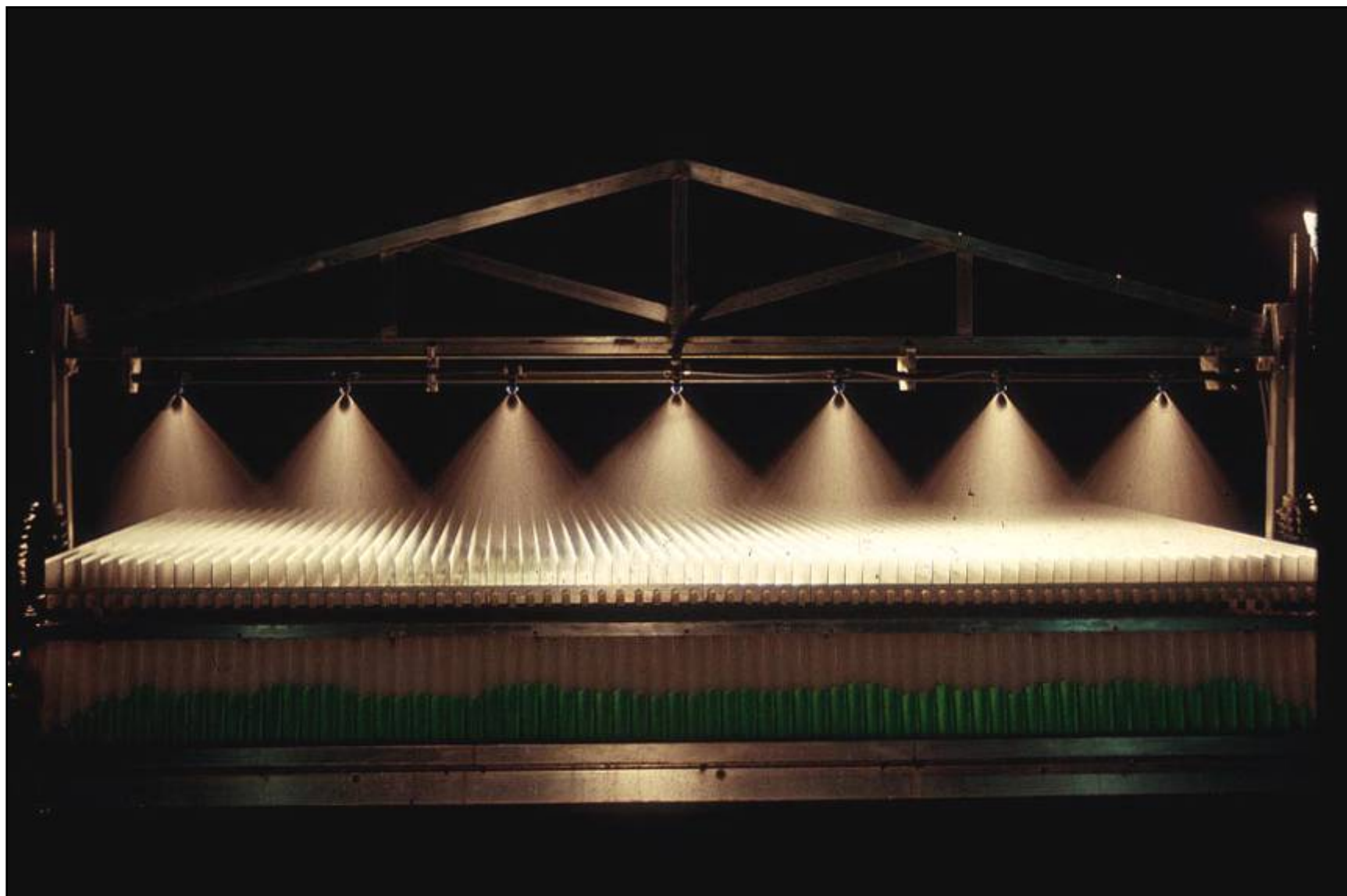


SET THE BOOM HEIGHT USING THE MANUFACTURER'S SPECIFICATIONS

The boom height is measured from the top of the plant canopy to the nozzle and is specific for the nozzle spray pattern

- 80 DEGREE NOZZLE= 1.5" HEIGHT FOR 1" SPACING ie. 20" spacing = 30" spray height
- 110-120 DEGREE = 1" HEIGHT FOR 1" SPACING ie. 20" spacing = 20" height
- OC AND BOOMLESS NOZZLES =
CHECK MANUFACTURERS
RECOMMENDATIONS!!!





- MINIMUM 30% OVERLAP OBTAINED EITHER FROM SPACING OR HEIGHT
- OPTIMAL 100% OVERLAP
- SOMETIMES HEIGHT AND OVERLAP ARE COINCIDENTAL(FUNGICIDES IN BEANS OR TALL BUSHY PLANTS)

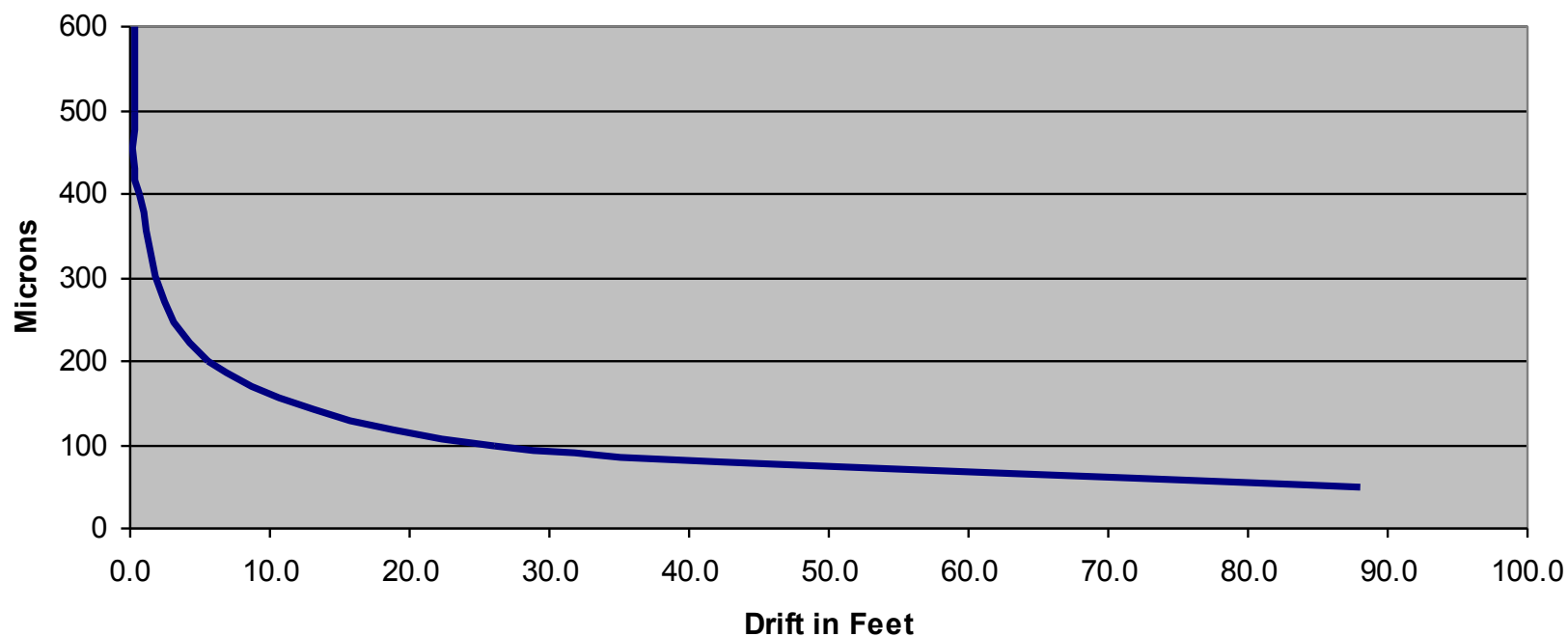
WHERE DO YOU WANT THE
CHEMICAL?

WHAT IS DRIFT?

Movement of spray particles and vapors off target causing less effective control and possible injury to susceptible vegetation and wildlife.

Adapted from National Coalition on Drift Minimization
1997 as adopted from the AAPCO Pesticide Drift
Enforcement Policy - March 1991

Water Droplet Drift in a 5 MPH Wind



DRIFT CONTROL STRATEGIES

- Spray at low wind velocities - early in the morning or late in the evening
- Reduce spraying pressures
- Consider using buffer zones

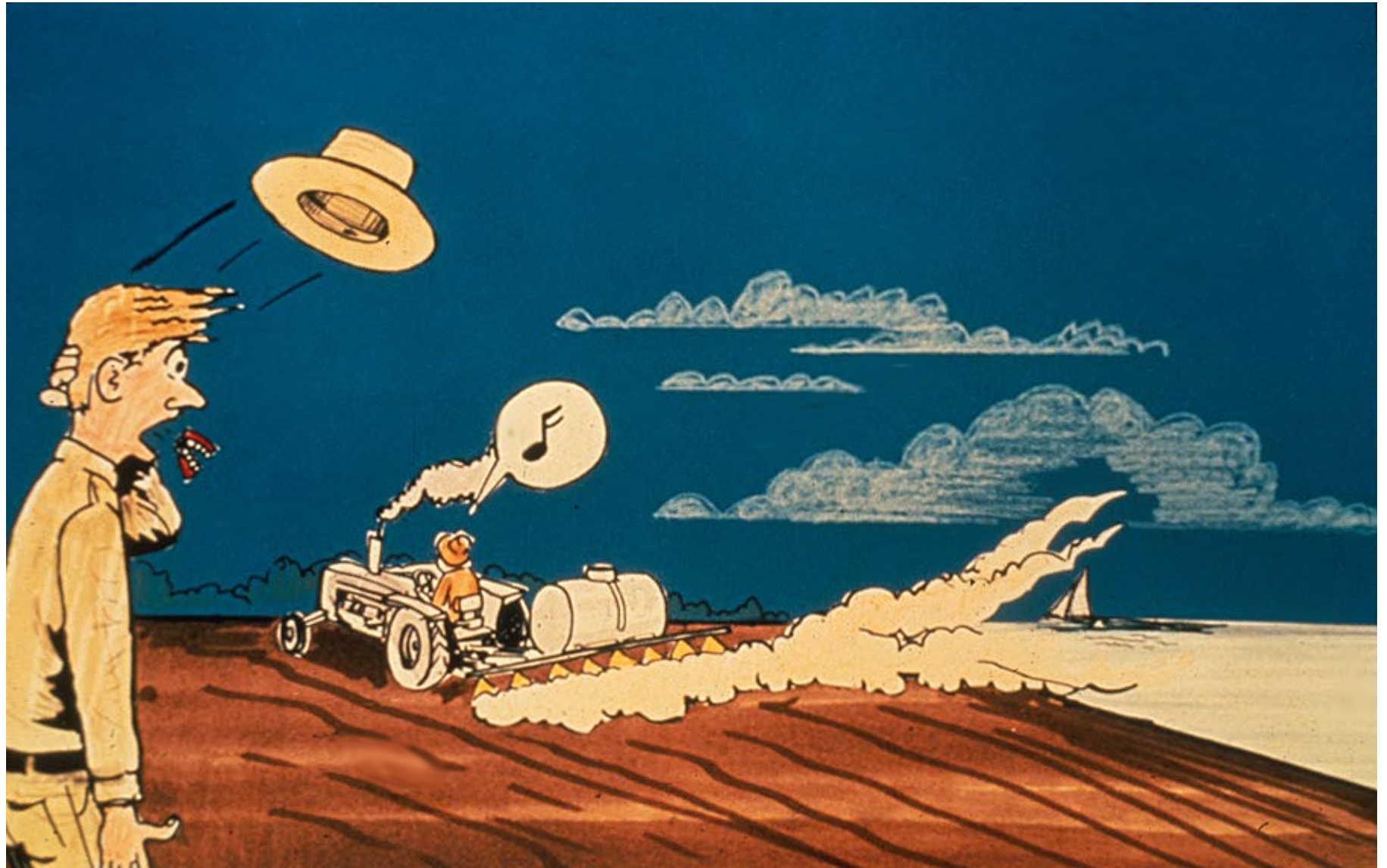


DRIFT CONTROL STRATEGIES

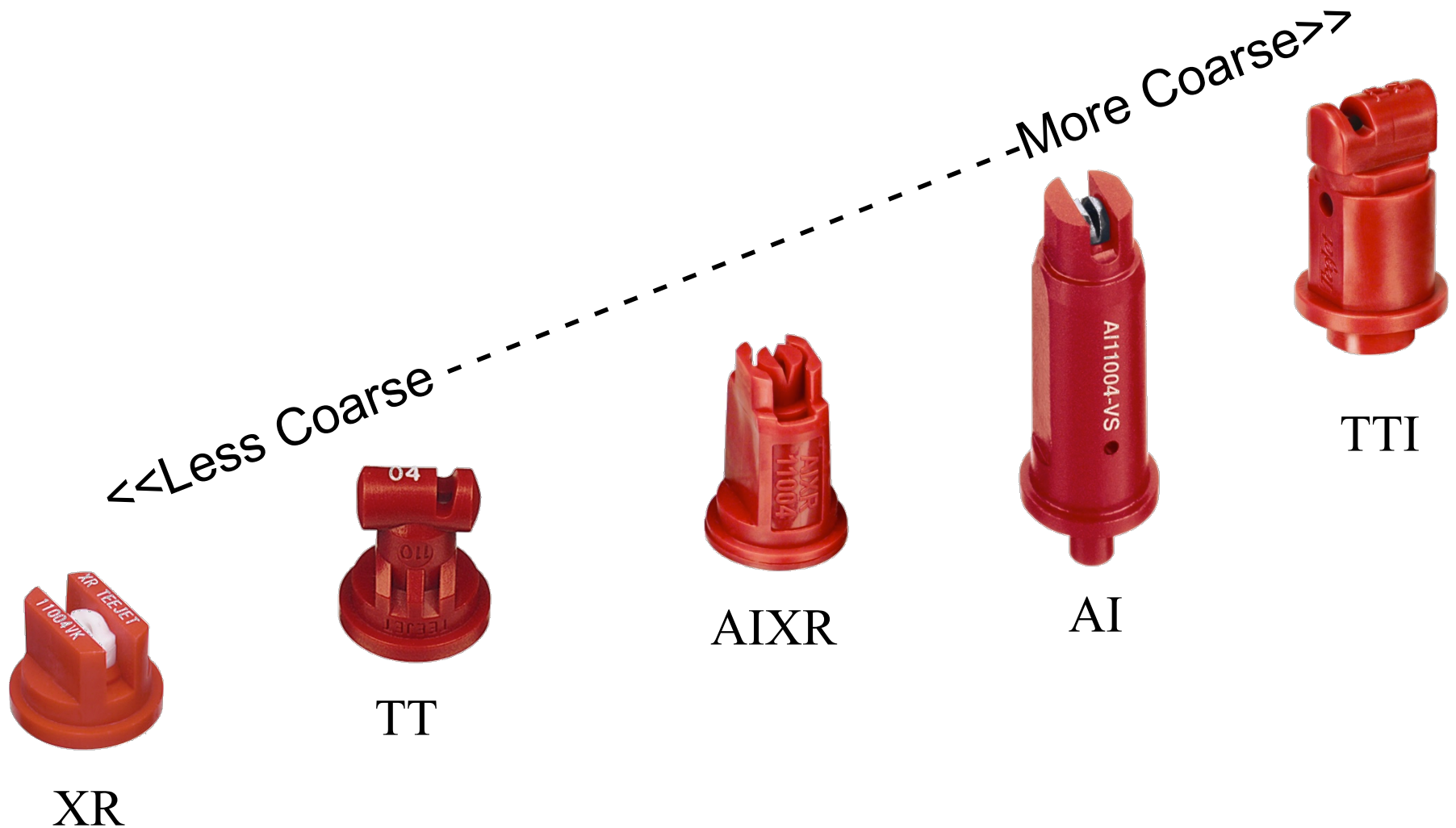
- Spray higher volumes
- Select the proper nozzles with larger spray particles
- Use lower spray (boom) heights



SPRAY TIPS ENGINEERED FOR DRIFT CONTROL



HOW DO THEY ALL FIT IN?

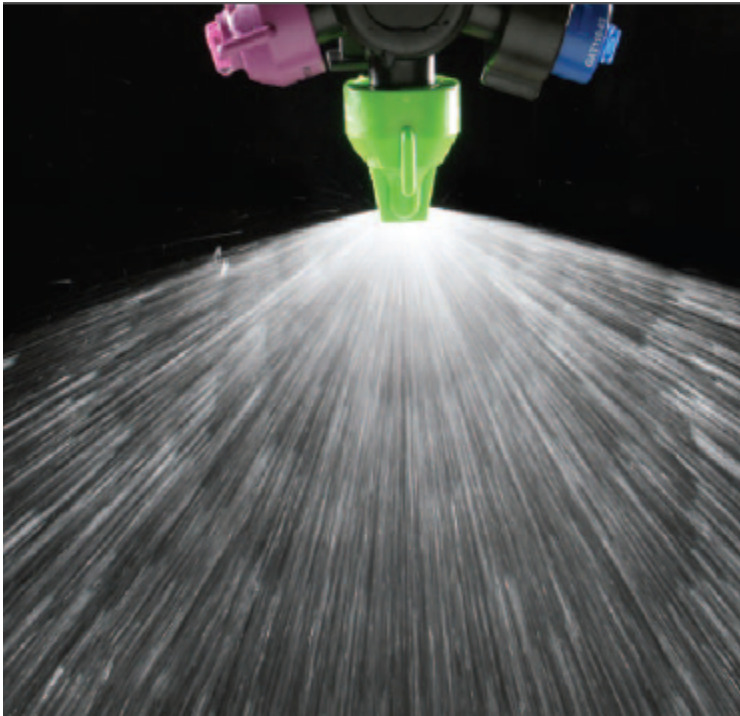


Category 1

Hi-Flow™



Pre-Emerge Broadcast Fertilizer



- Lay the building blocks the crop will use throughout the season.
- Requirements
 - High Flow, Uniformity
 - Extremely Course to Ultra Course Droplets

Category 2

Ultra[®] Lo-Drift tips

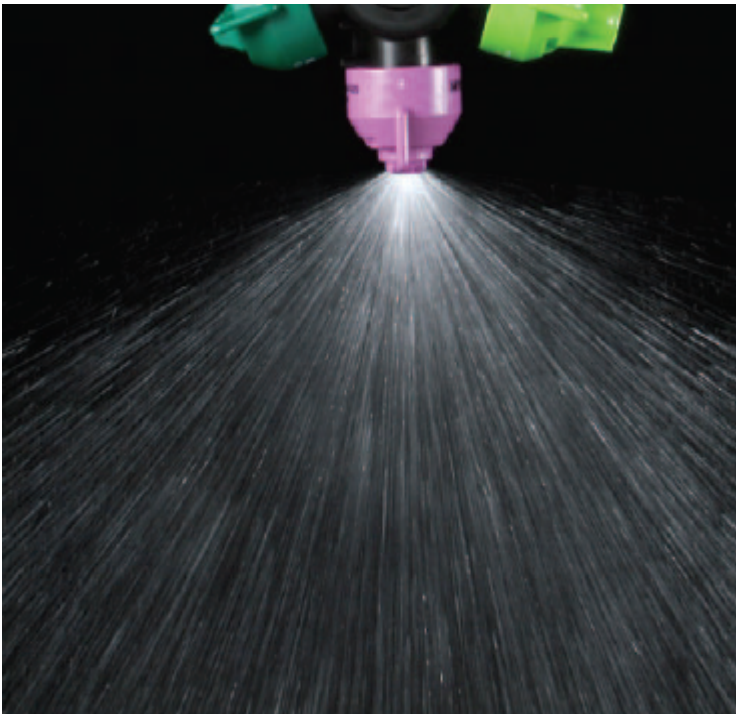


FRONT VIEW



Side View
Extra Wide Angle

Pre-Emerge Weeds



- Prevent weeds from becoming established competitors.
- Requirements:
Deposition on the soil,
Top-end speed.

Category 3, 4, 5

Guardian Family

Fungicide / Insecticides



Original Guardian
(non-air induced)



Guardian Air
(Air induced)



Guardian Air TWIN
(Air Induced Dual Spray)

Post-Emerge Plant Health



- Control insects and prevent disease from degrading the crop's ability to produce yield
- Requirements:
Uniformity, Canopy penetration, Enhanced coverage on foliage



Guardian

- An update on a good idea: pre-orifice low drift
- Wide & consistent spray pattern
- Reduced drift vs. standard tips
- Versatile spray incline for single or twin fan spraying
- Wide pressure range = wide speed range
- Cost-effective FastCap® Complete includes cap and strainer



← The guardian tip has an inclined spray pattern. Applicators will typically “alternate” each tip down the boom (front and back) to achieve a “Twin Spray” affect across the boom.



Guardian Air



ADVANTAGES

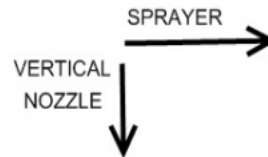
- Ideal air-induced spray tip for Fungicides and Insecticides
- Has been adapted for use in contact herbicides where the ULD droplets too large
- Droplets in the Medium to Course micron range
- More droplets per spray tip than any competitive air-induced spray tip (resulting in better coverage)
- More droplets for coverage than other venturi tips
- 50% to 75%+ less drift vs. standard fan tips
- Inclined spray enhances coverage – typical installed alternating pattern down the boom to get a twin spray affect
- Available as “ONE-PIECE” design including strainer, or as loose tips which fit standard spray caps.

Advantage of Inclined Spray Pattern

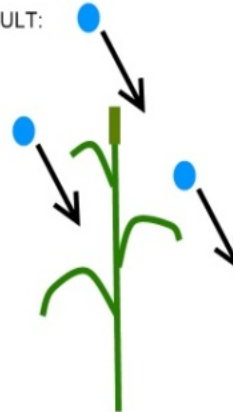
(Relative to Sprayer Direction and Speed)



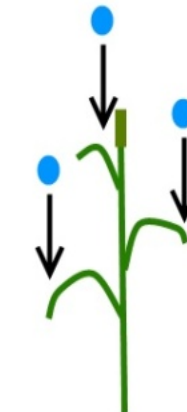
STANDARD PATTERN TIPS



RESULT:



HYPRO GUARDIAN AIR TIPS

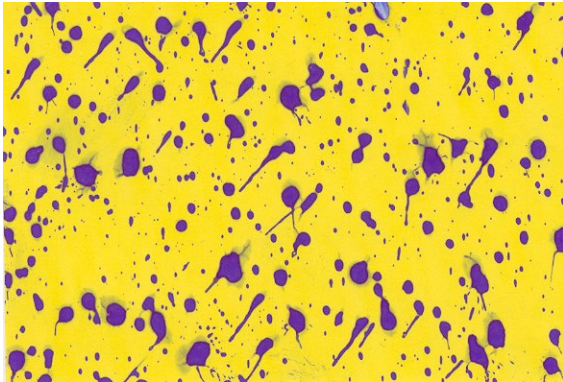


Guardian Air TWIN

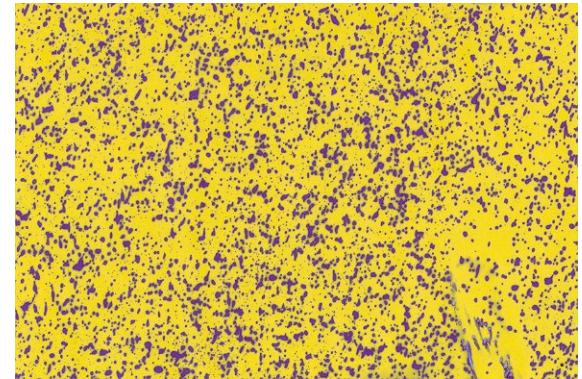
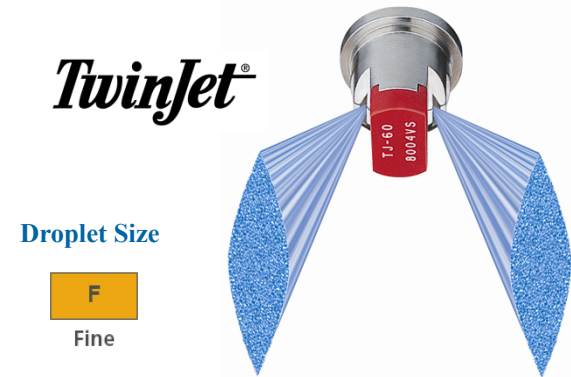
The Ideal Coverage Spray Tip for Fungicides and Insecticides



Coverage Difference

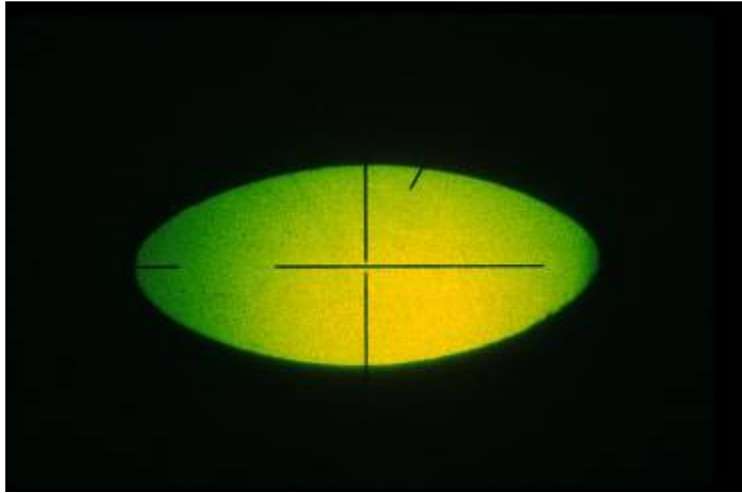


**Excellent for
Systemic Herbicide**



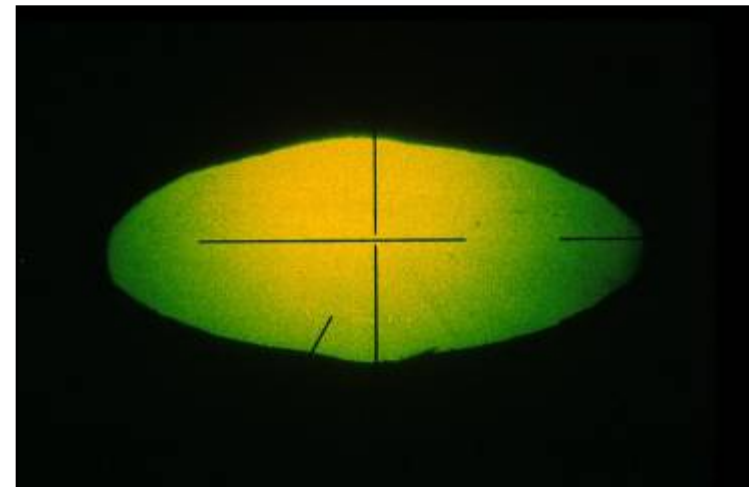
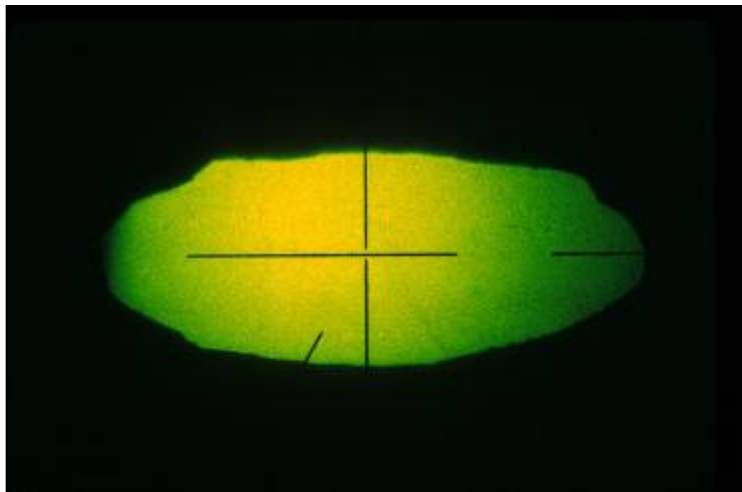
**Excellent for
Contact Fungicide**

Spray Tip Wear



← **New Flat-Fan Nozzle**

Worn Nozzle

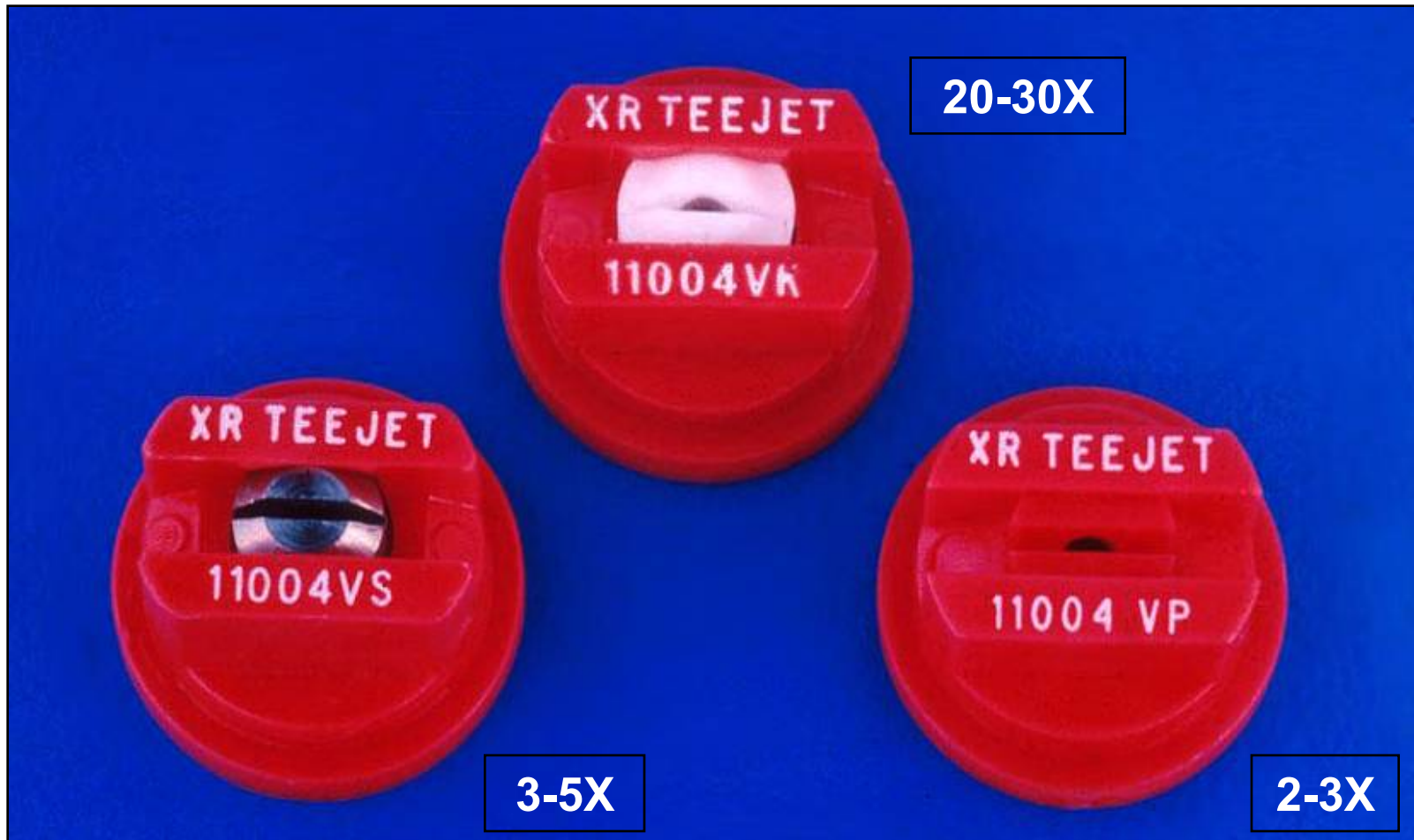


← **Improperly
Cleaned**

Nozzle Wear

- When do I need to replace my tips?
- Wear rates depend on:
 - Tip material (stainless, polymer, ceramic)
 - Chemicals used
 - Operating pressure
 - Care used when cleaning
- Spray tips are considered excessively worn and should be replaced when the flow exceeds the flow of a new tip by 10% or has a disrupted pattern. If more than one tip is worn, replace the entire boom.

Common Spray Tip Materials



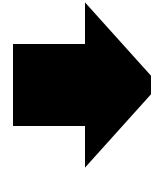
Sprayer Calibration

USEFUL FORMULAS

$$\text{GPM (Per Nozzle)} = \frac{\text{GPA} \times \text{MPH} \times W^*}{5940}$$

$$\text{GPA} = \frac{5940 \times \text{GPM (Per Nozzle)}}{\text{MPH} \times W^*}$$

*W - Nozzle spacing (in boom spraying) or spray swath (in boomless spraying) ... in inches.



Sprayer Calibration

- Selection Formulas

$$\text{GPM (per nozzle)} = \frac{\text{GPA} \times \text{mph} \times W}{5940}$$

OR

$$\text{GPM (per nozzle)} = \frac{\text{Gal/1000 Ft}^2 \times \text{mph} \times W}{136}$$



Sprayer Calibration

“W” is defined differently based on the application methods:

- ✓ **W (broadcast) = tip spacing
(in inches)**
- ✓ **W (banding or boomless) =
band width or swath width
(in inches)**

Sprayer Calibration

- Step No. 1 - Check your Tractor/Sprayer Speed
- Step No. 2 - The Inputs
 - Current Nozzle Type – AI11006VS
 - Recommended Application Volume – 40 GPA
 - Nozzle Spacing - 20 inches
 - Sprayer Speed - 5 mph

Sprayer Calibration

- Step No. 3 - Calculating the Required Nozzle Output

$$\text{GPM (per nozzle)} = \frac{40 \text{ GPA} \times 5 \text{ mph} \times 20 \text{ in.}}{5940}$$

$$\text{GPM} = 0.67 \text{ per nozzle}$$

Sprayer Calibration

- **Step No. 4 - Setting the Correct Pressure:**
Use catalog to determine proper pressure
Chart shows 0.67 GPM @ 50 psi
- **Step No. 5 - Checking Your System:**
Set pressure and conduct flow test

EXAMPLE 1

- TOMATO GROWER WANTS TO PUT 100 GPA AT FULL BUSH, He drives at 3.0 mph with 9 nozzles operating on 6ft rows. What disc core system should he use. Disc cores are located on pg 40 in the TeeJet book.
- $$\text{GPM} = \frac{\text{GPA} \times \text{MPH} \times \text{AVERAGE NOZZLE SPACING}}{5940}$$
- $$\text{GPM} = \frac{100 \times 3.0 \times 8''}{5940} = .404 \text{GPM/ NOZZLE}$$
 WHAT PRESSURE????

EXAMPLE 2

- Peach grower using air blast in 15ft rows with 20 nozzles(10 on each side) wants to put 200 gal/ac at 200 psi while driving 4.5 mph.
- $$\text{GPM} = \frac{200 \times 4.5 \times 9}{5940} = 1.36 \text{ GAL/ MIN/ NOZZLE??}$$
-

EXAMPLE 3

- Monaco Acres wants to spray 15 gpa under his 3 apple trees in a band 5ft wide on each side using a boom with 5 nozzles. He will spray under his plum trees 20 ft away later. If all goes well he will keep his day job and spray for his neighbor at night at 3.6 mph. Mitchem Estates has 40 acres of Qumquats that needs 2.5 pts per treated acre applied. Assume both farms were planted by the same people using the same methods.

- Treated acres vs. field acres
- 2 bands x 5ft = 10 ft
- Row spacing = 20ft
- 20 treated acres vs. 40 field acres
- $GPM = \frac{15GPA \times 3.6MPH \times 12''}{109gpm} = .$
- 5940
- DISCUSSION? NOZZLES,
STRAINERS, SPACING, GPA???
- PG29-33 AND PG 23

SIMPLE SIMON, PETER PIPER, TOM AND WAYNE TOLD-ME-TO-DO-IT- THIS WAY CALIBRATION METHOD

- OR THE 128th ACRE METHOD

- DIVIDE 4084 BY YOUR NOZZLE SPACING. (10", 15", 20" ETC.)
- THIS NUMBER IS THE LENGTH OF A COURSE THAT SHOULD BE MEASURED ON A REPRESENTATIVE SURFACE.

- DRIVE THE COURSE WITH THE TANK $\frac{1}{2}$ FULL OF WATER TIMING FROM START TO FINISH. THIS ALLOWS YOU TO GET INTO A COMFORTABLE GEAR AND THROTTLE RANGE. TIME THIS COURSE 3 OR 4 TIMES TO GET A GOOD AVERAGE. YOU SHOULD BE MOVING AT THE SPEED YOU WANT AS YOU PASS THE START AND FINISH LINES.

- SET UP WHERE YOU CAN CATCH WATER FROM ONE NOZZLE FOR THE AVERAGE TIME DRIVING THROUGH THE COURSE

- SET TRACTOR TO RUN AT THE RPM THAT YOU USED IN THE DRIVING PART AND ENGAGE THE PUMP. SET THE PRESSURE OF THE SPRAYER, WITH THE BOOMS ON, TO YOUR DESIRED PRESSURE.

- COLLECT WATER FROM ONE NOZZLE FOR THE TIME IT TOOK YOU TO DRIVE THE COURSE. AT THIS POINT, OZ.= GAL/AC

- IF THIS IS NOT THE OUTPUT YOU WANT EITHER CHANGE PRESSURE OR CHANGE NOZZLES.

- USEFUL FORMULA' S
- MPH X 88 = DISTANCE TRAVELED IN 1 MIN
- GPA X MPH X NOZ. SPACING = GPM
- 5940
- GAL/1000 SQ. FT.= 136 X GPM (PER NOZZLE)/MPH X NOZZLE SPACING
- EXAMPLE: 4084/ 20" SPACING = 204.2 FT.
- 4 MPH X 88 FT/MIN = 352 FT / MIN
- 204.2 FT / 352 FT/ MIN = .58 MIN X 60
SEC = 34.8 SEC. TO DRIVE THE COURSE AT 4
MPH.

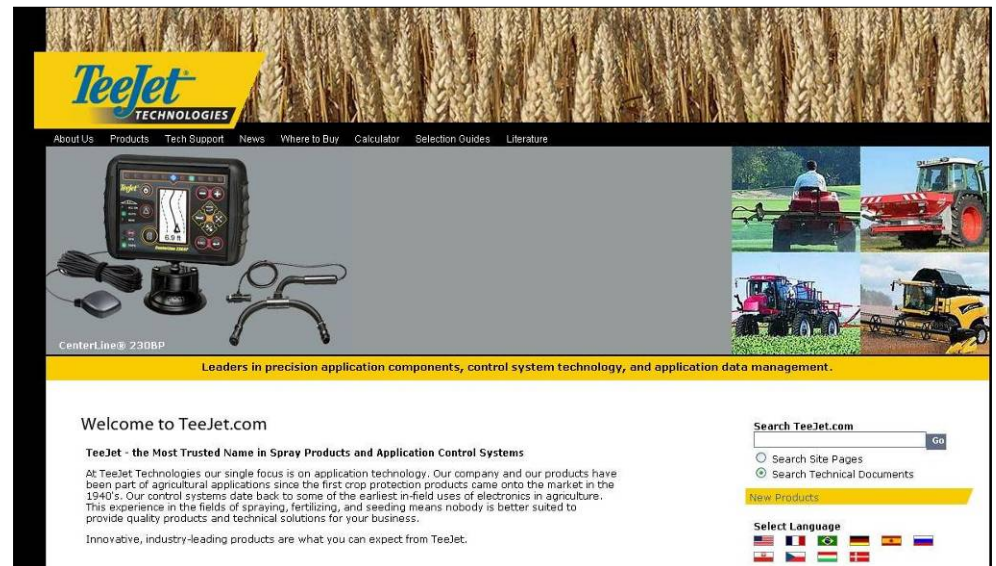
EXAMPLE 4

- Blueberry Plantation likes to spray an 18" band on each side of their row spaced 12 feet apart. They use 3rd gear about 1500 rpm. They use 1 nozzle mounted on an old tank frame their great-great grandfather inherited from somebody. How are you going to calibrate.

- $4084 / 18'' = 227\text{ft}$
- What next????



RESOURCES



WWW.TEEJET.COM

HYPRO TECHNICAL SPRAY TIP RESOURCES

H&H Farm Machine – Authorized Hypro Spray Tip Distributor

Brian, Chad, Dave, Melissa
Brian.nance@hhspray.com
(704) 753-4919

HYPRO Regional Territory Manager:

Joey Lane
(919) 522-7847
joey@jrlane.com

HYPRO Website:

www.hypropumps.com

HYPRO Spray Tip Application Support:

Gene Schellhorn
Gene.schellhorn@pentair.com
(800) 445-8360

Online Tools

Make tip selection easy.

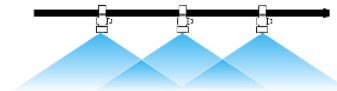
www.HyproPumps.com



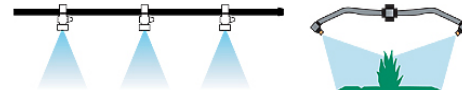
Welcome to the Hypro SprayIT Calculator. Hypro has designed this online calculator to make it easy to select the proper spray tip for your application. All you need to do is select the type of application from the list below and input your specific application data and the calculator will do the rest.

[Need Help?](#)

[Broadcast](#)



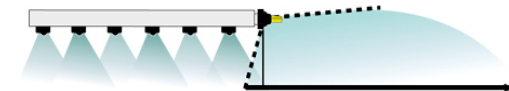
[Banding/Directed](#)



[Totally Boomless](#)



[Boom X Tender](#)



Example



Measurement Units

Tip Spacing inches

Speed mph

Application Rate gallons/acre

Solution Density lbs/gallon

Spray Quality

[Need Help?](#)



[ULD120-015 and FC-ULD120-015](#)

Required Pressure: 50 PSI
At Flow Rate: 0.168 GPM

Pressure
 40 PSI
 50 PSI
 60 PSI

Droplet Size
 Coarse
 Coarse
 Medium

Material: Polyacetal
Strainer: 100 Mesh
Technology: Air Eduction
Pressure Range: 15 - 115 PSI
Pattern: Tapered Flat Fan
Spray Angle: 120 Degrees



[ULD120-02 and FC-ULD120-02](#)

Required Pressure: 28 PSI
At Flow Rate: 0.168 GPM

Pressure
 15 PSI
 20 PSI
 30 PSI

Droplet Size
 Very Coarse
 Very Coarse
 Coarse

Material: Polyacetal
Strainer: 100 Mesh
Technology: Air Eduction
Pressure Range: 15 - 115 PSI
Pattern: Tapered Flat Fan
Spray Angle: 120 Degrees



[GA110-015 and FC-GA110-015](#)

Required Pressure: 50 PSI
At Flow Rate: 0.168 GPM

Pressure
 40 PSI
 50 PSI
 60 PSI

Droplet Size
 Coarse
 Coarse
 Coarse

Material: Polyacetal
Strainer: 50 Mesh
Technology: Air Eduction
Pressure Range: 15 - 115 PSI
Pattern: Tapered Flat Fan
Spray Angle: 110 Degrees



[GRD120-02](#)

Required Pressure: 28 PSI
At Flow Rate: 0.168 GPM

Pressure
 15 PSI
 20 PSI
 30 PSI

Droplet Size
 Very Coarse
 Coarse
 Coarse

Material: Polyacetal
Strainer: 100 Mesh
Technology: Pre-orifice
Pressure Range: 15 - 115 PSI
Pattern: Tapered Flat Fan
Spray Angle: 120 Degrees

QUESTIONS?



The background of the slide is a close-up photograph of blueberry bushes. Several clusters of berries are visible, some in the foreground and some in the background. The berries are in various stages of ripening, with some being green and others a light blue. The leaves are dark green and glossy. The overall lighting is soft, suggesting an outdoor setting.

Blueberry Weed Control Programs

by Dr. Mark Czarnota UGA, Griffin Campus











Herbicide Philosophy

- **Very limited arsenal of Select postemergence herbicides**
- **We would like to have a selective post herbicide for every weed (see it treat it!)**
- **Best way to control weeds is to prevent them (bed preparation, mulches and pre-herbicides)**



Weed Control Programs

Good weed control:

- ✓ does not happen by accident
- ✓ planning is required
- ✓ cost money
- ✓ takes time
- ✓ will not last



Blueberries



- Rabbiteye blueberries (*Vaccinium ashei*)
- Highbush blueberries (*Vaccinium corymbosum*)
- Georgia has a lot of acres of both

Bed preparation

- Consider sprays of Glyphosate and Garlon to eliminate woody and perennial weeds.
- Do a several months before planting – try to repeat



Weed control in Rabbiteye Blueberries

- **Hand Removal**
- **Mulches (2 – 4 inches of pine bark on loamy sand)**
- **Herbicides (a fairly good arsenal, but need more)**



Weed control in Highbush Blueberries



- **Hand Removal**
- **Bark Beds (8 to 12 inch
pine bark on loamy sand)**
- **Herbicides same as
Rabbiteye**

What labeled for Pre control:

Pre Control

➤ **Dichlobenil (Casoron 4 G and 1.4 CS)**

➤ **Diuron (Karmex and others)**

➤ **Flumioxazin (Chateau)**

➤ **Hexazinone (Velpar 80 DF)**

➤ **Mesotrione (Callisto)**

➤ **Napropamide (Devrinol)**

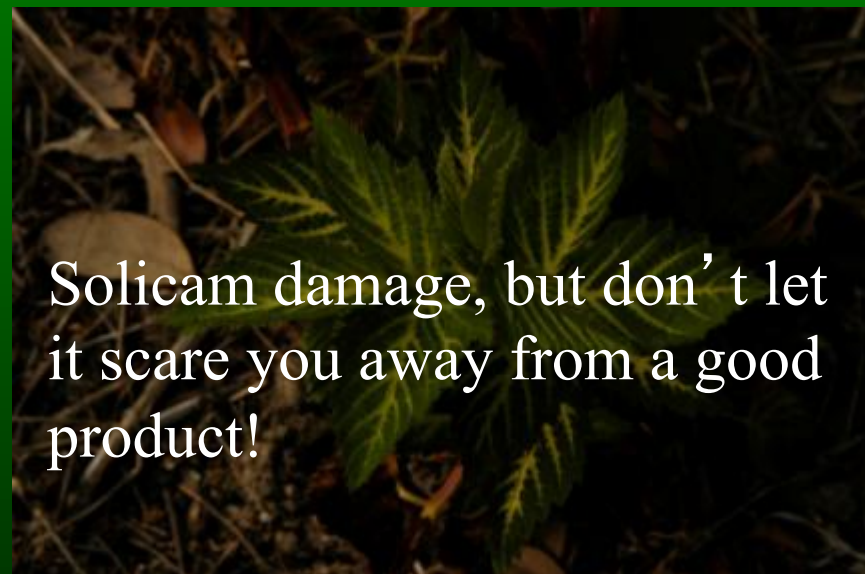
➤ **Norflurazon (Solicam 80 WDG)**

➤ **Oryzalin (Surflan)**

➤ **Pronamide (Kerb 50 W)**

➤ **Simazine (Princep)**

➤ **Terbacil (Sinbar 80 WP)**



Pre Herbicide Rotations in Blueberries

- Up to 4 years after planting: at least 2 pre applications a year (Feb/Mar and Jun/July)

Rotation A

Year 1	
1st app	Surflan + Simazine (2 qt each / A)
2nd app	Chateau (8 or 10 oz /A)
Year 2	
1st app	Surflan + Simazine (2 qt each / A)
2nd app	Chateau (8 or 10 oz /A)
Year 3	
1st app	Chateau (8 or 10 oz /A)
2nd app	Solicam (2.5 to 3 lb /A)

Rotation B

Year 1	
1st app	Surflan + Gallery (2 qt + 1 lb / A)
2nd app	Chateau (8 or 10 oz /A)
Year 2	
1st app	Kerb (3 lb /A)
2nd app	Chateau (8 or 10 oz /A)
Year 3	
1st app	Chateau (8 or 10 oz /A)
2nd app	Karmex (1.5 to 2 lb /A)

Herbicide Rotations in Blueberries

- Years 4 and beyond: at least 2 pre applications a year (Feb/Mar and Jun/July) – Florida maybe 3 or 4 with overhead irrigation
- Start with **Surflan / Simazine** (1st year, 1st 2 applications, 2 qt each)
- Next year Surflan / Simazine, rotate in spring to **Chateau** (8 to 10 oz /A) with fall applications of either **Karmex** (1.5 to 2 lb /A) or **Solicam** (2.5 to 3 lb /A)
- Other products to consider in the rotation are **Sinbar** (1.0 lb /A – fall) and **Velpar** 1.3 lb /A - spring)
- Sinbar, Velpar and Karmex cause less injury in soils with greater than 3% Organic Matter

Blueberry Herbicide Cost

- Most situations banding applications will be used, and 1 treated acre will equal a 3 acre banded application)

Herbicide	Price /A
Surflan (2 qt / A)	\$40
Simazine (2 qt / A)	\$20
Cost Acre	\$60
Cost Acre (Banded Acre)	\$20
Chateau (12 oz /A)	\$60
Cost Acre	\$60
Cost Acre (Banded)	\$20
Solicam (2.5 lb / A)	\$75
Cost Acre	\$75
Cost Acre (Banded)	\$25

Herbicide	Price /A
Karmex (2 lb/A)	\$20
Cost Acre	\$20
Cost Acre (Banded)	\$4
Surflan (2 qt / A)	\$40
Trellis (1 lb / A)	\$150
Cost Acre	\$190
Cost Acre (Banded Acre)	\$60
Kerb (3 lb/A)	\$120
Cost Acre	\$120
Cost Acre (Banded)	\$40

Pre Herbicide Tips

- **Use pre herbicide only when ½ inch rain event is expected or you can irrigate**
- **In field grown applications make 2 to 4 applications a year**
- **With pre herbicides, try to use at least 2 different products with 2 different modes-of-action**

Non-Bearing Pre for Blueberries

Trade Name	Formulation	Active
XL (Amaze)	2 GR	benefin / oryzalin
Broadstar	0.25 GR	flumioxazin
Freehand	1.75 GR	dimethenamid / pendimethalin
Snapshot	2.5 GR	isoxaben / trifluralin
Showcase	2.5 GR	isoxaben / trifluralin / oxyfluorfen
Jewel	3.25 GR	oxadiazon / pendimethalin
RegalStar	1.2 GR	oxadiazon / prodiamine
OH2	3 GR	oxyfluorfen / pendimethalin
Rout	3 GR	oxyfluorfen / oryzalin
Regal O-O	3 GR	oxyfluorfen / oxadiazon
Biathlon	2.75 GR	oxyfluorfen / prodiamine

Preemergent Herbicides

(Granular materials for containers and Small acreage <5Acre)

(Sparyable materials)

■ Dimension (dithiopyr)

■ Trellis (isoxben)

Non-Bearing Pre for Blueberries

- ❑ If growing blueberries in containers, 4 to 6 applications of pre herbicides should be utilized (every 3 or 2 months) in order to maintain adequate weed control.
- ❑ Would not use any product containing a DNA herbicide (i.e. oryzalin, pendimethalin, trifluralin) on newly rooted cutting (wait a month or 2 until good root development)
- ❑ Always remember that pre herbicides need a irrigation event in order to work (try to have overhead irrigation on containers).
- ❑ Remember that pre herbicides work best controlling weeds from seed.



Control

Herbicide Treatments

Post Control



What labeled for Post control:

- **Clethodim (Select 2EC)**
- **Glufosinate (Rely 1L)**
- **Glyphosate (Roundup and many others)**
- **Halosulfuron (Sandea 75 DF)**
- **Paraquat (Gramoxone Inteon and Fire storm)**
- **Sethoxydim (Poast 1.5 EC)**

Blueberry Herbicide Cost - Post

- Most situations banding applications will be used, and 1 treated acre will equal a 3 acre banded application)

Herbicide	Price /A
Roundup (2 qt / A)	\$5
Cost Acre	\$5
Cost Acre (Banded)	\$1.50
Sandea (1.2 oz /A)	\$60
Cost Acre	\$60
Cost Acre (Banded)	\$20
Rely / Ignite / Liberty 64 oz / A)	\$40
Cost Acre	\$40
Cost Acre (Banded)	\$13

Herbicide	Price /A
Paraquat (2 qt/A)	\$10
Cost Acre	\$10
Cost Acre (Banded)	\$3

Non-Bearing Post Herbicides for Blueberries

Post Herbicides

- Basagran T/O (bentazon)
- Fusilade DX (fluazifop)

Herbicides on the horizon!

- **Prowl and Dual Magnum**
- **Stinger (clopyralid) – Hope to get as a 24(c) in the near future!**
- **Trellis and Fusilade DX (fluazifop) - bearing**



Herbicides that might?

- **Asulox (asulam)**
- **Garlon 3A (triclopyr)**
- **Drive (quinclorac)**





Emerald Karmex and Sinbar 2.0 lb /A each



Brightwell: UTC 8 WAT



Brightwell: Sinbar 1 lb /A – 8 WAT

Herbicide Rotations in Blueberries

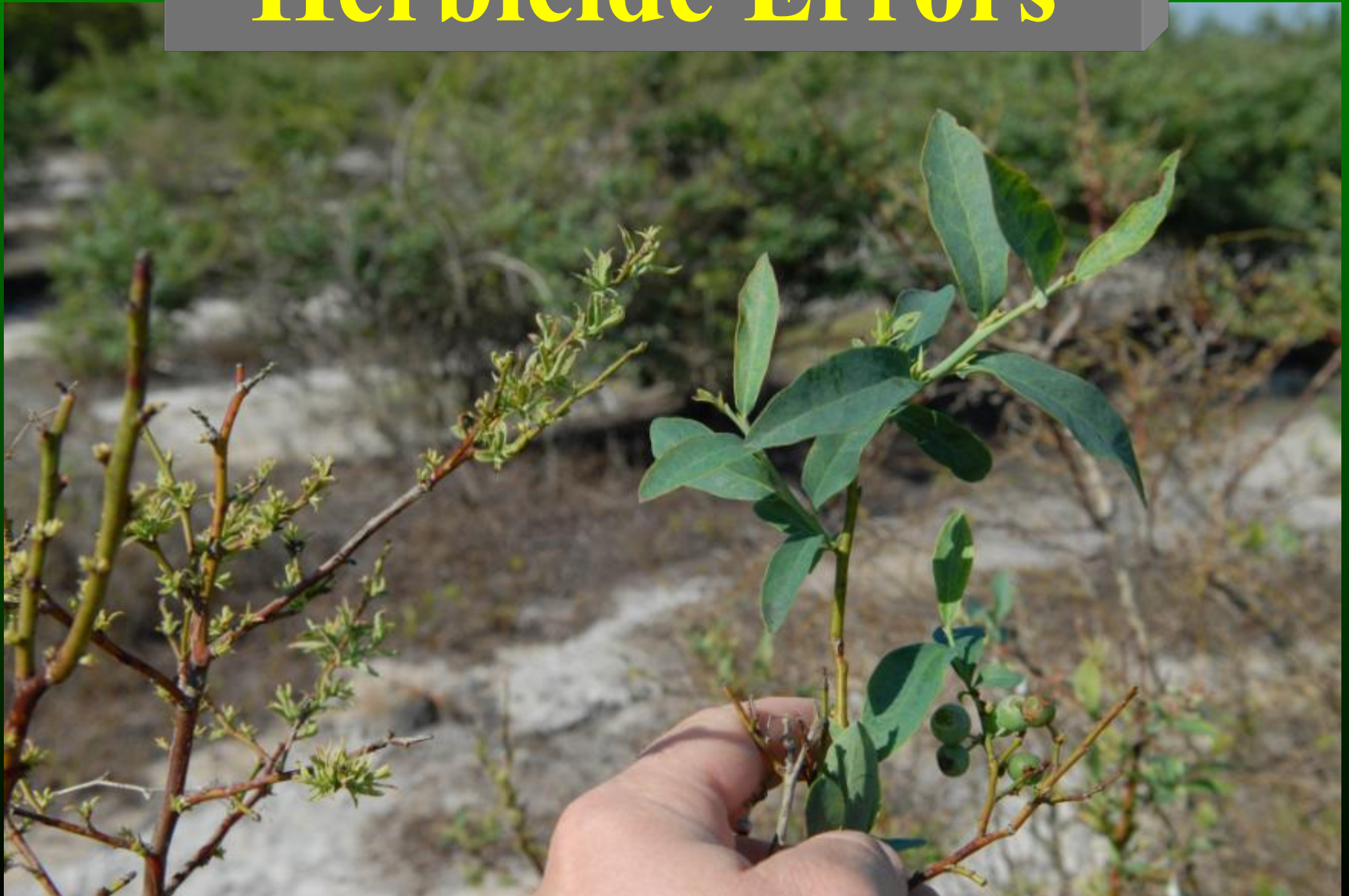
- Have Select and Poast grass herbicides for selective post bearing herbicide
- Sandea excellent for sedge control
- Glyphosate, glufosinate, and paraquat are broad spectrum post herbicide but all have problems
- All can be tank mixed with most pre herbicides

Herbicide Errors

- No rain after a pre herbicide application
- Rain after a post herbicide application
- Poorly calibrated equipment
- Poor choice of a herbicide
- Using a pre herbicide after most weed seed have germinated



Herbicide Errors



Roundup



Glyphosate damage in ornamentals (sub lethal doses)

Organic

- **Organic production - Several products on the market that contain burndown type chemicals:**
 - Acetic acid
 - Capric acid
 - Clove oil
 - Cinnamon oil
 - Fatty acids
 - Lemon oil
 - Malic Acid
 - Strong Soap
- **Also one preemergent product Corn Gluten**
- **NaCl can be used as a pre / post herbicides**

Organic





Maintaining a grassy middle

- If you have Bermudagrass and Bahiagrass row middles, many maintain with glyphosate to limit growth.
- Treat middles in Spring when actively growing (treat with 2 lb ai/A glyphosate (shielded sprayer)).
- That year, retreat one or 2 more times (1 lb ai/A glyphosate when normal growth starts again



A close-up, microscopic view of a plant stem, likely a moss or lichen. The central stem is dark and textured. Numerous fine, hair-like structures (setae) radiate from the stem, each ending in a small, dark, spherical bud or spore. The background is a light, out-of-focus surface.

Questions!

Vineyard Weed Management



Wayne Mitchem

Orchard and Vineyard Floor Management

Dept. of Horticultural Science



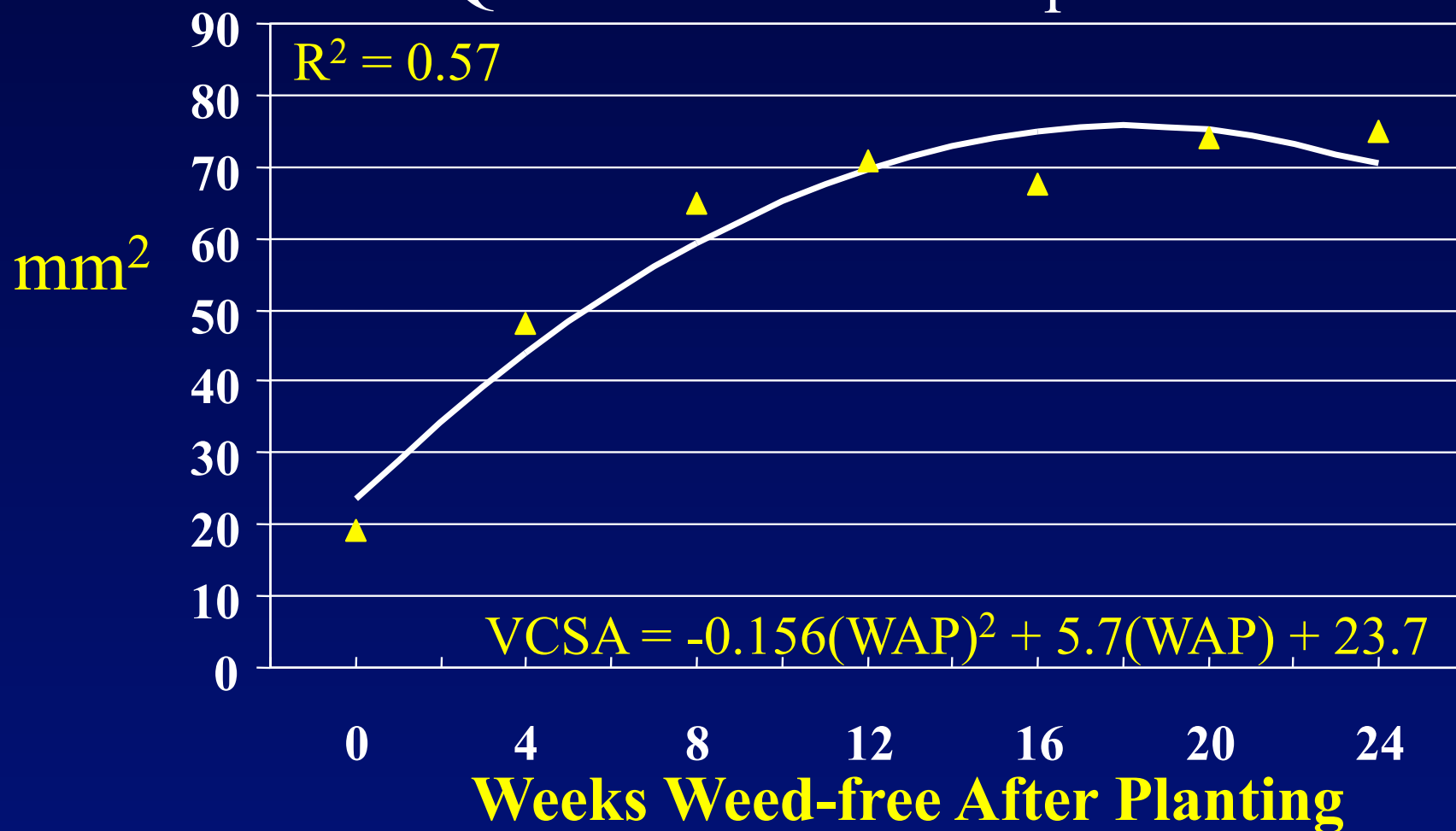
Vineyard Weed Management Objectives

- Prevent competition
 - Water
 - Irrigation efficiency
 - Nutrients
 - Newly planted vineyards
 - Survivability
 - Growth in formative years
- Radiant heat benefit
- Worker efficiency
- Prevent interference with grape root borer mgt
- Aesthetic



VCSA

Quadratic Relationship





0 WWF



4 WWF



8 WWF

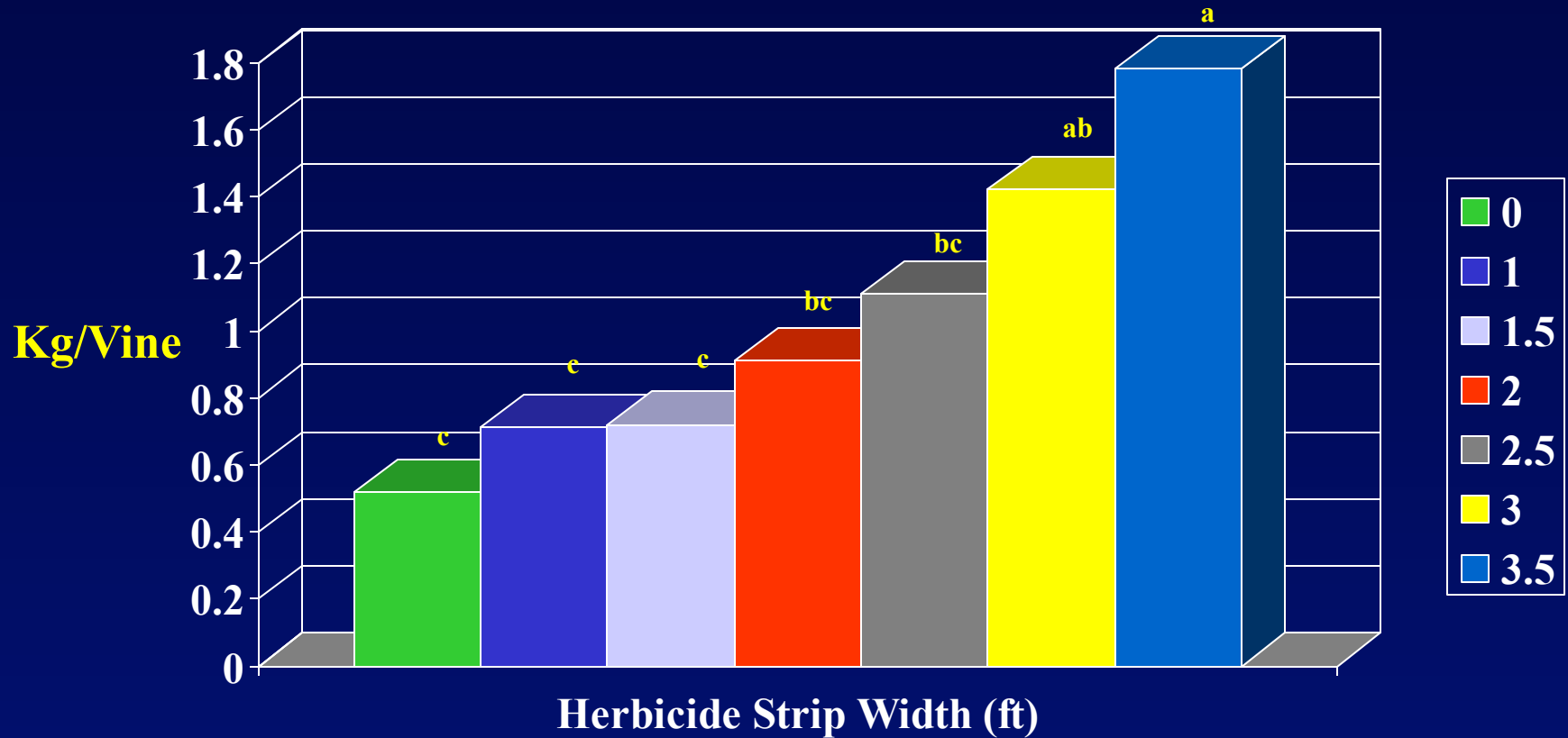


12 WWF



Weed control should be the primary concern in newly planted and young vineyards because survival and growth can be dramatically influenced.

Effect of Herbicide Strip Width on Grape Yield



LSD 0.05

Wilkes Co., NC

Buckelew et. al. unpublished

PRE Herbicides

- Casoron
- Chateau
- Devrinol 50 DF
- Kerb
- Diuron
- Rimsulfuron
- Oryzalin
- Oxyfluorfen
- Prowl H2O
- Simazine
- Solicam
- Trellis

Casoron 4G or CS

dichlobenil

- 4G @ 100 to 150 lb/A or CS @ 1.4 to 2.8 gal/A
 - Only 4G can be used in newly planted (4 wks after planting)
- Temperature and Precipitation is critical
 - 4G - Temp < 55 F (Jan/Feb application time)
 - CS - Temp < 70 F
 - Need rain or snow to activate
- Very broad spectrum



Chateau

flumioxazin



- 6 to 12 oz/A
- **Use hooded application equipment when applied after flowering**
 - Do not tank mix with glyphosate after bud break
- 60 day PHI
- PRE and POST activity
- Broad spectrum – No activity on nutsedge

Chateau + Glyphosate Issue

- Movement of Chateau with glyphosate
 - Volatilization – NO!
 - Inversion – Yes!
- What causes an inversion?
 - Layer of cool surface air with warmer air in the immediate atmosphere
 - Most common occurrence
 - During calm periods
 - During the morning.

Prevention: *Tank mix Chateau with paraquat or Rely after vines leaf out. This problem has not occurred when these herbicides are used in place of glyphosate*



Chateau injury on apples

Kerb SC or 50W

pronamide



- 2.5 to 9.5 pt/A
- Use in vineyards established at least 1 year
- Apply in fall or early winter (temp <55 F) but prior to soil freeze up.
- PRE and POST activity on cool season perennial grass weeds
 - KY bluegrass, tall fescue, orchard grass, quackgrass, perennial ryegrass eveningprimrose

Karmex, Diuron, or Direx 4L

diuron

- 2 to 3 lb/A or 1.6 to 2.4 qt/A
- Use on vines established at least 3 years.
- Soils with 1 to 2 % organic matter
- Crabgrass, barnyardgrasses, horseweed, lambsquarter, nightshade, wild radish, ragweed, smartweed, purslane, prickly lettuce, chickweed, morningglory, sowthistle



Matrix, Purvin, or Solida

rimsulfuron

- 4 oz/A
 - “When applied as a banded treatment (50% band or less) Matrix SG may be applied twice per year. However do not apply more than 4 oz/A on a broadcast basis”
- Vines have to be established 1 year or more
- 14 day PHI
- PRE and POST
- Yellow nutsedge activity
 - PRE + Early POST
 - Apply prior to emergence followed by 2nd application when 2” to 4” tall
 - POST + POST
 - Apply when 2” to 4” tall followed by a second application 14 days later.



Surflan or Oryzalin

oryzalin

- 2 to 6 qt/A
 - Sequential applications
 - 2.5 months between application
 - Cannot 12 qt/A in 12 month period
- PRE tank mix partners
 - Simazine
 - Rimsulfuron
 - Goal
 - Trellis
- Extend residual control of annual grasses
- Orange label or Green label?



GoalTender or Galigan H₂O

oxyfluorfen



- 1 to 4 pt/A (Galigan no greater than 3 pt/A)
- Apply after harvest until bud swell
- PRE and POST activity
 - 2.5+ pt/A for PRE activity
- Henbit, pigweed, lambsquarters, nightshade, groundsel, purslane, smartweed, prickly sida, spurge, filaree, mustard, pepperweed, malva sp
- Weak PRE control of crabgrass, goosegrass, barnyardgrass, signalgrass.
- Does it have a fit in the Southeast?



Prowl H₂O

pendimethalin

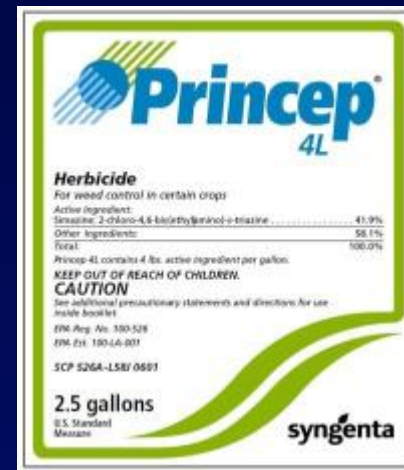


- 2 to 6.3 qt/A
 - Sequential applications may be used so long as total use rate does not exceed 6.3 qt/A/yr.
 - 30 days between applications
- Apply in newly planted vineyards prior to bud swell.
 - Can be applied PPI or PRE prior to transplanting
 - Do not allow treated soil to contact roots.
- 90 day PHI
- Time between application and activation less than that of oryzalin
- Simazine and rimsulfuron are excellent tank mix partners

Princep or Simazine

simazine

- 2 to 4 qt/A
- Make only one application per year.
- Vines established at least 3 years
- Fall or spring application
- Needs a partner for extended PRE annual grass control
 - Oryzalin
 - Prowl H₂O



Solicam

norflurazon



- 1.25 to 5 lb/A
- Vines est. at least 2 years
- Rate is soil texture dependent
 - Whitening in leaf veins may occur when Solicam is used on grapes grown in coarse soils
- 60 day PHI
- Crabgrass, foxtails, panicum, signalgrass, tropic croton, common chickweed, Carolina geranium, purslane, Florida pusley, prickly sida.
- Suppression of yellow and purple nutsedge

Trellis

isoxaben



- 0.66 to 1.33 lb/A
 - Use two applications so long as total use rate does not exceed 1.33 lb/A
- Can it be used in newly planted vineyards?
 - Use “in established non-bearing vineyards”
- 165 day PHI
- No activity on grass weeds
- Galinsoga, henbit, Carolina geranium, horseweed, lambsquarter, nightshade, wild radish, ragweed, smartweed, spotted spurge, prickly sida, purslane, plantain, prickly lettuce, chickweed, eveningprimrose

Chateau vs. Surflan



Weed Response to Chateau and Oryzalin

Weeds	Oryzalin	Chateau
Crabgrass	E	E
Fall Panicum	G	G
Goosegrass	G	E
Pigweed	G	E
Lambsquarters	G	E
Tropic Croton	P	E
Florida Pusley	G	E
Morningglory	P	E

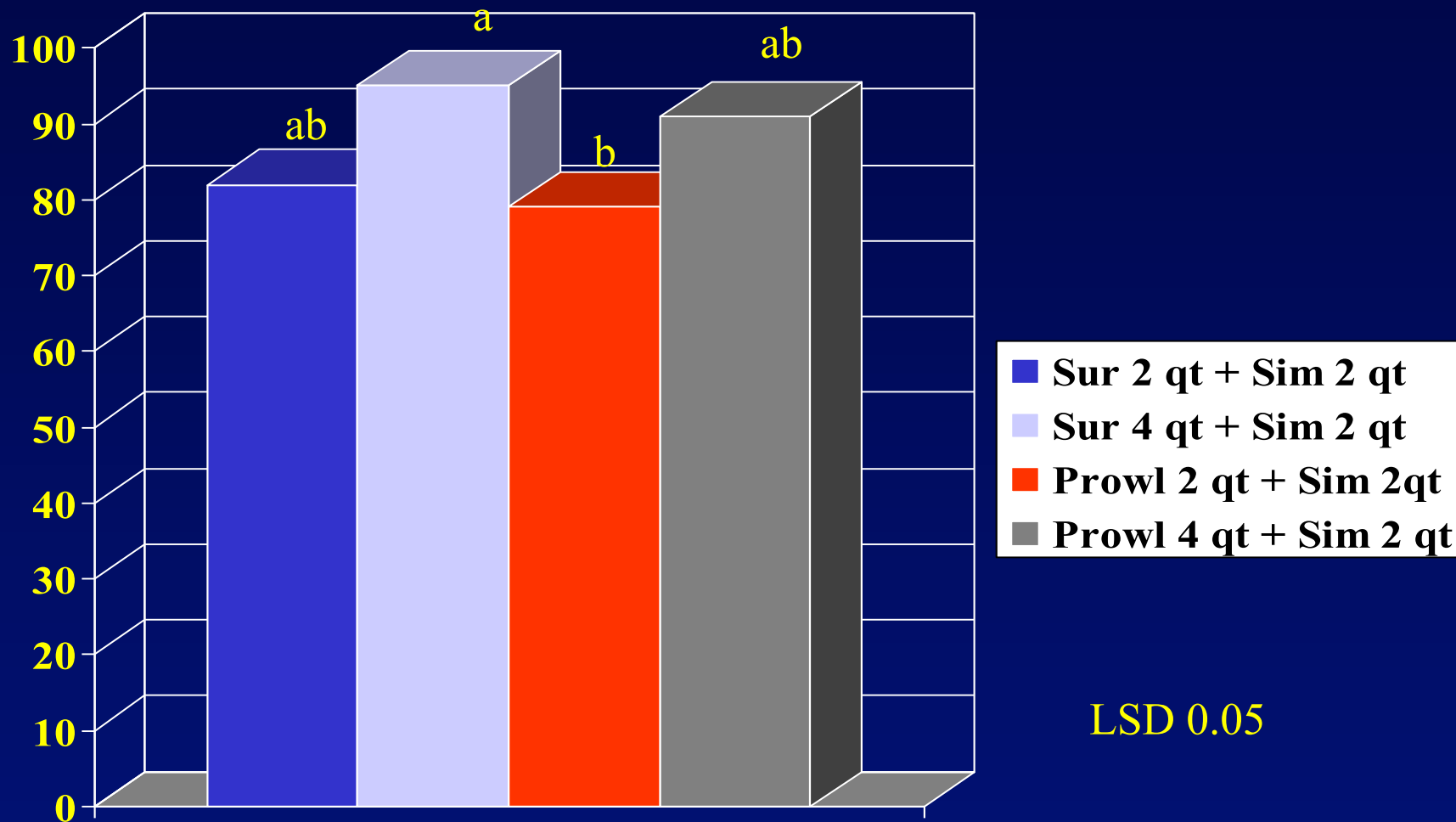
Weed Response to Chateau August 1st

Herbicide Treatment*	Palmer Amaranth Control	Morningglory Control	Large Crabgrass Control	% Bare Ground
Chateau 6 oz Fb Chateau 6 oz	100 a	95 a	98 a	88 ab
Chateau 8 oz Fb Chateau 8 oz	100 a	98 a	100 a	94 a
Nontreated	-	-	-	3 c

*March 29th and June 13th were the two application dates. Gramoxone and X-77 were included at each application time for POST weed control.

Simazine Needs Oryzalin or Prowl H₂O

99 DAT



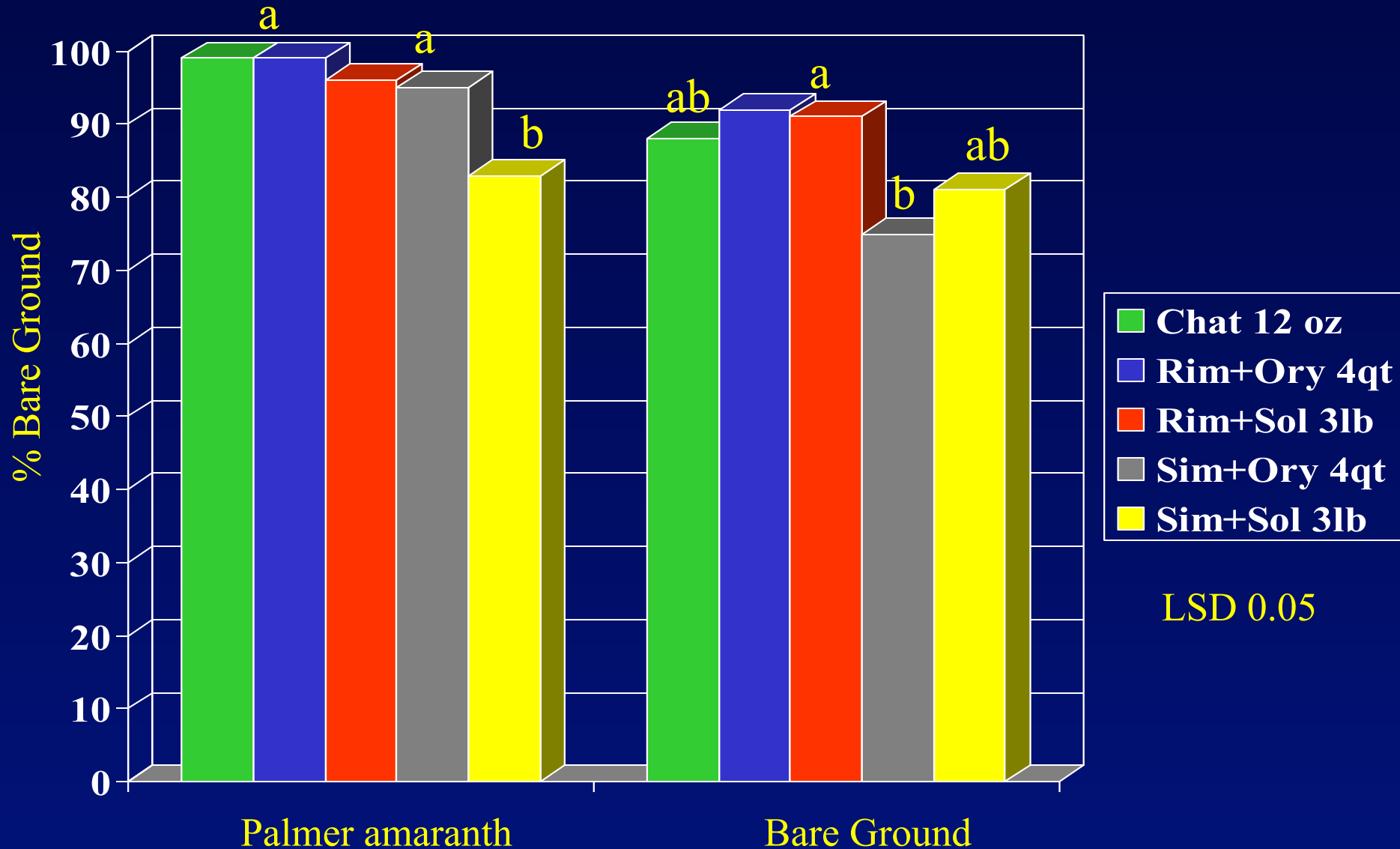
Large Crabgrass

Rainfall within 3 days of application

**Glyphosate was included for
POST weed control**

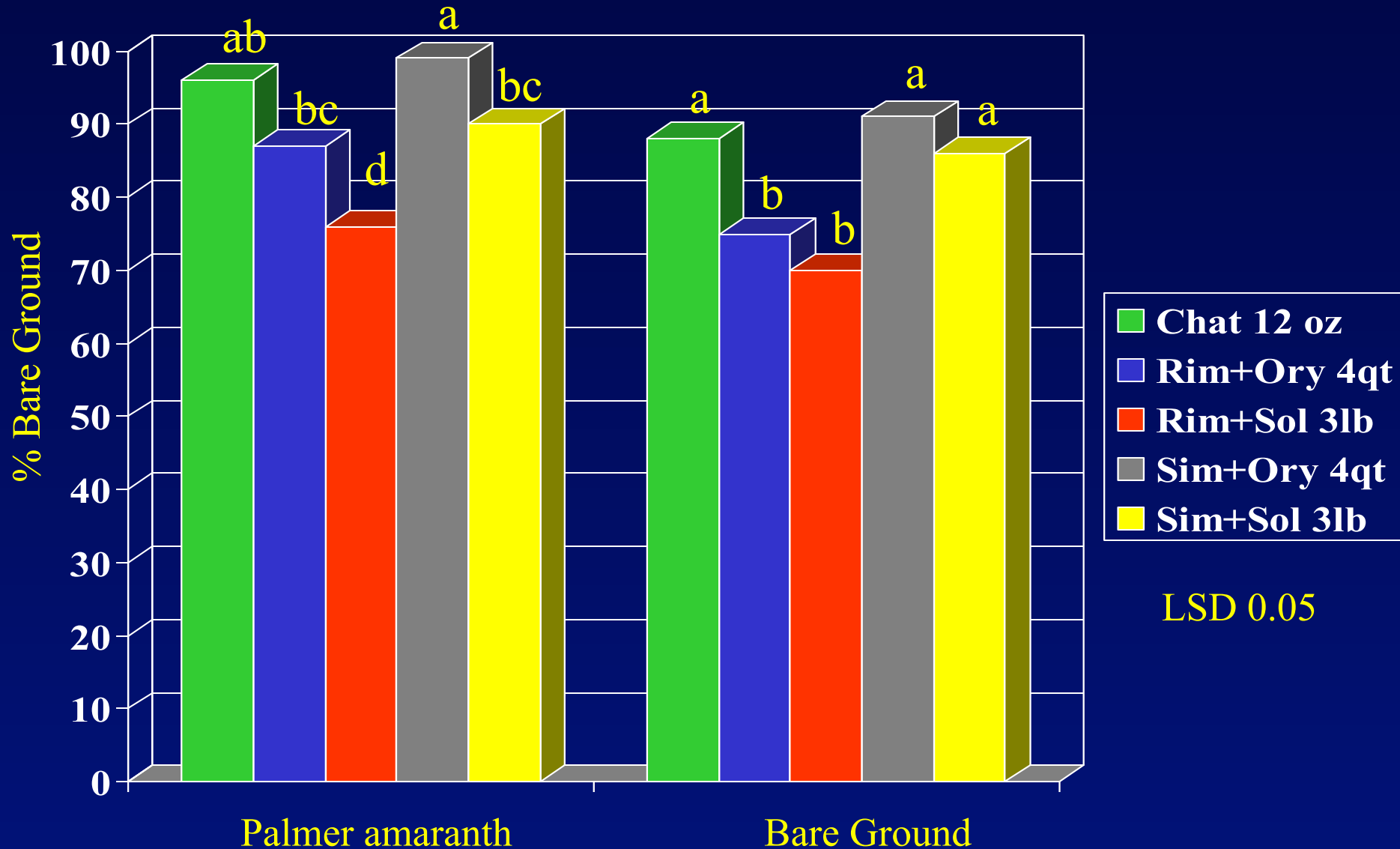
Rimsulfuron and Simazine Tank Mixes

128 DAT



Rimsulfuron and Simazine Tank Mixes

176 DAT

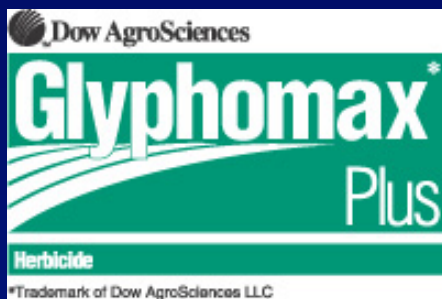




POST Herbicides



POAST



Glyphosate

- Rate depends on formulation
 - PowerMax – 1 to 1.5 pt/A
 - 41% generic – 0.75 to 1 qt/A
- Name Brand or Generic?
 - Let cost (per acre) be your guide
 - No difference in rainfastness (on the label)
 - Crop safety claims for glyphosate tolerant crops
- Suggestions
 - Avoid use first year
 - Grow tubes a must even in 2nd year
 - Limit use to 1 but no more than 2 applications
 - DO NOT apply after June





Rely 280

glufosinate



No Additional Surfactant Needed!

- Availability (not a 1 year problem)
 - All production directed to Liberty
 - Be prepared for “Can I use Liberty?”
 - Same ai and concentration
- Rate
 - 48 to 82 fl. oz/A
 - Row crop rates are lower – 28 to 32 fl oz/A does a good job.
- Restrictions
 - *“Only trunks with callused, mature brown bark should be sprayed unless protected from spray contact with non-porous wraps, grow tubes, or waxed containers” – Rely 280 Label*
 - Plan on 2 years of protection

Gramoxone, Firestorm, Parazone, etc.

paraquat

- Rate
 - 3 SL (generic formulations)
 - 1.75 to 2.5 pt/A
 - 2 SL
 - 2.5 to 4 pt/A
- Use with NIS
- Let price (per acre) be your guide
- Use grow tubes for 2 years

MANA Parazone™ 3 SL

 **Gramoxone® SL**

Firestorm®
HERBICIDE

Select Max and Various Generics

clethodim

- Rate
 - 2 L (generic formulations)
 - 1.75 to 2.5 pt/A
 - 1 L (Select Max, Intensity One)
 - 9 to 16 fl. oz/A
 - NIS @ 0.25% v/v
- Non-bearing caneberry ONLY!



Intensity one
POST-EMERGENCE GRASS HERBICIDE

Fusilade DX

fluazifop

- Rate
 - 12 to 24 fl. oz/A
 - Do not exceed 72 fl oz/A per year
- Surfactants
 - COC @ 1% v/v
 - NIS @ 0.25% to 0.5% v/v
- 50 day PHI



Poast

sethoxydim

- Rate
 - 1 to 2.5 pt/A
 - Do not exceed 5 pt/A per year
- COC @ 2 pt/A
- 50 day PHI

POAST

Surfactants

- Designed to improve the dispersing, absorbing, spreading, sticking and /or pest penetration.
- Surfactant classes
 - Non-ionic (NIS)
 - Gramoxone or Firestorm
 - Glyphosate (if formulation does not contain a surfactant)
 - Crop oil concentrates (COC)
 - Poast, Select
 - Aim
- What should growers use?
 - Let the label be the guide!

Putting Timing and Chemistry Together



Herbicide Program

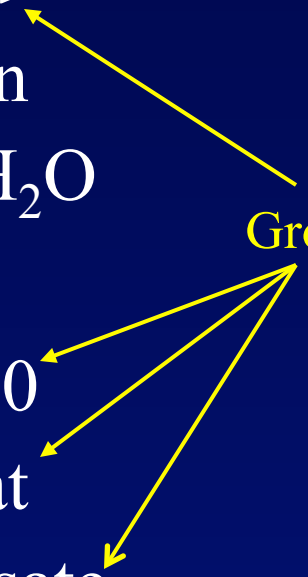
PRE Newly Planted Vineyards

Crop Age	Spring	Summer
Newly Planted	Oryzalin 2 qt/A (once soil settles after transplanting)	Oryzalin 2 qt/A + Paraquat or Rely (June)
	Chateau 6 to 8 oz/A (Once soil settles after transplanting)	Chateau 6 to 8 oz/A + Paraquat or Rely (June or July)

Summer Notes: DO NOT apply summer PRE until control from initial application begins to fail (1 to 3" tall weeds). If perennial grasses are a problem it will be necessary to use Fusilade or clethodim.

Herbicide Options for Newly Planted Vineyards



- PRE
 - Chateau
 - Oryzalin
 - Prowl H₂O
 - POST
 - Rely 280
 - Paraquat
 - Glyphosate
 - Clethodim (Select)
 - Poast
 - Fusilade
- Grow Tubes
- 

Sequential PRE Programs for Established Vineyards

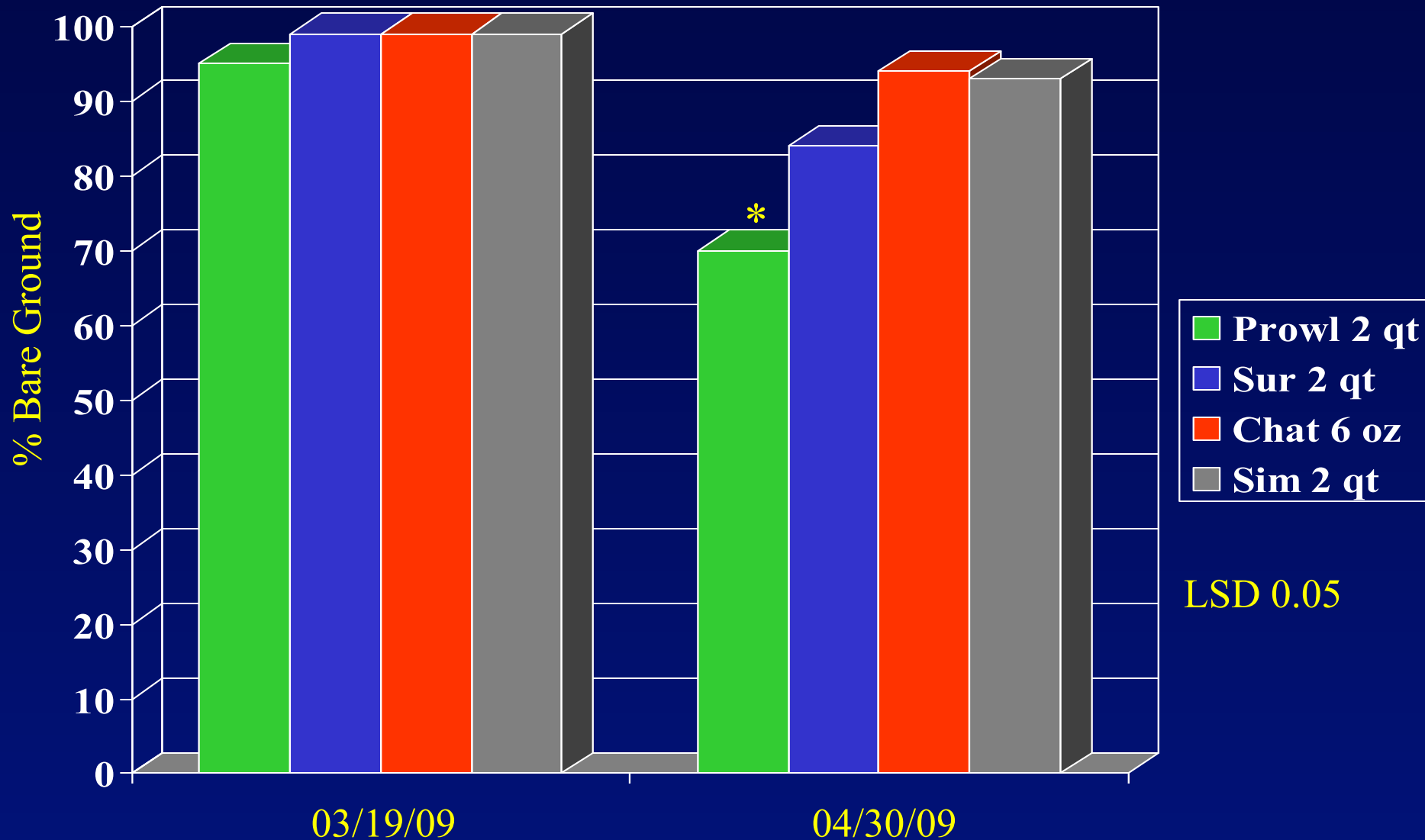
Crop Age	Mid March	Mid to Late June
Vines est. 1 year or more	Rim. 4 oz/A + Oryzalin 2 qt/A + Glyphosate	Rim. 4 oz/A + Oryzalin 2 qt/A + Rely or Paraquat
	Chateau 6 to 8 oz/A + Glyphosate	Chateau* 6 to 8 oz/A + Paraquat or Rely

**Chateau can only be applied after bud break if using hooded application equipment. Do not tank mix with glyphosate*

Summer Notes: DO NOT apply summer PRE until control from initial application begins to fail (1 to 3" tall weeds). If perennial grasses are a problem it will be necessary to use Poast.

Fall PRE Herbicide Benefit

Applied Oct. 31, 2008



Fall/Summer Sequential Options for Established Vineyards

Crop Age	November	Early June
Vines est. 3 years or more	Chateau 6 to 8 oz/A + Paraquat	Chateau* 6 to 8 oz/A or simazine + oryzalin 2 qt/A + Paraquat or Rely
	Simazine 2qt/A + Paraquat	Karmex 2 lb/A + Glyphosate or paraquat or Rely
	Simazine 2qt/A + Paraquat	Chateau* 12 oz/A + Paraquat or Rely

****Chateau can only be applied after bud break if using hooded application equipment. Do not tank mix with glyphosate***

Summer Notes: DO NOT apply summer PRE until control from initial application begins to fail (1 to 3" tall weeds). If perennial grasses are a problem it will be necessary to use Poast.

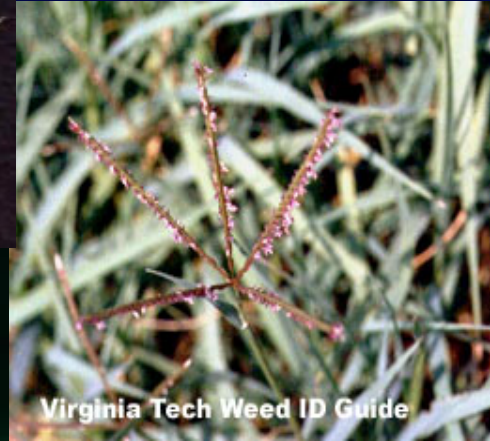
Delayed PRE Options for Established Vineyards

Crop Age	Mid March	Early May
Vines est. 3 years or more	Glyphosate or Rely	Simazine 2 qt/A + Oryzalin 2 to 4 qt/A + Glyphosate or Paraquat or Rely
		Karmex 2 lb/A + Glyphosate or Paraquat or Rely (Piedmont only!)
		Oryzalin 2 to 4 qt/A + Rim. 4 oz/A + Glyphosate or Paraquat or Rely

Summer Notes: **DO NOT** apply early May application until control from initial application begins to fail (1 to 3" tall weeds). If perennial grasses are a problem it will be necessary to use Poast.

Bermudagrass

- Perennial
- Thin leaves, erect hairs on collar region
- Root at stem nodes
- Spreads via stolons and rhizomes



***Control – Poast 1.5 pt (6”) fb 1 pt (4”),
Fusilade 1.5 pt (8”) fb 1 pt (8”); Always
include COC with Poast and Fusilade***

PRE Herbicide Rotation

- Prevents selection for weeds a herbicide program does not control
- Aids in resistance management
- Find at least two PRE herbicide programs and rotate them.
- Example
 - Even years use Chateau program
 - Odd years use simazine+oryzalin program

No herbicide program is so good that it can be used forever without eventually failing

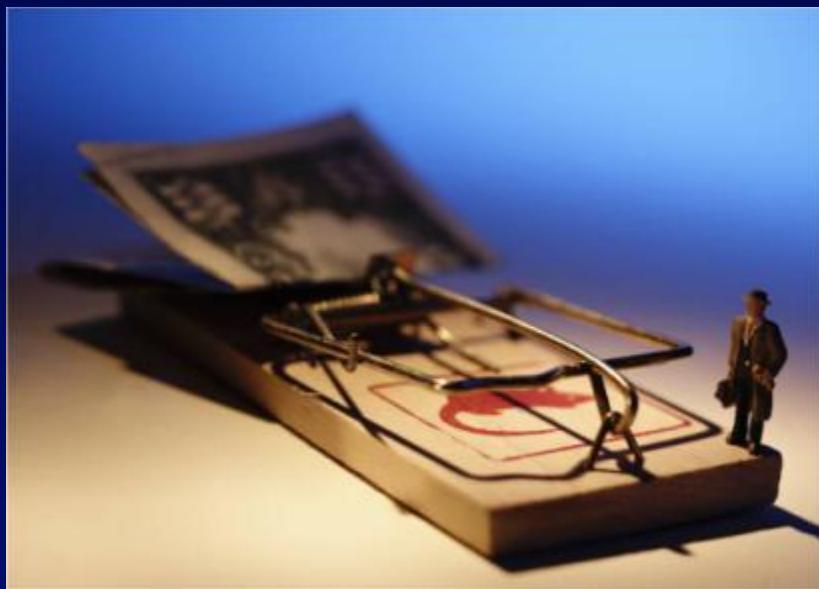


Glyphosate Resistant Weeds

- Palmer amaranth (NC, SC, and GA)
 - Chateau PRE is excellent!
 - Gramoxone POST
- Horseweed (NC, SC, TN)
 - Assume everything east of I-95 is infested with glyphosate resistant horseweed – Dr. Alan York, 2006.
 - Rely is excellent!



The Trap!



Glyphosate!

Total POST Control Programs Can Be Costly!

Glyphosate...What is the Sub Lethal Dose?

- Multiple Applications
- Applications in Late Summer
- Symptoms
 - Cankers
 - Brittle trunks
 - Weak trees
 - Post harvest fruit storage issues

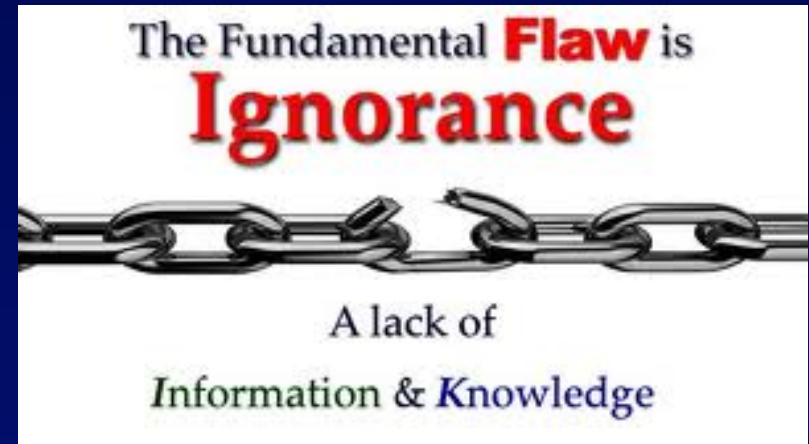


Photo Source: Mark Longstroth, Michigan State University

Be Ready for the Next GMO's

- Bayer
 - 2, 4-D tolerant crops
 - Soybean
 - Cotton
 - Corn
 - 2014/2015
- Monsanto
 - Dicamba tolerant crops
 - Soybean
 - Cotton
 - Corn
 - 2015
- Stacked tolerance with glyphosate or glufosinate

*A need exists for
education of technology
users and their neighbors
with sensitive crops!!!!*



The Technology and the Crops Need Protecting

Southeast Regional Bunch Grape Integrated Management Guide

the
Southern Region
small fruit consortium



<http://www.smallfruits.org/>

IPM/Production Guides

Herbicide Options for Blackberries



Wayne Mitchem

Orchard and Vineyard Floor Management

Dept. of Horticultural Science



Weed Control is Important



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- Weed control is important in establishing and maintaining a vigorous and highly productive blackberry planting. Hoeing, shallow disking and herbicides are recommended. Since blackberries produce shallow fleshy root systems, deep cultivation must be avoided.

- Bramble Fact Sheet, Univ. of Florida

Weed Competition in Spring Planted Raspberries

Trt.	1971		1972	
	Canes/plot	Avg. Ht.	Canes/plot	Avg. Ht.
WF	15	59	71	94
WF 5/28+	14	25*	56	91
WF 6/27+	11*	23*	37 *	74
Weedy	4*	32*	15*	79

H.M. Lawson and J.S. Wiseman. Weed Research, 1976, Vol. 16:155-162.

Weed Competition in Spring Planted Raspberries

Trt.	Fruit Yield Data		
	Kg/plot	g/cane	g/100 cm cane
WF	1.28	82	140
WF 5/28+	0.26*	20*	77*
WF 6/27+	0.22*	17*	60 [#]
Weedy	0.06*	15*	41 ^{\$}

H.M. Lawson and J.S. Wiseman. Weed Research, 1976, Vol. 16:155-162.

Objective in a Newly Planted Fruit Crop is to Grow, Grow, Grow!



14
Months



It takes water, fertilizer, more fertilizer and NO WEEDS!

Blackberry Ground Cover Management

- 4 ft weed-free band
 - Less than 4 ft may result in competition from row middle
- Row middles or drive alley
 - Established sod
 - Annual cover crop
 - Native vegetation



Weed-free Strip – How?

- Mulch
 - Plastic (1 to 2 year)
 - Hand weed in the holes around the crop (\$10 to \$15 per 1000 plants). If fumigation used there will be some benefit (but don't expect a lot).
 - Control weeds adjacent to the bed
 - Are herbicides labeled for this?
 - After 1st year weeds coming through holes in plastic must be controlled
 - Organic
 - Labor intensive
 - Annual replacement
 - Not suitable for large scale production (*my opinion*)



Weed-free Strip – How?

- Mechanical removal (newly planted)
 - Cultivation
 - Hoeing
- Herbicides
 - Cost effective



PRE Herbicide Options in Newly Planted Brambles

- Simazine 4F or 90DG – 1 qt or 1.1 lb/A
 - Activation within 14 to 21 days
 - Controls ragweed, lambsquarters, pigweed, henbit, prickly lettuce, purslane, and annual grasses
- Trellis 75 DF - 0.66 to 1.33 oz
 - Activation within 21 days
 - Controls a number of broadleaf weeds; MG suppression
 - Tank mix with oryzalin for PRE grass control

PRE Herbicide Options in Newly Planted Brambles

- Devrinol 50 DF – 4 lb/A
 - Activation within 24 hrs is best
- Oryzalin or Surflan – 2 to 4 qt/A
 - Activation within 14 to 21 days
 - Controls annual grasses, pigweed, lambsquarters

Newly Planted Blackberry Herbicide Programs

- Bare Ground

- Option #1


- Cultivation (until plants get established)
 - PRE herbicide
 - Oryzalin + ½ rate Simazine
 - Oryzalin
 - Poast or Select if needed
 - Paraquat late summer

- Option #2

- PRE herbicide
 - Surflan + ½ rate Simazine
 - Surflan
 - Poast or Select if needed
 - Paraquat late summer




PRE Herbicide Options Established Brambles

- Solicam  2.5 to 5 lb/A
 - Dormant application
 - Weak on pigweed and lambsquarter
 - Annual grasses, prickly sida, dogfennel, spurge
 - Suppresses yellow and purple nutsedge
 - Activation within 28 days; Brambles est. 12 mos.
- Oryzalin or Surflan – 2 to 4 qt/A
 - Activation within 14 to 21 days
- Simazine 4F or 90DG – 2-4 qt or 2.2-4.4 lb/A
 - Even at higher rates the addition of Surflan will be necessary for maximum residual annual grass control.



PRE Herbicide Options


Established Brambles

-  Casoron 4G – 100 lb/A or Casoron CS – 2.8 gal/A
 - Soil surface application may be applied in January
 - May be applied up until May 1 if incorporated immediately
 - Established plantings (1+ year)
 - Controls ragweed, dandelion, dogfennel, horseweed
 - 4G formulation is most effective
 - CS formulations less likely to volatilize



PRE/POST Herbicide Options

Established Brambles

- Sinbar  1 to 2 lb/A
 - Established plantings of 1 year or more
 - Apply in spring prior to fruit set
 - Do not apply within 70 days of harvest
 - Do not use on sandy soils with less than 1% OM
 - Activation within 14 days
 - Weeds must be small (<2" tall) for POST control
 - Controls horseweed, pigweed, lambsquarters, annual morningglory, ragweed, Florida pusley, annual grasses



Sinbar[®]
Agricultural Herbicide

Sinbar Brings More than PRE Control




Sinbar...Be Careful It Cuts Both Ways

- Caneberries can be sensitive
 - Use low rate on coarse/gravelly soils
 - Avoid repeated use
 - Good sprayer calibration




PRE/POST Herbicide Options

Established Brambles

- Callisto  3 to 6 fl. oz/A
 - Apply prior to the on-set of bloom
 - May be applied as a split application (3 oz/A applied twice)
 - Apply in combination with COC @ 1% v/v.
 - PRE
 - Pigweeds (including Palmer amaranth), lambsquarter, jimsonweed, galinsoga, nightshade, smartweed, velvetleaf, and ragweed.
 - Suppresses morningglory sp., cocklebur, and giant ragweed
 - POST
 - Common chickweed, Florida pusley, and wild mustard
 - Suppresses wild carrot, curly dock, horsenettle, horseweed, and pokeweed

POST Herbicide Options in Brambles


-  The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been corrupted. Restart your computer, and then open the file again. If the red x still appears, you may have to delete the image and then insert it again. Gramoxone SL (2.5 to 4 pt/A) or generic paraquat (1.5 to 2.7 pt/A)
 - NIS @ 0.25 % v/v
 - Contact with new canes will cause injury
 - Primocanes need to be 3 ft tall or more
 - May tank mix with PRE herbicides
- Glyphosate – 11 to 32 oz/A or 1 to 3 pt/A
 - DO NOT ALLOW CONTACT WITH GREEN CANES, BARK OR FOLIAGE
 - Apply as a directed shielded spray

The safest place for glyphosate around blackberry plants is in the jug!


What is This?



POST Herbicide Options in Brambles

-  The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been corrupted. Restart your computer, and then open the file again. If the red x still appears, you may have to delete the image and then insert it again. Aim – 0.8 to 2 fl. oz/A
 - COC @ 1% v/v
 - 15 day PHI
- Poast – 1.5 to 2.5 pt/A
 - COC @ 1 % v/v
 - 45 day PHI
- Fusilade – 12 to 24 oz/A
 - COC @ 1% v/v
 - Nonbearing use only
- Select Max – 12 to 16 oz/A
 - NIS @ 0.25 % v/v
 - 7 day PHI

Expectations of Blackberry Weed Management Program

- Eliminate  hard to control winter annuals
 - Horseweed, dandelion, dock, henbit, Carolina geranium, wild lettuce
 - Remember glyphosate is not an option
- Eliminate spring/summer weed competition
 - Maximize fruit size and yield
 - Extended harvest period
 - Primocane development
 - Worker efficiency
- Post harvest
 - Competition with developing primocanes
 - Interference with cane borer insecticide application

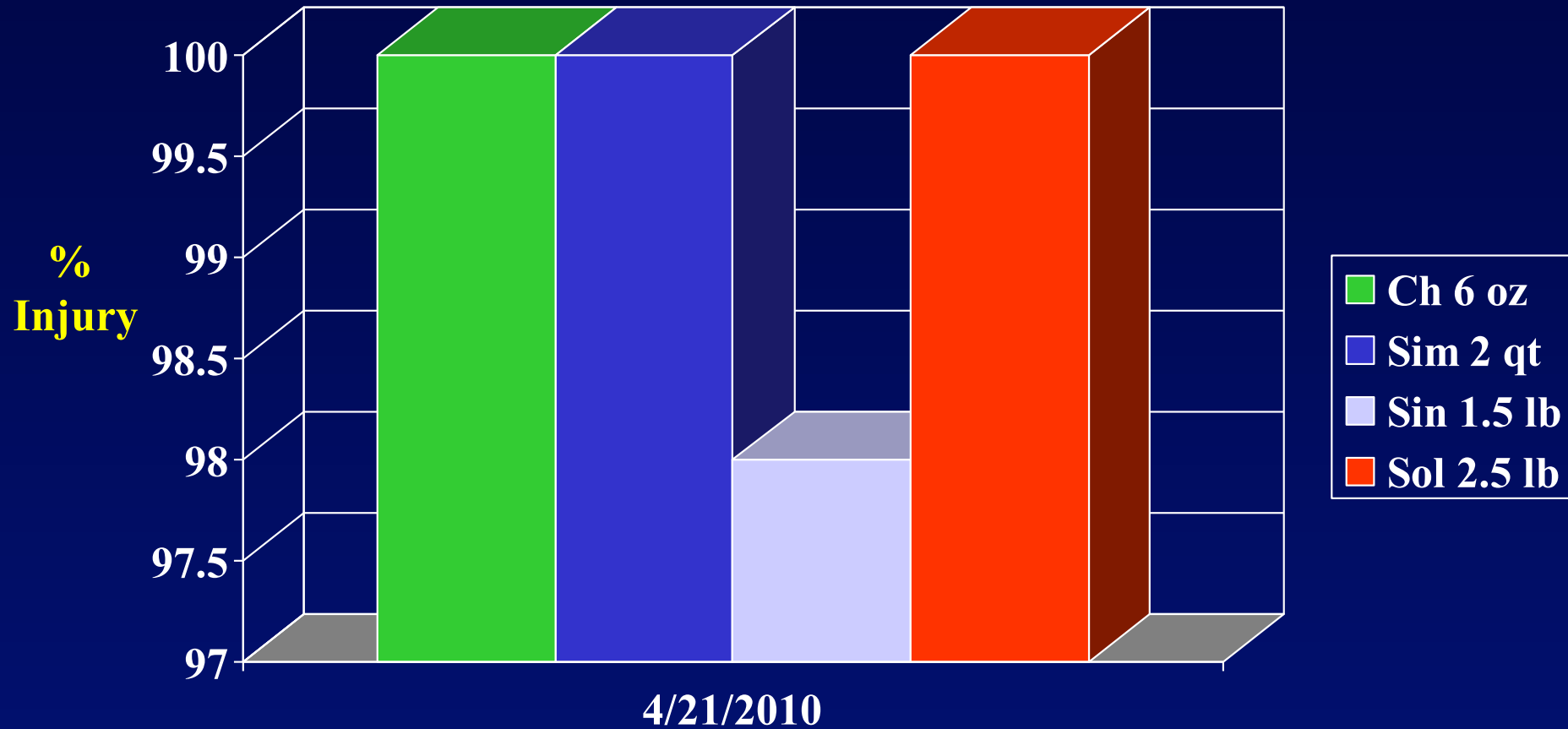


Benefits from Fall PRE Application

- Controls winter annual weeds that can be difficult to control with paraquat (horseweed, cutleaf eveningprimrose)
- Delays application time of Spring PRE
- Clean area for crown borer sprays applied post-harvest.



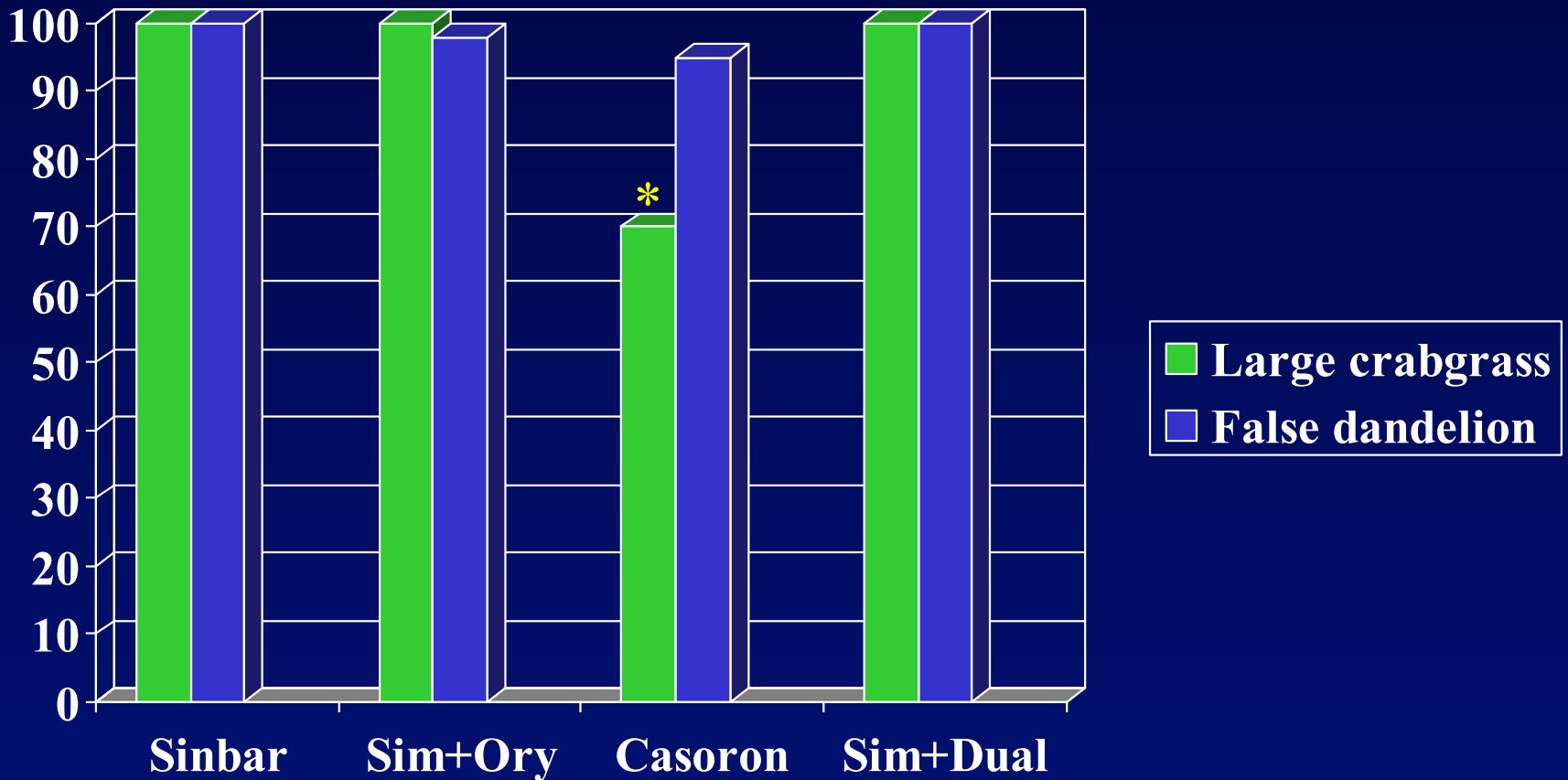
Wild Lettuce Control with Fall Applied PRE Herbicides



Herbicides applied November 18

Lincoln County, NC

PRE Herbicide Comparison

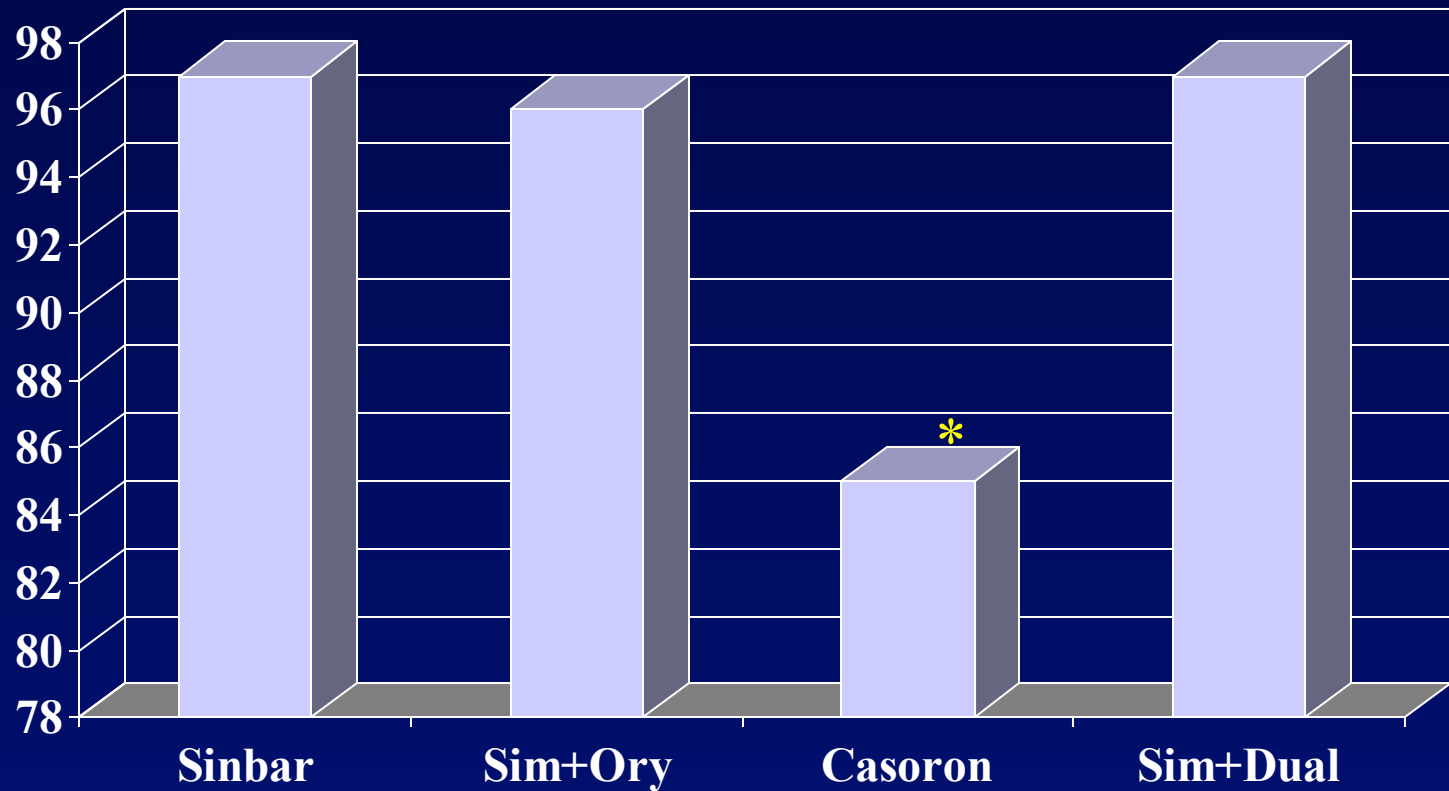


Casoron was applied 3/12/2010

All others was applied 4/20/2010

PRE Herbicides in Blackberry

% Bare Ground – June 9th



Casoron was applied 3/12/2010

All others was applied 4/20/2010

Post Harvest

September 2008



Paraquat applied after floracane removal

Recommended Herbicide Programs for Established Blackberry Plantings

Crop Age	Fall	Winter	Spring	Summer
Blackberry and Raspberry Established 1 or more years	Sinbar		Simazine + Surflan (Paraquat if needed)	Paraquat or Aim (multiple applications as needed); Select Max (as needed)
	Simazine + Paraquat		Sinbar (Paraquat if needed)	Paraquat or Aim (multiple applications as needed); Select Max (as needed)
		Simazine + Solicam + Paraquat		Paraquat or Aim (multiple applications as needed); Select Max (as needed)
	Paraquat	Casoron		Paraquat or Aim (multiple applications as needed); Select Max (as needed)
		Sinbar or Callisto + Paraquat	Simazine + Surflan (Paraquat if needed)	Paraquat or Aim (multiple applications as needed); Select Max (as needed)

Future Herbicide Registrations

- Expected 2013 or 2014
 - Dual Magnum
 - 24(c) labels being developed by manufacturer
 - Sandea
 - Notice of filing issued/Petition
- 2015 or Beyond
 - Chateau
 - Data collected
 - Spartan
 - MFG objective
 - TreeVix
 - Collecting crop tolerance data





?



Contact Info



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Weed Identification and Control Options in Strawberry

Katie Jennings
NC State University
January 10, 2013



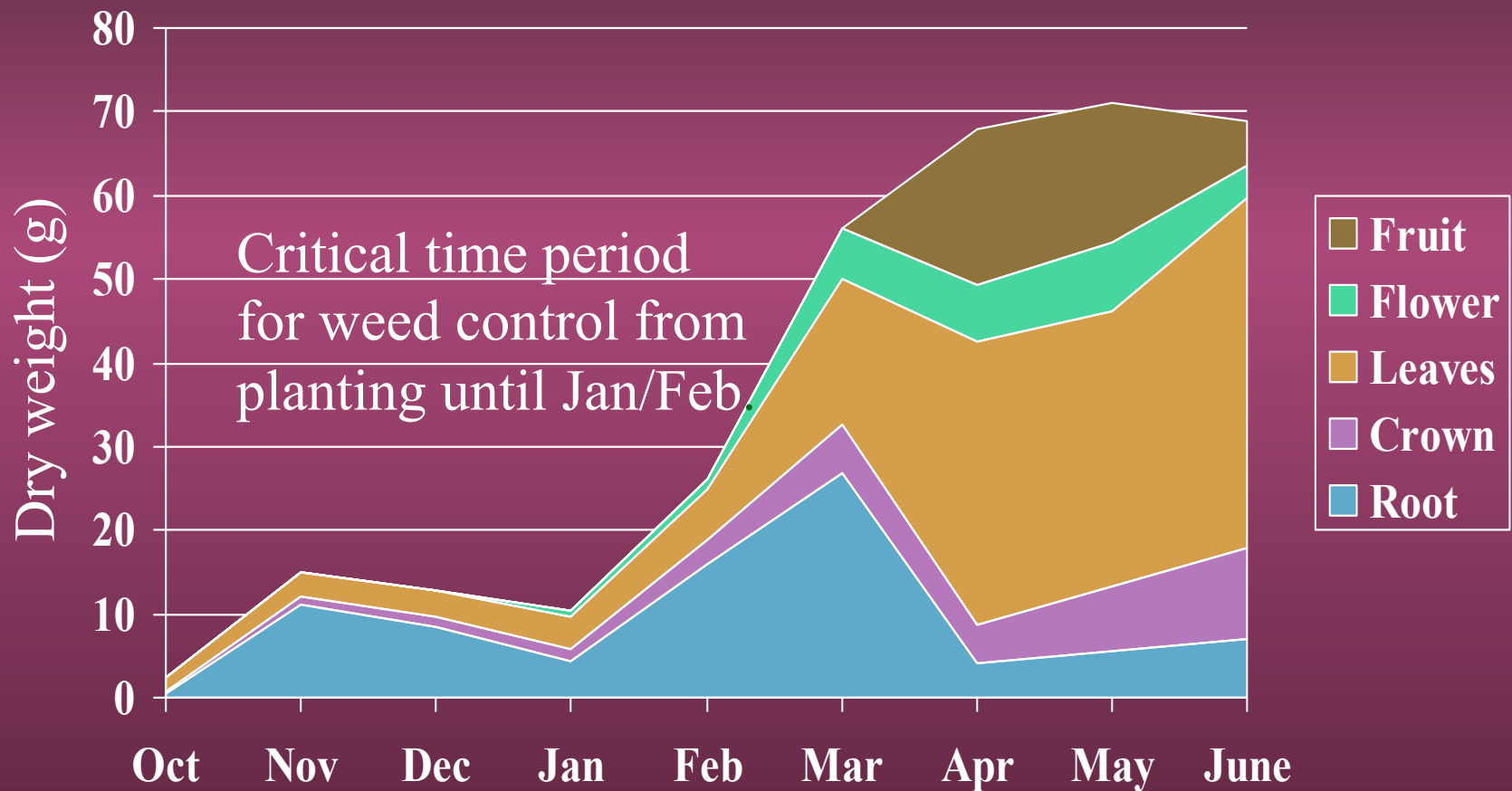


Outline

- Introduction
- Weed identification
- Preemergence herbicide options
- Postemergence herbicide options
- Possible registrations
- Research



Strawberry Growth





Beale's Study

- Buried seed of 20 species.
- Extracted seed at various time intervals and checked germination.



Beale's Study 40 Years Later Viable Seed

- Curly dock
- Evening primrose
- Black mustard
- Virginia pepperweed
- Broadleaf plantain
- Common purslane
- Redroot pigweed



Weed Identification

- To identify a weed it is necessary to understand “key” features of a weed and their differences between species.
- Use of a hand lens for small seedlings is important as seedling ID can be important.
- Accurate weed ID is crucial for implementation of a weed control method.



Life Cycle of Weeds

- Annual
- Biennial
- Perennial



Winter Annual Weeds

Completes life cycle in one year

- Germinate in the fall, overwinter as small plants, flower and produce seed in the spring and die in late spring as temperatures rise.
 - Henbit, deadnettle, chickweed, geranium, yellow rocket, mustards



Biennial Weeds

Requires two growing seasons
to complete life cycle

- Seed germinate in the spring, summer or fall of the first year and a rosette is formed. Plants overwinter as a rosette with a thick storage root.
- After vernalization (exposure to cold) the plants flower and produce seed in the second year.
 - Cutleaf evening primrose



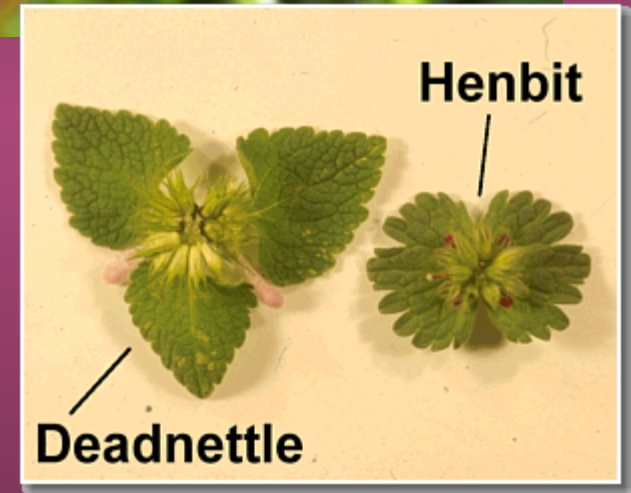
Perennial Weeds

- Produce vegetative structures that allow them to live for more than two years without having to produce seeds.
 - **Simple perennial** – overwinters by means of a vegetative root but primarily reproduces by seed; does not spread by means of a vegetative structure.
 - ✦ Curly dock
 - **Creeping perennial** – can overwinter and produce new plants by vegetative structures. Most can reproduce by seed also.
 - ✦ Common bermuda, yellow and purple nutsedge

Winter Annual Weeds

Completes life cycle in one year

Henbit



Herbicide Options:

1. Chateau 3 oz/A applied to preformed bed prior to laying plastic.
2. Goal 1 pt/A applied to preformed bed prior to laying plastic.
3. No postemergence options available.

Common and mousear chickweed



Herbicide Options:

1. Chateau 3 oz/A applied to preformed bed prior to laying plastic.
2. Devrinol 8 lb/A applied to preformed bed prior to laying plastic.
3. No postemergence options available.

Carolina geranium

Virginia Tech Weed ID Guide



Herbicide Options:

1. Goal at 1 pt/A applied to preformed bed prior to laying plastic.
2. No postemergence options available.

Vetch



Herbicide Options:

1. Stinger POST at 0.3 to 0.5 pt/A.

Wild radish



Herbicide Options:

1. Goal at 1 pt/A applied to preformed bed prior to laying plastic (wild mustard).
2. Chateau at 3 oz/A applied to preformed bed prior to laying plastic.
3. No postemergence options available.



Biennial Weeds

Requires two growing seasons
to complete life cycle

- Seed germinate in the spring, summer or fall of the first year and a rosette is formed. Plants overwinter as a rosette with a thick storage root.
- After vernalization (exposure to cold) the plants flower and produce seed in the second year.

Cutleaf evening primrose



Herbicide Options:

1. Goal at 1 pt/A applied to preformed bed prior to laying plastic will provide partial control.
2. Chateau 3 oz/A applied to preformed bed prior to laying plastic.
3. No postemergence options available.

Perennial Weeds

- Produce vegetative structures that allow them to live for more than two years without having to produce seeds.
 - **Simple perennial** – overwinters by means of a vegetative root but primarily reproduces by seed; does not spread by means of a vegetative structure.
 - **Creeping perennial** – can overwinter and produce new plants by vegetative structures. Most can reproduce by seed also.

Curly dock



Herbicide Options:

1. Goal at 1 pt/A applied to preformed bed.
2. Chateau and Devrinol will not control.
3. Stinger 0.3 to 0.67 pt/A applied postemergence



White clover

Virginia Tech Weed ID Guide



Herbicide Options:

1. Chateau and Devrinol will not control.
2. Goal has some activity.
3. Stinger 0.3 to 0.67 pt/A applied postemergence.

Buckhorn plantain



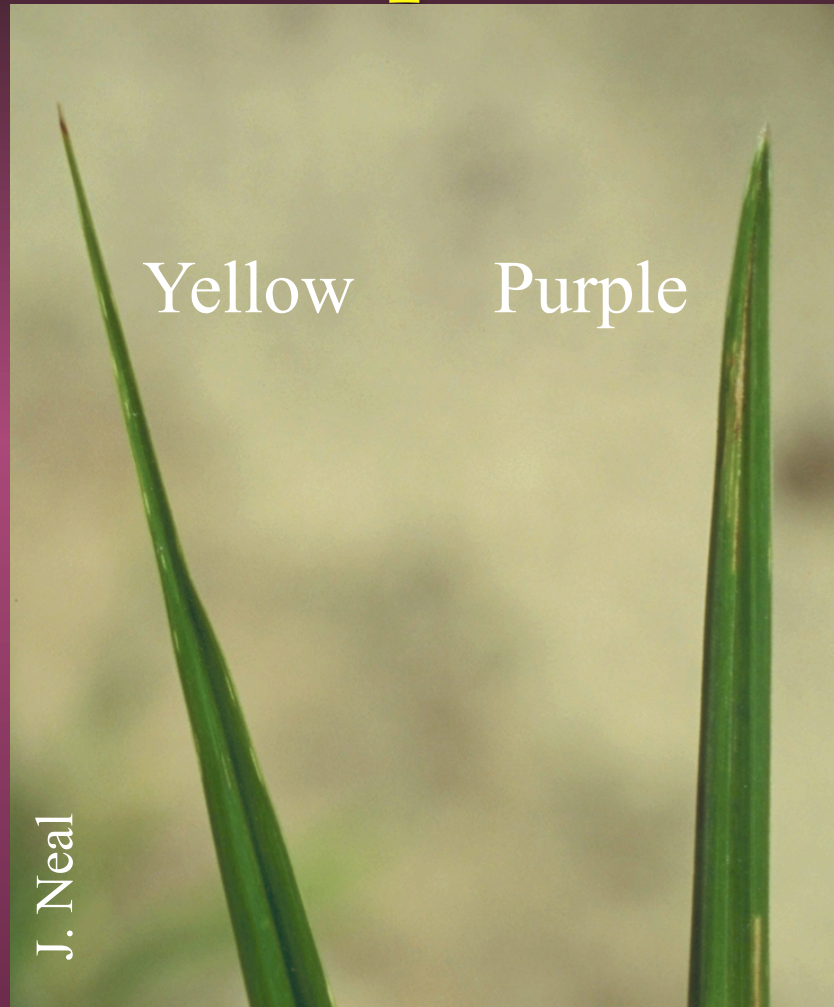
Herbicide Options:

1. Chateau, Goal, and Devrinol will not control.
2. Stinger 0.3 to 0.67 pt/A applied postemergence will suppress.



Yellow vs. Purple – Leaf tips

Yellow
nutsedge
leaf tips
taper to a
long,
narrow
point

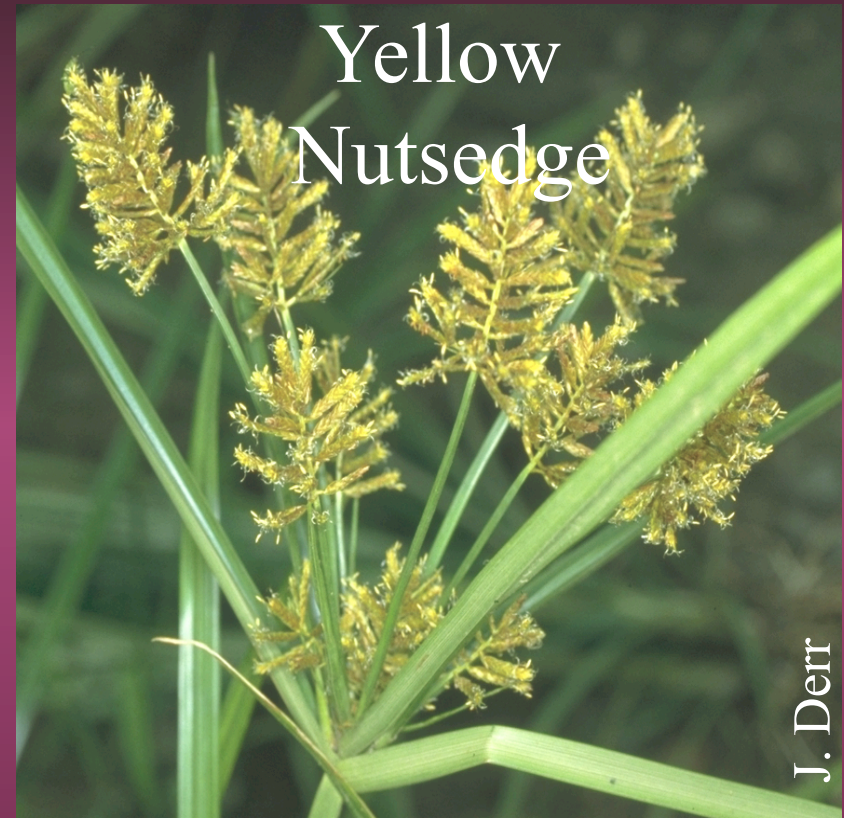


Purple
nutsedge
leaf tips
are
pointed
but not
tapered

Yellow vs. Purple -- Flowers



Purple or reddish
brown turning black



Yellow fading to tan

Herbicide Options for Preemergence Weed Control in the Row





New Herbicide Registration Spartan

- Rate: 4-8 oz/A; dependent on soil type.
- Increased pH (pH=7) reduced tolerance.
- Pretransplant.
- May be tank mixed with other herbicides.
- Weeds controlled or suppressed: chickweed, curly dock, common purslane, shepherdspurse, yellow and purple nutsedge (fair)



Goal PRE

- Rate: 1 to 2 pt/A to pre-formed bed at least **30 days before transplanting**.
- Plastic mulch should be applied soon after application.
- Avoid soil disturbance for best results.
- Controls Carolina geranium, henbit, cutleaf eveningprimrose, and curly dock.





Chateau PRE

- Rate: 3 oz/A to pre-formed bed prior to laying plastic.
- Apply at least 30 days prior to transplanting.
- Controls cutleaf eveningprimrose, **henbit**, **chickweed**, pigweeds, wild radish.





Chateau PRE 3 oz/A



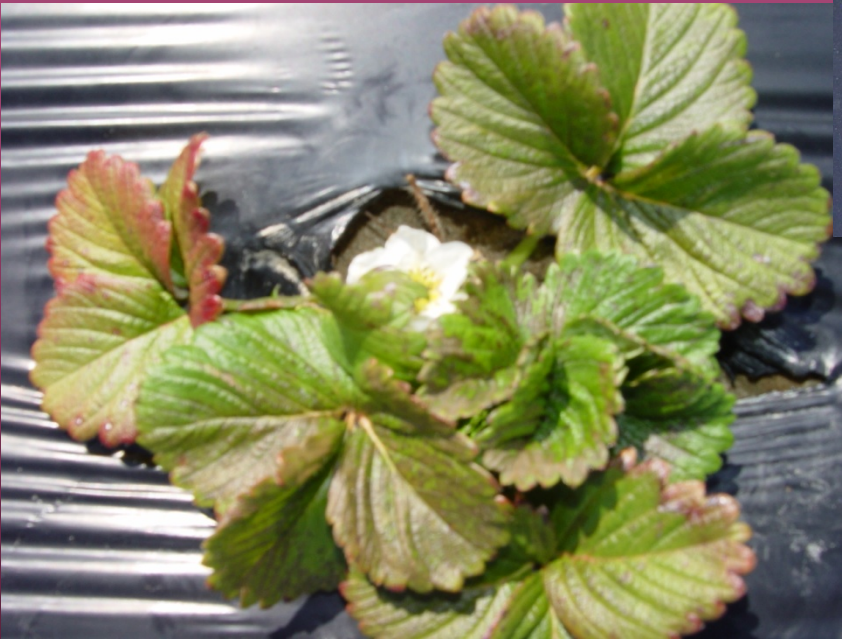
Chateau PRE

- Some yellowing observed although short-lived.
- No effect on plant size noted.
- Total yield from 0, 1, 2, and 3 oz/A were similar.
- Only 4 oz caused a significant reduction in yield, this is above labeled rate.
- Likely a good option for broadleaf weed control in row.

Chateau POST Results



Chateau is not registered for POST application.





Ultra Blazer PRE

- Rate: 0.5 to 1.5 pt/A to pre-formed bed.
- Avoid soil disturbance after application for best results.
- Plastic mulch should be applied soon after application.
- **No thirty day restriction.**
- Weed spectrum similar to Goal.
- Limited research in NC.



Devrinol PRE

- Rate: 8 qt or 8 lb to pre-formed bed prior to laying plastic. Incorporate or spray on surface.
- If bed is dry irrigate in with enough water to soak bed 2 to 4”.
- Subject to photodegradation. About 50% is lost after 4 days on the soil surface in the summer.
- Controls annual grasses and small seeded broadleaf weeds.
- Potential for injury – limited work in NC.



What about applying Sinbar PRE in the Bed?

- Injury has been observed in NC on our sandy soils.
- Some years we have seen minimal injury. However, other years injury has been pretty severe.





Response to Preemergence Herbicides in Strawberry

	Yellow Nutsedge	Carolina Geranium	Cut. Evening Primrose	Vetch	Henbit	Curly Dock	Chick	Annual Grasses
Chateau	N	---	G	N	GE	N	GE	F
Devrinol	N	N	N	G	N	N	G	G
Goal	N	GE	GE	N	GE	GE	GE	F
Ultra Blazer*	N	---	---	N	---	---	---	F
Prowl H ₂ O	N	N	N	N	FG	N	F	G

Key: N = no control, F= fair, G = good, E = excellent, --- = no data available.

*Data is limited but activity is probably similar to activity from Goal.



Weed Response to Postemergence Herbicides in Strawberry

	Yellow Nutsedge	Carolina Geranium	Cut. Evening Primrose	Vetch	Henbit	Curly Dock	Chick	Annual Grasses
Aim	P	FG	FG	PF	F	P	FG	N
Paraquat	F	G	G	G	G	G	G	FG
Roundup	FG	G	FG	G	FG	F	G	G
Stinger	N	N	N	E	N	G	N	N
Poast Select Select Max	N	N	N	N	N	N	N	GE

Key: N = no control, F= fair, G = good, E = excellent.

Herbicide Options for Postemergence Weed Control in the Row





Select/Arrow

- POST for annual and perennial grasses.
- Rate: 6 to 8 oz/A.
- Newly planted or established plantings.
- Use high rate and sequential applications for perennial grasses (bermudagrass or johnsongrass).
- Total use during season can not exceed 32 oz per acre per year.
- Do not apply within 4 days of harvest.



Select Max

- Rate: 12 to 16 oz/A.
- Nonionic surfactant or COC
- Newly planted or established plantings.
- POST for annual and perennial grasses.
- Use high rate and sequential applications for perennial grasses (bermudagrass or johnsongrass).
- Total use during season can not exceed 32 oz per acre per year.
- Do not apply within 4 days of harvest.



Poast

- Rate: 1 to 1.5 pt/A
- POST for annual and perennial grasses.
- Sequential applications necessary for perennial grass control.
- Do not apply within 7 days of harvest.
- Do not exceed 2.5 pt/A per year.



Poast

- Some recent questions about slowing down the ryegrass in row middles.
- Recommend spraying Poast at about 5 oz/A without crop oil.
- Hard to say what will happen – hopefully will slow down and not kill the ryegrass completely. If it doesn't slow it down enough spray again 10 days later.
- Downside – lower rates select for resistant ryegrass.



New Herbicide Registration Spartan

- Rate: 4-8 oz/A; dependent on soil type.
- Increased pH (pH=7) reduced tolerance.
- Pretransplant.
- May be tank mixed with other herbicides.
- Weeds controlled or suppressed: chickweed, curly dock, common purslane, shepherdspurse, yellow and purple nutsedge (fair)



Several Options for Row Middles

- Cultural
Annual ryegrass
- Herbicide options
 - Preemergence
 - Chateau
 - Dacthal
 - Devrinol
 - Prowl H2O
 - Postemergence
 - Poast
 - Select/Select Max
 - Stinger
 - Ultra Blazer
 - Aim
 - Gramoxone Inteon
 - Roundup WeatherMax

Ryegrass in the Row Middles



Resistant Ryegrass

- Two sources

- Seed source.
- Seed bank - introduced seed planted in row middles in strawberries in previous years.
- Seed moving in from wheat-growing areas that have Hoelon resistant ryegrass.

What Herbicides Will Hurt Ryegrass?

Preemergence

- Chateau - YES
- Dacthal - YES
- Devrinol – YES
- Prowl H2O - YES

Postemergence

- Poast - YES
- Select/Select Max - YES
- Stinger - NO
- Ultra Blazer - YES
- Gramoxone Inteon – YES
- Roundup WeatherMax - YES
- Aim - YES



How to Kill Resistant Ryegrass in Row Middles?

- Roundup – Multiple applications applied with a hooded or shielded sprayer.
- Keep Roundup solution from contacting the strawberry plant and fruit to avoid severe crop injury.
- As strawberry plant ages tolerance to Roundup increases.



Future Herbicide Registration Dual Magnum

- Controls annual grasses and small seeded broadleaf weeds, yellow nutsedge (control/suppression).
- Most likely will be applied pretransplant to preformed bed or soon after planting as it will not control emerged weeds.



NCSU Weed Science Research Dual Magnum

- Dual Magnum applied at various timings to strawberry grown in an annual production system.
 - Preplant, Post 7 to 10 DAP, POST 14 to 21 DAP.
 - Controls yellow nutsedge, pigweed, annual grasses.



Dual Magnum Materials and Methods

- Applied to pre-formed bed or 1 or 2 wk after transplanting.
- Chandler strawberry plug plants transplanted October 6, 2010.
- Clayton, NC
- Data collected includes crop injury, yield, strawberry size.
 - Harvested weekly from April 18 to May 16 2011.



Strawberry Response to Dual Magnum

Treatments	Rate pt/A	Timing	Injury %	Marketable Yield lb/20 plants
Nontreated			0	49 a
Dual Magnum	0.5	A	0	41 ab
Dual Magnum	0.75	A	0	37 ab
Dual Magnum	0.5	B	0	42 ab
Dual Magnum	0.75	B	0	44 ab
Dual Magnum	0.5	C	0	36 ab
Dual Magnum	0.75	C	0	25 b
Devrinol UV		A	0	34 ab
Devrinol		A	0	31 ab

Key: A = preplant; B = 1 WAP; C = 2 WAP.



Potential Herbicide Registration Reflex

- Active ingredient- fomesafen.
- PPO inhibitor (like Chateau).
- Registered for use in tomato and bell pepper.



Questions about Row Covers and Stinger and Poast Materials and Methods

- Chandler plug plants transplanted October 12, 2010.
- Stinger 0.33 (1X rate), 0.67, and 1.34 pt/A.
- Poast 1, 2, and 4 pt/A plus crop oil concentrate at 1% v/v.
- Treatments applied March 4, 2011.
- Castle Hayne, NC
- Data collected: crop injury, yield, strawberry size.
 - Harvested weekly from April 19 to May 17 2011.



Strawberry Response to Stinger with and without Row Covers

Treatments	Rate pt/A	Row Cover	Injury 2 WAT %	Marketable Yield lb
Nontreated		No	0 c	35 a
Stinger	0.33	No	1 c	39 a
Stinger	0.67	No	3 c	32 a
Stinger	1.34	No	13 c	36 a
Nontreated		Yes	0 c	35 a
Stinger	0.33	Yes	26 b	33 a
Stinger	0.67	Yes	30 ab	29 a
Stinger	1.34	yes	40 a	34 a





Strawberry Response to Poast with and without Row Covers

Treatments	Rate pt/A	Row Cover	Injury 2 WAT %	Marketable Yield lb
Nontreated		No	0	56
Poast	1	No	0	50
Poast	2	No	0	56
Poast	4	No	0	48
Nontreated		Yes	0	49
Poast	1	Yes	0	48
Poast	2	Yes	0	37
Poast	4	yes	0	44
Isd			ns	ns

COC (1% v/v) was included with all treatments.

Questions?

