What Every UGA County Agent Should Know About Weed Science

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General Thoughts

- Herbicides are unpredictable
  - influenced by everything: sprayer, soil type, temperature, moisture, humidity, weed species, stage of growth, etc. etc.
  - when things go bad, they can go really bad!
    - fungicides/insecticides rarely (never?) kill crops
- Herbicides
    - do not guess
    - do not assume
    - share only results based on repeatable sound science

Herbicide Application Methods

- Preplant Incorporated (PPI)
- Preemergence (PRE)
- Postemergence (POST)
  - *Cracking*
  - *Early-Post (EPOST)*
  - *Late-Post (LPOST)*
- Lay-By or Post-Directed

Herbicide Application Methods

What Every UGA County Agent Should Know - I

- Water pH and hardness are not the same thing
- atrazine is awesome
- ALS Herbicides
- OP/ALS/HPPD/Hybrid Interactions
- Know your grasses
- metribuzin is awesome
- glyphosate does not cause nutrient deficiencies

What Every UGA County Agent Should Know - II

- Valor will cause peanut injury but so what!
- No way to predict Cadre carryover to cotton!
  - *Lime/pH*
  - *other ALS herbicides (Staple, etc.)*
- Use Concep treated seed with Dual or Warrant on grain sorghum
- Nematodes and soil fertility problems cause more issues than herbicide carryover.
- Glyphosate/picloram/peanuts

Table 1. Water pH and major cation concentrations of South Georgia Wells from July 1, 2014 to May 2, 2017[a].

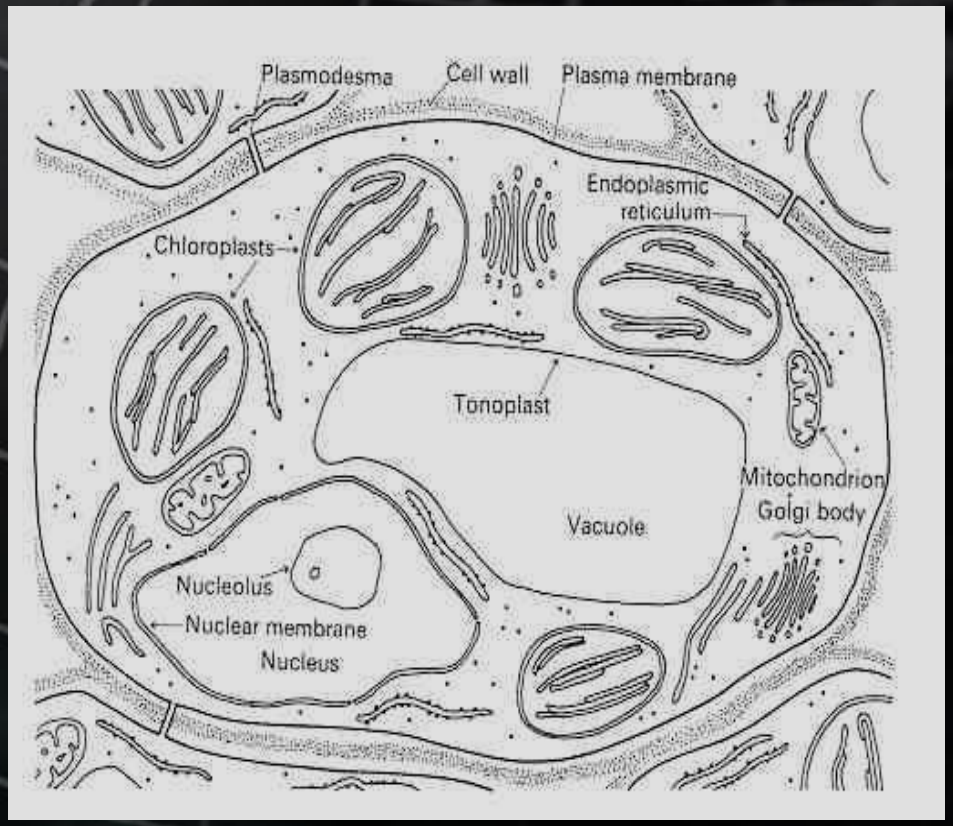
Value	pH	Cation Concentration (ppm)					AMS/100 gals (lbs)[b]
		Ca	Fe	K	Mg	Na	
Median	7.7	30.17	<0.1	1.52	4.66	5.89	0.37
Minimum	4.5	1.9	<0.1	<0.5	0.22	<0.5	0.03
Maximum	8.59	126.23	14.45	97.1	35.10	97.22	2.92

[a]*Dr. Jay T. Lessl, Program Coordinator, UGA Soil, Plant & Water Laboratory, 1146 water well samples.*

[b]*lbs of AMS/100 gallons of water needed to overcome potential hard water antagonism. Based upon the following equation developed at North Dakota State University: (0.002 X K ppm) + (0.005 X Na ppm) + (0.009 X Ca ppm) + (0.014 X Mg ppm) + (0.042 X Fe ppm).*


Atrazine 4L @ 2 qts/A + COC @ 1% v/v
Applied to 4”-9” Palmer Amaranth (6” average)
Photo 13 DAT

What does ALS mean?



- Acetolactate synthase (ALS)
- Acetohydroxyacid synthase (AHAS)
- chloroplast enzyme needed to form certain amino acids
  - *Valine, leucine, isoleucine*
- Herbicide families
  - *Imidazolinone, sulfonanalide, benzoates, sulfonylurea*

Commonly Used ALS Herbicides

- Accent
- Ally/Cimarron
- Beyond
- **Cadre**
- Classic
- Envoke
- Express
- Finesse
- FirstRate
- **Harmony Extra**
- Maverick Pro
- Osprey
- Permit/Sandea
- Powerflex
- Pursuit
- Python
- **Staple**
- **Steadfast Q**
- **Strongarm**

Insecticide/Herbicide Interactions

- Insecticides
  - *Organophosphates (OP'S)*
  - *Counter, Lorsban, Thimet*
- Herbicides
  - *Steadfast Q*
  - *Capreno*
  - *Halex GT*
  - *Sandea*

- Why?
  - *overload the plant's ability to metabolize chemicals*

GUIDELINES FOR HERBICIDE USE WITH COUNTER 20G INSECTICIDE

The following corn herbicides may be safely applied at specified timings in a program with Counter 20G insecticide:

Manufacturer	Corn Herbicide	Timing
AMVAC	IMPACT®	Post
Monsanto Company	Degree®	EPP/PPI/Pre/Post
	Degree Extra®	EPP/PPI/Pre/Post
	Harness®	EPP/PPI/Pre/Post
	Harness Extra®	EPP/PPI/Pre/Post
	Warrant®	Post
	Roundup PowerMAX®	Post
	Roundup WeatherMAX®	Post
Syngenta Crop Protection, Inc.	AAtrex 4L®	EPP/PPI/Pre/Post
	Princep 4L®	EPP/PPI/Pre
	Bicep II® Magnum	EPP/PPI/Pre/Post
	Bicep Lite II® Magnum	EPP/PPI/Pre/Post
	Dual II® Magnum	EPP/PPI/Pre/Post
	Lumax®	PPI/Pre
	Lexar®	PPI/Pre
	Camix®	Pre
	TouchDown®	Post
Dow Agrosciences, LLC	Keystone®	PPI/Pre/Post
	Fultime®	PPI/Pre/Post
	Durango®	Post
	2,4-D®	Post

Manufacturer	Corn Herbicide	Timing
DuPont Crop Protection	Breakfree ATZ®	EPP/PPI/Pre/Post
	Cinch ATZ®	EPP/PPI/Pre/Post
	Abundit™ Extra	Post
BASF Ag Products	G-Max Lite™	PPI/Pre/Post
	Guardsman Max®	PPI/Pre/Post
	Outlook®	PPI/Pre/Post
	Prowl H2O®	Pre/Post
	Status®	Post
	Clarity®	Pre/Post
	Marksman®	Pre/Post
Bayer CropScience	Balance® Pro	EPP/PPI/Pre
	Balance® Flexx	EPP/PPI/Pre/Post
	Laudis®	Post
	Ignite®	Post
	Buctril 4EC®	Post
FMC Corporation	Aim®	Post
	Cadet®	Post
Valent USA	Resource®	Post

The following corn herbicides* have labeled restrictions at specified timings with Counter 20G insecticide:

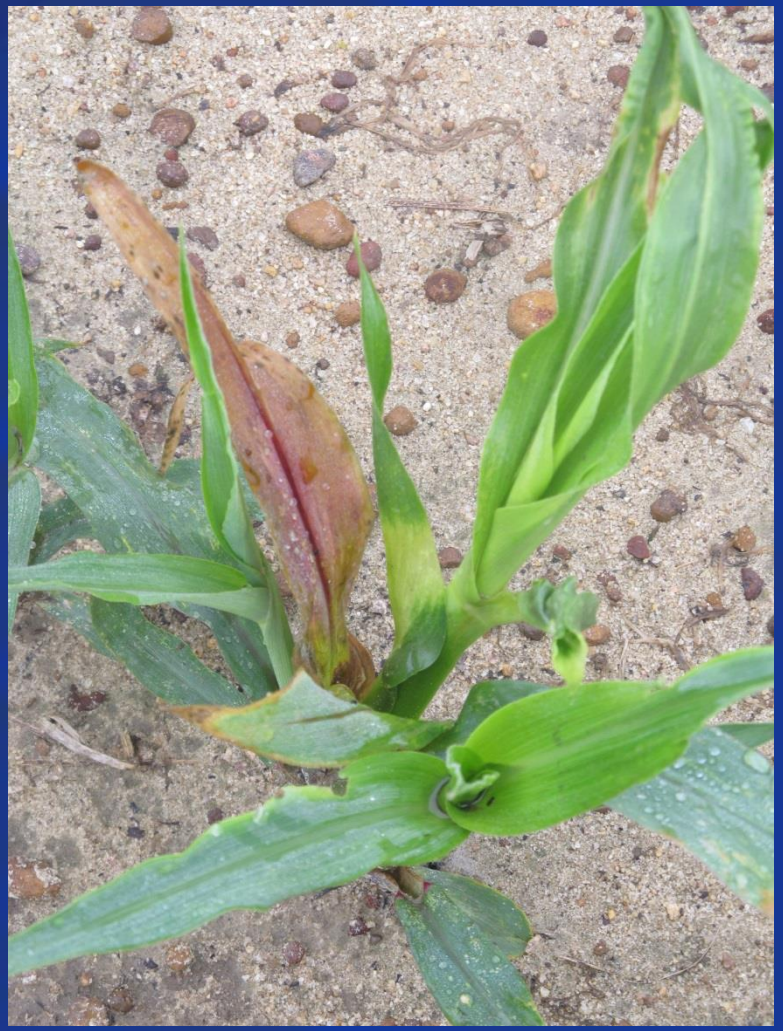
Manufacturer	Corn Herbicide	Timing
DuPont Crop Protection	Accent® / Accent® Q	Post
	Basis®	PRE/post
	Prequel®	Preplant/PRE
	Realm® Q	Post
	Require® Q	Preplant/PRE/Post
	Resolve® / Resolve® Q	Preplant/PRE/Post
	Steadfast® / Steadfast® Q	Post
	Stout®	Post
Monsanto Company	TripleFLEX™	PRE/Post
Syngenta Crop Protection, Inc.	Beacon®	Post
	Northstar®	Post
	Spirit®	Post
	Callisto® / Callisto® Xtra	Post
	Camix®	Post
	Halex™ GT	Post
	Lexar®	Post
	Lumax®	Post

Manufacturer	Corn Herbicide	Timing
Dow Agrosciences, LLC	Hornet®	Preplant/PRE/Post
	Python®	Preplant/PRE
	SureStart®	Preplant/PRE/Post
Bayer CropScience	Capreno®	PRE/Post
	Corvus®	Preplant/PRE/Post
	Option®	Post
BASF Ag Products	Sharpen®	Preplant/PRE
	Verdict™	Preplant/PRE
FMC Corporation	Solstice™	Post
Gowan Co., LLC	Permit®	Post

*Other herbicides not listed may have restrictions. Always read and follow label directions/restrictions. For more information about COUNTER 20G, and other AMVAC insecticides, contact your local agricultural chemical retailer or AMVAC representative at 1-888 GO AMVAC (1-888-462-6822) or visit www.amvac-chemical.com.

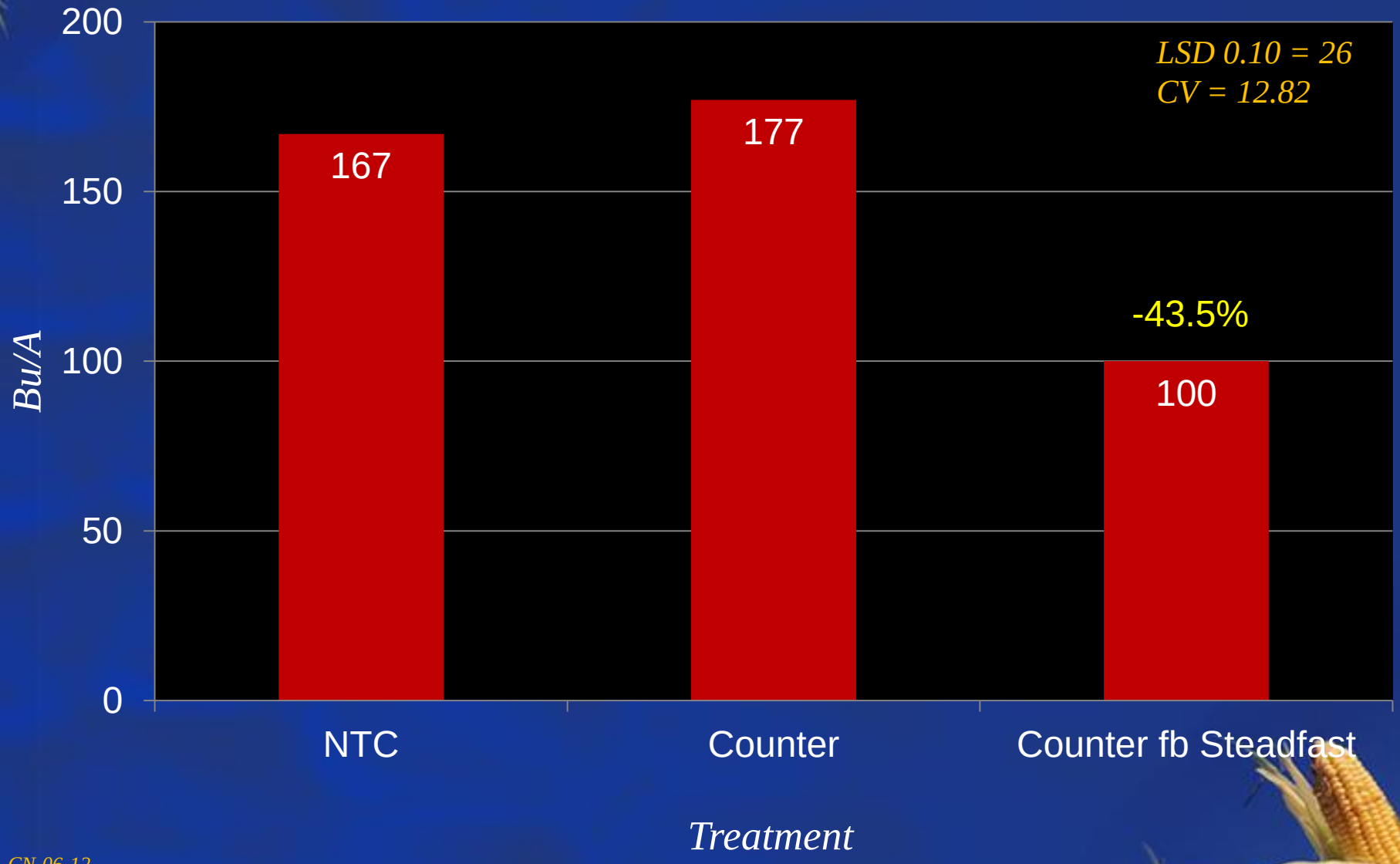
Proudly produced in the U.S.A. by AMVAC

Counter 20CR @ 6 oz/A (INFR) FB Steadfast 75WG @ 0.75 oz/A + NIS @ 0.25% (V3-V4)



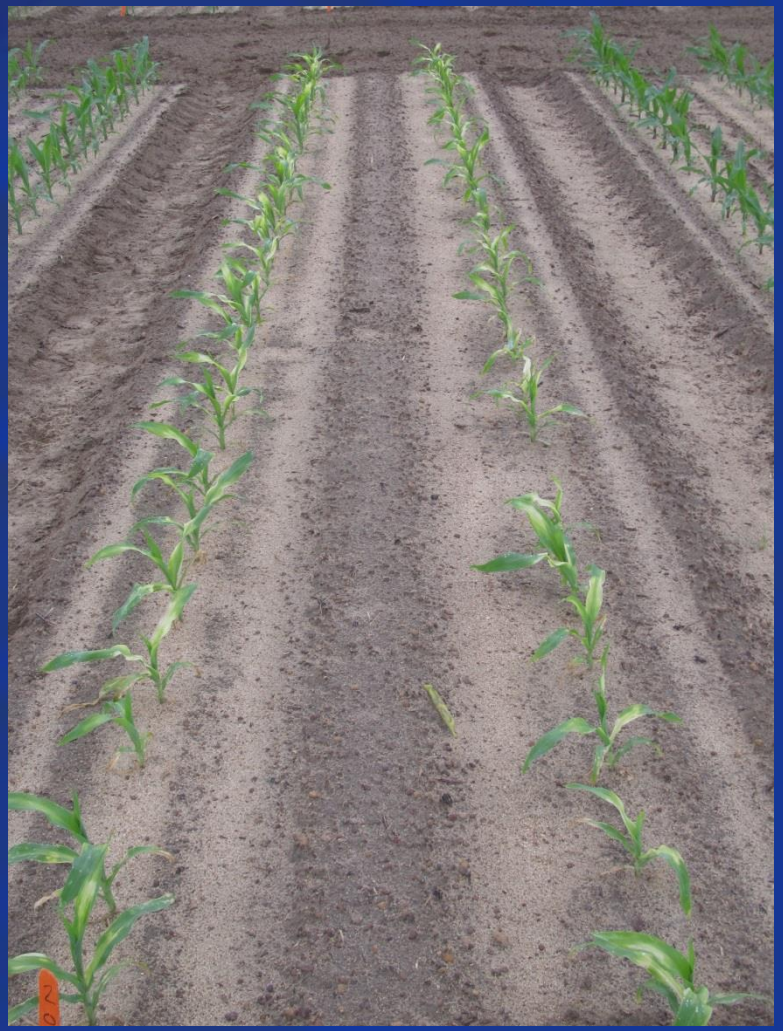
CN-06-12
DKC 66-97
15 DAT

Field Corn (DKC 66-97) Yield Response to Counter fb Steadfast - 2012

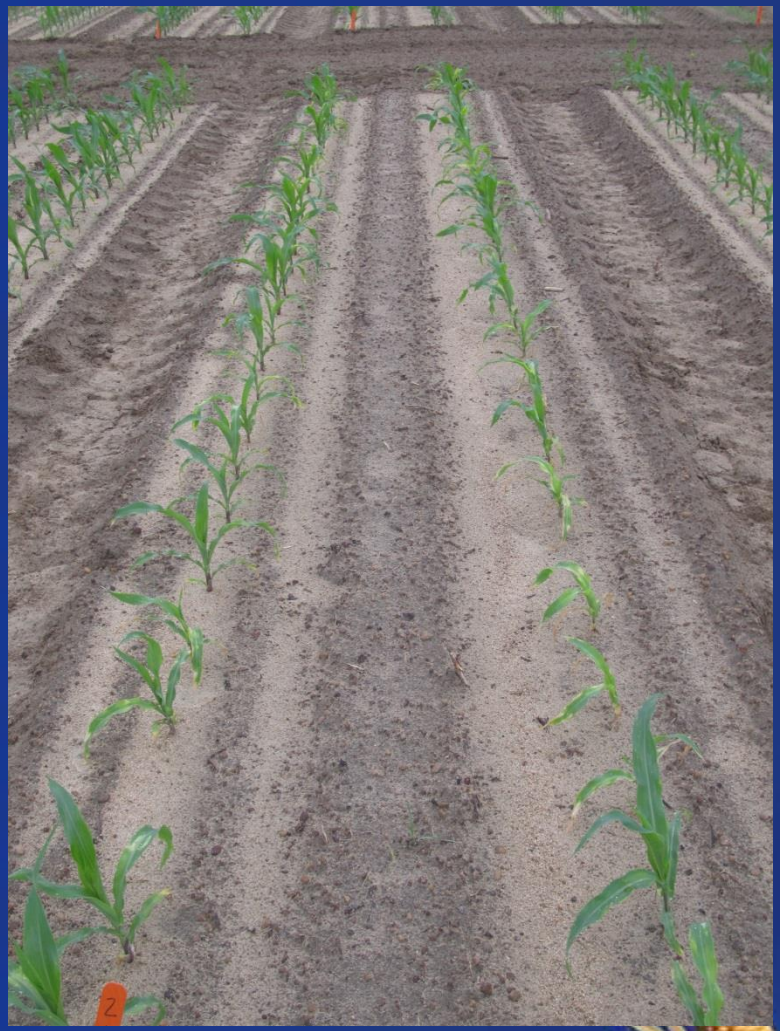


CN-06-12

Counter 15G (INFR) fb Halex GT + Atrazine + AMS + NIS (V4)



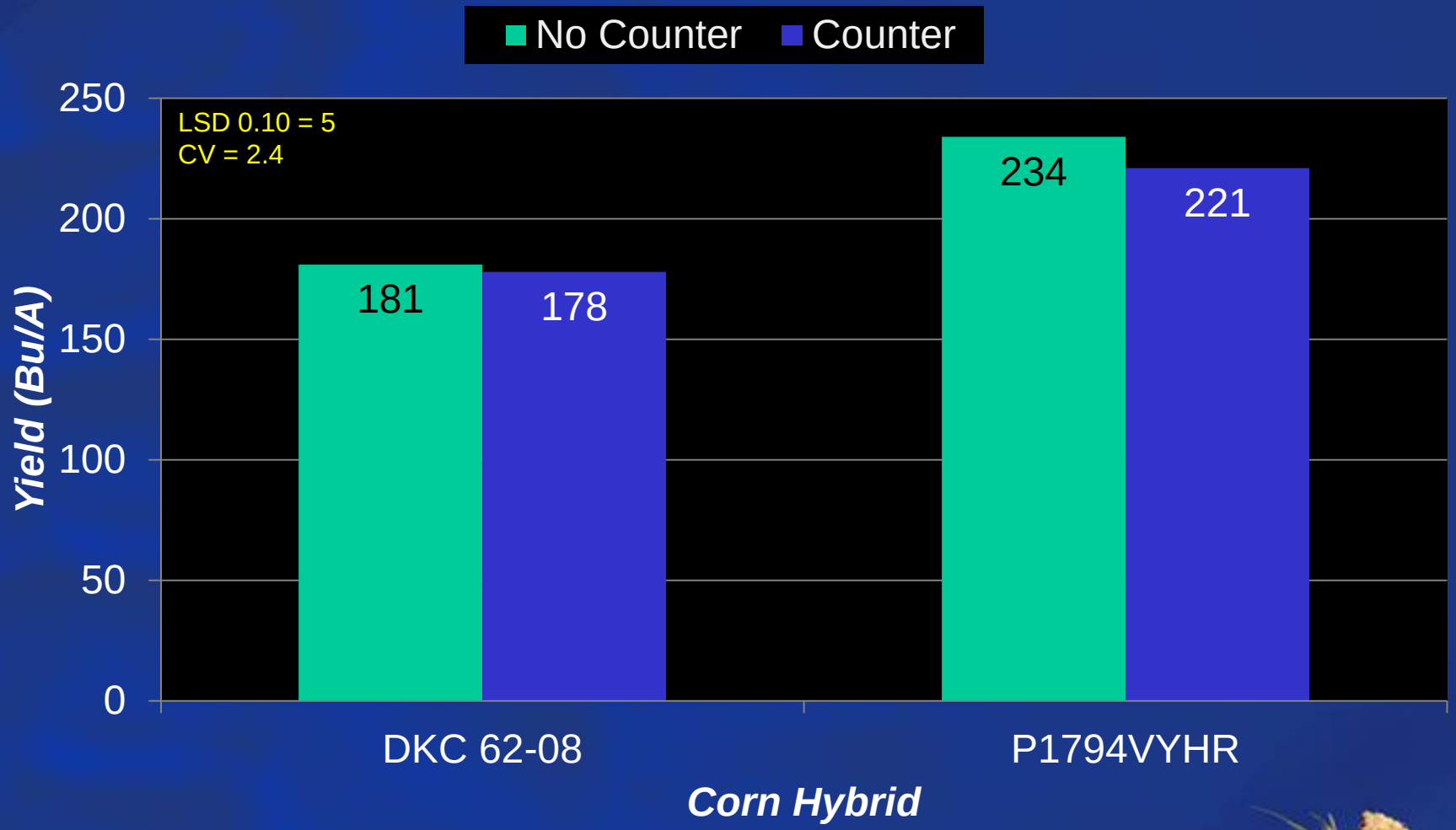
DKC 62-08



P1794VYHR

CN-07-17
April 24
6 DAT

Field Corn Hybrid Yield Response to POST Applied Acuron or Halex GT with/without Counter INFR - 2017



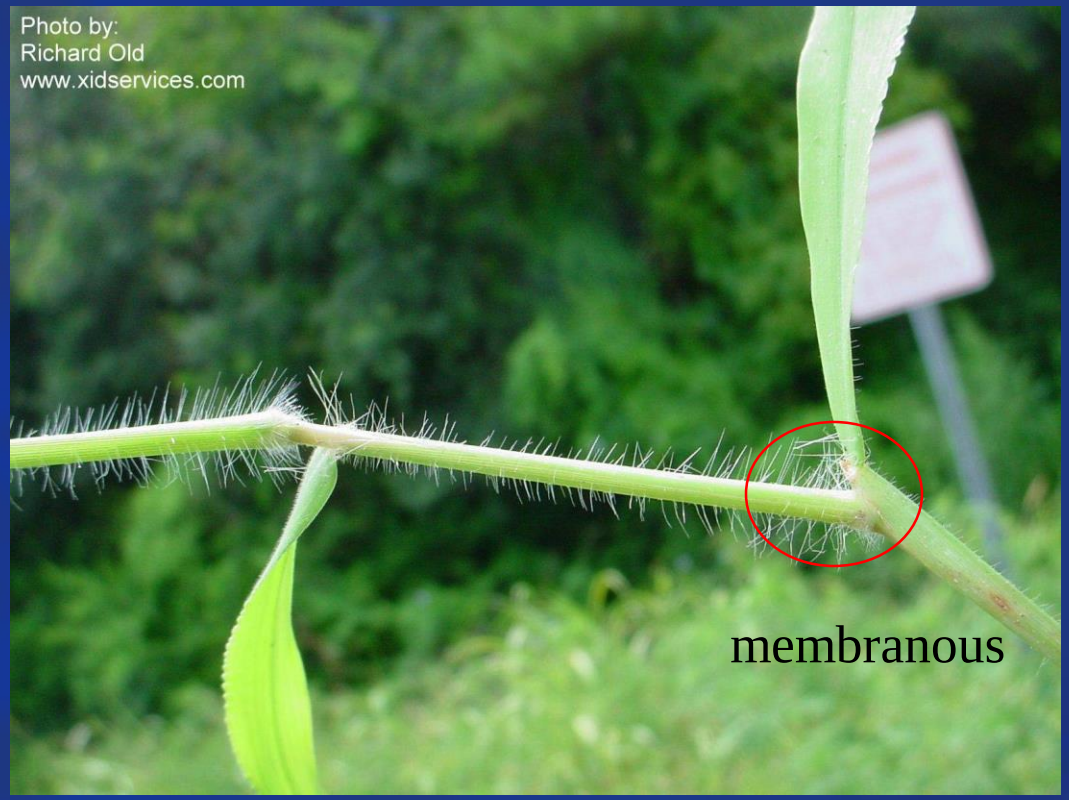
CN-07-17
**21,606 plant population*

ALS-Sensitive Field Corn Hybrids

- Dekalb
  - *WARNINGS*
    - *DKC 62-05*
    - *DKC 62-06*
    - *DKC 62-08*
    - *DKC 63-44*
    - *DKC 63-47*
    - *DKC 63-55*
    - *DKC 64-69*
  - *CAUTIONS*
    - *65-17, 65-18, 65-20*
    - *70-01, 70-03*
    - *RX940, RX940RR2*
- Pioneer
  - *WARNINGS*
    - *P1324HR*
    - *P1360*
    - *P1360AM*
    - *P1360CHR*
    - *P1360HR*
    - *P1739R*
    - *P1739YR*
  - *CAUTIONS*
    - *P1637R, P1637VYHR, P1637YHR*
    - *P1690,P1690HR, P1690R*
    - *P2088R, P2089YHR*

Texas Panicum vs. Crabgrass

Texas panicum



Southern crabgrass

Metribuzin on soybean
Sencor/Lexone

- Not a PPO (Valor or Reflex)
- triazine
- Good on pigweed and sicklepod
- Can be applied PPI
  - Dryland fields?
- Issues
  - *soil texture, OM, pH*
  - *Varieties*
  - *Rotations*
  - *Company support*
  - *Lack of incentive at dealer level*

Syngenta Boundary 6.5 EC

AUTHORITY MTZ

DuPont™ Canopy® herbicide

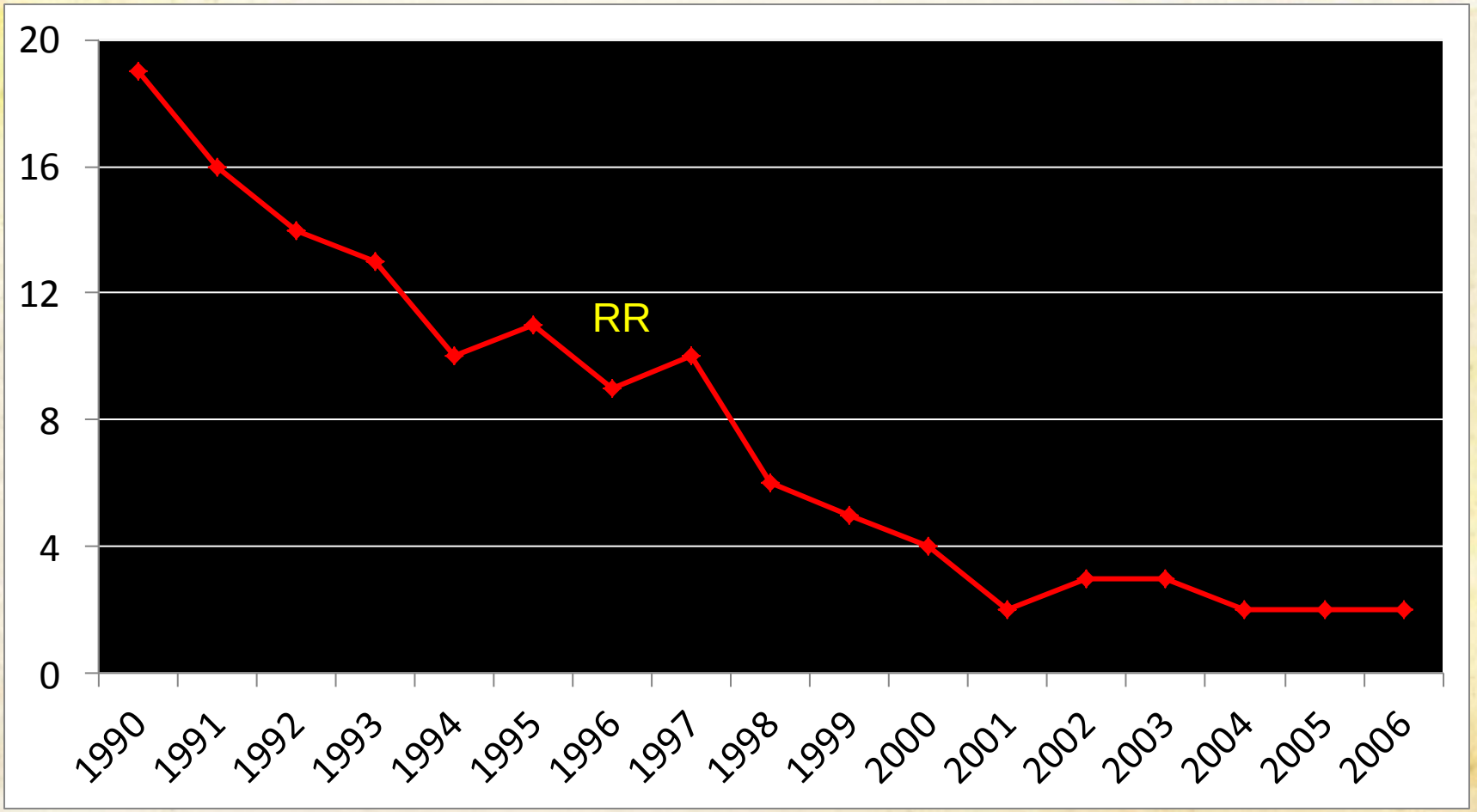
TriCor 75DF

Metribuzin 75DF

Loveland Products INTIMIDATOR™

Metribuzin Use (%) – US Soybeans (NASS)

Commercial Sale of Sencor began in 1973



Command – 1985, Scepter - 1986, Pursuit - 1989

Metribuzin Injury

Glyphosate Yellow Flash

Likely Cause of Glyphosate Yellow Flash

- Degradation of glyphosate to AMPA
- AMPA reduces chlorophyll content in soybean

AMPA = aminomethylphosphonic Acid

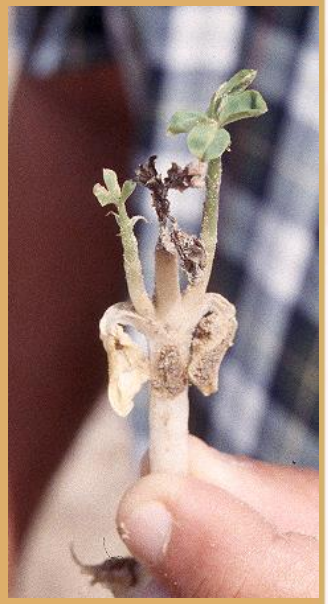
Recent Research on Glyphosate and Mineral Accumulation

- "Glyphosate is **unlikely** to cause macro and micronutrient deficiencies in soybean if soil nutrient levels are properly maintained."
  - Henry, R.S, K.A. Wise, and W.G. Johnson. 2011. Glyphosate's effect upon mineral accumulation in soybean. Online. Crop Management doi:10.1094/CM-2011-1024-01-RS.

- "Considering the available data, growers are unlikely to need Mn fertilizers just because they use glyphosate on GR soybeans."
  - Duke, S.O., J. Lydon, W.C. Koskinen, T.B., Moorman, R.L. Chaney, and R. Hammerschmid. 2012. Glyphosate Effects on Plant Mineral Nutrition, Crop Rhizosphere, Microbiota, and Plant Disease in Glyphosate-Resistant Crops. J. Agric. Food Chem. 60:10375−10397

Valor
Great Weed Control vs. Crop Injury

Valor Injury in Peanut



Valor Injury @ (6 oz/A) 16 DAT

PD: May 5

Rainfall Events:

May 5 = 0.04”
May 14 = 0.56”
May 15 = 0.16”
May 16 = 0.01”
May 17 = 0.51”
May 20 = 0.07”
May 21 = 0.59”
May 22 = 0.58”
May 23 = 0.24”
May 24 = 0.13”
May 25 = 0.20”
May 26 = 0.89”
May 28 = 0.05”
June 3 = 0.08”
June 4 = 0.56”
June 5 = 0.77”

30 day rainfall total from planting = 5.44”

PE-08-09
May 22, 2009

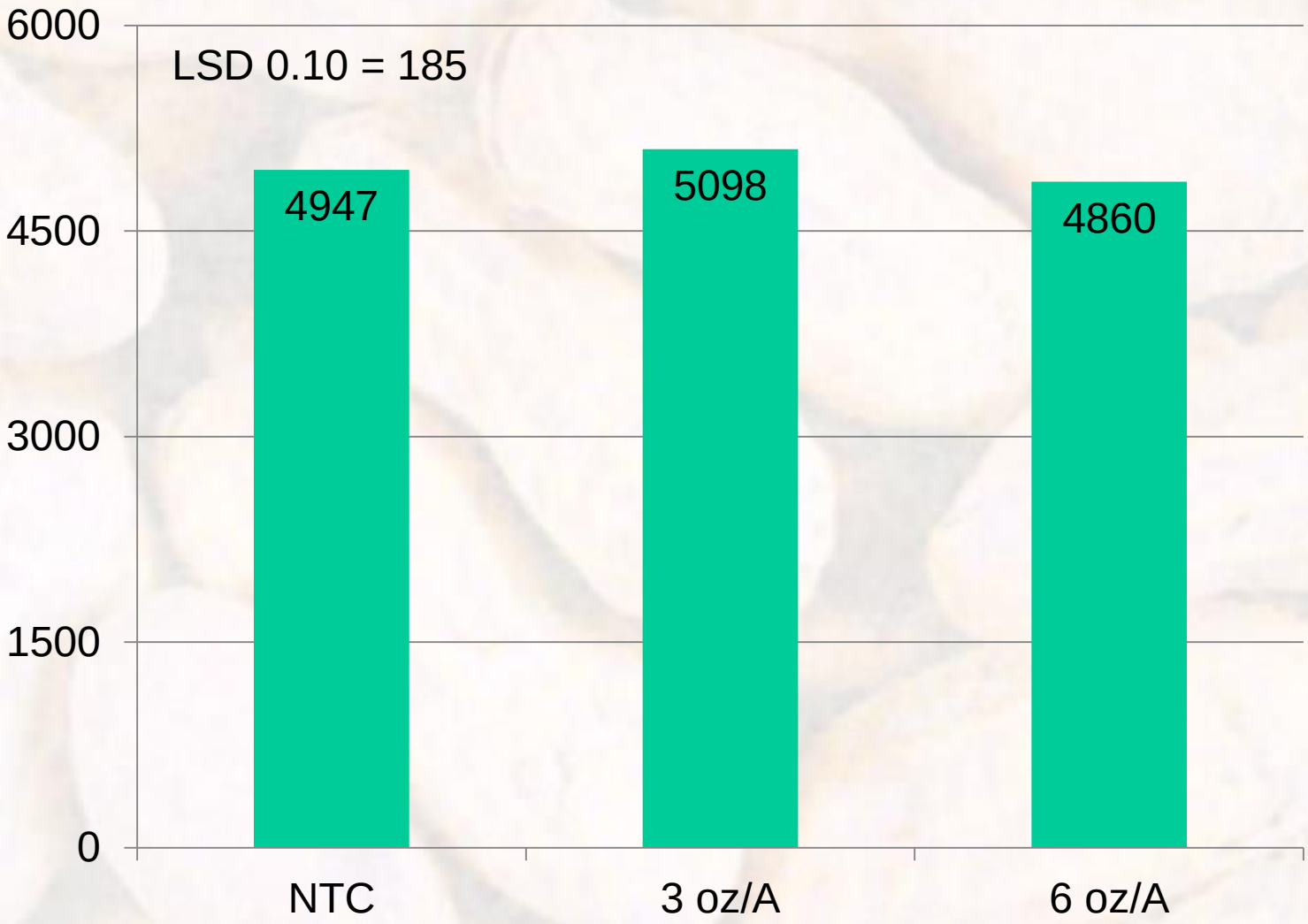
Valor SX 51WG Injury - 2018

3 oz/A

6 oz/A

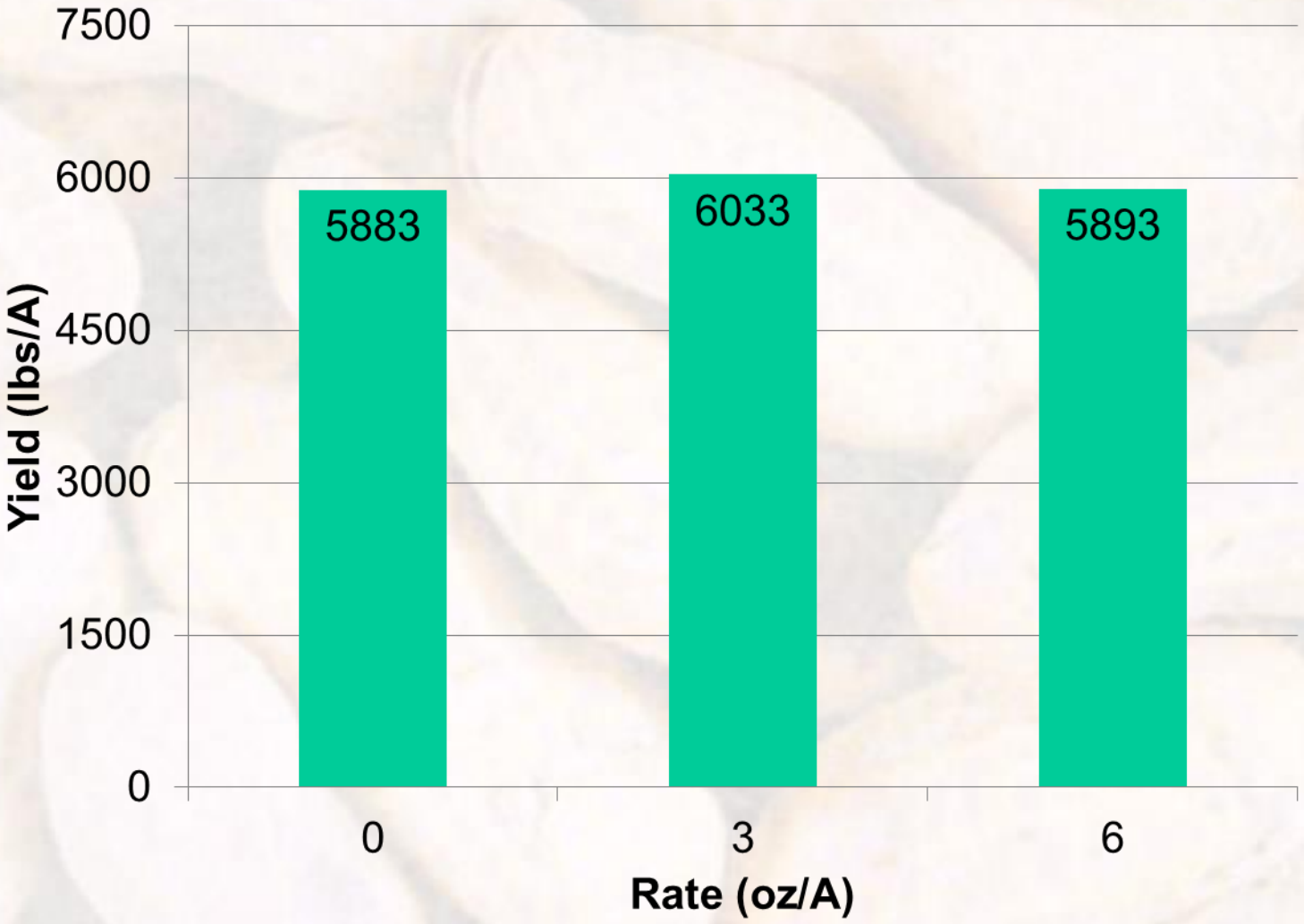
PE-06-18
May 23
16 DAP
3.11" (R/I)

Peanut Yield Response to Valor - 2009



PE-08-09
Averaged over 3 varieties
(GA Green, GA-06G, GA-07W)
Weed-free

Peanut Yield Response to Valor 51WG - 2013

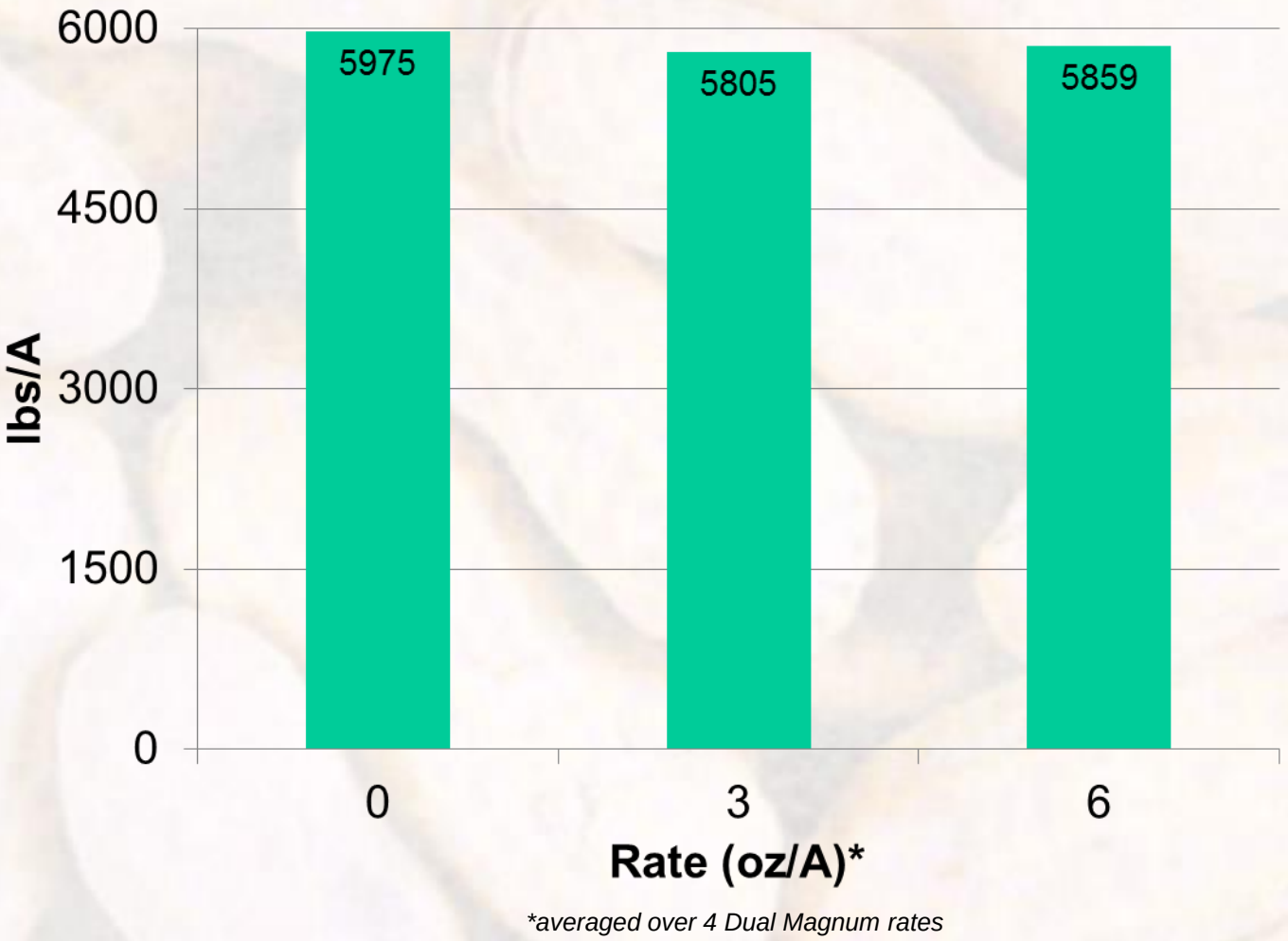


PE-14-13
GA-06G
Averaged over 3 planting dates (April 16, April 29, May 13)
Weed-free

P=0.4015

Valor Effects on Peanut Yield - High Moisture Conditions - 2018

11.315” rainfall/ irrigation first 30 DAP



*averaged over 4 Dual Magnum rates

PE-09-18 Weed-free

P = 0.7674, CV = 11.3

Cadre/Cotton

Cadre/Impose Rotational Restrictions

ROTATIONAL CROPS

The following rotational crops may be planted after applying CADRE DG in peanuts:

1. Any interval after CADRE DG application:

   Peanuts

2. Four months after CADRE DG application:

Bahiagrass	Rye	Wheat

3. Nine months after CADRE DG application:

Field Corn	Snapbeans	Southern Peas
Soybeans	Tobacco	

4. Eighteen months after a CADRE DG application:

Barley	Cotton*	Grain Sorghum
Oats	Onions**	Sweet Corn

5. Twenty-six months after a CADRE DG application:

   All crops not otherwise listed.

6. Forty months after CADRE DG application:

Canola	Potatoes	Red Table Beets
Sugar Beets		

Dual/Warrant Injury on Sorghum

Herbicide Carryover or Nematodes

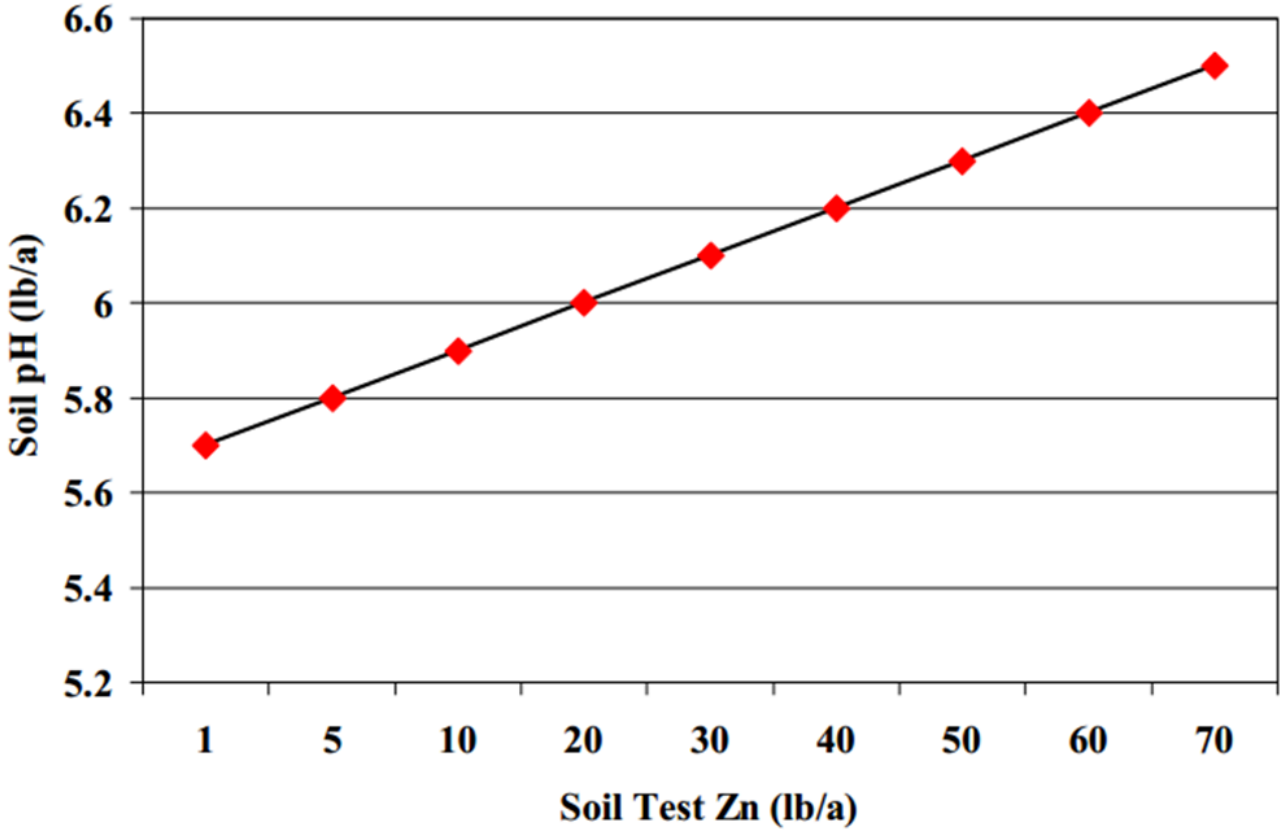
Burke County
April 2017
Stubby Root Nematodes
21/100cm^3 of soil
>9 is threshold

Brooks Co. - 2014

- Low pH = 5.3
- Very high Zn = 25 lbs/A

Peanut/pH/Zinc

Figure 2. Relationship between pH and zinc availability. Maintain soil pH levels above the line to help avoid zinc toxicity.
Source: Davis-Carter, J. et al. 1991 Peanut Research Extension report

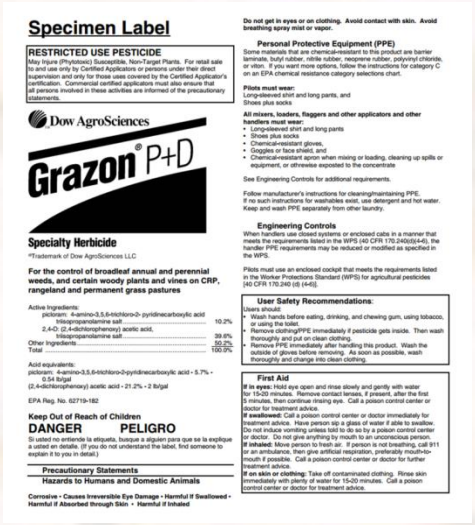


Recent Picloram Episodes - 2016

Mitchell County (GA)
June 20, 2016

Baldwin County (AL)
June 23, 2016

Grazon P+D



Specimen Label

RESTRICTED USE PESTICIDE

May Injure (Phytotoxic) Susceptible, Non-Target Plants. For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification. Commercial certified applicators must also ensure that all persons involved in these activities are informed of the precautionary statements.

Dow AgroSciences

Grazon® P+D

Specialty Herbicide

*Trademark of Dow AgroSciences LLC

For the control of broadleaf annual and perennial weeds, and certain woody plants and vines on CRP, rangeland and permanent grass pastures

Active Ingredients:

picloram: 4-amino-3,5,6-trichloro-2- pyridinecarboxylic acid triisopropanolamine salt	10.2%
2,4-D: (2,4-dichlorophenoxy) acetic acid, triisopropanolamine salt	39.8%
Other Ingredients	50.0%
Total	100.0%

Acid equivalents:
picloram: 4-amino-3,5,6-trichloro-2-pyridinecarboxylic acid - 5.7% - 0.54 lb/gal
(2,4-dichlorophenoxy) acetic acid - 21.2% - 2 lb/gal

EPA Reg. No. 62719-182

Keep Out of Reach of Children

DANGER PELIGRO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

Precautionary Statements

Hazards to Humans and Domestic Animals

Corrosive • Causes Irreversible Eye Damage • Harmful If Swallowed • Harmful If Absorbed through Skin • Harmful if Inhaled

Do not get in eyes or on clothing. Avoid contact with skin. Avoid breathing spray mist or vapor.

Personal Protective Equipment (PPE)

Some materials that are chemical-resistant to this product are barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, polyvinyl chloride, or viton. If you want more options, follow the instructions for category C on an EPA chemical resistance category selections chart.

Pilots must wear:
Long-sleeved shirt and long pants, and
Shoes plus socks

All mixers, loaders, flaggers and other applicators and other handlers must wear:
- Long-sleeved shirt and long pants
- Shoes plus socks
- Chemical-resistant gloves,
- Goggles or face shield, and
- Chemical-resistant apron when mixing or loading, cleaning up spills or equipment, or otherwise exposed to the concentrate

See Engineering Controls for additional requirements.

Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables exist, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering Controls

When handlers use closed systems or enclosed cabs in a manner that meets the requirements listed in the WPS (40 CFR 170.240(d)(4-6), the handler PPE requirements may be reduced or modified as specified in the WPS.

Pilots must use an enclosed cockpit that meets the requirements listed in the Worker Protections Standard (WPS) for agricultural pesticides [40 CFR 170.240 (d) (4-6)].

User Safety Recommendations:

Users should:
- Wash hands before eating, drinking, and chewing gum, using tobacco, or using the toilet.
- Remove clothing/PPE immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.
- Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

First Aid

If in eyes: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.
If swallowed: Call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.
If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.
If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

- Picloram (0.54 lb/gal) and 2,4-D (2 lb/gal)
- Picloram was first introduced in 1963 as Tordon 101
- WSSA MOA #4 (synthetic auxin)
- broadleaf annual and perennial weeds in rangeland and ***permanent*** grass pastures
- Picloram has average field half-life of 90 days (20-300 day range)

Peanuts/Picloram UGA Results

- 1/10th X rates of Grazon P+D reduced peanut yields by 11%

- 1/100thX rates of Grazon P+D caused injury symptoms but not yield loss.

Glyphosate/Peanuts

Questions/Comments