

CORN DAY 2014

Russ Hahn

Crop & Soil Sciences

Cornell University

CORN DAY 2014

■ Acetochlor herbicides

- Product stewardship

arpinfo.com

- Product performance

■ Herbicide adjuvants

ACETOCHLOR HERBICIDES

SEEDLING SHOOT INHIBITORS

Group	Site of Action	Family	Product
15	Long-chain fatty acid inhibition (4)	Chloroacetamide	Dual II Mag Outlook Harness Surpass Warrant

CHLOROACETAMIDE EFFECTIVENESS*

Annual Grasses & Nutsedge	Harness Surpass	Outlook	Dual
Crabgrass	9	9	9
Barnyardgrass	9	9	9
Fall Panicum	8+	8+	8+
Foxtails	9	9	9
Nutsedge	7+	7+	8

***Penn State Agronomy Guide**

CHLOROACETAMIDE EFFECTIVENESS*

Annual Broadleaf	Harness Surpass	Outlook	Dual
Velvetleaf	6	N	N
Pigweeds	9	8	8
C. Ragweed	7+	6	6
Lambsquarters	7	6	6
E B Nightshade	8+	7+	7+

***Penn State Agronomy Guide**

ACETOCHLOR PRODUCTS

MONSANTO

Product	Formulation	Acetochlor	Atrazine
Harness	7EC	7 lb/gal	-
Harness Xtra	6L	4.3 lb/gal	1.7 lb/gal
Harness Xtra 5.6L	5.6L	3.1 lb/gal	2.5 lb/gal
Degree Xtra	4.04L	2.7 lb/gal	1.34 lb/gal
Warrant	3L	3 lb/gal	-

ACETOCHLOR PRODUCTS

DOW

Product	Formulation	Acetochlor	Atrazine
FulTime NXT	4.04L	2.7 lb/gal	1.34 lb/gal
Keystone	5.25L	3 lb/gal	2.25 lb/gal
Keystone NXT	5.6L	3.1 lb/gal	2.5 lb/gal
Keystone LA	5.5L	4 lb/gal	1.5 lb/gal
Keystone LA NXT	6L	4.3 lb/gal	1.7 lb/gal
Surpass EC	6EC	6.4 lb/gal	-
Surpass NXT	7L	7 lb/gal	-

ACETOCHLOR PRODUCTS

DOW and MONSANTO

Product	Acetochlor	Clopyralid “Stinger”	Flumetsulam “Python”
SureStart	3.75 lb/gal	0.38 lb/gal	0.12 lb/gal
TripleFLEX	3.75 lb/gal	0.38 lb/gal	0.12 lb/gal

PRE ACETOCHLOR

ACOR0513

	2013
Hybrid	DKC 42-72
Planted	May 21
Sprayed	PRE – May 27
Rainfall	Week 1 – 1.06 in. Week 2 – 1.64 in.

Untreated Check



PRE ACETOCHLOR

ACOR0513

	Rate	% Control 3 WAT 3.57 inches	
Herbicides	Amt/A	Rag	Fox
Harness	2.3 pt	98	100
Keystone LA NXT	2 qt	99	100
Keystone NXT	2.5 qt	99	100
Lumax + AAtrex 4L	2.5 qt 1pt	97	100
Untreated	-	0	0
LSD (0.05)		2	<1

PRE ACETOCHLOR

ACOR0513

	Rate	% Control 8 WAT 9.70 inches	
Herbicides	Amt/A	Rag	Fox
Harness	2.3 pt	79	90
Keystone LA NXT	2 qt	91	93
Keystone NXT	2.5 qt	94	96
Lumax + AAtrex 4L	2.5 qt 1pt	92	99
Untreated	-	0	0
LSD (0.05)		6	<3

PRE ACETOCHLOR

ACOR0513

	Rate	% Control 8 WAT		Yield
Herbicides	Amt/A	Rag	Fox	Bu/A
Harness	2.3 pt	79	90	243
Keystone LA NXT	2 qt	91	93	249
Keystone NXT	2.5 qt	94	96	257
Lumax + AAtrex 4L	2.5 qt 1pt	92	99	241
Untreated	-	0	0	167
LSD (0.05)		6	<3	24

EPO ACETOCHLOR

ACOR0113

	2013
Hybrid	DKC 42-72
Planted	May 17
Sprayed	EPO – June 5
Corn	V2 – 5 in.
Ragweed	1 in.
Foxtail	1.5 in.

EPO ACETOCHLOR

ACOR0113

	Rate	% Control 5WAT 7.94 inches	
Herbicides	Amt/A	Rag	Fox
Halex GT + AAtrex 4L	3.6 pt 1 pt	94	98
Keystone LA NXT + Hornet WDG + Durango DMA	2 qt 3 oz 24 fl oz	93	80
Untreated	-	0	0
LSD (0.05)		4	8

EPO ACETOCHLOR

ACOR0113

	Rate	% Control 5WAT		Yield
Herbicides	Amt/A	Rag	Fox	Bu/A
Halex GT + AAtrex 4L	3.6 pt 1 pt	94	98	231
Keystone LA NXT + Hornet WDG + Durango DMA	2 qt 3 oz 24 floz	93	80	229
Untreated	-	0	0	80
LSD (0.05)		4	8	26

EPO ACETOCHLOR

ACOR0113

	Rate	% Control 5 WAT 7.94 inches	
Herbicides	Amt/A	Rag	Fox
Halex GT + AAtrex 4L	3.6 pt 1 pt	94	98
SureStart + AAtrex 4L + Durango DMA	2 pt 1 pt 24 fl oz	93	80
Untreated	-	0	0
LSD (0.05)		4	8

EPO ACETOCHLOR

ACOR0113

	Rate	% Control 5 WAT		Yield
Herbicides	Amt/A	Rag	Fox	Bu/A
Halex GT + AAtrex 4L	3.6 pt 1 pt	94	98	231
SureStart + AAtrex 4L + Durango DMA	2 pt 1 pt 24 fl oz	93	80	223
Untreated	-	0	0	80
LSD (0.05)		4	8	26

CORN DAY 2014

■ Acetochlor herbicides

- Product stewardship

arpinfo.com

- Product performance

■ Herbicide adjuvants

HERBICIDE ADJUVANTS

- Adjuvant is any substance **in a herbicide formulation** or **added to the spray tank** to modify herbicidal activity or application characteristics.

HERBICIDE ADJUVANTS

- **Formulation adjuvants** are in container when purchased

HERBICIDE ADJUVANTS

- **Formulation adjuvants** are in container when purchased
- **Spray adjuvants** are added, along with formulated product to water in the spray tank to enhance performance

GLYPHOSATE FORMULATIONS

- Touchdown Total – fully loaded
- Touchdown HiTech – “This product does not contain a surfactant. A nonionic surfactant or wetting agent must be added at 0.25% - 0.5% v/v (1–2 qt/100 gal) of finished spray volume.”

TOUCHDOWN TOTAL VS. TOUCHDOWN HIGHTECH

Product	ae/gal	Amt/A	\$/A
Touchdown Total	4.17 lb	32 fl oz	\$6.49
Touchdown HiTech + NIS (Preference)	5 lb -	26.6 fl oz 0.25%	\$5.27 <u>\$2.34</u> \$7.61

SPRAY ADJUVANTS

- **Special purpose adjuvants**
 - **Compatibility agents**
 - **Buffering agents**
 - **Antifoam agents**
 - **Drift reduction agents**

SPRAY ADJUVANTS

■ Special purpose adjuvants

- Compatibility agents

- Buffering agents

- Antifoam agents

- Drift reduction agents

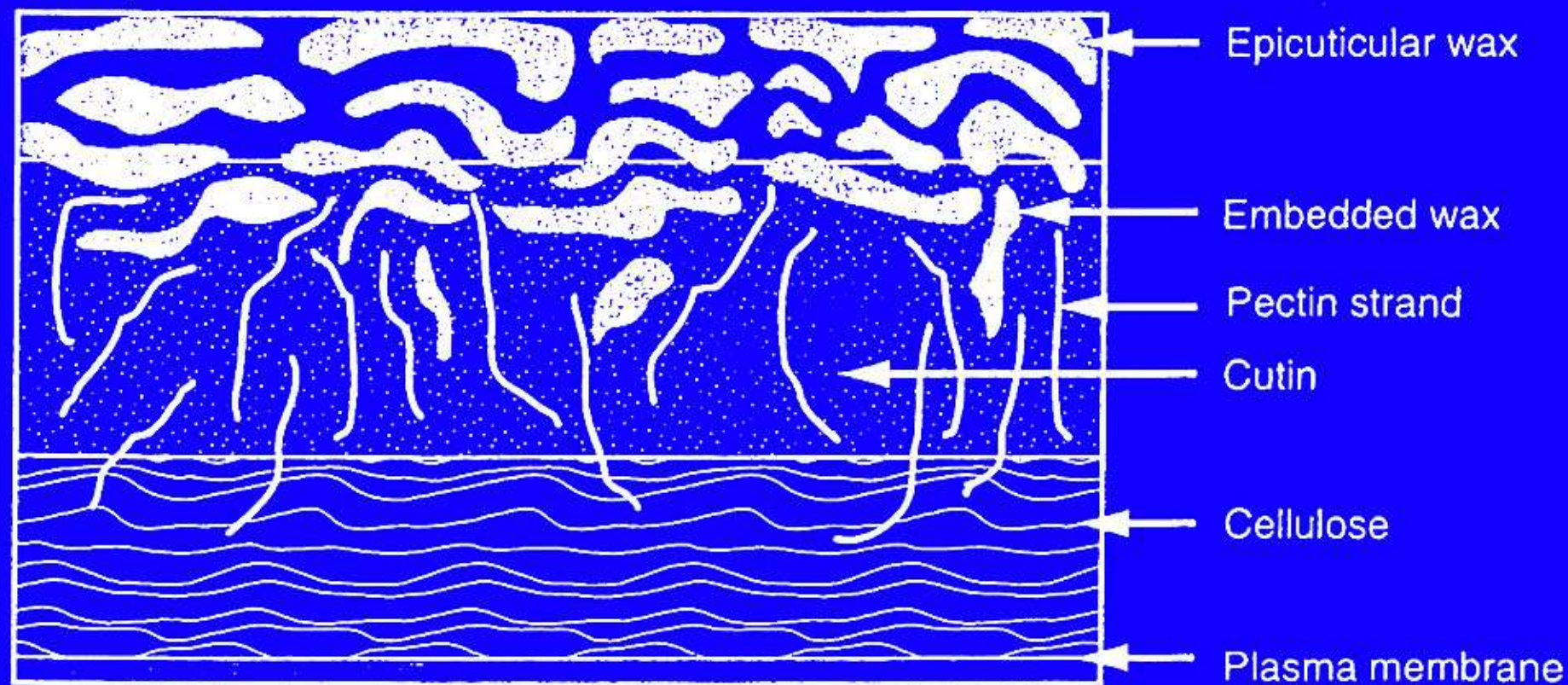
■ Activator adjuvants

PLANT CUTICLE

- **Continuous, non-cellular, non-living membrane covers plant**
 - **water-repellant waxes**
 - **less water-repellant cutin and pectins**

Figure 1. Simplified plant cuticle (taken from F. D. Hess, Sandoz Crop Protection)

Atmosphere



Leaf Epidermis

PLANT CUTICLE

- **Continuous, non-cellular, non-living membrane covers plant**
- **Very diverse and varies with species**

PLANT CUTICLE

- **Continuous, non-cellular, non-living membrane covers plant**
- **Very diverse and varies with species**
- **Varies with age of plant**

PLANT CUTICLE

- **Continuous, non-cellular, non-living membrane covers plant**
- **Very diverse and varies with species**
- **Varies with age of plant**
- **Varies with environment**



ACTIVATOR ADJUVANTS

- **Surfactants** *or*
surface active agents

ACTIVATOR ADJUVANTS

- **Surfactants *or***
surface active agents
- **Crop-oil concentrates**

ACTIVATOR ADJUVANTS

- **Surfactants *or***
surface active agents
- **Crop-oil concentrates**
- **Ammonium fertilizers**

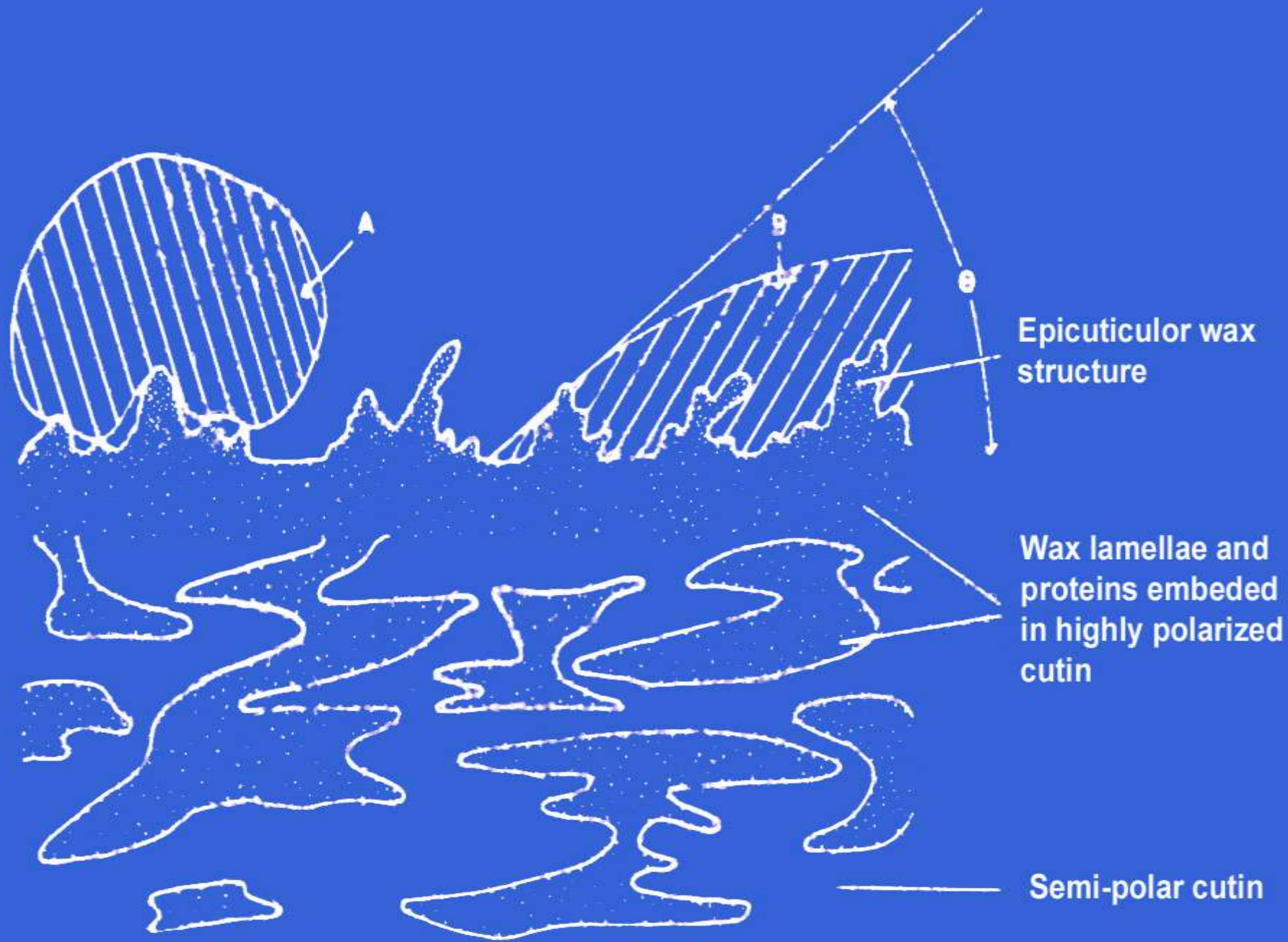
ACTIVATOR ADJUVANTS

■ **Surfactants** *or*

surface active agents

ACTIVATOR ADJUVANTS

- **Surfactants** – reduce surface tension of spray solution
 - better contact with leaf surface
 - improves herbicide absorption
 - may alter permeability of cuticle



TYPES OF SURFACTANTS

- **Nonionic** – have a neutral charge
 - most commonly used
 - compatible with most herbicides
- **Cationic** – positively charged
 - used with glyphosate products
- **Anionic** – negatively charged
 - more specialized

ACTIVATOR ADJUVANTS

- Surfactants or surface active agents
- Crop-oil concentrates

CROP OIL CONCENTRATES

80 – 85% non phytotoxic oil

- petroleum based oil - COC

- modified seed oil – MSO

(sunflower, soybean, linseed)

+

15 – 20% nonionic surfactant

CROP OIL CONCENTRATES

■ **Non-phytotoxic oil**

- promote penetration of cuticle
- solubilize herbicides on leaf

CROP OIL CONCENTRATES

■ **Non-phytotoxic oil**

- promote penetration of cuticle
- solubilize herbicides on leaf

■ **Nonionic surfactant**

- emulsify the oil
- lower surface tension of spray

ACTIVATOR ADJUVANTS

- Surfactants *or*
surface active agents
- Crop-oil concentrates
- Ammonium fertilizers

AMMONIUM FERTILIZERS

- **Ammonium-based liquid fertilizer**
 - 28, 30, or 32% UAN
 - 10-34-0 or 21-0-0
- **Ammonium sulfate – AMS**
 - reduces hard water antagonism
 - reduces antagonism with other pesticides

AMMONIUM FERTILIZERS

- Unclear how ammonium salts improve herbicide performance
- Herbicides that benefit include
 - Sulfonylureas - Resolve Q
 - Imidazolinones - Pursuit

PURSUIT ADJUVANTS

Nonionic Surfactant – 1 qt/100gal

or

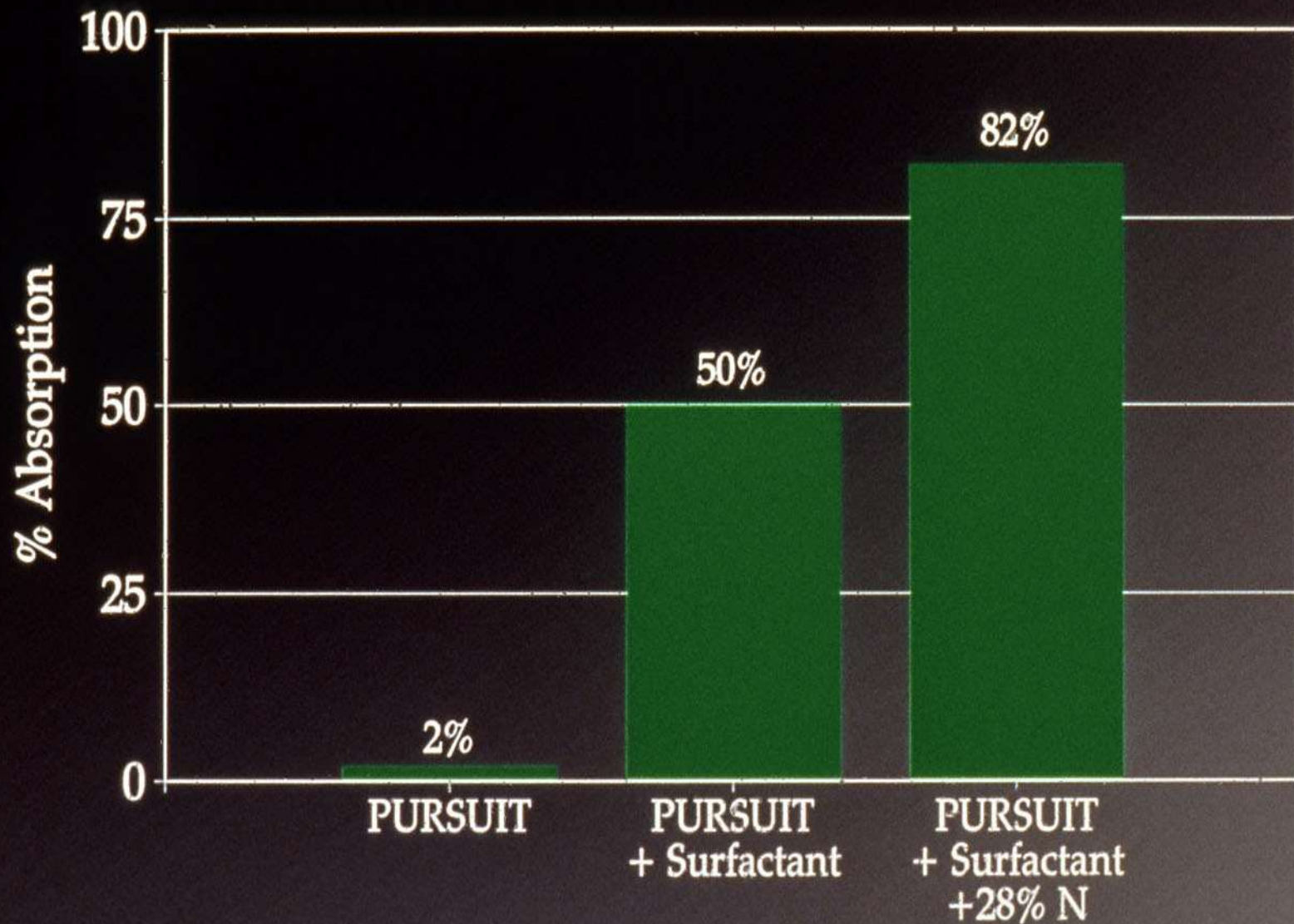
Crop Oil Conc. – 1.5 to 2 pt/A

and

Liquid Fertilizer – 1 to 2 qt/A

(28% N, 32% N, or 10-34-0)

PURSUIT Foliar Uptake



HOW DO YOU DECIDE WHAT TO USE?

- **Read and follow the label**

- **There's often a choice**

**Resolve Q – must include
either a “COC” *or* NIS +
ammonium nitrogen fertilizer**

RESOLVE Q ADJUVANTS

- Petroleum based COC at 1% (v/v) *or*
Modified seed oil (MSO) at 0.5% (v/v)
or
- Nonionic surfactant (NIS) at 0.25% (v/v)
and
- 2 qt/A 28 or 32% UAN *or*
2 lb/A Ammonium sulfate (AMS)

RESOLVE Q ADJUVANTS

Type	Amount/A	Cost/A
Crop Oil Conc. + AMS	1% v/v (0.8 qt) 2 lb	\$3.95 <u>\$.95</u> \$4.90
Meth Seed Oil + AMS	0.5% v/v (0.4 qt) 2 lb	\$3.25 <u>\$.95</u> \$4.20
NIS + AMS	0.25% v/v (0.2 qt) 2 lb	\$2.34 <u>\$.95</u> \$3.29

IMPACT ADJUVANTS

Type	Amount/A	Cost/A
Meth Seed Oil + AMS	1% v/v (0.8 qt) 2 lb	\$6.50 <u>\$.95</u> \$7.45
Crop Oil Conc. + AMS	1% v/v (0.8 qt) 2 lb	\$3.95 <u>\$.95</u> \$4.90

QUESTIONS?



The only good weed
is a dead weed

