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WILBUR-ELLIS
AGRIBUSINESS

PRO MARKETS

LAWN & LANDSCAPE

Now, independent lawn and landscape operations can get the disease and pest control that's right for their needs, topped off with water feature, application aid and hydro-seeding products.

NURSERY & GREENHOUSE

We've got you covered with water, building, and container sanitization, irrigation system additives that control moss and algae, plus a complete line of inputs to address recommendations based on assessments, sampling and analysis.

VEGETATION MANAGEMENT

Wilbur-Ellis is here to help vegetation managers find the best product combination to control weeds along roads, highways and rail systems.

PRO MARKETS

GOLF

Achieve and maintain the greenest course around with management programs for diseases, weeds and insects, plus tailored soil and water recommendations, rounded out with Wilbur-Ellis aquatic enhancements.

SPORTS TURF

Get on top of your game with broad spectrum and resistance management programs for disease, weeds and insects. Then rule the field with professional consultations for local and professional sports turf managers, plus annual training seminars for you and your staff.

FORESTRY

If you're looking for ways to improve your forestry management, it's time to work with Wilbur-Ellis. We can provide anything from general recommendations to specific site reviews, training seminars and more.

ACTIVES

ADJUVANTS

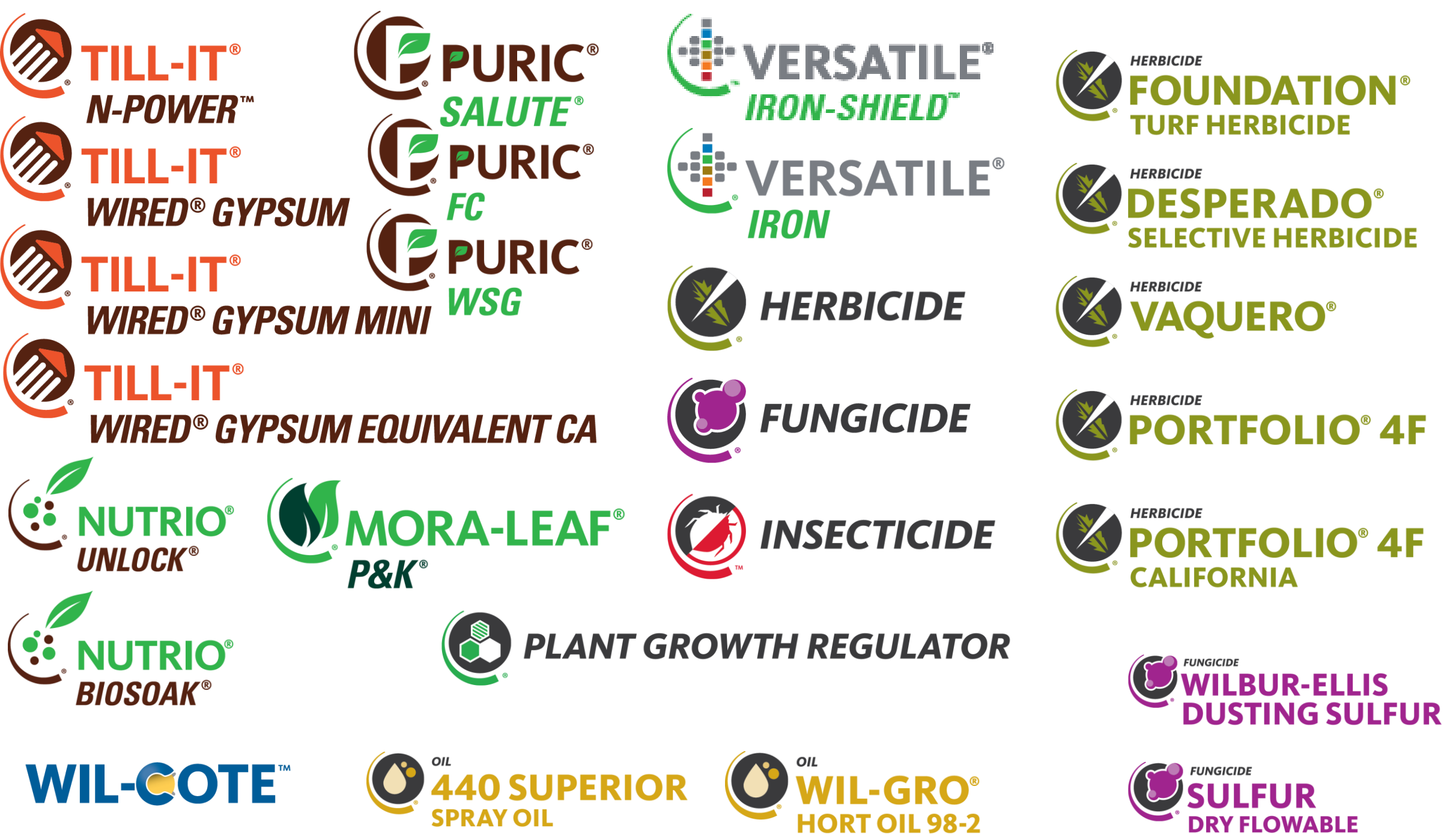
NUTRITION

ORGANIC

PRO MARKETS

SEED
TECHNOLOGY





ADJUVANTS

 SURFACTANT - BLEND

 SURFACTANT - NIS

 SURFACTANT - BLEND
ANTERO-EA®

 SURFACTANT - BLEND
ARVON®

 SURFACTANT - BLEND
ASCENSION®

 SURFACTANT - BLEND
DENALI-EA®

 SURFACTANT - NIS
EMBRECE-EA®

 SURFACTANT - NIS
INFOLIUM-EA™

 SURFACTANT - NIS
INSIST® 90 PLUS

 SURFACTANT - NIS
R-11®

 SURFACTANT - NIS
RAINIER-EA®

 SURFACTANT - BLEND
REGUARD®

 SURFACTANT - BLEND
SYL-COAT
WILBUR-ELLIS
AGRI-BUSINESS

 OIL

 OIL - PURE

 OIL - BLEND

 OIL - PURE
COMPETITOR®

 OIL - BLEND
GLACIER-EA®

 OIL - PURE
HASTEN-EA®

 OIL - BLEND
HIGH LOAD®

 OIL - PURE
MOR-ACT®
CROP OIL CONCENTRATE

 OIL - PURE
MOR-ACT®
ADJUVANT

 OIL - BLEND
PENATROL®

 OIL - BLEND
RENEGADE-EA®

 OIL - PURE
R.O.C.

 OIL - PURE
SUPER SPREAD®
MSO

 OIL - BLEND
SYL-TAC-EA®

 WATER QUALITY - NON-AMS

 WATER QUALITY - AMS

 WATER QUALITY - AMADS

 WATER QUALITY - AMADS
BRIMSTONE®

 WATER QUALITY - AMS
BRONC®

 WATER QUALITY - AMS
BRONC®
MAX

 WATER QUALITY - AMS
BRONC®
PLUS DRY

 WATER QUALITY - AMS
BRONC®
PLUS DRY EDT

 WATER QUALITY - AMS
BRONC®
TRIPLE®

 WATER QUALITY - AMS
CAYUSE®
PLUS

 WATER QUALITY - AMS
CUT-RATE®

 WATER QUALITY - AMADS
CYNDER®

 WATER QUALITY - AMS
RETRIBUTION™

 WATER QUALITY - NON-AMS
SERENITY®

 WATER QUALITY - NON-AMS
VOLIFLEX®

 DRIFT REDUCTION TECHNOLOGY
CROSSHAIR®

 DRIFT REDUCTION TECHNOLOGY
DGUARD®

 DRIFT REDUCTION TECHNOLOGY
IN-PLACE®

 ADVANCED WATER TECHNOLOGY
ADVANTAGE SOIL PENETRANT®

 ADVANCED WATER TECHNOLOGY
AQUATE®
MAX

 ADVANCED WATER TECHNOLOGY
AQUATE®
PRO

 UTILITY
CLIMB®

 UTILITY
FTF® DEFOAMER

 UTILITY
SSC-11®

 UTILITY
STABILITY®

 UTILITY
TIE DOWN®

 UTILITY
VaporGrip® Xtra
AGENT

 UTILITY
TRI-FOL®

 UTILITY
VOLIFLEX®
DUO


SOIL RETENTION

SOIL RETENTION
EFFICAX®

LINK Items



PERFECTION Items



ECO ADVANTAGE™

FOUR PILLARS FOR PREMIER
PRODUCTS



NONYLPHENOL ETHOXYLATES

NPE

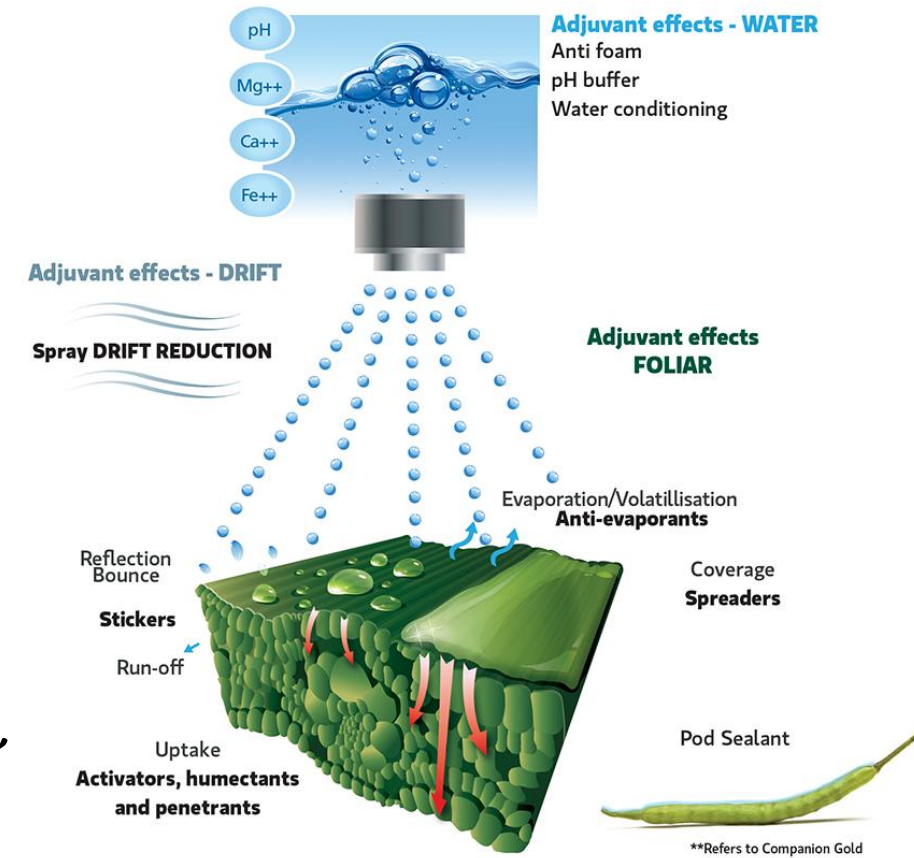
- They are used in manufacturing antioxidants, lubricating oil additives, laundry and dish detergents, emulsifiers, and solubilizers.
- They are used extensively in epoxy formulation in North America but its use has been phased out in Europe. EPA IS LOOKING TO BAN NPE.
- These compounds are also precursors to the commercially important non-ionic surfactants alkylphenol ethoxylates and nonylphenol ethoxylates, which are used in detergents, paints, pesticides, personal care products, and plastics.
- Nonylphenol has attracted attention due to its prevalence in the environment and its potential role as an endocrine disruptor and xenoestrogen, due to its ability to act with estrogen-like activity. HIGHLY TOXIC TO AQUATIC LIFE.

Adjuvant Terminology

An *ADJUVANT* is defined as:

A product added to a spray application to improve the biological activity of the pesticide being applied; to enhance or modify the spray droplet, spray pattern or spray deposit; to improve handling characteristics of the spray solution and spray equipment performance.

“Sticker” “Wetter” “Surfactant” “Sticker-Spreader” “Spreader-Sticker” “Spreader-wetter” “Deposition”



Adjuvant Selection – Extremely Important

The use of adjuvants as effective management tools require:

- 1) Understanding the spray application and the challenges associated with it.
- 2) Understanding if the spray challenges can be better managed with the use of an adjuvant.
- 3) Selecting the proper adjuvant type for the challenge or problem at hand.



No **single** adjuvant can be used for all spray applications.



Spray Drift – What is it?

EPA defines pesticide spray drift as:

"Spray or dust drift is the physical movement of pesticide droplets or particles through the air at the time of pesticide application or soon thereafter from the target site to any non or off-target site. Spray drift shall not include movement of pesticides to non- or off-target sites caused by erosion, migration, volatility, or windblown soil particles that occurs after application or application of fumigants unless specifically addressed on the product label with respect to drift control requirements."



Volume, Pressure, Tips

- **In General:**
 - 1-3 gal per 1000ft²
 - Or 10-80 gal per acre
 - High volume & low pressure makes droplets large
 - Low volume & high pressure makes droplets small
 - Droplets below 150 microns are considered susceptible to drift

Droplet size and surface coverage

Doubling the droplet size – results in 8 times fewer droplets



250 microns | 64 droplets



500 microns | 8 droplets



1,000 microns | 1 droplet

Drift

Use the correct pressure for the equipment and spray tip to minimize risk of off-target drift.



Best Management Practices – Spray Drift

Best practices for a successful spray application start with...

1. Use Good Judgment

2. Understand and Consider These:

- Nozzle Type and Size
- Boom Height
- Relative Humidity
- Wind Speed and Direction
- Spray Pressure (PSI)
- Gallons per Acre (GPA)
- Temperature Inversions
- Air Temperature

3. Use a Deposition Aid / Drift Control Adjuvant



Deposition Aids

(Drift Reduction Technology)



- Provides drift reduction – fines created by spray nozzle
- Attaches to active ingredients – allows for single use rate

When to use:

- Spray applications: Ground/Aerial - Herbicides, Insecticides, Fungicides
- Scenarios: General use for managing drift-able



DRIFT REDUCTION TECHNOLOGY

IN-PLACE®

Drift reduction – reducing amount of drift-able fines

Encapsulation

- Encapsulates active ingredients
- Odor management

FOUR-TWO-ONE			
Formulation	EC	Powders	Flowables
Amount	pt.	lb.	pt.
IN-PLACE oz.	4	2	1
IN-PLACE RATES MADE EASY			

Positioning:

- Spray applications: Herbicides, Insecticides, Fungicides
- Tank-mix combinations: Different formulations
- Scenarios: Where encapsulation would benefit applications...



DRIFT REDUCTION TECHNOLOGY

IN-PLACE®



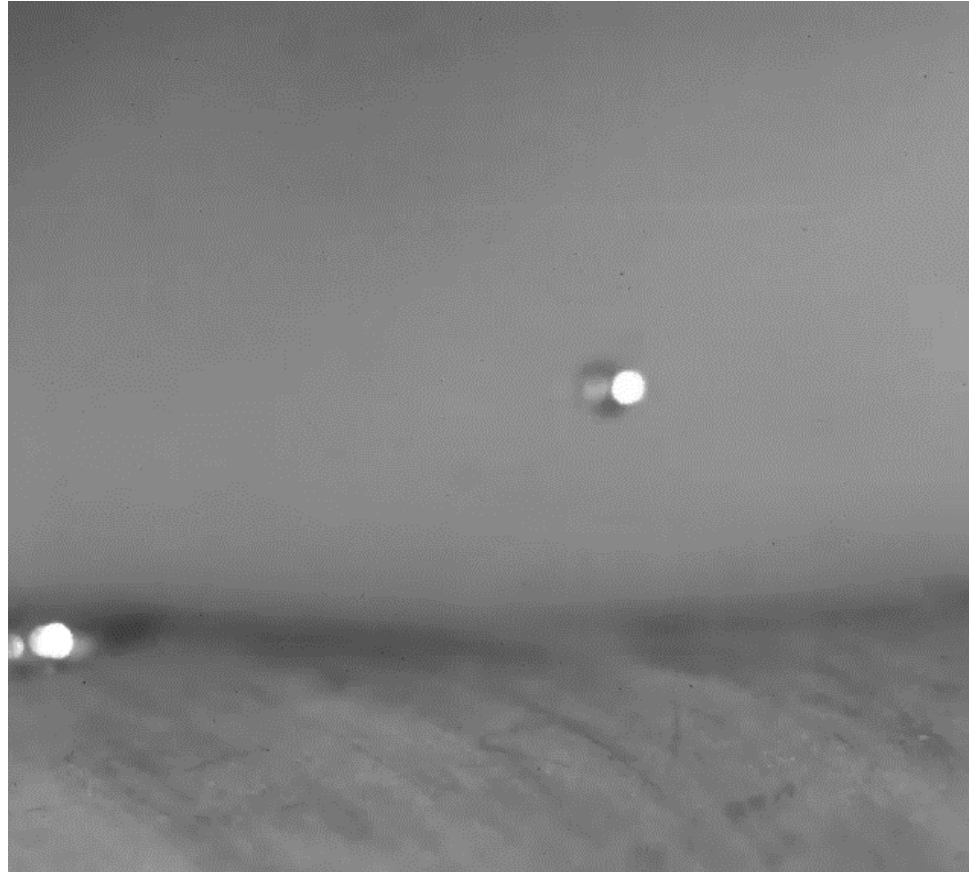
■ **IN-PLACE** Encapsulation of
Trifluralin + Water

Trifluralin + Water

Video Examples

**Droplets
bouncing**

No surfactant



Video Examples

**Droplets
depositing**

***In-Place
inclusion***

**Bivert
Droplet**



Residual improvements – Soil-applied herbicides

- Extended residual herbicide control

More Consistent Performance

- Herbicides stay in top part of soil profile – weed zone
- Minimizes potential leaching through soil profile

Drift mitigation

- Provides some drift mitigation
- EFFICAX generates a more uniform droplet size spectrum, which results in enhanced deposition and coverage of the spray on the target surface.

Positioning:

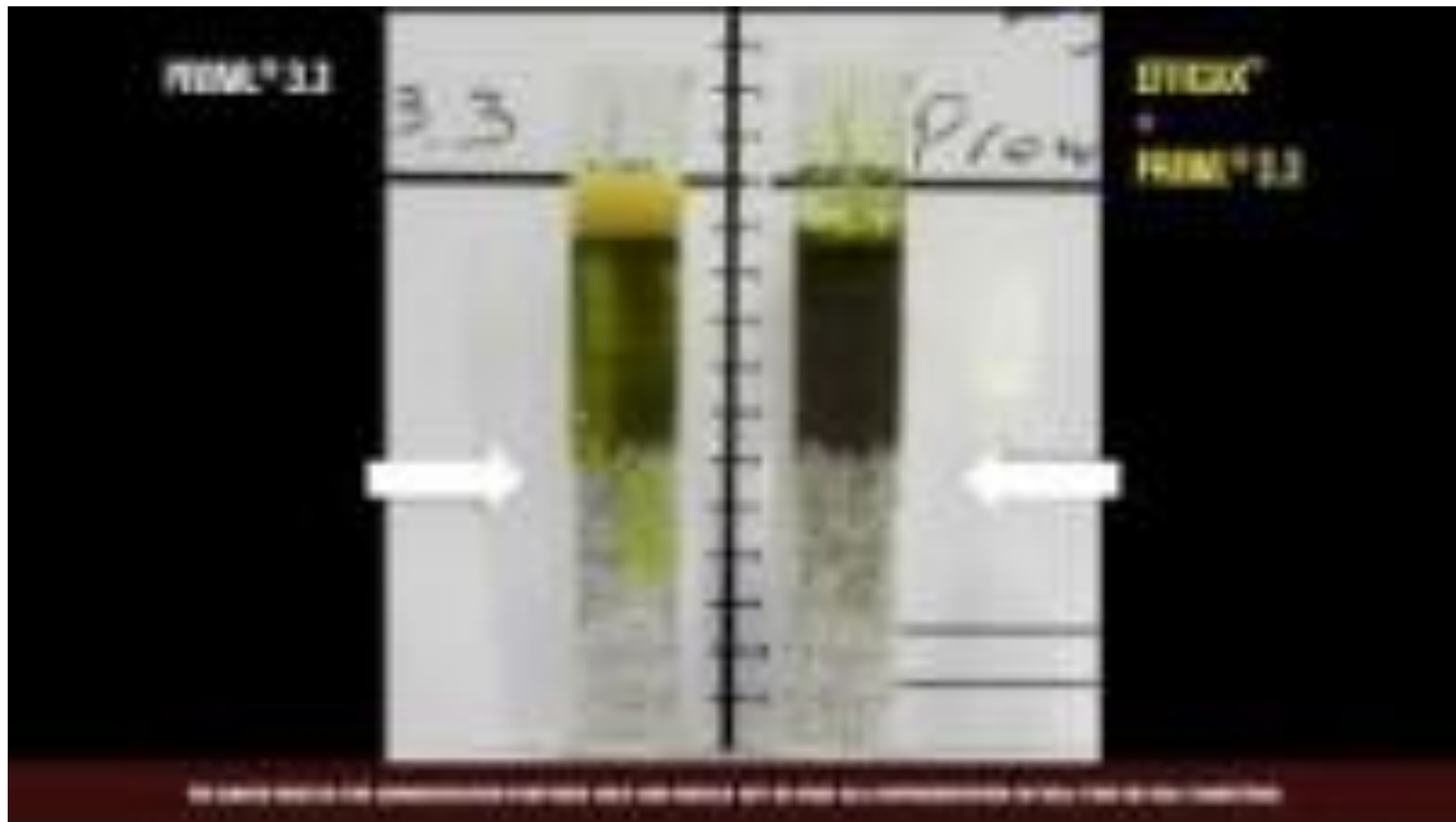
- Use applications: Herbicides
- Tank-mix combinations: Various
- Scenarios: Soil-applied applications – Ground or overhead irrigation

Seeing is Believing



See How EFFICAX Holds
Your Investment Where It's
Needed





PROWL® 3.3



EFFICAX™
+
PROWL® 3.3

8x

14:12:24

The above time lapse video is for demonstration purposes only and should not be used as a representation of real time or soil conditions.

Surfactants

Surfactants and Wetting Agents

Surfactants are just **ONE** common type of Adjuvant...

The term “surfactant” was coined from the phrase:

“Surface Active Agent”

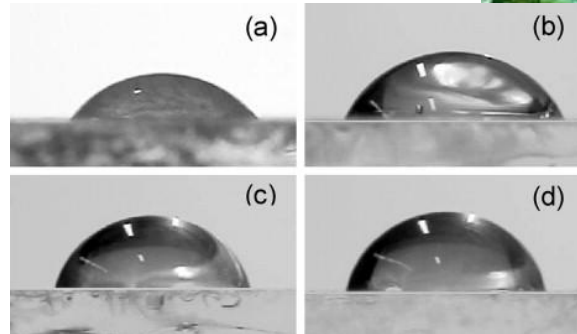
All surfactants are adjuvants, but not all adjuvants are surfactants.

Surfactant - Properties

Nonionic Surfactant Adjuvants Are Generally Tested In The Laboratory To Compare And Measure Key Surfactant Properties.

1. Surface Tension –

surfactants reduce spray water surface tension to increase droplet spread and improved coverage.



2. Contact Angle –

surfactants reduce contact angle of spray droplets to improve spray coverage.

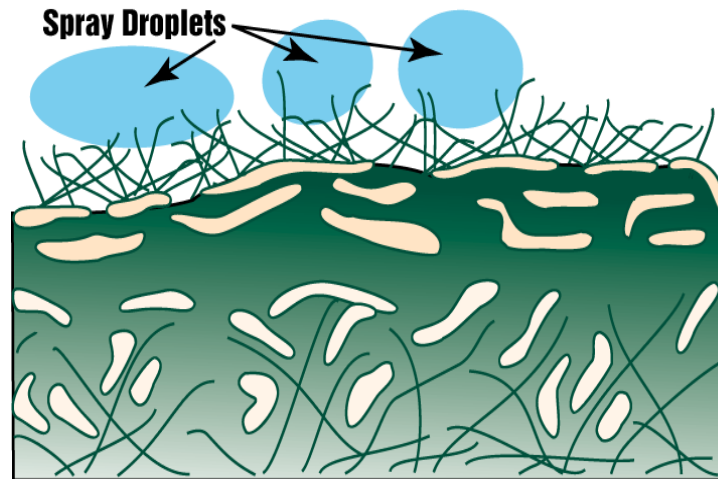


Surface tension causes these water droplets on leaves to bead up and form the smallest surface possible. The water molecules at the surface are pulled in by the cohesive force between themselves and molecules inside the droplet.

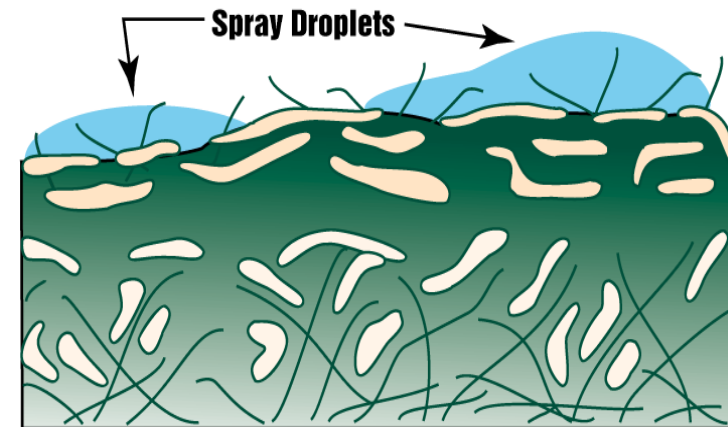
Barriers of Entry

Leaf Hairs (Pubescence)

Spreading and uptake requires a droplet to reach the leaf surface



Dense pubescence prevents wetting

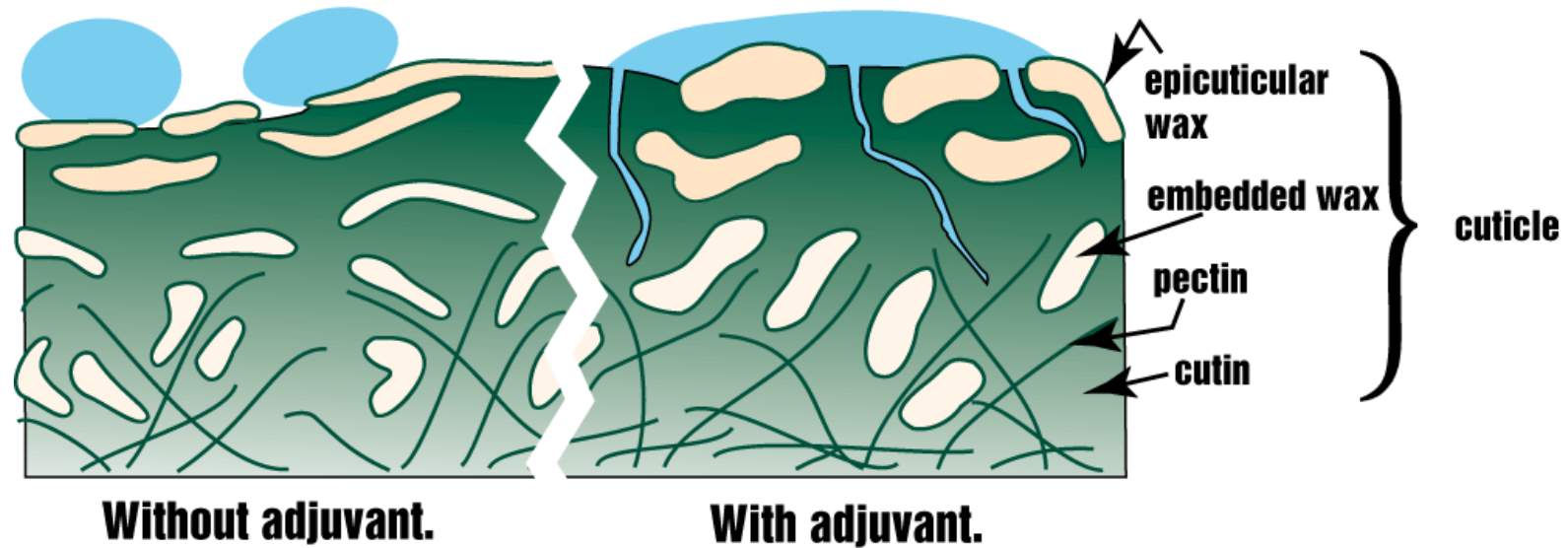


Sparse pubescence may increase wetting.

Barriers of Entry

Leaf Surface or Cuticle

Spreading and uptake requires a droplet to reach the leaf surface



Spreading

No surfactant, waxy leaf



By Dr. Heping Zhu, USDA-ARS-ATRU

With surfactant, waxy leaf



By Dr. Heping Zhu, USDA-ARS-ATRU

Japanese Maple with and without spreader sticker

With Surfactant

Without Surfactant



Advantages:

Nonionic surfactant – highest surfactant content

- 88 percent pure surfactant versus “other” surfactants

Better penetration – more active ingredients where needed

- All about the deposit – what does that mean?

Faster burndown – better, consistent control

- Provides higher percentage of control versus “other” surfactants

When to use:

- Spray applications: Herbicides
- Tank-mix combinations: Various Formulations
- Scenarios: Normal - Extreme weather conditions, Tough weed species, high heat – drought stress situations

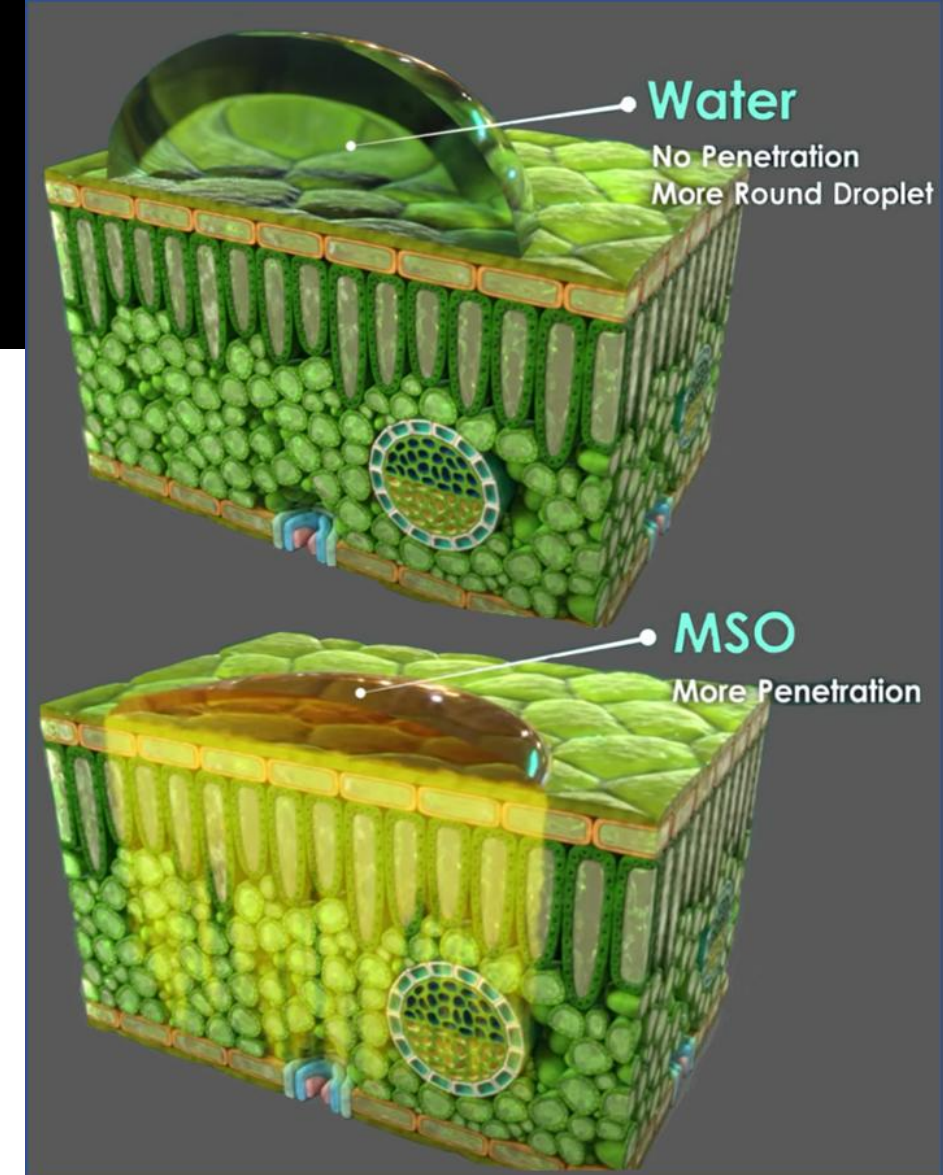
Oil Adjuvants



Oil Based Adjuvants

The basics of Oil Based adjuvants...

- Oil based products usually contain 75-80 percent oil.
- Oil based products also contain small amounts of surfactants.
Why? Surfactants work as emulsifiers to help the oil materials mix into water-based spray solutions.
Note: The emulsifier-surfactants also contribute to wetting and spreading performance.
- Oil based adjuvants are generally recognized for enhanced penetrating performance.
Why? They help the spray solution dissolve waxy leaf surfaces, enhancing the ability for spray penetration and uptake.



Like Dissolves Like

Types of Oil Based Adjuvants

In General – Two Types of Oil Based Adjuvants



Petroleum Based Oil Adjuvants

Oil derived from petroleum production

Usually called “Crop Oil Concentrate” or COC

Seed Oil Based Adjuvants

Oils produced from oil plants and seeds such as Soybean, Canola, Sunflower, and Cotton

Usually called “Modified Vegetable Oil” or MVO/MSO



Seed Oil-Based Adjuvants

Modified Vegetable Oils:

- Are better spreaders versus crop oil concentrates (COC)
- Has a high boiling point, allows less evaporation - increasing the absorption
- Remains as an oily liquid on the leaf - does not dry to a salt crystal
- Is similar in structure to cuticular waxes - causing “swelling” of waxes - increasing penetration



Advantages:

Oil Blend

- Organo-silicone PLUS Ethylated Seed Oil (Canola)

Translaminar effect

- Moves through the leaf tissue – top of leaf to underside of the leaf

Spreading effectiveness

- Spreads out chemistry evenly, allowing better absorption

Crop Safety – Less Solvency = Less phytotoxicity risk (compared to MSO)

Use rate – dependent upon multiple factors (common rate = 4 oz/A)

Positioning:

- Use applications: Insecticides/Fungicides – Sensitive Crops
- Scenarios: Aphids/Mites – Translocation is advantageous, Sensitive crops



Methylated Seed Oil

Meets label minimum requirements

Spreading – Better than Crop Oil Concentrates

Use rate – dependent upon multiple factors

Positioning:

- Use applications: Herbicides
- Tank-mix combinations: Minimum label requirements - MSO
- Scenarios: “Normal” weather conditions

Adjuvants - Summary

Key Take-aways...

- Adjuvants are a useful tool in any spray application.
- Not all adjuvants are created equal – CPDA (Crop Producers and Distributors of Agrotechnology) Certified Products MUST do what they claim to.
- Understand what you are trying to accomplish with each spray application.
Choose the appropriate adjuvant for that application.
- Nonionic surfactants generally have great wetting and spreading characteristics.
- Oil-based adjuvants are great penetrators that allow herbicides to enter the plant.
- Deposition Aids (Drift Reducing Adjuvants) help minimize off-target drift by providing better spray deposition
- Water Conditioning is extremely important to prevent herbicide tie-up

Water Conditioning



Spray Tank Characteristics

Have you ever used a pesticide and find that it did not control the pest?

Was it...

The chemical?

Weather?

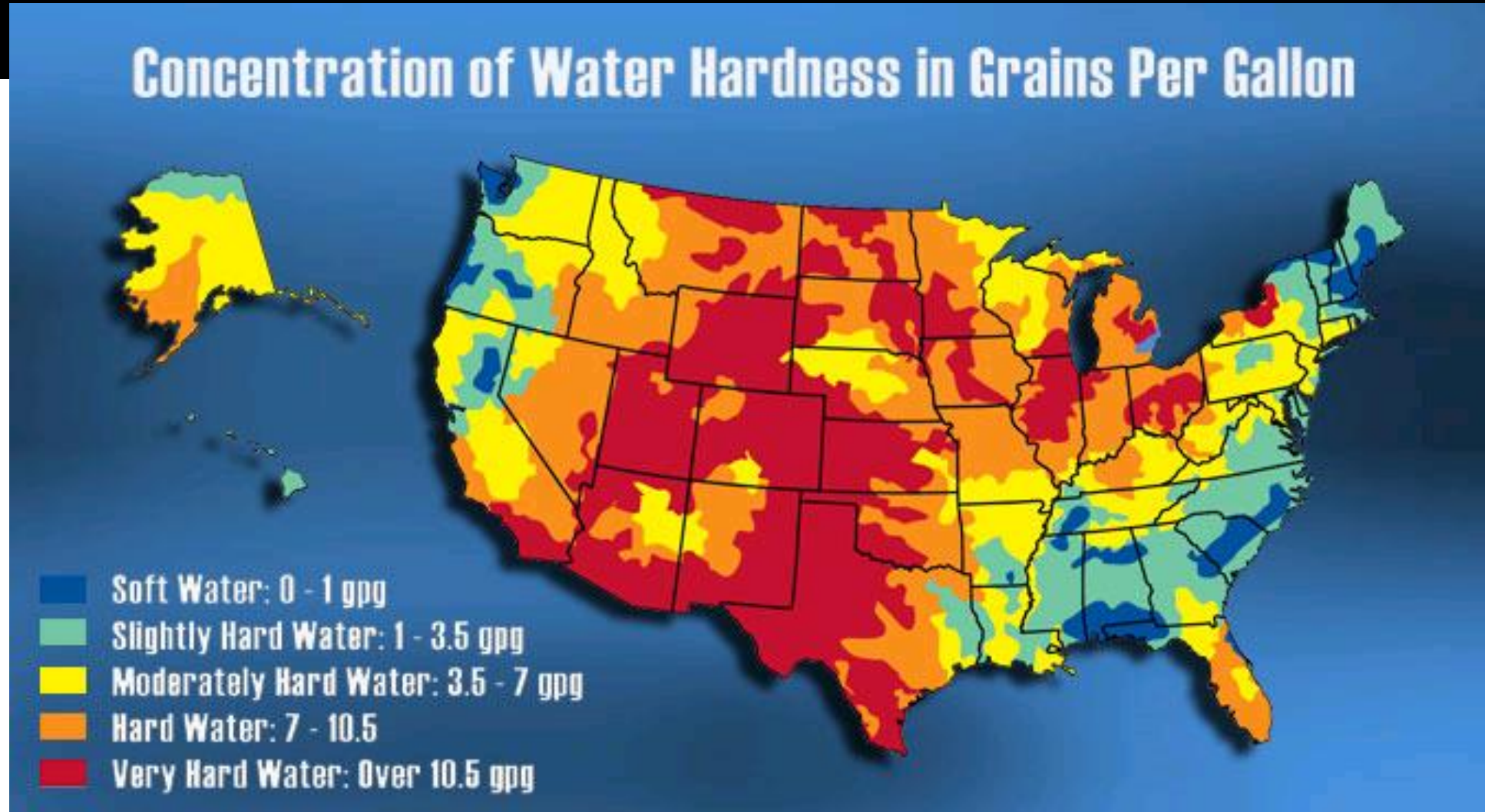
Applicator error?

Pest resistance?

Wrong pesticide?

Ever stop & think that it might be the water?

US Water Hardness Map



Water Hardness

All water sources in nature contain dissolved minerals such as Calcium, Magnesium and Iron.

Water Hardness refers to the dissolved minerals in the water.

Measured by the total amount of calcium and magnesium ions in the water. The greater the concentration, the harder the water.

Water becomes “soft” as dissolved calcium and magnesium ions are replaced with sodium or potassium ions.

Water Hardness

- **Active ingredients can be greatly affected by extreme water hardness and additives must be added to formulations to overcome this issue.**
- **Label will typically address any potential concerns.**
- **Ester formulations are less problematic in hard water.**

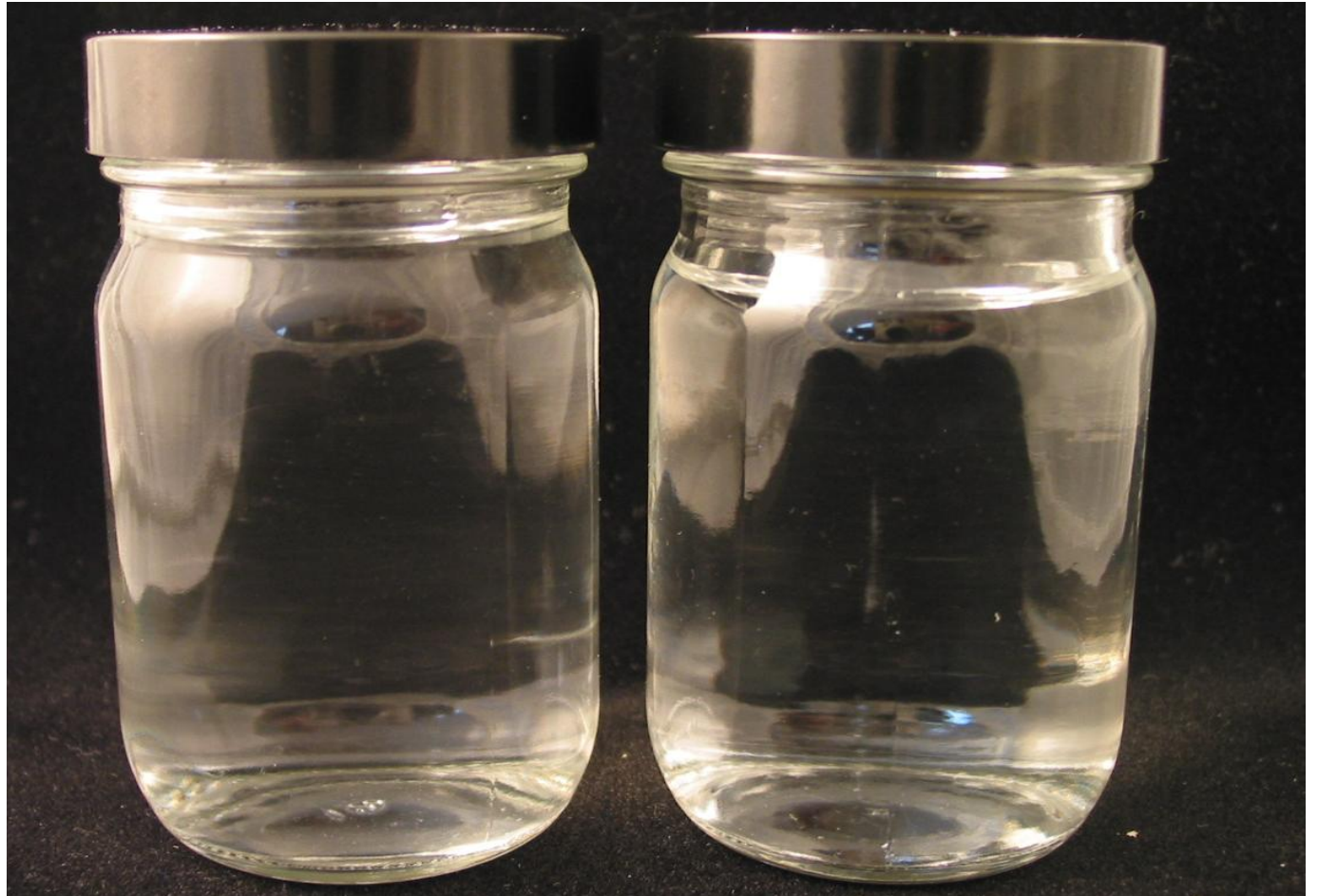
Water Quality Observations

The challenge...

Although we can easily distinguish dirty water from clean water, we can not so simply determine water quality by its appearance.

Almost all natural water sources contain some level of naturally occurring minerals. **The minerals and other impurities in water impact spray water pH and overall spray water quality.**

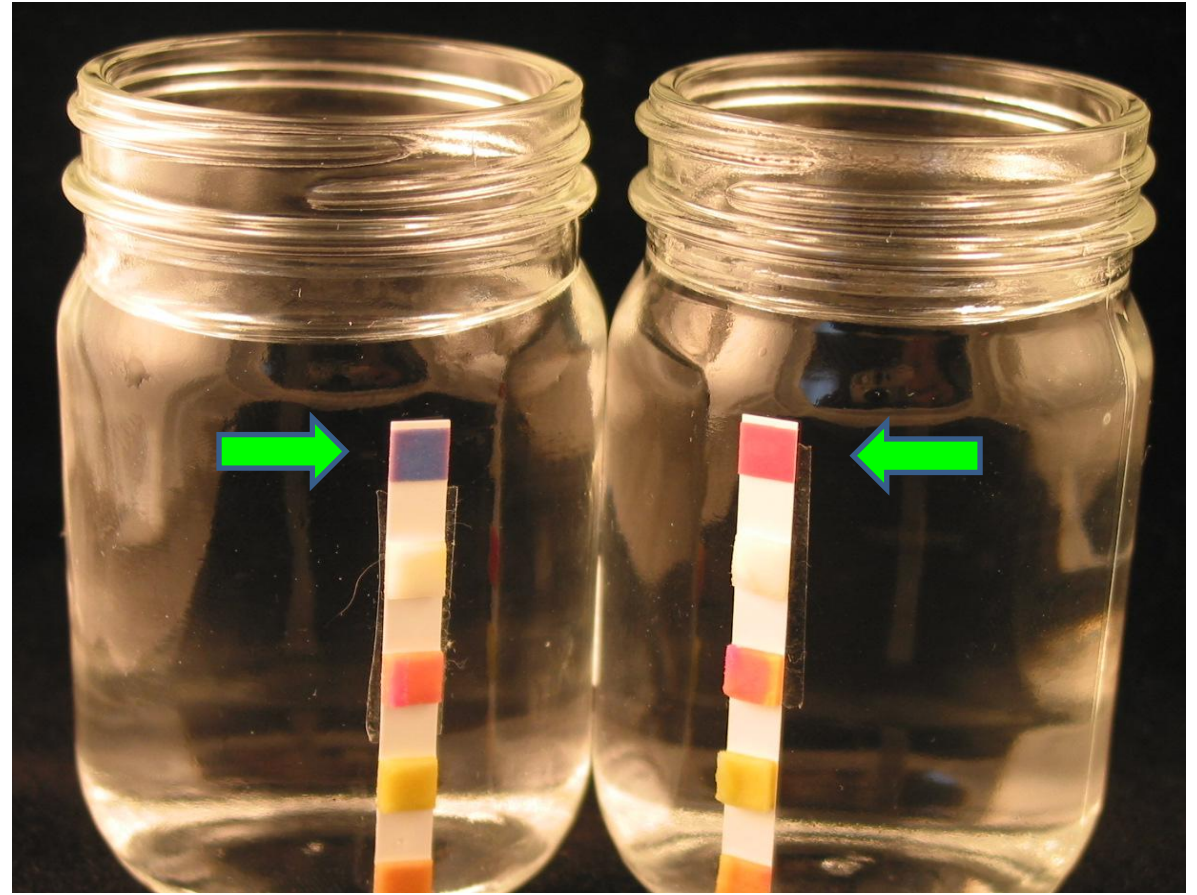
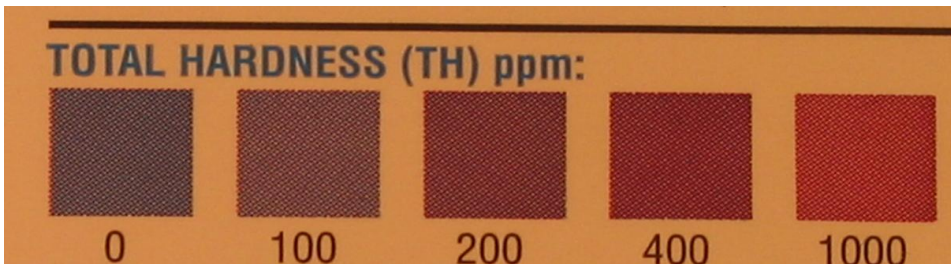
Hard water sources contain higher levels of minerals such as **calcium, magnesium, and iron.**



Water Quality Observations

Proactively testing your source of water...

Utilizing water testing strips will give you the best idea of where your water is in terms of hardness.

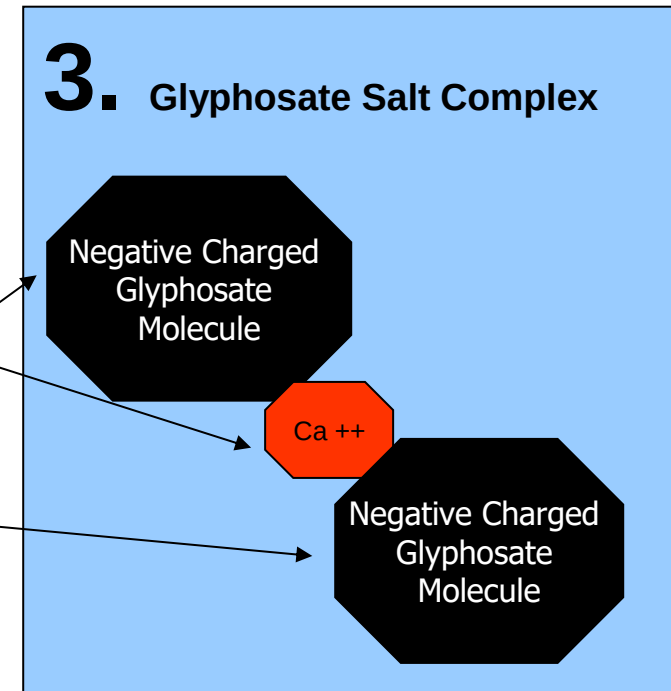
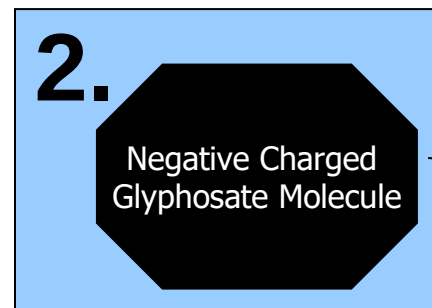
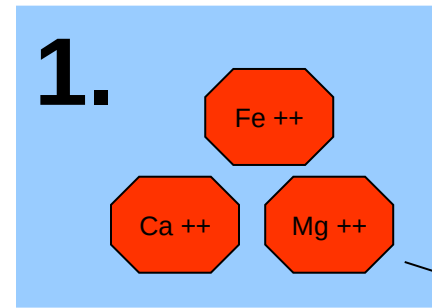


“Soft” Water
0 ppm hardness

“Hard” Water
200+ ppm hardness

Water Quality Observations

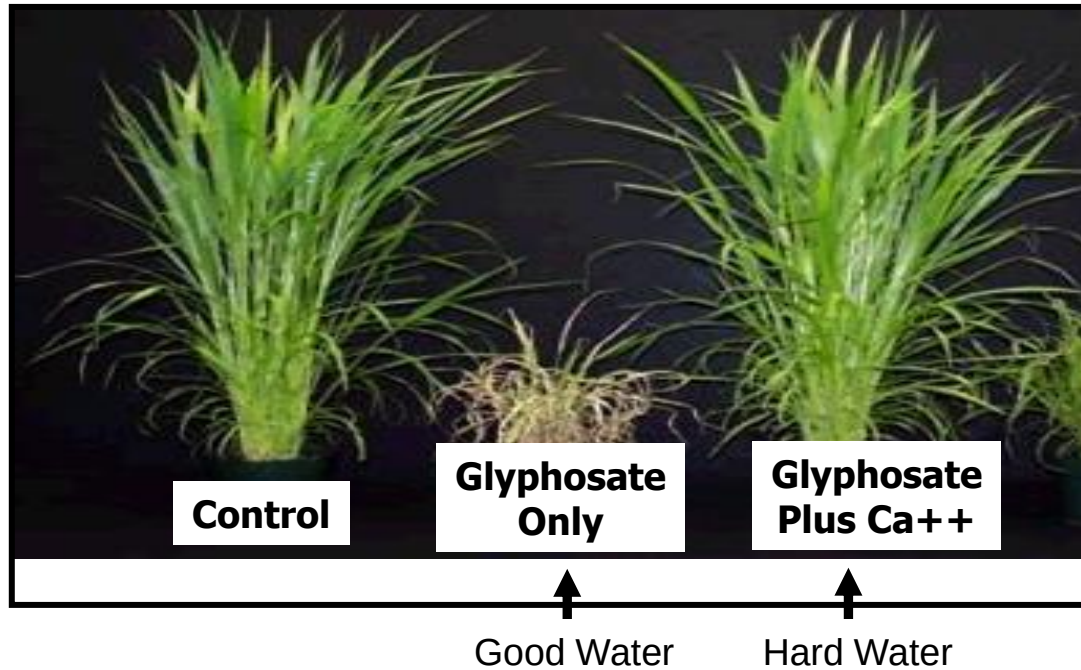
What does antagonism look like...?



Antagonism – cloudy reaction beginning

Water Quality Observations

Visual antagonism, known as herbicide tie-up.



“Soft” Water
0 ppm hardness

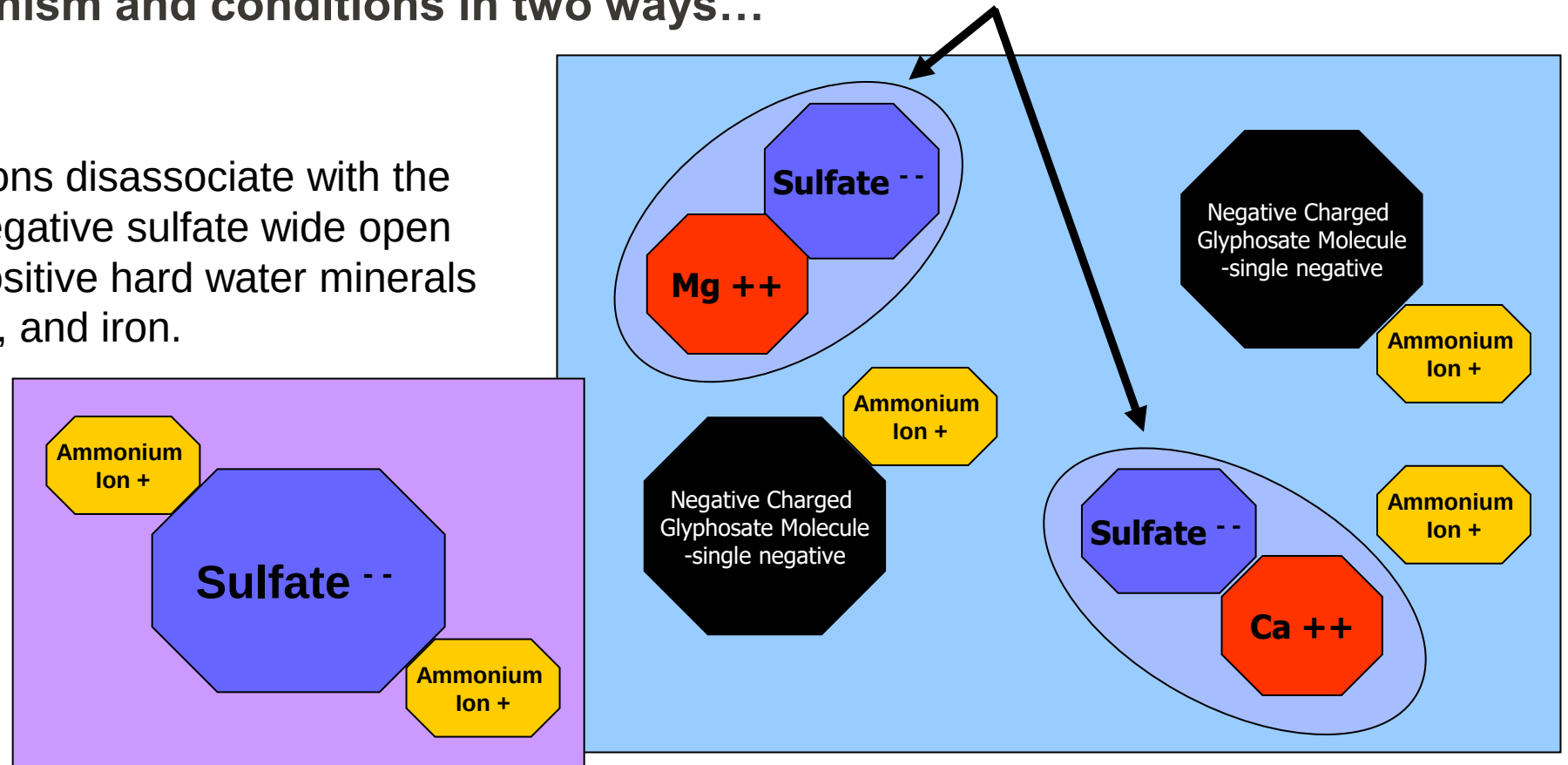
“Hard” Water
200+ ppm hardness

Conditioning The Water – How it works

AMS “disrupts” antagonism and conditions in two ways...

FIRST:

Weakly bonded ammonium ions disassociate with the sulfate, leaving the double negative sulfate wide open for attraction to the double positive hard water minerals such as calcium, magnesium, and iron.



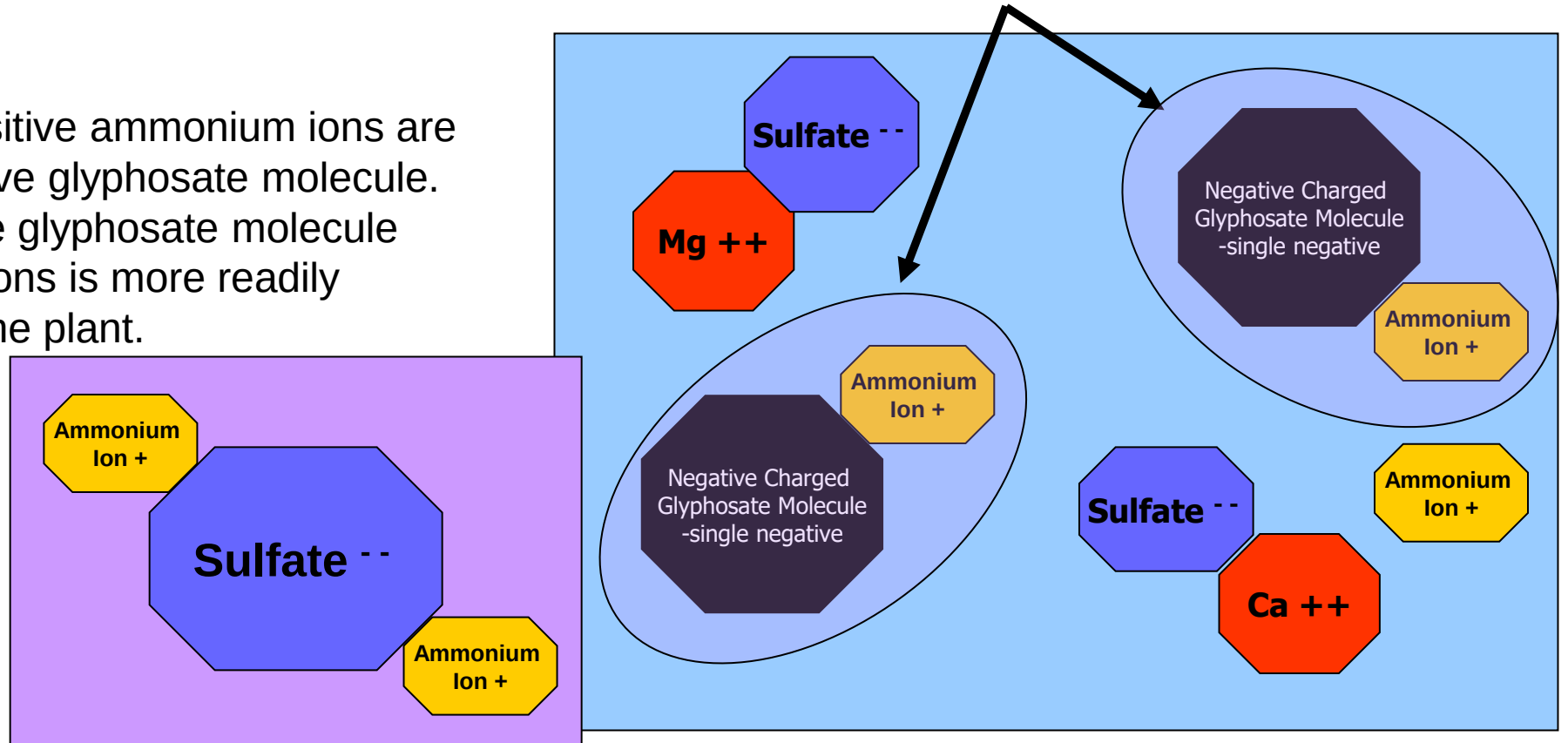
1. Prevents minerals from reacting with herbicide.

Conditioning The Water – How it works

AMS “disrupts” antagonism and conditions in two ways...

SECOND:

The disassociated single-positive ammonium ions are attracted to the single-negative glyphosate molecule. Research has shown that the glyphosate molecule associated with ammonium ions is more readily available to be taken up by the plant.



Water Hardness in Spray Tank

- **Can Be Overcome By Two Methods –**
 - Spray tank adjuvants –
 - Must know hard water issues are present.
 - Water hardness can vary during the year.
 - Add the sequestering agent into the formulation
 - Greatly reduces concern for issues relating to hard water.



- **NPE Free**
- Contains liquid ammonium sulfate
- Aids in sequestering of iron cations and enhances solubility of magnesium and calcium salts
- 2 qt/100 gal is the common use rate with higher use rates recommended for extremely hard water.
- Use Rates: Best determined by testing your spray water with a Wilbur-Ellis Water Quality Test Kit
- **Slightly acidifies (lowers) the spray solution pH.**
- It is a water conditioning agent and does not replace need for a nonionic surfactant.
- **AQUATICALLY REGISTERED**
- **CPDA certified**
- **Add it to the spray water before adding spray materials.**



WATER QUALITY - AMADS

BRIMSTONE[®] Advantages:

AMADS – Reacting urea with sulfuric acid = urea sulfate (acidic pH)

- acronym for 1-aminomethanamide dihydrogen tetraoxosulfate

Designed for use with glyphosate applications

- Acidic pH (tank-mix solution ~3.0-3.3 pH)

Provides adequate spreading and wetting across leaf surface

Faster burndown – better weed control (key feature)

Positioning:

- Use applications: Herbicides (Burndown & In-Crop)
- Tank-mix combinations: Various herbicide mixes
- Scenarios: Buffering/Acidification, Surfactant



Advantages:

AMADS Plus Water Conditioning Agents

- Combination of buffering/acidifying agent plus water conditioning agents
- Acidic pH (tank-mix solution ~3.7 pH)
- Citric/Phosphate acids – allows for better absorption into the plant tissue

Burndown/Pre-plant and In-Crop applications (Flexibility)

Consistent Performance – Quicker Knock-Down

Signal word = Warning

Positioning:

- Use applications: Herbicides
- Tank-mix combinations: Various herbicide mixes
- Scenarios: Water conditioning, Buffering/acidification, surfactant

Bring the Heat

Increased Uptake for Quicker Burndown

- Water conditioning alternative to ammonium sulfate
- Conditions water, mitigates harsh effects of hard water
- Nonionic surfactant for increased spreading and wetting
- Quicker burndown of targeted weeds

With its unique blend of water conditioners and a proprietary surfactant, CYNDER® increases uptake of active ingredient(s), allowing for a quicker burndown of targeted weeds. CYNDER is ideal for use with weak acid herbicides such as glyphosate, paraquat, dicamba, and 2,4-D formulations. The recommended labeled rates for CYNDER are 1-4 qt/100. Rates can vary depending on the hardness of water used in the spray solution.

12 DAYS AFTER TREATMENT
Common Lambsquarters (left) and Kochia (right)

Glyphosate + AMS
Rate: Roundup® PowerMAX® 22 fl oz/A + AMS 4 lb/100 gal

Glyphosate + CYNDER
Rate: Roundup® PowerMAX® 22 fl oz/A + CYNDER @ 2 qt/100 gal

PDF185019C005

CYNDER BENEFITS

- Heats Up Herbicide Activity
- Replacement for AMS + NIS @ 2 qt/100 gal (use rate)
- Excellent Crop Safety
- Overcomes Hard Water Antagonism
- Improves Herbicide Translocation
- Penetrates Leaf Surface Faster

THE POWER OF WE

Product Description



CYNDER is a water conditioning alternative to ammonium sulfate. CYNDER is designed to condition water, effectively mitigating the harsh effects of hard water that can be antagonistic to spray mix solutions. CYNDER has the additional benefit of being a nonionic surfactant – helping to break the surface tension of spray droplets and allowing for better spreading and wetting of spray materials onto the leaf tissue.

With its unique blend of water conditioners and a proprietary surfactant, CYNDER increases uptake of active ingredient(s), allowing for a quicker burndown of targeted weeds. CYNDER is ideal for use with weak acid herbicides such as glyphosate, paraquat, dicamba and 2,4-D formulations. The recommended labeled rates for CYNDER are 1– 4 quarts/100. Rates can vary depending on the hardness of water used in the spray solution.

Glyphosate + AMS



4 Days After Treatment

Common Lamquarters (left) Kochia (right)

Rate: Roundup PowerMAX® 22 fl oz/ac + AMS 4 lb/100 gal



12 Days After Treatment

Common Lamquarters (left) Kochia (right).

Rate: Roundup PowerMAX 22 fl oz/ac + AMS 4 lb/100 gal

Trial Number: PDF185019CO05

Glyphosate + CYNDER



4 Days After Treatment

Common Lamquarters (left) Kochia (right).

Rate: Roundup PowerMAX 22 fl oz/ac + CYNDER at 2 qt/100 gal

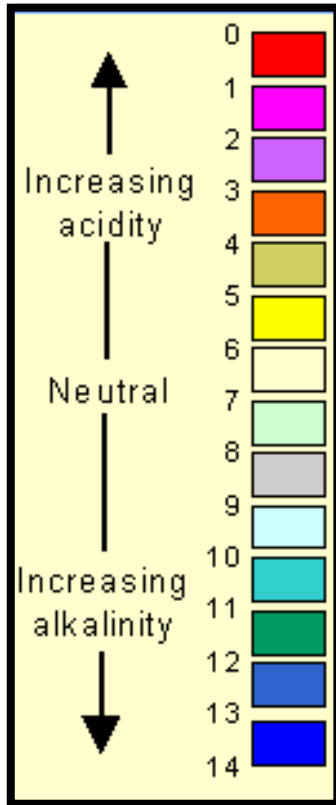


12 Days After Treatment

Common Lamquarters (left) Kochia (right).

Rate: Roundup PowerMAX 22 fl oz/ac + CYNDER at 2 qt/100 gal

pH & pH Basics



pH 0-6.99
(Acidic)

← **pH = 7.00 Neutral**
(# acid ions = # of
alkaline ions in solution)

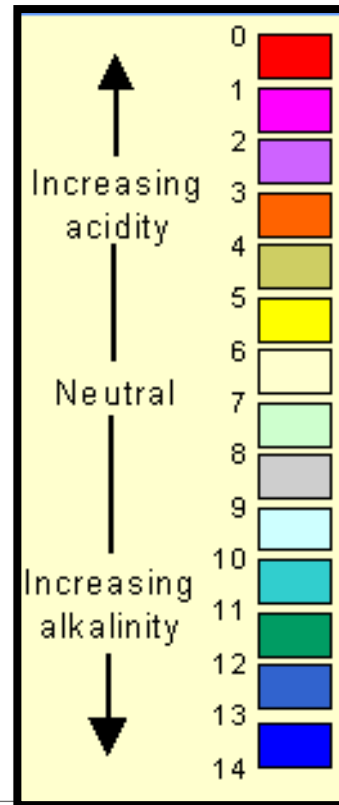
pH 7.01 – 14.00
(Alkaline or Basic)

pH scale is logarithmic

Every unit is multiplied by 10
pH change from 4 to 5 makes it
10 times more alkaline
pH change from 4 to 6 makes it
100 times more alkaline

pH & pH Basics

Ideal pH range



***pH* range of 4 – 6 is best for most fertilizer and pesticide applications.**

Spray Tank Characteristics

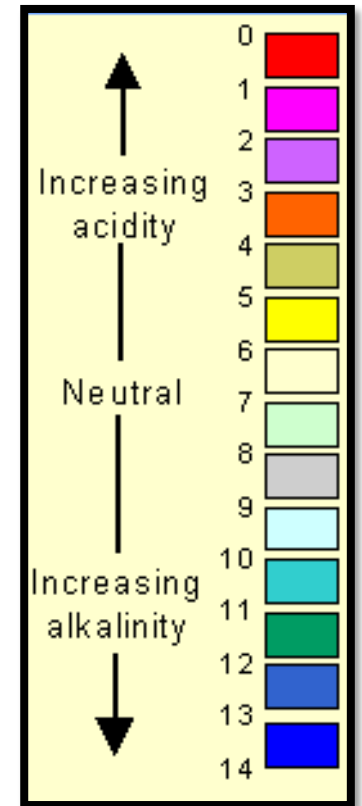
Select pesticides (i.e., organophosphates and carbamates) undergo a chemical reaction in the presence of alkaline water (high pH) that reduces effectiveness... Called “alkaline hydrolysis”

Alkaline hydrolysis:

The pesticide is hydrolyzed and rendered ineffective when mixed with water with a pH higher than 7.

The more alkaline the water, the faster the pesticide breaks down.

pH 7.01 – 14.00
(Alkaline or Basic)



Active Ingredient Degradation in Spray Tank

Examples of Half-Lives

Half-life = Time it takes for 50% of the active ingredient to break down

Active Ingredient	pH = 6	→ pH = 7	→ pH = 9
Carbaryl (Sevin)	100-150 days	24-30 days	1-3 days
Captain	N/A	8 hours	2 minutes
Malathion	8 days	3 days	8 hours

Product labels will often address pH if there is reason for concern.

pH Modifiers of Spray Tank

- **Interactions With Pesticides Include**
- **Fertilizers**
- **Iron Additives**
- **Anionic/Cationic Adjuvants**
- **Too Many Pesticide Formulations in Spray Tank**

Non-pH Inducing

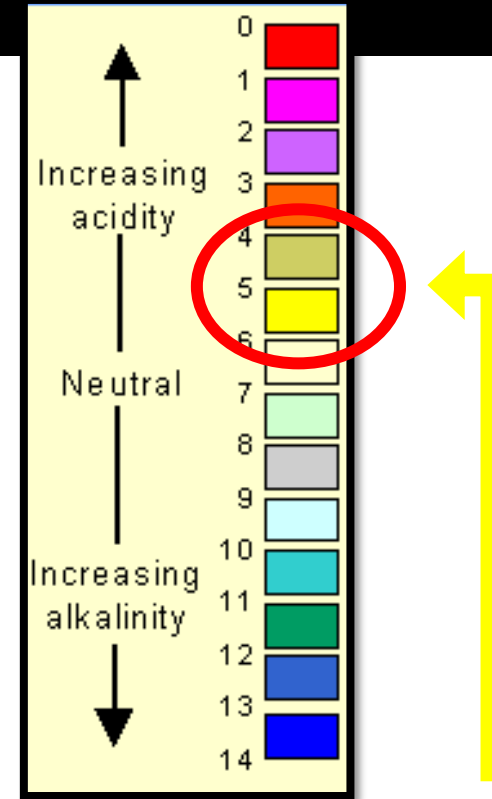
- Tank Mix Additives that do not Affect Tank Mix pH Include
- Nonionic adjuvants/surfactants
- Defoamers
- Spreaders/Stickers
- Markers

pH in Spray Tank

Can Water pH be Adjusted?... Yes!

Spray Buffer or Buffering Agent –
Change the pH of spray solution to a prescribed level and keeps it there.
Must know the initial pH before it can be adjusted.

Some pesticides have additives in the formulation, so the pH of the spray tank adjusts to proper pH to optimize chemical stability.



***pH* range of 4 – 6 is best
for most fertilizer and
pesticide applications**



- NPE Free
- TRI-FOL Organically approved OMRI
- Reduces pH of spray water
- Reduces spray material degradation cause by alkaline hydrolysis.
- Has a pH of 0.4
- Most insecticides and fungicides perform best at a spray water pH of 5-6.5
- Buffering Agent with GREAT Buffering Capacity
- Use Rates: Best determine by conducting a pH test of the spray water with a Wilbur-Ellis Water Quality Test Kit
- DO NOT use with copper fungicides
- TRI-FOL should be added to the spray water first before spray material is added to the solution



- **NPE Free**
- Alkaline Buffer (raises the spray water pH).
- **Will increase the slurry water pH to 10.6**
- By treating the slurry water only, it doesn't affect your tank mix partners that don't like a high spray water pH.
- Should be used with all the sulfonylurea products.
- CLIMB® also helps to dissolve and solubilize other DF's: Krovar®, Diuron, Tri-Cor®, Lorox®, Axiom®, Spartan®
- **Should be used with all herbicides formulations that are not EC (emulsifiable concentrates)**
- 2 oz/gal of slurry water.
- As the water pH increases it increases the solubility of certain products making more product available to kill weeds.
- **Add to water AFTER the pesticide is added to the spray water in the inductor or mix container and off the water surface.**
- Should also be used with; Distinct®, Overdrive®, Status®, Frequency™, Olympus®, PowerFlex HL®, Opensight®, Everest® 2.0, Sierra™, Pre-Pare®, Detail™, Sharpen®, Verdict®, TreeVix®, OpTill®, OpTill® Pro, Callisto®, Impact®, Armezon®, Laudis®, Orion®



Other tank-active adjuvants

Other spray tank-active adjuvants

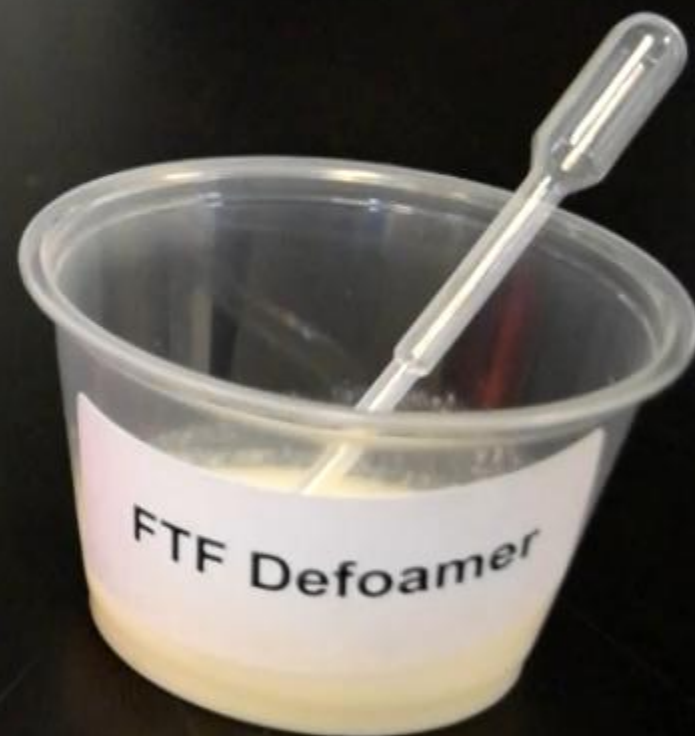
When added to a spray tank:

Defoamers –reduce the foaming properties of the tank-mixture

Buffering agents or acidifiers – reduce or increase the pH of the tank-mixture

Compatibility agents – improve the mixability of the tank-mixture

Dyes and Scents - adds a color or a scent to your tank-mixture





RENEGADE-EA®

Uses: Penetrant, Spreading, Wetting

Features

- Unique blend of MSO, NIS, UAN
- Contains a proprietary surfactant
- Utilizes microemulsion technology
- Formulated with a neutral pH
- Labeled for aquatic use
- NPE free product

Benefits

- Enhances retention and penetration of herbicides
- Allows for use with non-selective tank mix combinations
- Improves the efficacy of the pesticide(s)
- Greater stability in spray tank mixtures
- Enhanced viscosity, especially in cold water
- Ability to use with aquatically labeled pesticides
- Excellent safety and handling characteristics

GLACIER-EA®

Uses: Penetrant, Spreading, Wetting

Features

- High load methylated oil plus a proprietary non-ionic surfactant
- Designed to work with most pesticides
- Low foaming technology
- Labeled for aquatic use
- NPE Free

Benefits

- Lower use rates than standard methylated seed oils
- Increases wetting and penetrating of the pesticide(s) into the plant tissue
- Compatible with non-selective tank mixes – improves performance
- Improves desiccation and burndown over standard methylated seed oils
- Ability to use with aquatically labeled pesticides
- Excellent safety and handling characteristics

SUPER SPREAD® MSO

Uses: Penetrant, Wetting

Features

- Excellent crop tolerance
- Low rates per acre
- Use in place of crop oil concentrate

Benefits

- Excellent wetting and penetrating
- Improves transportation through waxy cuticle
- Consistent and stable emulsion

HERBICIDE + OILS

RAINIER-EA®

Uses: Penetrant, Spreading, Wetting

Features

- High concentration NIS formulated to increase uptake from spray droplet deposits
- Reduces surface tension of spray droplets and provides uniform foliage coverage
- Low foaming technology
- Aquatic use
- NPE Free

Benefits

- Quickly wets and spreads, allowing for uniform coverage
- Increases absorption and translocation of systemic products into the plant tissue
- Ease of use with less foam resulting in the final tank solution
- Can be used with aquatically labeled pesticide
- Excellent safety and handling

R-11®

Uses: Penetrant, Activator, Spreading, Wetting

Features

- Acidifier/Buffering agent
- High load of surfactant - 90% active
- Reduces surface tension
- Proprietary formulation components

Benefits

- Improves coverage over leaf surface
- Better absorption through plant cuticle
- Excellent tank mix compatibility (especially in cold water)

DENALI-EA®

Uses: Multi-Functional, Spreading, Wetting, pH Buffer

Features

- Acidifier/Buffering agent
- Proprietary nonionic surfactant mixture
- Enhanced wetting and spreading performance
- Labeled for aquatic use
- NPE Free

Benefits

- Lowers and maintains pH of the tank solution
- Allows for better activation and/or penetration of the pesticide
- Increases efficacy of pesticide(s) including weak acid herbicides
- Promotes uniform coverage on the plant surface
- Ability to use with aquatically labeled pesticides
- Excellent safety and handling characteristics

HERBICIDE + SURFACTANTS

BRIMSTONE®

Uses: Multi-functional, Spreading, Wetting, pH Buffer, Water Conditioning

Features

- Unique AMADS Chemistry
- Formulation of Buffers, Activators, and Water Conditioners
- Nitrogen Humectancy
- NPE Free

Benefits

- Quicker burn down
- Less regrowth in hard-to-control weeds
- Excellent for use in hot and dry conditions
- Improved glyphosate performance in hard water

BRONC® MAX

Uses: AMS, pH Buffer, Water Conditioning

Features

- CPDA Certified
- Liquid Formulation
- Tank Compatibility - unique formulation of liquid AMS
- Low corrosion factor
- Special filtering process to remove impurities
- NPE Free

Benefits

- Enhances sequestering to block mineral tie-up of herbicides
- Reduces pH of spray solution to enhance uptake
- Easier mixing with complex tank mixes
- Low use rates for easy handling and mixing
- No sedimentation going into spray tank
- Approved for aquatic use

BRONC® MAX PLUS DRY E.D.T.

Uses: Water Conditioning, Wetting, Drift Reduction

Features

- Enhanced sequestering to block mineral tie-up of herbicides
- Reduces pH of spray solution
- Contains patented Enhanced Deposition Technology (EDT)
- NPE Free

Benefits

- Low use rates for easy handling and mixing
- Enhances uptake
- Increased spray deposition

BRONC TRIPLE®

Uses: Water Conditioning, Spreader, Wetting, Drift Reduction

Features

- Unique blend
- Triple action adjuvant system
- NPE free

Benefits

- Improved performance with actives such as glyphosate
- Non-Ionic Surfactant, Water Conditioner and DRT – All-in-one

HERBICIDE + WATER QUALITY

wilburellisagribusiness.com

Adjuvants:



Adjuvants 101:

Adjuvants 101

Non-ionic surfactants (NIS) and Oils

NON-IONIC SURFACTANT (NIS)

A surfactant is a substance that reduces the surface tension of the tank-mixture, providing for greater spreading and wetting properties.



WHY ARE SURFACTANTS NEEDED?

Since spray tank-mixtures are made up of mostly water, you need to be able to break water's unique adhesive and cohesive properties, to improve deposition on plant surfaces. Surfactants are also used to help cut through a leaf's waxy cuticle, allowing for better absorption through the leaf. Surfactants not only help improve deposition but can break through tough layers on the plant's surfaces.

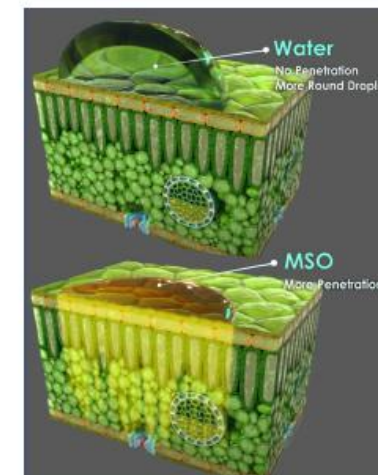


Surfactants are crucial to improve deposition on vertical plant surfaces like this grass. On the left, no surfactant was used, and on the right it was. You see how evenly coated the grass on the right is compared to the left.

Surfactants in Wilbur-Ellis' portfolio include:
ANTERO-EA®, DENALI-EA®, EMBRECE-EA®,
INFOLIUM-EA®, INSIST® 90 PLUS, R-11®,
RAINIER-EA®, SYL-COAT®

OILS

Oil based adjuvants can be made from petroleum (crop oil concentrates) or seed oil (modified vegetable oil or methylated seed oil). Oil based adjuvants are generally 75-80% oil and also contain some surfactant to help the spreading and penetration of the adjuvants.



WHY ARE OILS NEEDED?

Plant cuticles are waxy, and to cut through the wax and improve pesticide penetration, oils can aid in that process. The low amounts of surfactant help droplets to spread out, but the oils contained help to act as a penetrating agent to help move product into the plant cells. The surfactants in MVOs/MSOs work as emulsifiers to help the oil materials mix into water-based spray solutions. MVOs have reduced evaporation compared to COCs, allowing for greater leaf surface wax swelling and greater penetration into the leaves.

Oils in Wilbur-Ellis' portfolio include:
GLACIER-EA®, HASTEN-EA®,
MOR-ACT® ADJUVANT, RENEGADE-EA®,
SUPER SPREAD® MSO, SYL-TAC-EA®

Thank You!

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