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2019 Pesticide Safety - Adjuvants

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ADJUVANTS

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PESTICIDE SAFETY MEETING, APRIL 25, 2019



- **Terminology**
- **What adjuvants do**
- **What we use**

LOTS of types; LOTS of categories

ADJUVANTS

**ANY PRODUCT ADDED TO PESTICIDES
TO IMPROVE PERFORMANCE**

“Other” Ingredients in Pesticide Formulations

- Adjuvants are ingredients that modify and enhance the performance of pesticides.
- Act as solvent, carrier, emulsifier, spreader, and drift control.
- Surfactants are another major “other” ingredient.

SHOULD YOU USE AN
ADJUVANT??



FAILING TO CORRECTLY USE AN ADJUVANT
ACCORDING TO LABEL IS AS MUCH A
VIOLATION AS INAPPROPRIATE USE OF
PESTICIDE

SPRAY APPLICATION PROBLEMS

- Pesticide stability
 - Solubility
 - Incompatibility
 - Suspension
 - Foaming
 - Evaporation
- SURFACE TENSION
 - COVERAGE
 - PENETRATION
 - ADHERENCE
 - DRIFT
 - DEGRADATION

ADJUVANTS....

- Are designed to combat these issues
- But, cannot single-handedly perform all these functions
- May need to combine different adjuvants to get the job done

Modify spray mixture

- **EMULSIFIERS:** USED W/ OIL-BASED PRODUCTS TO IMPROVE MIXING
- **SPREADERS:** IMPROVE DISTRIBUTION ON TARGET
- **STICKERS (~THICKENERS):** HELP RESIST RAIN, RUN-OFF, EVAPORATION
- **THICKENERS:** REDUCE DRIFT

Spreader-stickers are general-use products that include wetting agent and adhesive.

SPRAY ACTIVATORS

- **COC**: PENETRANTS FOR HERBICIDES
- **NIS**: BREAK WATER TENSION; SPREADER
- **OILS**: SMOTHER INSECTS, SHATTER CHITIN, DISSOLVE WAX /CUTICLE
- **METHYLATED SEED OIL (MSO)**: AGGRESSIVE PENETRANT
- **AMMONIUM SULFATE**: SOFTENS WATER

SURFACTANT

**ANY MATERIAL ADDED TO PESTICIDE
FORMULATION DESIGNED TO MODIFY
OR REDUCE SURFACE TENSION**

SURFACTANT IS SHORT-HAND FOR :

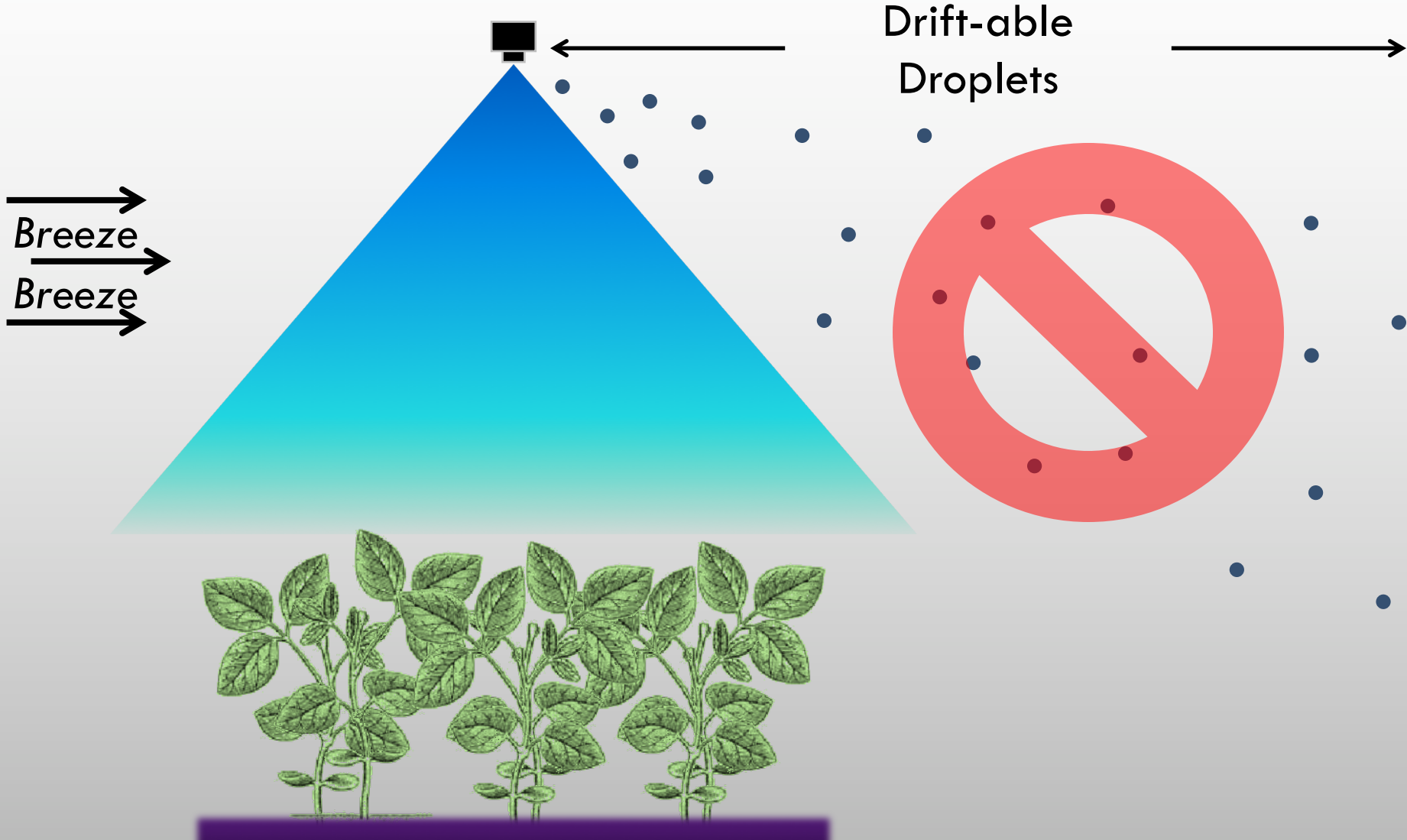
SURFACE ACTIVE AGENT

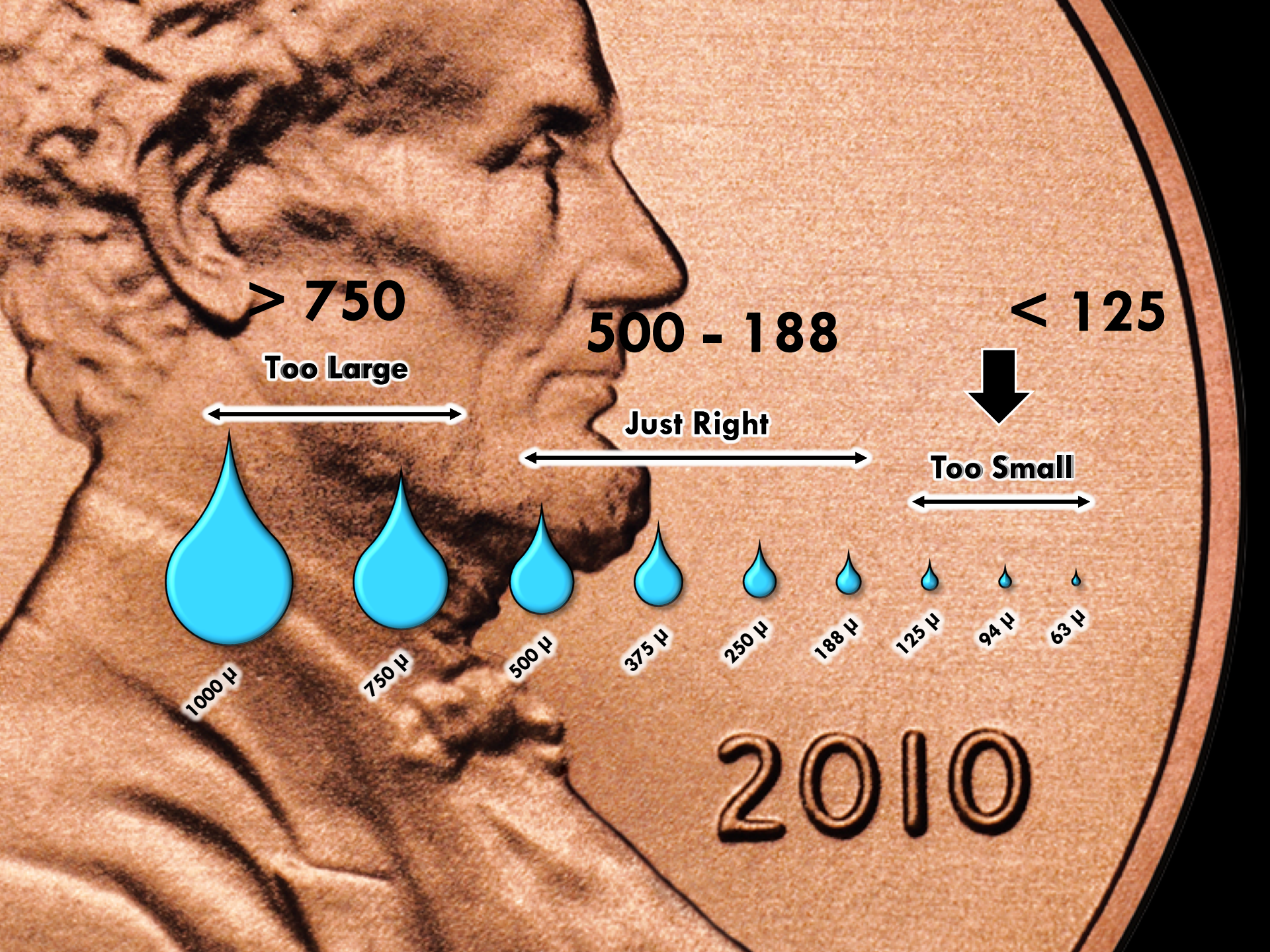
SURFACTANTS

- MAY ALSO BE CALLED WETTING AGENTS OR SPREADERS
- USUAL JOB = BREAK SURFACE TENSION OF SPRAY DROPLET
- TOO MUCH = PESTICIDE RUNS OFF LEAF
- TOO LITTLE = BAD COVERAGE

***ALL SURFACTANTS ARE ADJUVANTS BUT
NOT ALL ADJUVANTS ARE SURFACTANTS!***

What Happens To A Droplet Once Sprayed





> 750

Too Large



500 - 188

Just Right



< 125



Too Small



1000 μ



750 μ



500 μ



375 μ



250 μ



188 μ



125 μ



94 μ



63 μ

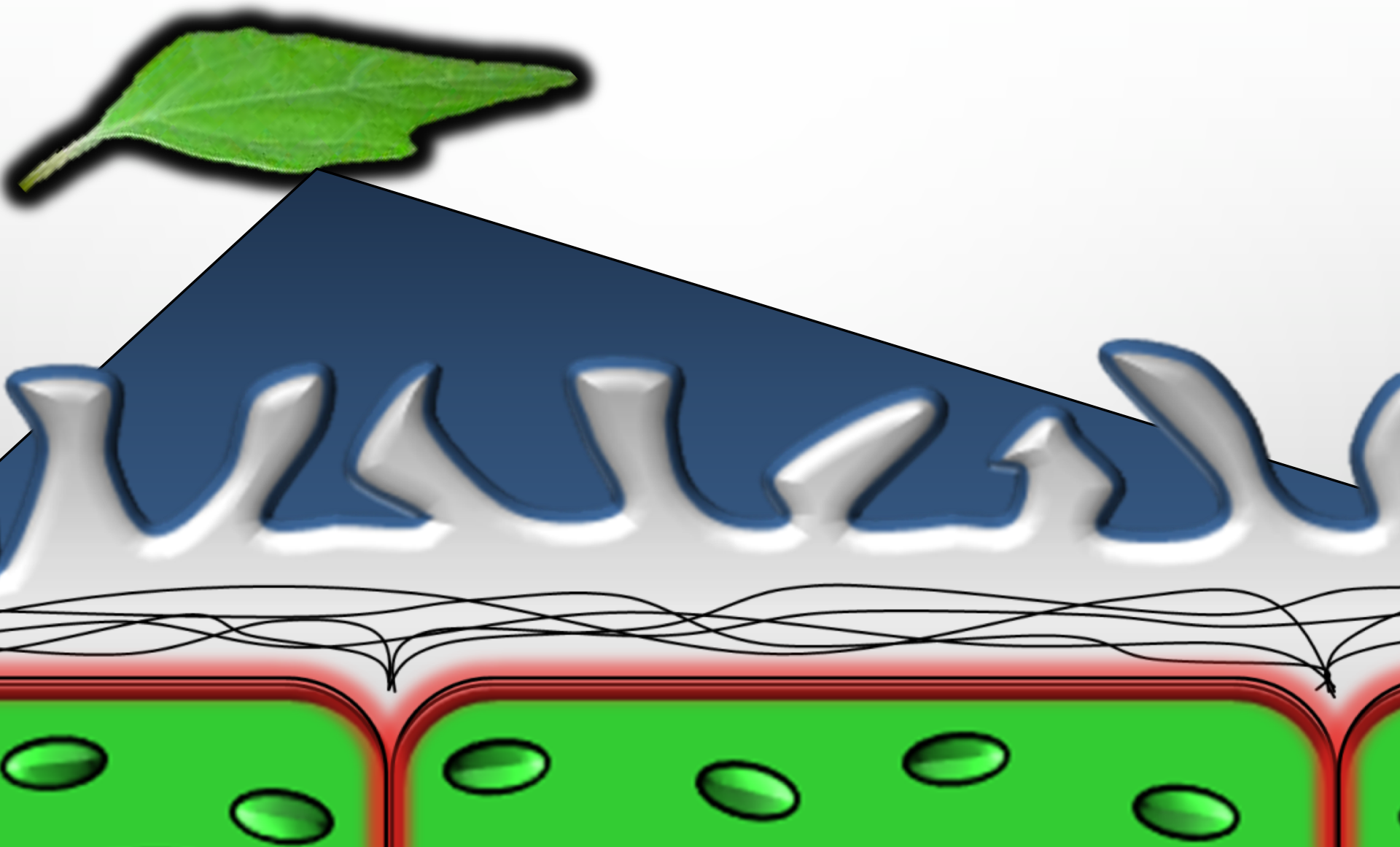
2010

What Happens To A Droplet Once Sprayed



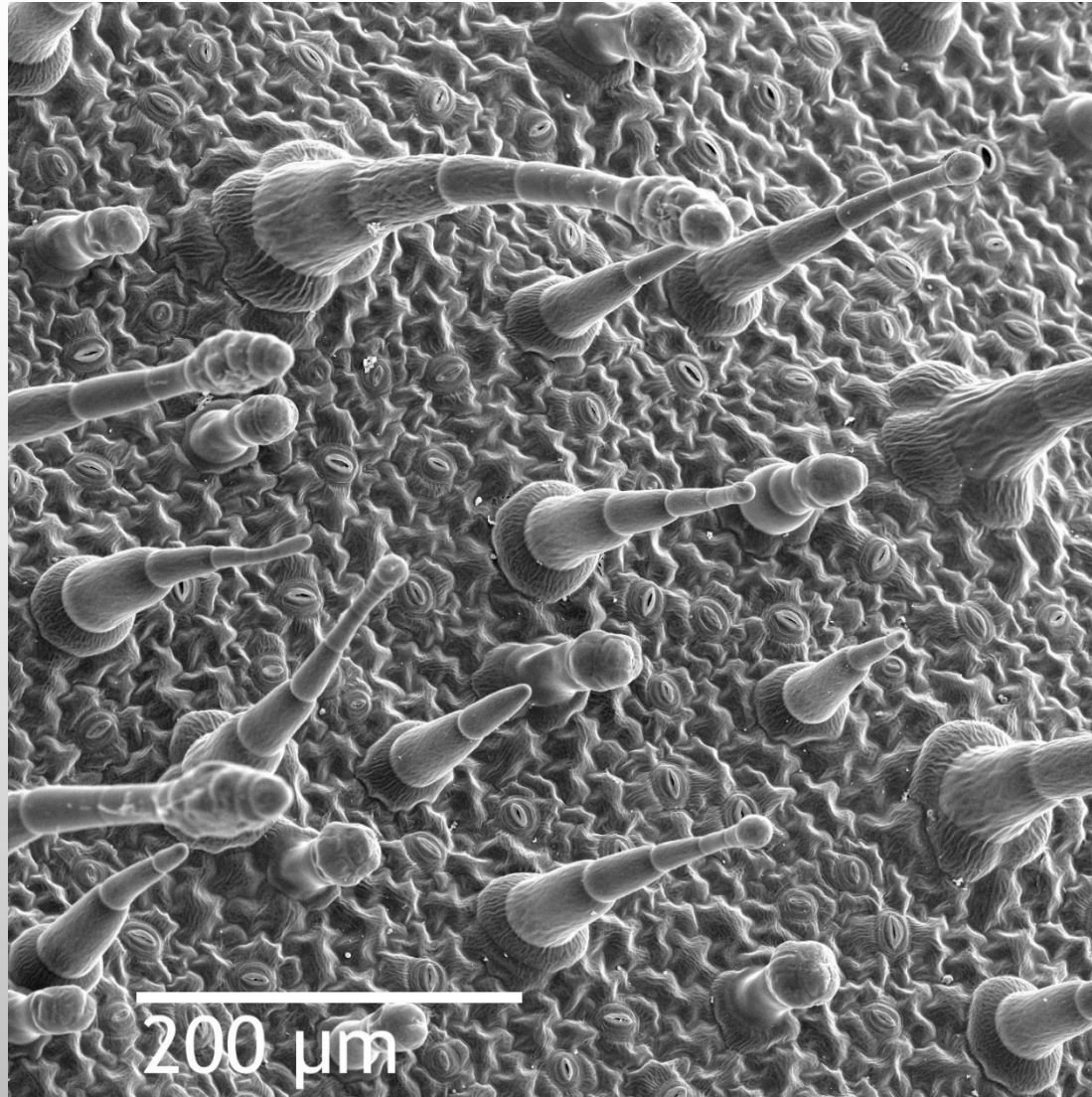
Plant Cuticle

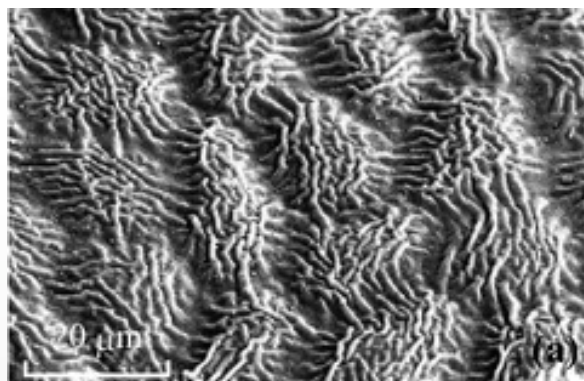
Barrier to Herbicide Uptake



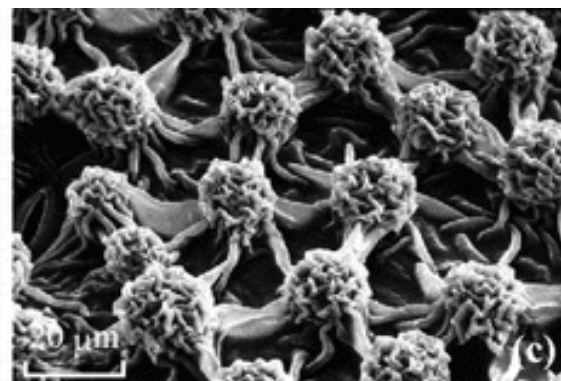
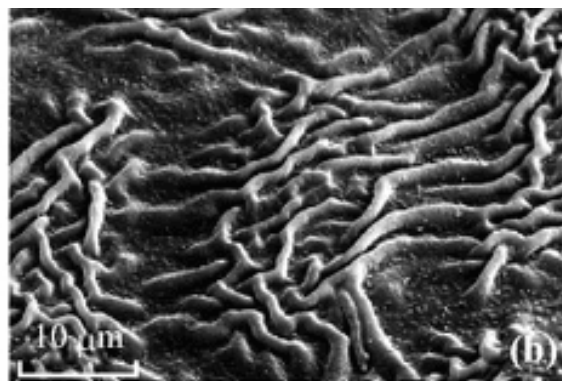
Plant Cuticle

Barrier to Uptake

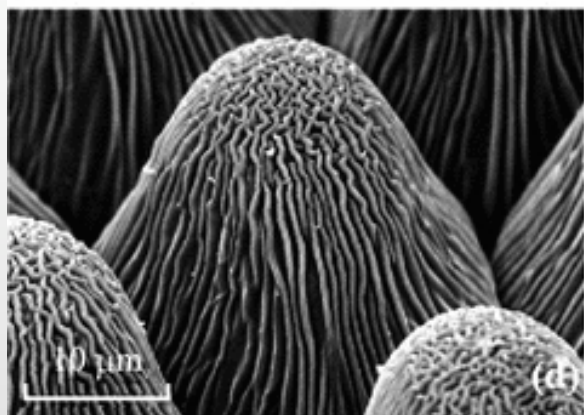




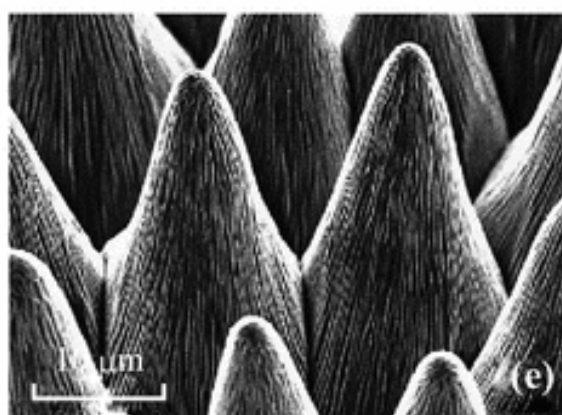
Schismantoglottis neoguineensis: upper leaf (a) side and detail in (b)



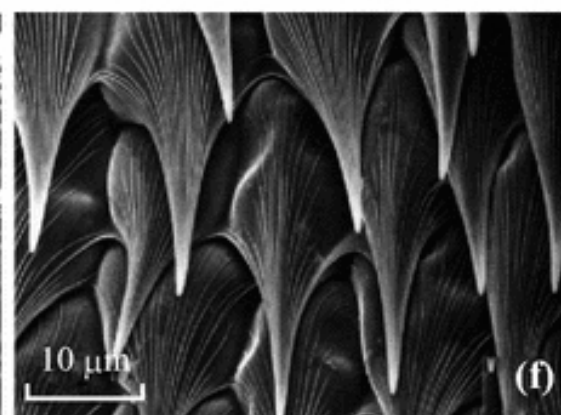
Alocasia macrorrhiza: lower leaf side



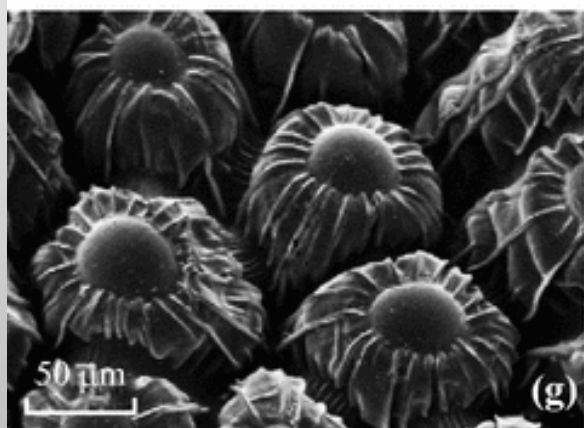
Rosa montana: upper side flower leaf



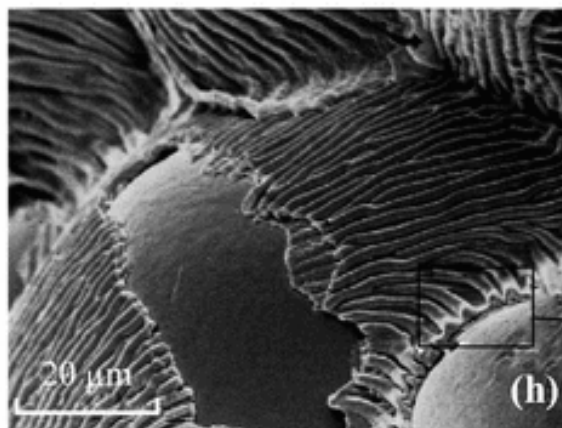
Viola tricolor: upper side flower leaf



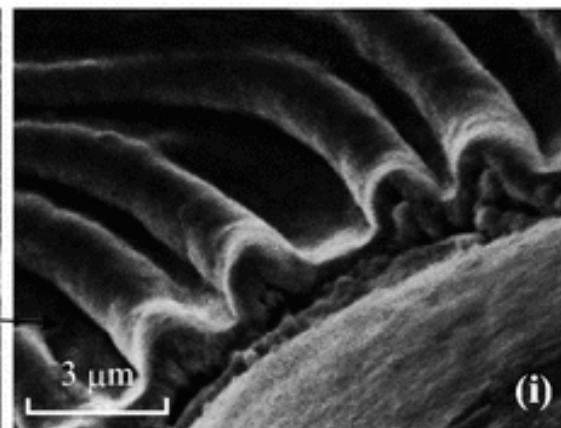
Sarracenia leucophylla: trap leaf



Austrocactus patagonicus: seed surface



Aztekium ritteri: seed cells with a partial removed cuticle (h) and a detail (i)



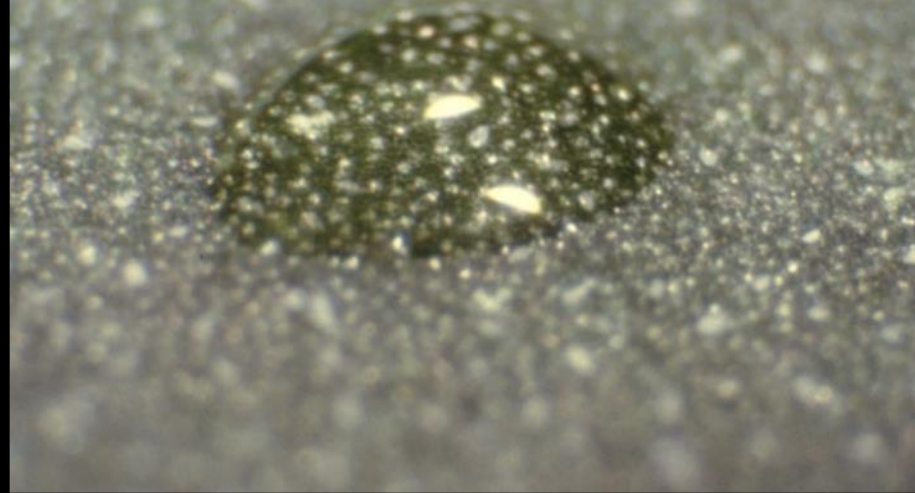
Difficult To Wet Leaves



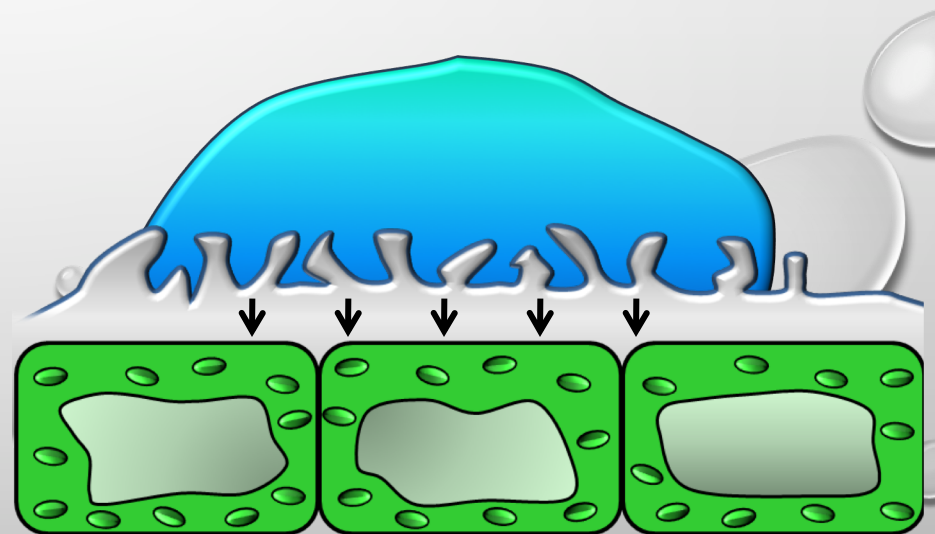
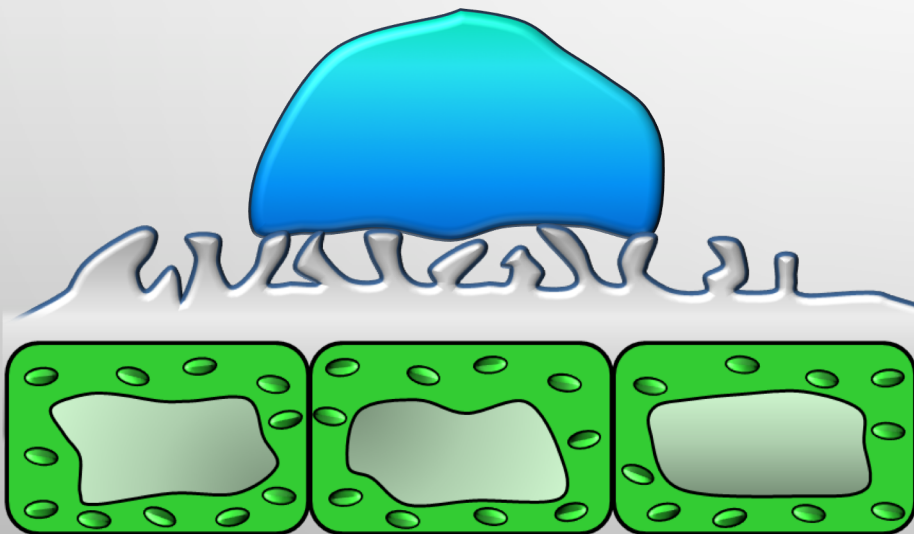
No Surfactant Added



Surfactant Added

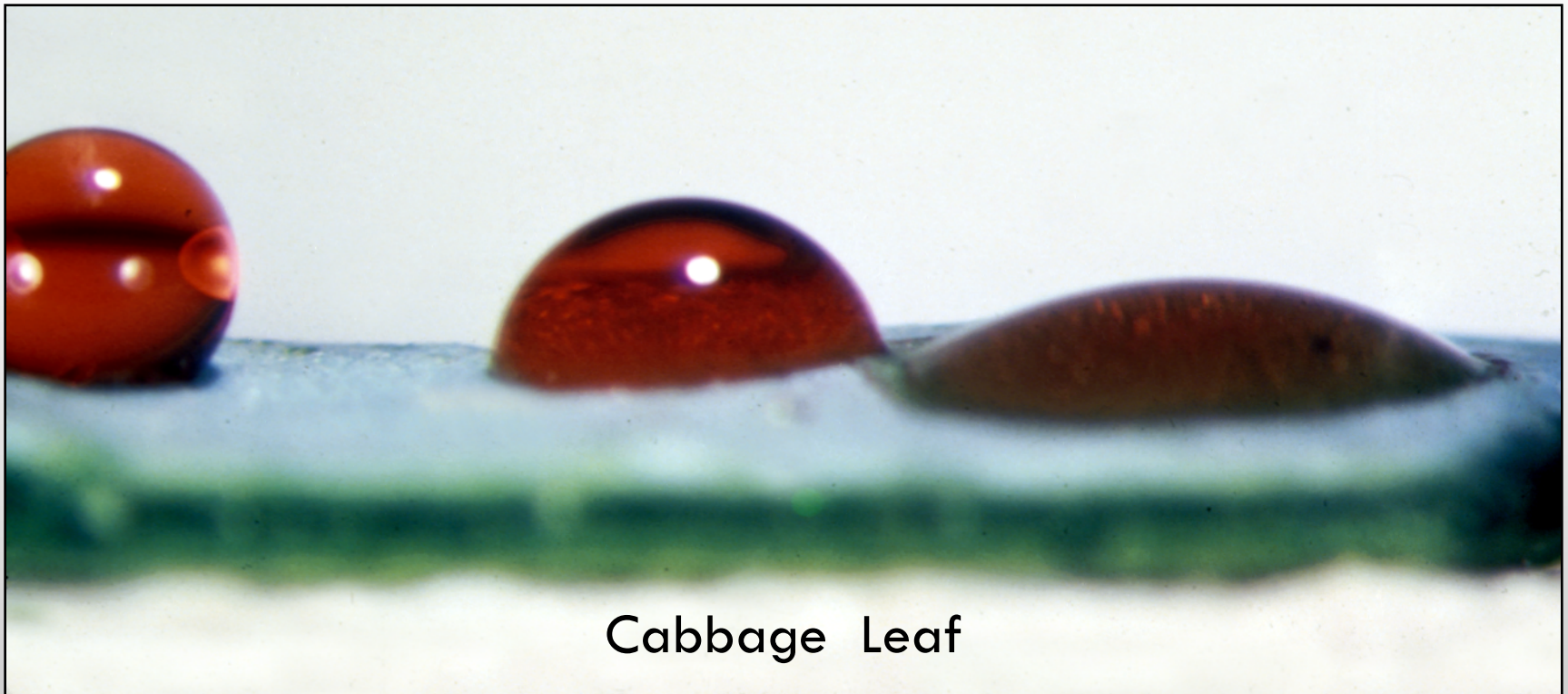


Gene Gangwish, Loveland Products



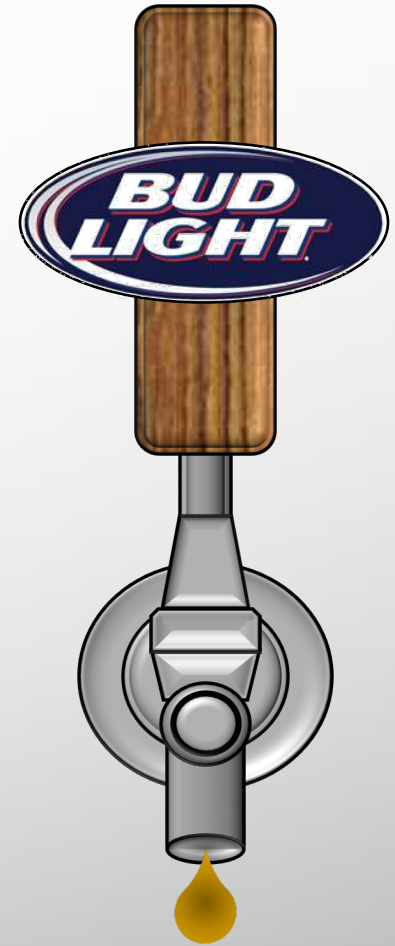
Lateral View of Droplets

Left to Right: 0, 0.01, 0.1% Non-Ionic Surfactant



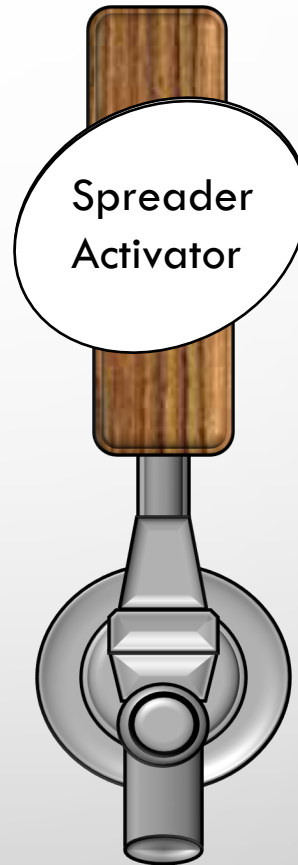
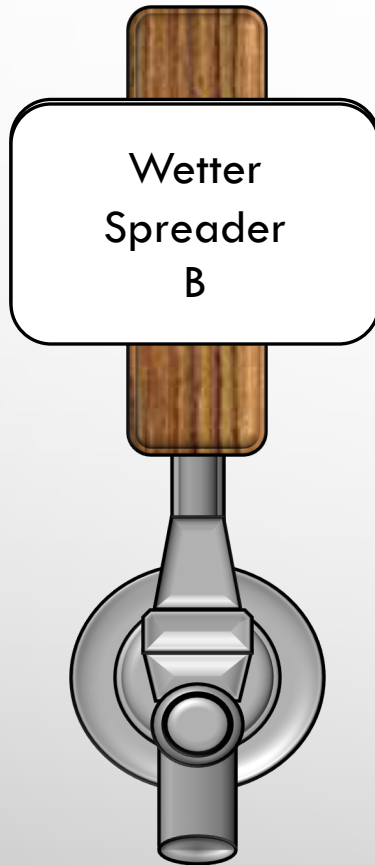
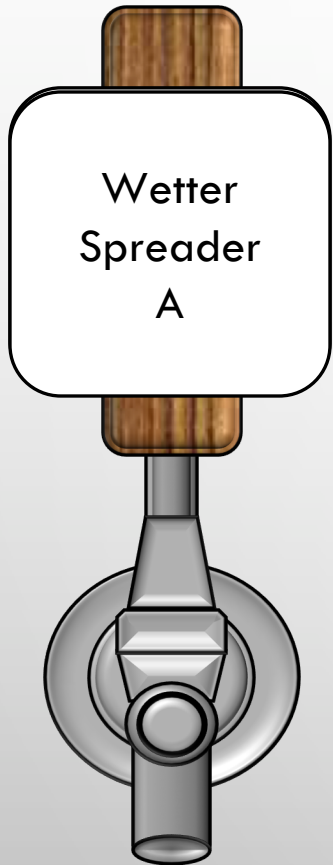
Courtesy: Bukovac - Michigan State University

Not all Beer is the same!



Adjuvants

not all the same



TYPICAL ADJUVANTS



- **NONIONIC SURFACTANTS (NIS):**

- LI-700, EXIT, INDUCE, ACTIVATOR 90



- **PENETRANTS:** CROP OIL (HERBIMAX)

- SYSTEMIC / AUXIN-TYPE HERBICIDES AND TRANSLOCATABLE FUNGICIDES CAN BENEFIT FROM USE OF PENETRANTS.



- **SPREADER – STICKERS**

- BOND, STIK (ESP. WITH BT PRODUCTS)



- **DRIFT RETARDANTS**, MAYBE IF < 125 MICRONS

WHAT NOT USE.... ??

- **SOAPS:** MAY REACT BADLY; HAVE BOTH CATIONIC (+) AND ANIONIC (-) COMPONENTS

FOAMING ISSUES (+)

PLANT INJURY (-)

- **NATURAL SURFACTANTS**

- COCONUT/PALM OIL, WHEAT AMINO ACIDS
- JURY IS STILL OUT; NOT CURRENTLY RECOMMENDED

ADJUVANT GUIDELINES

- USE ONLY THOSE LABELED FOR AG OR HORT USE.
 - NO INDUSTRIAL PRODUCTS, HOUSEHOLD DETERGENTS
- THERE ARE NO “MIRACLE” ADJUVANTS.
 - BEWARE OF AWESOME CLAIMS
- LIMITED - AREA TESTING FIRST.
- USE **RIGHT** ADJUVANT WITH **RIGHT** PESTICIDE.
- READ AND FOLLOW THE LABELS.
- BE AWARE OF NEW FORMULATIONS; THEY MAY HAVE NEW ADJUVANT RECOMMENDATIONS.
- KNOW WHEN **NOT** TO USE ONE, TOO!

WHAT ABOUT TANK MIXES?

- NEW ADJUVANTS ON THE MARKET.
- GENERICS MAY NOT ALWAYS BE THE SAME AS ORIGINAL.
- TRY A SMALL TEST AREA FIRST.
 - GROWTH STAGE
 - WEATHER

**Maximize entry into
the plant**

Compatibility Basics

- Do a jar test.
- Simple, quick, easy
- Saves money, time, crop



Combo with Discoloration QuinStar with Exit



ADJUVANTS IN CRANBERRY

- ADJUVANTS NEEDED WITH MANCOZEB PRODUCTS; SPREADER-STICKERS TO IMPROVE DEPOSITION / DURABILITY
- BRAVO HAS SPREADER-STICKER IN IT!
 - USING EXTRA COULD CAUSE MORE RUN-OFF, REDUCE RETENTION, CAUSE INJURY

ADJUVANTS IN CRANBERRY

- RECOMMENDED WITH PROLINE
- “MAY BE ADDED” WITH ABOUND, INDAR
 - DO NOT USE PENETRANT (INDAR)
 - LABEL: 0.25% V:V NIS BUT ~1 PT/A SHOULD BE FINE

ADJUVANTS IN CRANBERRY

- ADJUVANTS RECOMMENDED WITH INTREPID, CONFIRM, AND DIPEL.
 - IMPROVES: DEPOSITION
REDISTRIBUTION
WEATHERABILITY
- DELEGATE, ALTACOR, AND AVAUNT:
RECOMMENDED TO IMPROVED PERFORMANCE
 - DENSE CANOPY
 - WAXY LEAVES

HERBICIDES AND ADJUVANTS

- **CALLISTO** (MESOTRIONE):

SPOT-TREATMENT POST

- NIS (0.25%) = 2 TSP OR 0.3 OZ/GAL
- COC (1%) = 2.5 TBSP OR 1.3 OZ/GAL;
MAY CAUSE INJURY IN SOME
CONDITIONS
- ADJUVANT RATES ARE THE SAME NO
MATTER WHAT RATE OF CALLISTO IS USED!

HERBICIDES AND ADJUVANTS

- **CALLISTO: CHEMIGATING POST**

- USE NIS OR COC AT 1-4 PT/A

- **QUINSTAR** (QUINCLORAC)

- 2 PT/A COC; CHEMIGATION

- **POAST** (SETHOXYDIM)

- 1% COC = 1.3 OZ OR 2.5 TBSP / GAL

- SPOT-TREATMENT ONLY

Continued

- **SELECT** (CLETHODIM) – NO CHEMIGATION ALLOWED!
 - NIS AT 0.25% V:V FOR **SELECTMAX**
 - COC AT 1% V:V FOR **SELECT 2EC**
- **INTENSITY/ONE** (CLETHODIM) –
24C FOR CHEMIGATION
 - 1-4 PT/A NIS (COC PREFERRED W INTENSITY)

Continued

NONE NEEDED WITH...

- **ROUNDUP** (GLYPHOSATE)
 - USUALLY NONE NEEDED
 - MANY GENERICS OUT THERE! CHECK LABELS!
- **STINGER** (CLOPYRALID)
- **WEEDAR 64** (2,4-D)

IF YOU HAVE QUESTIONS....

- CONTACT THE MANUFACTURER
 - MSDS ; LABEL
 - PROMOTIONAL LITERATURE
- CALL YOUR AG SUPPLIER
- CALL THE CRANBERRY STATION



Questions ?



Questions ?

