2015 Pesticide Safety: Adjuvants: Improving herbicide performance

Adjuvants: Improving herbicide performance

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Pesticide Safety Meeting
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- Terminology
- What adjuvants do
- What we use

Why do we need adjuvants?

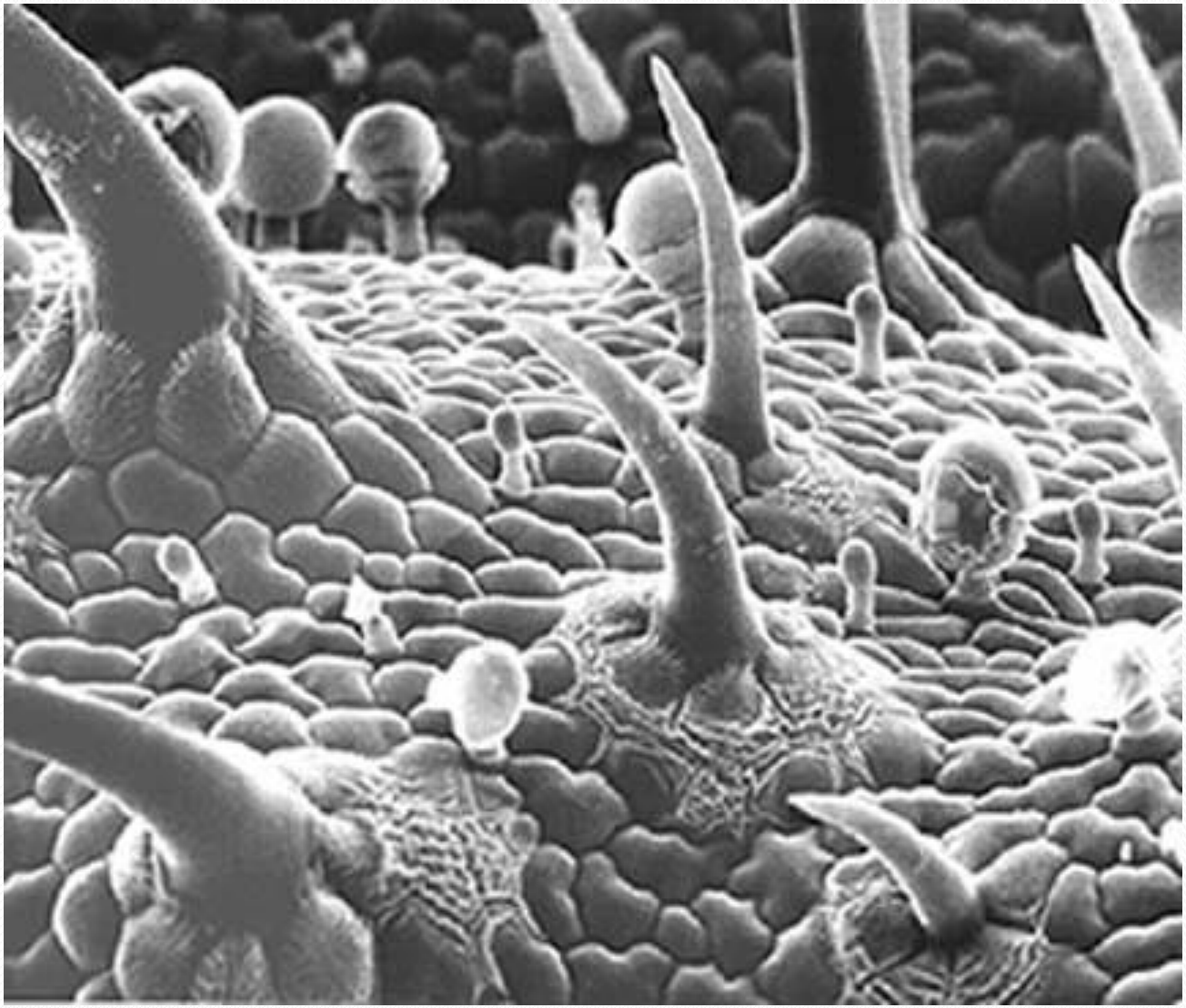
- Much effort devoted to making pesticides water-soluble
- Waxy nature of plant leaves, fungi, and even insect bodies was a barrier
- Compounds needed to improve efficacy

Valued at $2.29 B in 2013; projected $3.18 B by 2019. U.S. Ag dominates market .

ABC Channel 6, ReportLinker, Feb. 4, 2015

Plant Cuticle

Barrier to Herbicide Uptake



ADJUVANT

any product added to pesticides to improve performance

LOTS of types; LOTS of categories

Should you use an adjuvant??

Failing to correctly use an adjuvant according to the label is as much a **violation** as an inappropriate use of the 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

Adjuvant Terminology

Spray modifiers:

Modify spray mixture

- Spreaders, stickers, foaming agents, drift retardants, antifoam agents, compatibility agents, buffering agents, dyes, water conditioners, humectants, UV absorbents

Spray activators:

- Surfactants, crop oils, crop oil concentrates, vegetable oils, modified seed oils, ammonium fertilizers

Enhance biological efficacy

Adjuvant Terminology

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Enhance biological efficacy

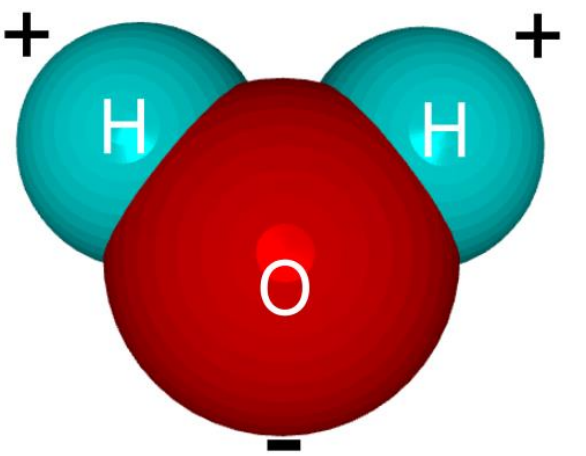
Surfactant

- Any material added to a pesticide formulation designed to modify or reduce surface tension.

Surfactant is short-hand for :

Surface Active Agent

Water has charge:

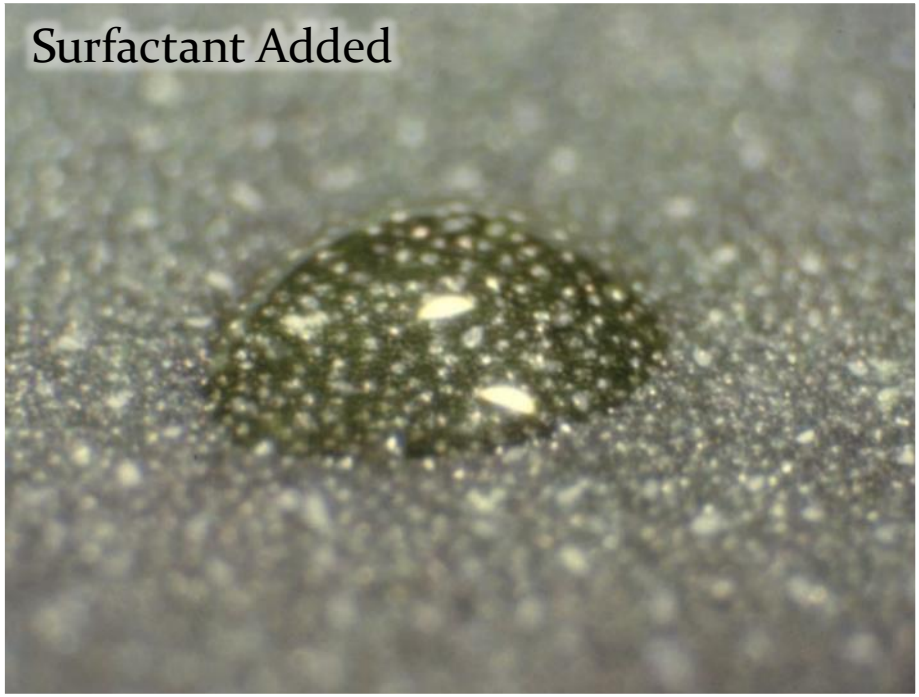


- Anionic surfactants (-)
  - Increase foaming; undesirable
- Cationic surfactants (+)
  - usually injure plants!
- Nonionic surfactants (no charge)
  - Remain stable
  - Can break surface tension
  - What we use!

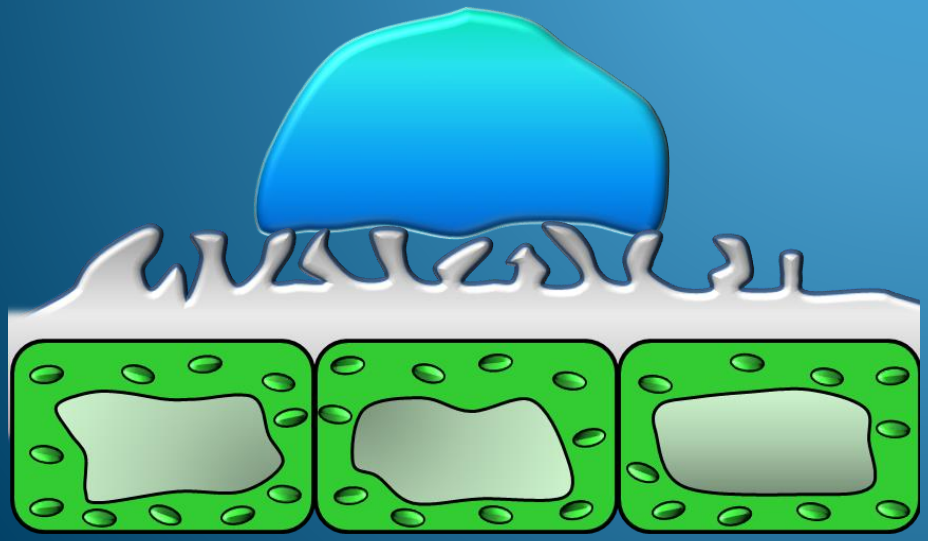
Surfactants

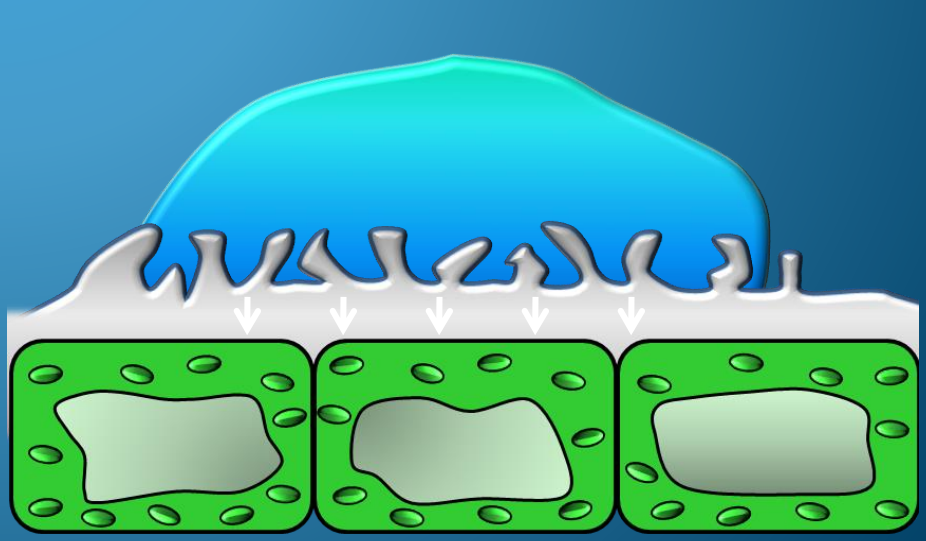
- May also be called wetting agents or spreaders
- Usual job = break surface tension of spray droplet
- Too Much = pesticide runs off leaf
- Too Little = bad coverage

All surfactants are adjuvants but not all adjuvants are surfactants!



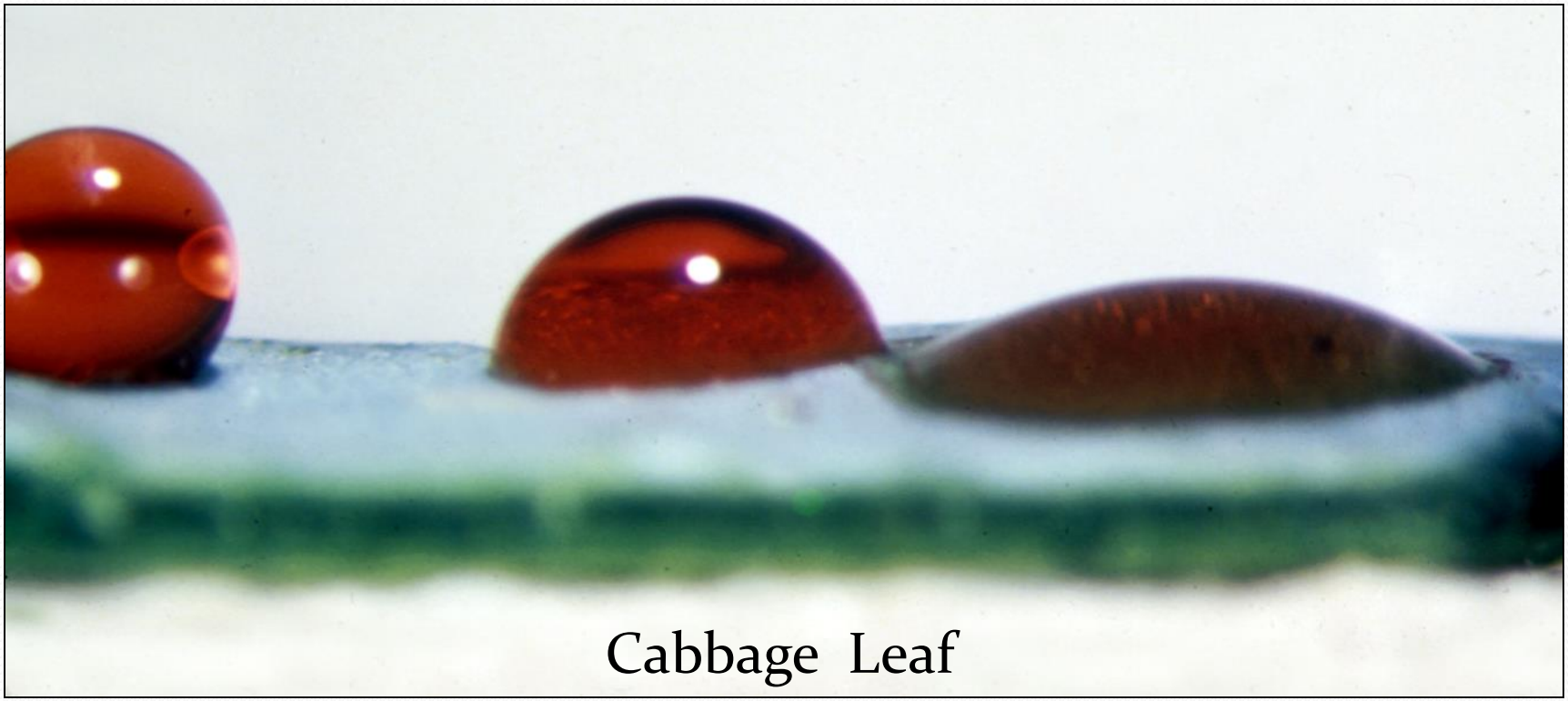
Gene Gangwish, Loveland Products





Lateral View of Droplets

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



Courtesy: Bukovac - Michigan State University

Spray Modifiers

- **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

Modify spray mixture

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

Spray Activators

- **COC:** penetrants for herbicides
- **Oils:** can smother insects, shatter chitin, dissolve wax/cuticle
- **NIS:** break water tension; spreader
- **Methylated seed oil (MSO):** aggressive penetrant
- **Ammonium sulfate:** softens water

Enhance biological activity

Newer Products for CB

- **Organosilicates**: improve rainfastness, reduce surface tension, improve wetting
  - could actually improve ability of fungi and bacteria to enter plant!

- **Alkyl polyglucosides**: new; organic/envt'l friendly, low toxicity, research on-going.

What not use…. ??

- **Soaps:** may react badly with compounds; have both cationic (+) and anionic (-) components (see previous slide)

- **Natural surfactants**
  - coconut/palm oil, wheat amino acids
  - jury is still out; not currently recommended

MOMENTIVE

Silwet Stik 2

HELENA

INDUCE

Exit
Nu-Film-P
Nu-Film-17

Miller Chemical

Penetrator PLUS

HiWett SUPER-SPREADER

BOND max

ACTIVATOR 90

HERBIMAX

Loveland Products

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!

Herbicides and Adjuvants

- **Callisto** (Mesotrione):

  Spot-treatment POST

  - NIS (0.25%) = 1.9* 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!

Error in 2015 Chart Book: says 1.6 tsp

Herbicides and Adjuvants

- **Callisto: Chemigating POST**
  - Use NIS or COC at 1-4 pt/A
  - Labels (24c and master) currently have NIS @ 0.25% or COC @ 1% v:v
    - If applying water at 400 GPA, this would be 1 GAL NIS or 4 GAL COC per acre !! **TOO MUCH!!**

Herbicides and Adjuvants

- **QuinStar** (Quinclorac)
  - 2 pt/A COC; chemigation
- **Poast** (Sethoxydim)
  - 1% COC = 1.3 oz or 2.5 TBsp / gal
  - Spot- treatment only

No Chemigation

- **Select** (Clethodim)
  - NIS at 0.25% v:v for SelectMax
  - COC at 1% v:v for Select 2EC
- **Intensity** (Clethodim)
  - 1% COC = 1.3 oz or 2.5 TBsp / gal

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

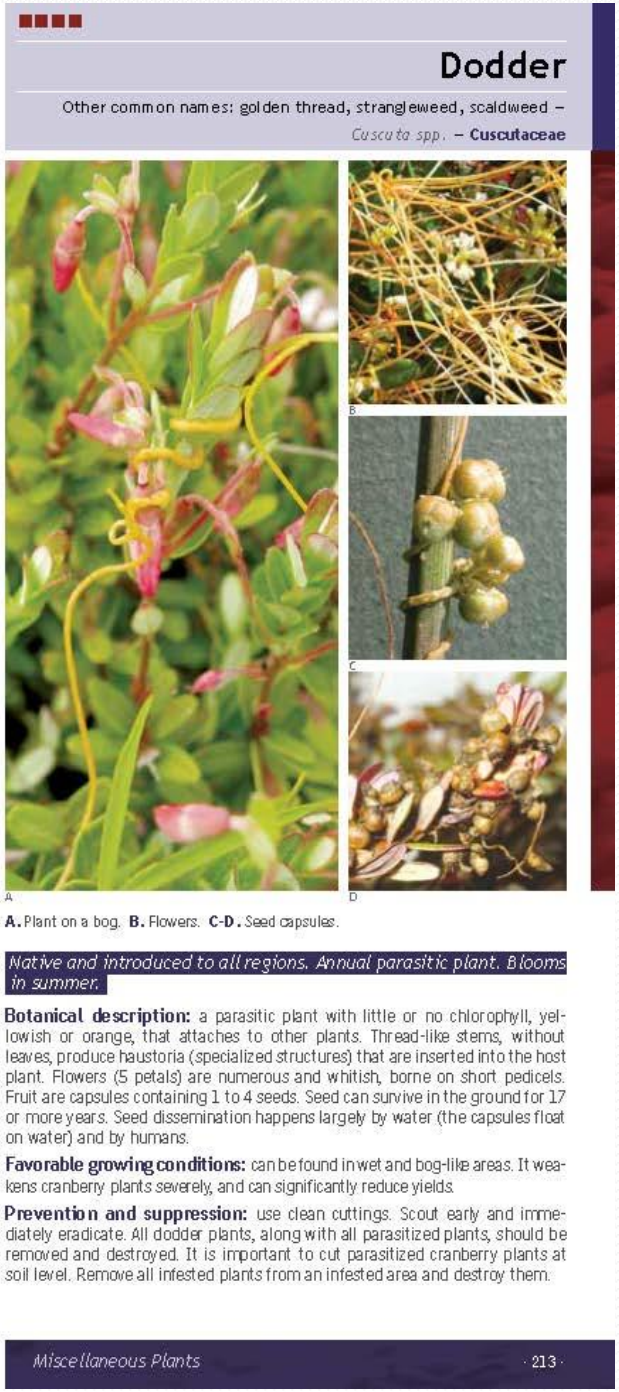
- Call your ag supplier

- Call the Cranberry Station

New Weed ID Guide Coming Soon!

- per NE-IPM Center $$ supporting publication, I need to get a sense of your current knowledge or use of:

- **Weed ID**
- **Weed mapping**
- **Using Prioritization of Weed Impacts**



Dodder

Other common names: golden thread, strangleweed, scaldweed – *Cuscuta spp.* – **Cuscutaceae**

A. Plant on a bog. **B.** Flowers. **C-D.** Seed capsules.

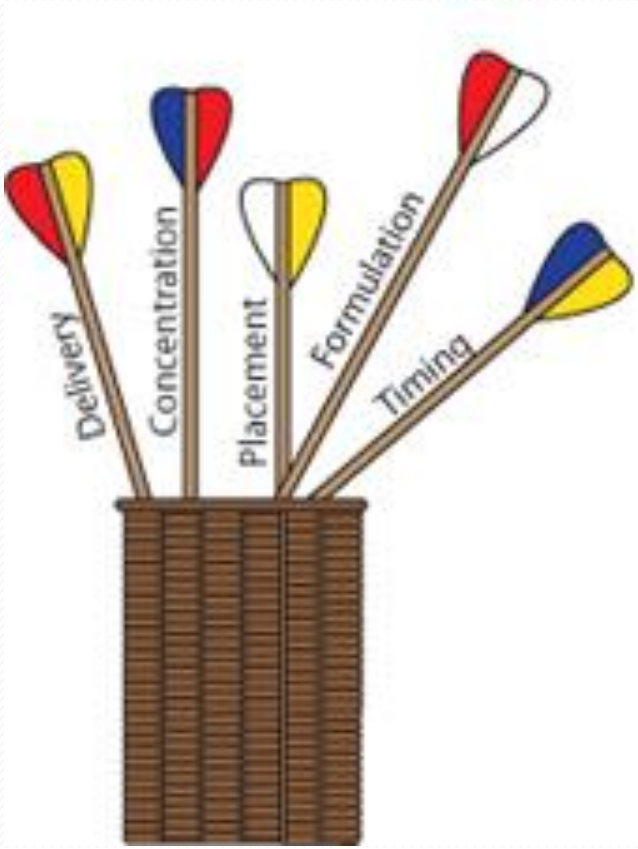
Native and introduced to all regions. Annual parasitic plant. Blooms in summer.

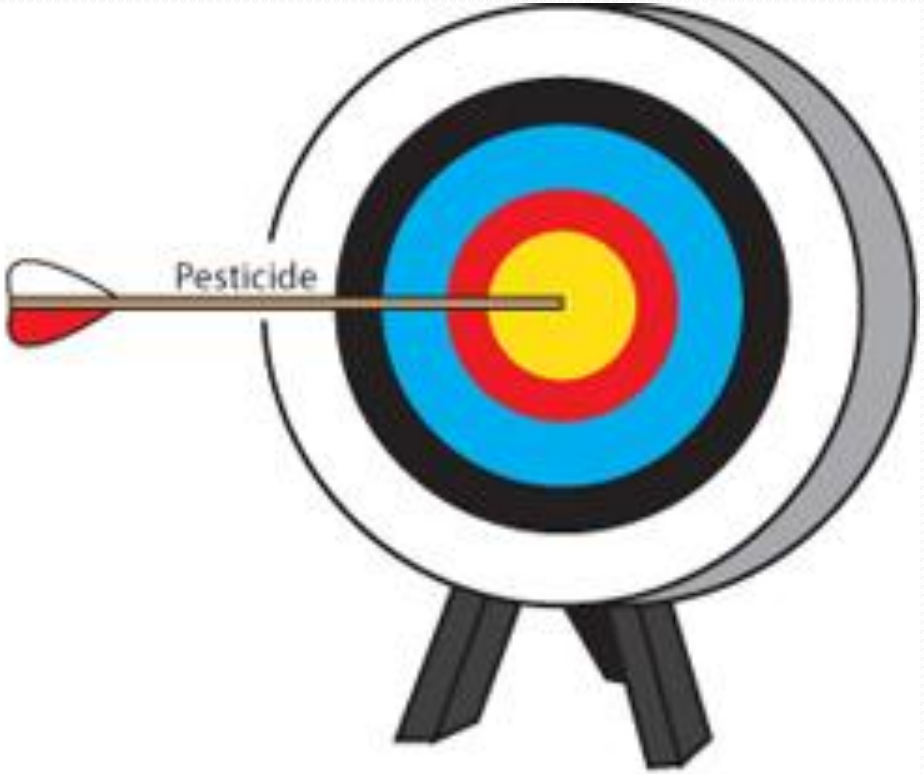
Botanical description: a parasitic plant with little or no chlorophyll, yellowish or orange, that attaches to other plants. Thread-like stems, without leaves, produce haustoria (specialized structures) that are inserted into the host plant. Flowers (5 petals) are numerous and whitish, borne on short pedicels. Fruit are capsules containing 1 to 4 seeds. Seed can survive in the ground for 17 or more years. Seed dissemination happens largely by water (the capsules float on water) and by humans.

Favorable growing conditions: can be found in wet and bog-like areas. It weakens cranberry plants severely, and can significantly reduce yields.

Prevention and suppression: use clean cuttings. Scout early and immediately eradicate. All dodder plants, along with all parasitized plants, should be removed and destroyed. It is important to cut parasitized cranberry plants at soil level. Remove all infested plants from an infested area and destroy them.

Questions ?


Delivery
Concentration
Placement
Formulation
Timing


Pesticide