

Effect of film permeability on strawberry tolerance to herbicides

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The question

- Does tarp permeability affect strawberry tolerance to herbicides?

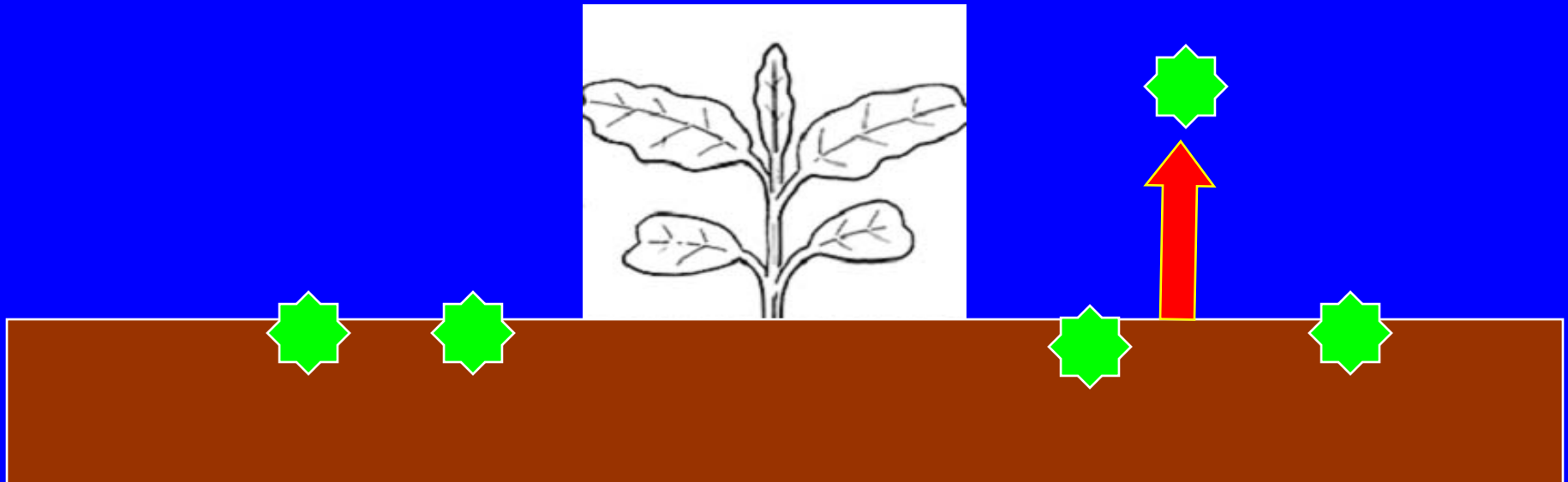
Outline

- **How do herbicides move?**
- **Types of tarps**
- **Field experiment results from Salinas and Santa Paula**
- **Summary**

Volatility



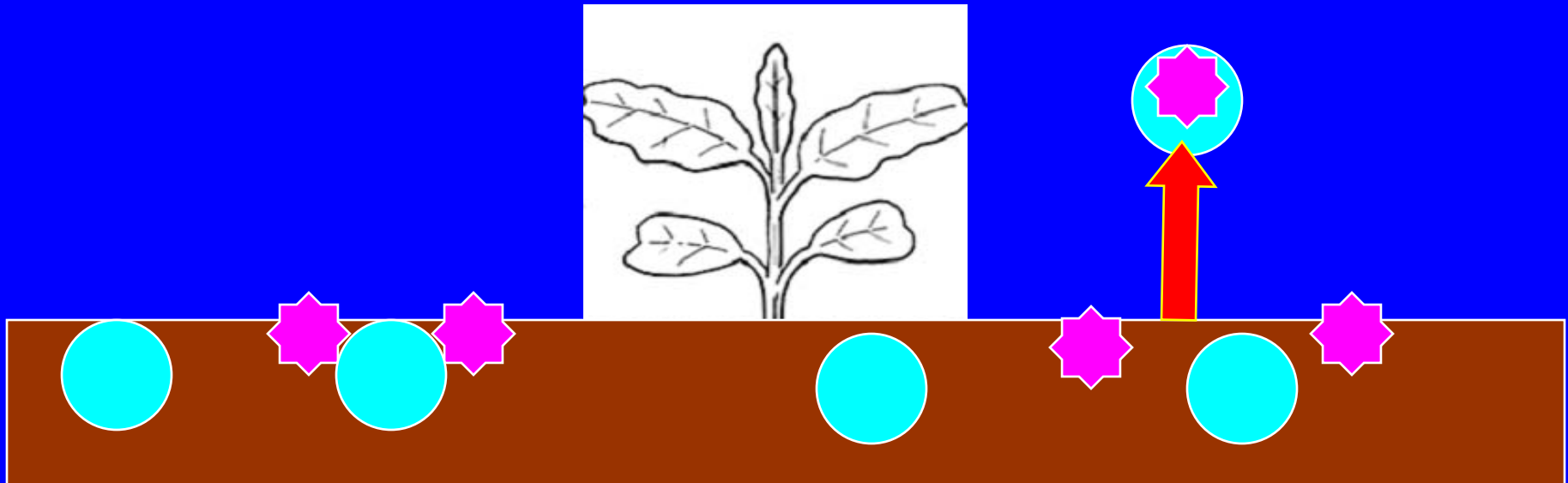
- The evaporation of herbicide molecules directly from water, soil or plant surfaces.



Codistillation (lift off)



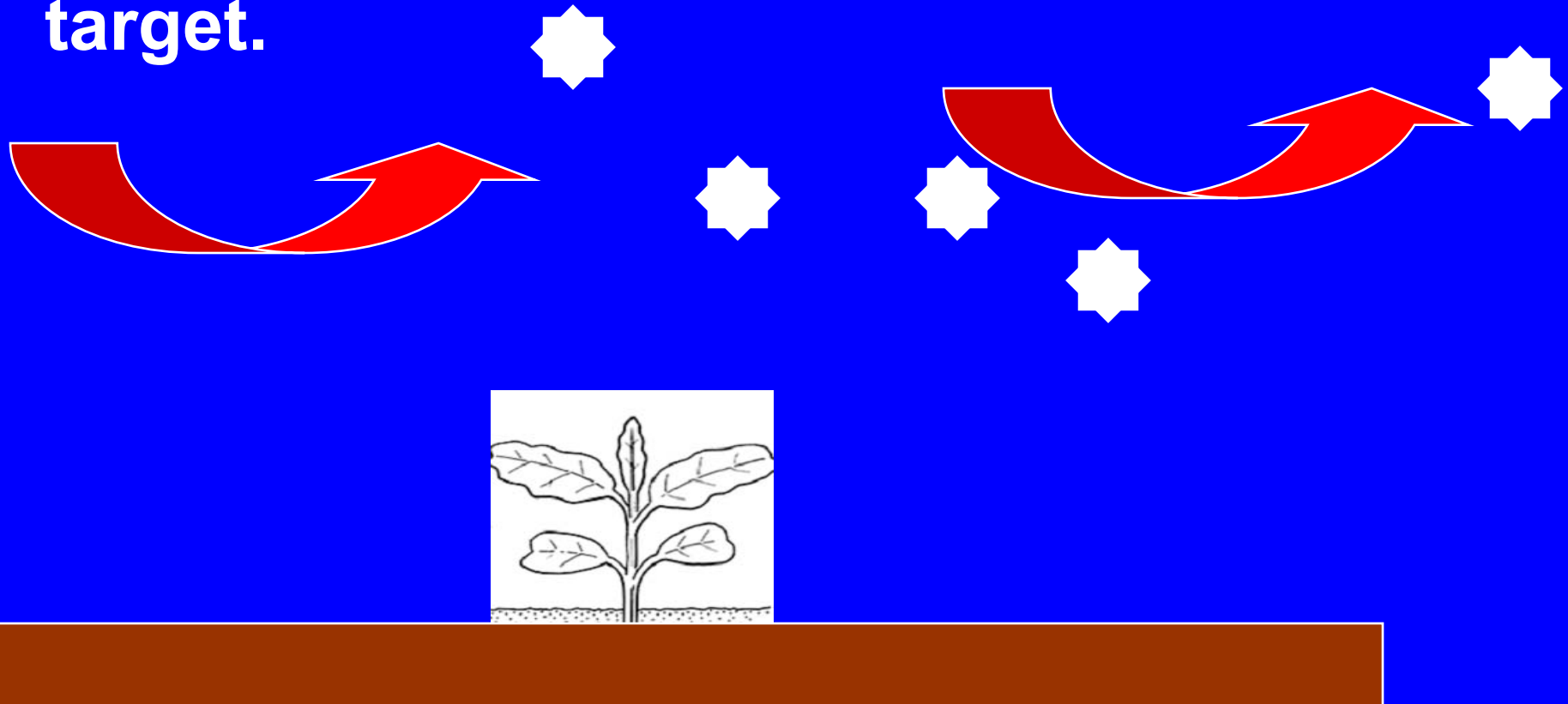
- The evaporation of herbicide molecules from water, soil or plant surfaces together with water vapor.



Drift



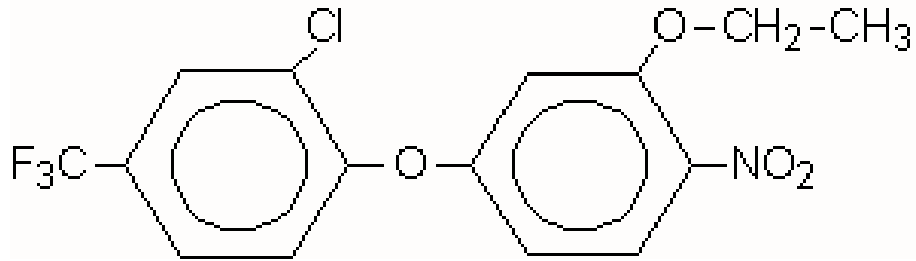
- The herbicide does not hit the intended target.



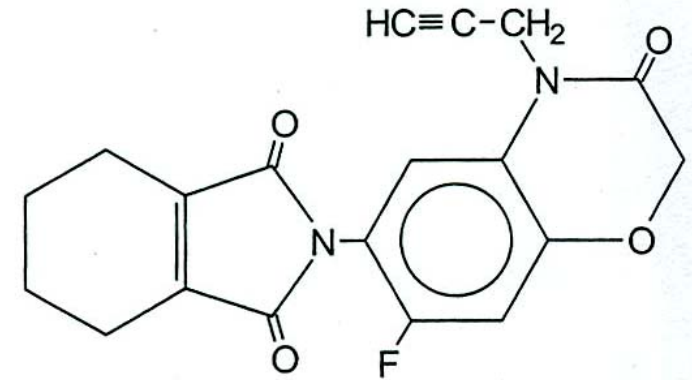
Protox inhibitor herbicides

- **Carfentrazone – Shark from FMC**
- **Flumioxazin – Chateau or Valor from Valent**
- **Oxyflourfen – Goal, GoalTender from Dow AgroSciences**

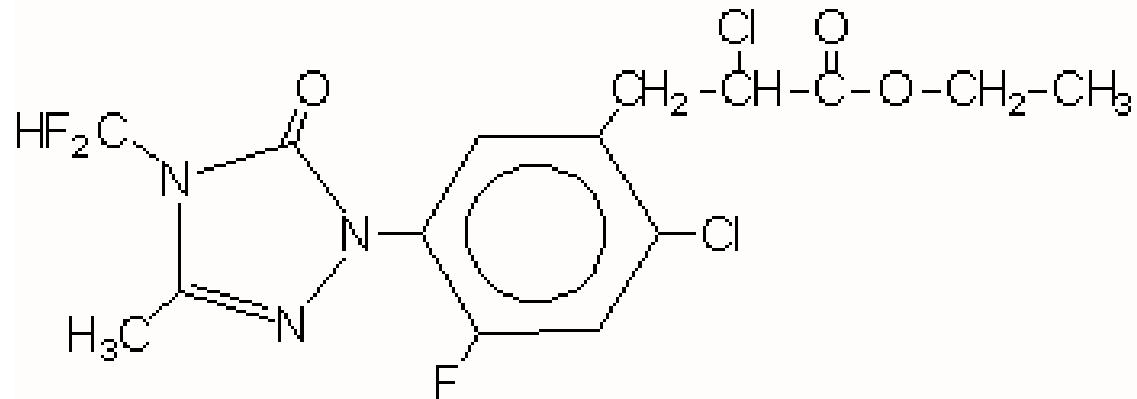
Protox inhibitors



Goal (oxyfluorfen)



Chateau (flumioxazin)



Shark (carfentrazone)

Main point

- These herbicides have very different chemistries, but cause similar symptoms on plant foliage.

Protox inhibitor herbicides

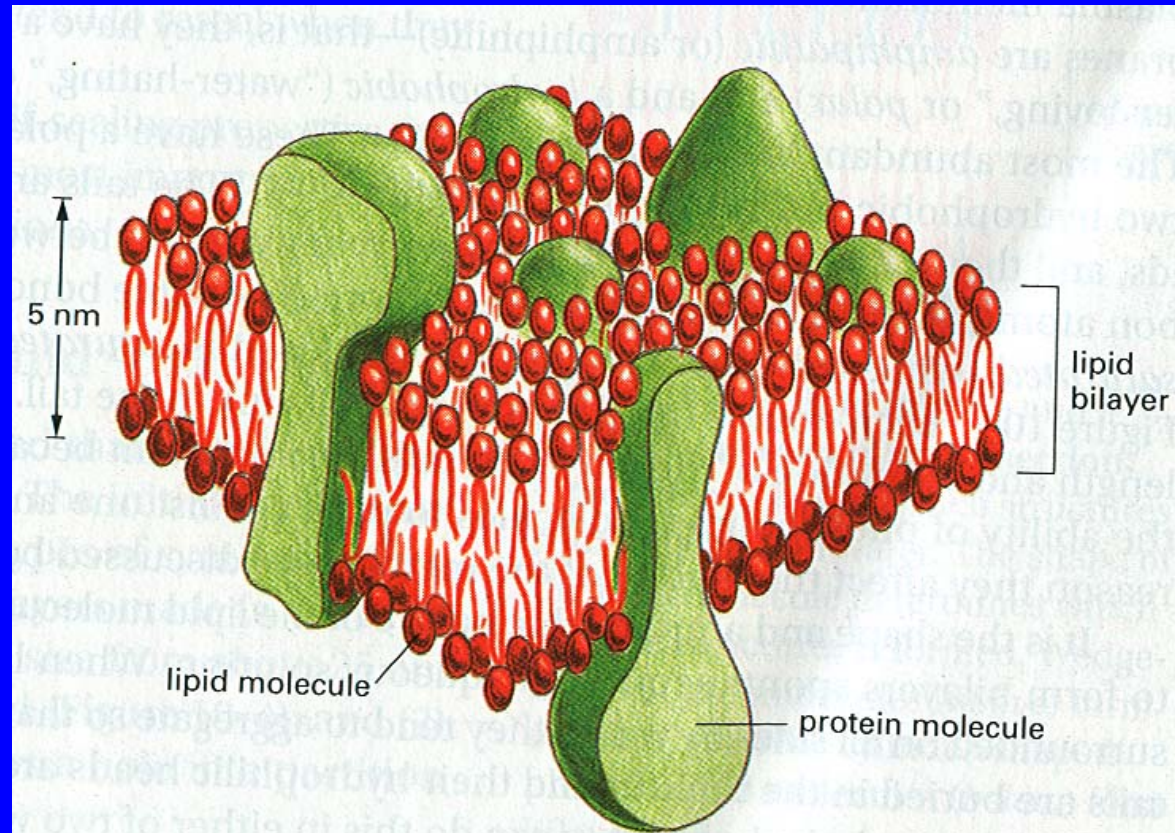
- These herbicides act in the chlorophyll synthesis pathway.
- They all inhibit an enzyme called “protoporphyrinogen oxidase” or “protox”.
- Also called “PPO” herbicides
- These herbicides kill by lipid peroxidation. In other words they break down the cell membrane. The cell then breaks open and the leaf dies.

Protox & paraquat herbicides compared

Factor	Chateau	Goal	Shark	Paraquat
Soil residues	Long	Long	Short	None
Lift off	No	Yes	No	No
Drift concerns	Yes	Yes	Yes	Yes

How protox inhibitors & paraquat kill weeds

- These herbicides cause a reaction that attacks lipid molecules in the plant cells



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□ **How Applied:**

Soil and foliar applied with limited movement in the soil.

□ **Mode of Action:**

Oxyfluorfen, flumioxazin and carfentrazone cause membrane disruption through lipid peroxidation.

□ **Common Symptoms:**

These herbicides cause necrosis of leaves and stems.

Goal injury on strawberry



More on protox herbicides

- These herbicides are fast acting
- Don't translocate
- Crop selectivity is based on placement and timing
- Most crops are susceptible to foliar drift injury eg. Lettuce.
- Selectivity for Goal on onion is due to the waxy cuticle.

Goal soil characteristics

- Moderately volatile, and can co-distill from moist soil surfaces.
- Goal binds to the soil organic matter.
- Some Goal dissociates to enter the soil water and kill weed seedlings.
- Forms a soil barrier that can be broken by tillage.

Chateau – characteristics

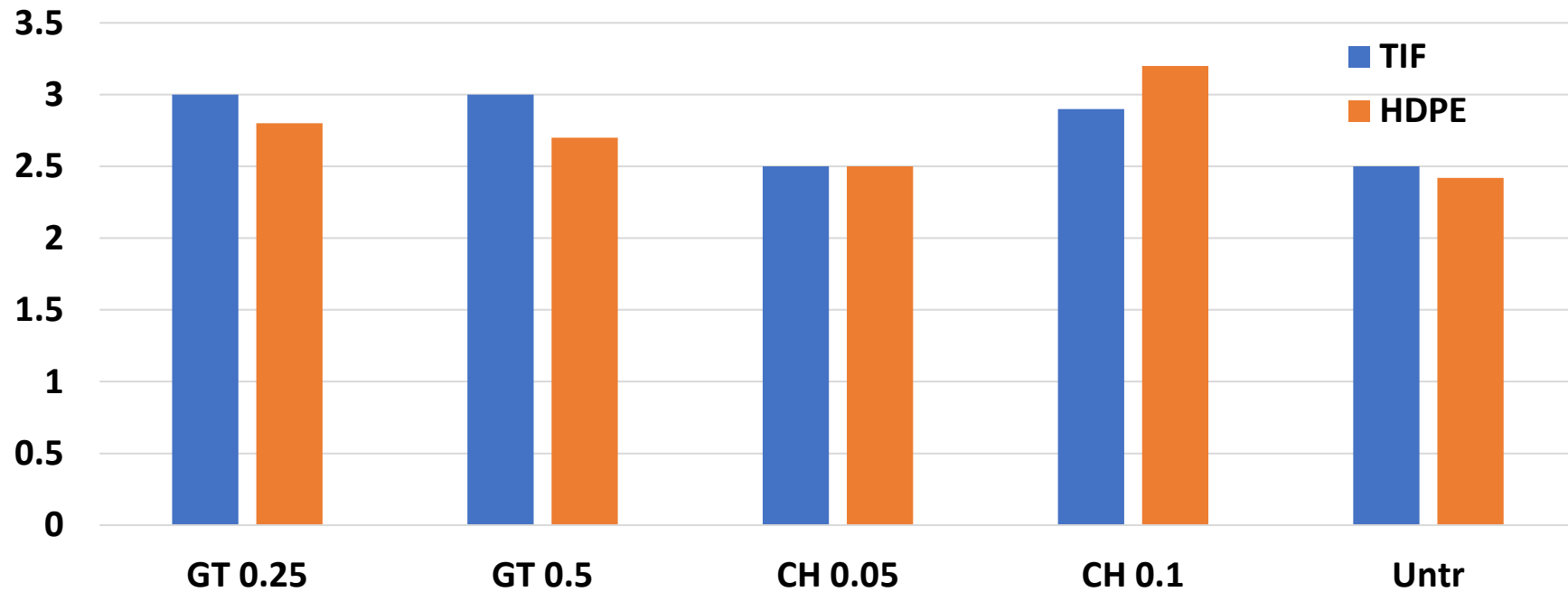
- **Can photo degrade**
- **Not volatile**
- **Has soil residual activity. Broken down by microbial activity and hydrolysis.**
- **Very effective on hairy fleabane**
- **Good clover control preemergence**

2018-19 Santa Paula

- clay loam, pH 7.6, OM 1.8
- Chateau and GoalTender at 2 rates and Untreated
- HDPE or TIF installed within 24h after bed top application
- 'Fronteras' plated on Oct 21, 45 DAT

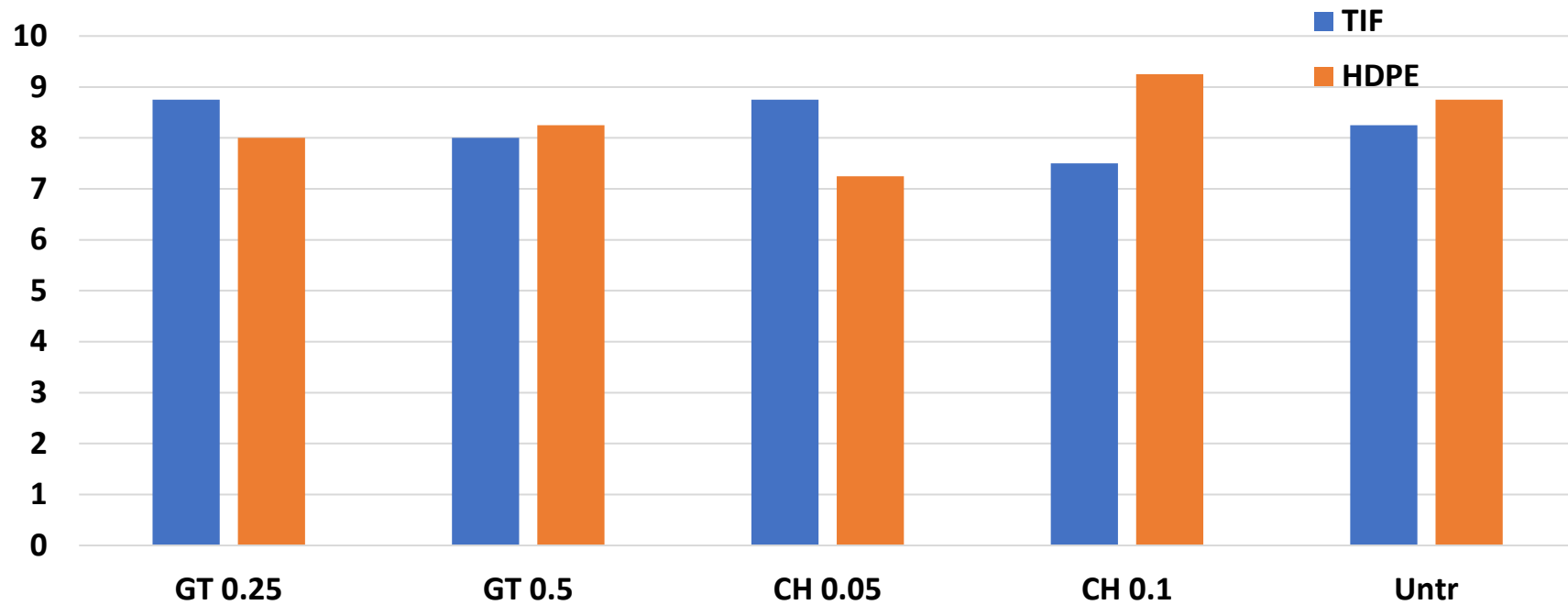
Strawberry Injury

Injury score (1-10) at 3 WAP for Fronteras

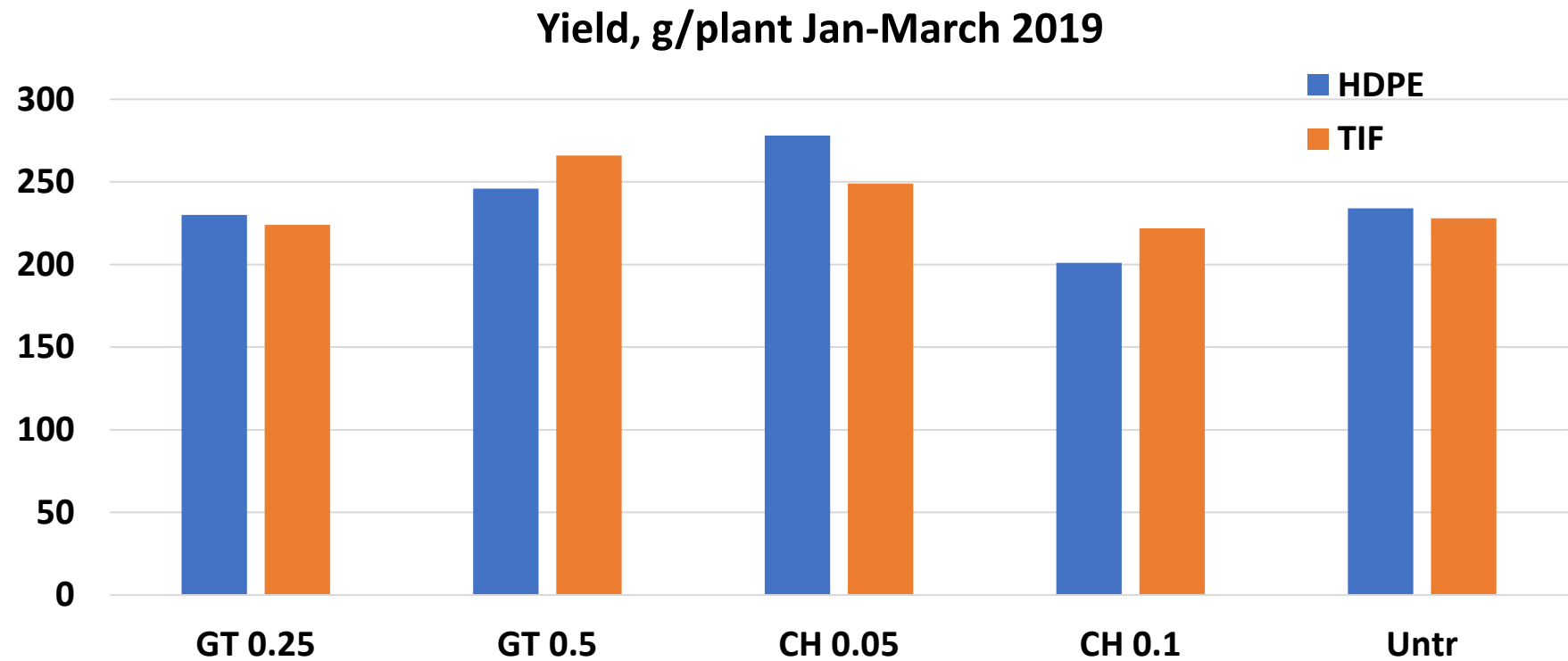


Stand, plants/plot

Live plants/out of 12 at 3 WAP for Fronteras



Early fruit yield



Tarp effects on herbicide injury in strawberry

- Trial conducted Oct. 2017 to Sept. 2018
- Two films
 - Standard HDPE “Black Cast” 1.5 mil
 - TIF “OZGARD BLACK T PLUS, C8666”
- Two herbicides
 - GoalTender 0.5 & 1 pint per acre
 - Chateau 1.6 & 3 oz product per acre

Crop injury

Treatment	Standard	TIF
Control	0 c	0 c
Chateau 1.6 oz	3 bc	13 b
Chateau 3 oz	13 b	5 bc
GoalTender 0.5 pt	3 bc	13 b
GoalTender 1 pt	3 bc	25 a

March 28, 2018

Strawberry stand %

Treatment	Standard	TIF
Control	92 a	82 bc
Chateau 1.6 oz	95 a	89 ab
Chateau 3 oz	88 ab	90 ab
GoalTender 0.5 pt	88 ab	88 abc
GoalTender 1 pt	92 a	79 c

February 14, 2018

Strawberry fruit yield tons/A

Treatment	Standard	TIF
Control	30.6 a	28.3 a
Chateau 1.6 oz	30.8 a	28.0 a
Chateau 3 oz	28.1 a	29.8 a
GoalTender 0.5 pt	30.6 a	30.6 a
GoalTender 1 pt	32.0 a	29.7 a

Yield through Sep. 12, 2018

Photos

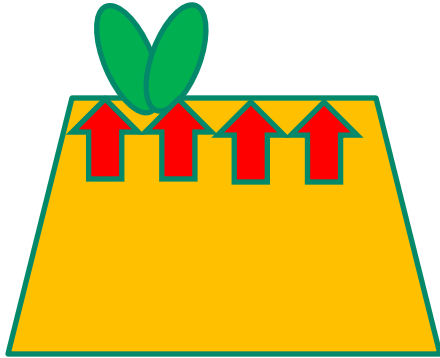


Standard



TIF

Possible explanation



Standard



TIF

With standard film the GoalTender liftoff is dispersing more evenly, and the concentration is less than with the TIF where the liftoff is concentrated on the plant hole exposing the strawberry to higher concentrations of herbicide.

Summary

- GoalTender seems to be associated with injury where applied under the TIF.
- Chateau seems to perform the same under both films. Chateau does no lift off.
- Where TIF is used on the beds, it is recommended that Chateau be used in place of GoalTender.