# Evaluating in-season management strategies for branched broomrape in California processing tomatoes

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# Branched Broomrape *Phelipanche ramosa* syn. *Orobanche ramosa*

- Native to Eurasia and North Africa- Mediterranean countries
- Obligate root parasite
- Haustorium– modified root that parasitizes host plant
- Wide range of agricultural host species
  - Brassicaceae, Solanaceae, Fabaceae, Cucurbitaceae, Asteraceae
- “A-Listed” noxious weed in California

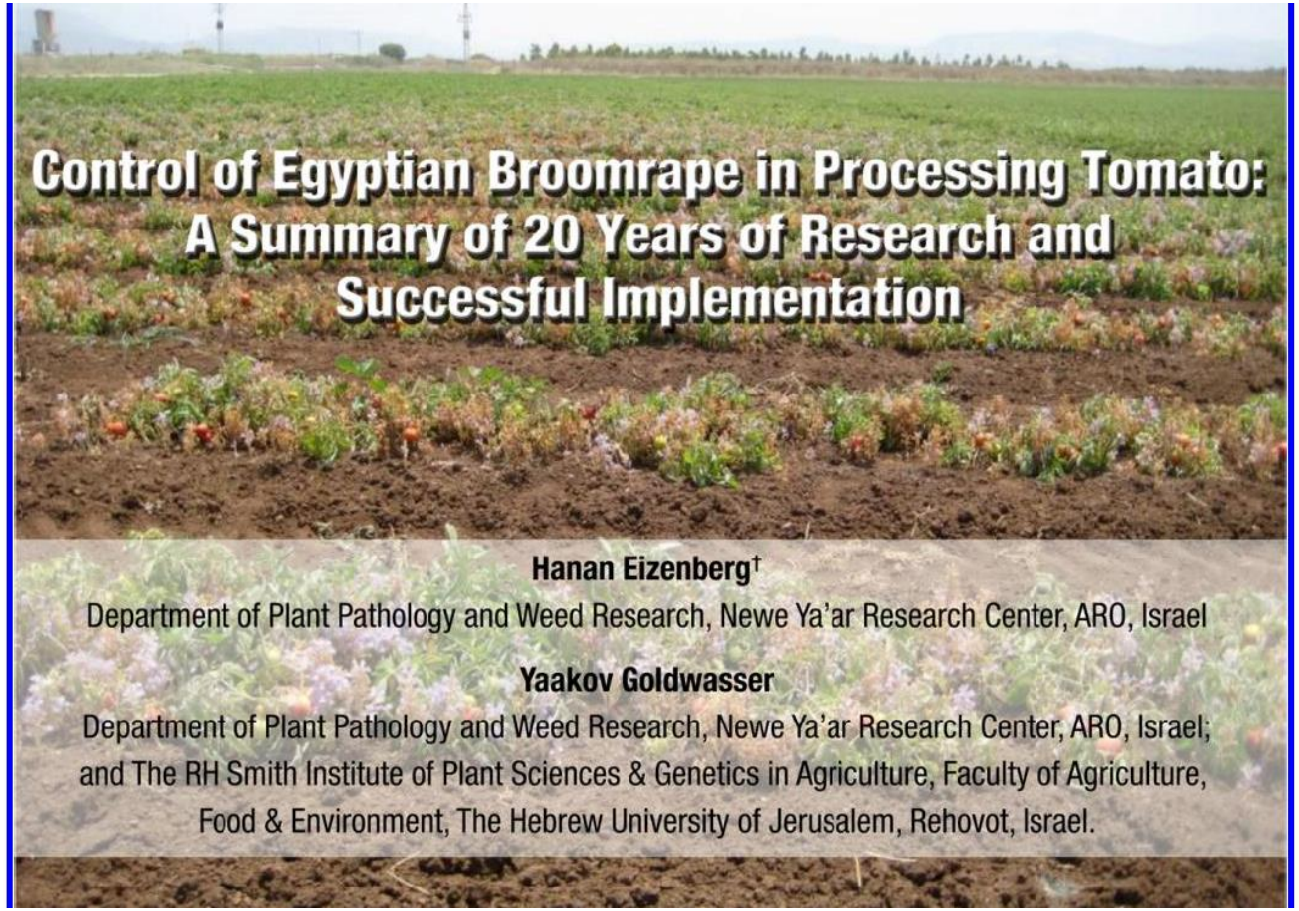
# California tomatoes

- California made up 90% of US processing tomato production in 2020
- California produced 11.4 million tons across 230,000 acres in 2020
- Transplanted
- Drip irrigated
- Mechanically harvested
- San Joaquin and Sacramento Valley
  - Fresno, Yolo, Kings, Merced, San Joaquin


Photo: CivilEats.com

# PICKIT Decision Support System

- Developed over 20 years of research in Israel to manage Egyptian broomrape *(Phelipanche aegyptiaca)*
- Growing Degree Days
- Preplant incorporated application (PPI): sulfosulfuron (Outrider)
- Chemigation application: Low doses of imazapic (Cadre)
- Treatment regimes reflect infestation levels
- Herbicides NOT registered for tomatoes in CA



# Overview of broomrape management trials in CA

- 2019/2020 evaluated chemigated imazapic and preplant incorporated sulfosulfuron according to PICKIT protocols
- 2021 focus shifted to chemigated imazamox paired with PPI sulfosulfuron
- 2022 continued to evaluate chemigated imazamox as well as chemigated rimsulfuron alone and paired with PPI sulfosulfuron
  - 2021/22 trial site in Chile evaluated several combinations of chemigated imazamox, rimsulfuron, and sulfosulfuron as well as three planting dates
  - 2022 trial site in California evaluated chemigated imazamox and rimsulfuron alone and paired with sulfosulfuron and two planting dates
  - Rotational crop safety study evaluating residual effects on rotational crops
  - Crop safety studies

# 2022 Field Season Objectives

1. Evaluate the efficacy of chemigated imazamox and rimsulfuron alone and paired with preplant incorporated sulfosulfuron for branched broomrape control
2. Evaluate the effect of different planting dates on broomrape emergence

# 2022 Infested Field Efficacy Studies

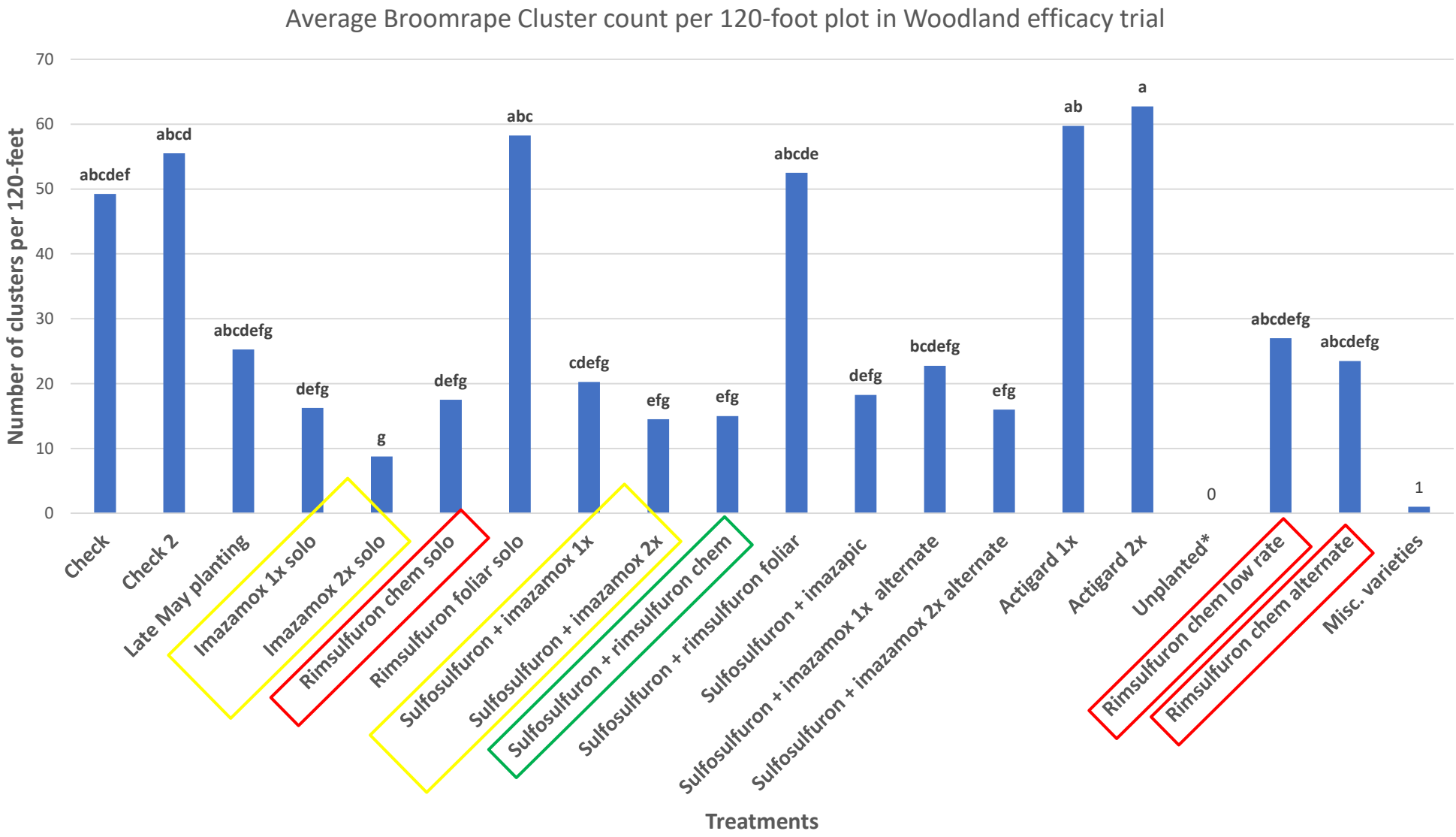
- Evaluated chemigated imazamox and rimsulfuron alone and paired with sulfosulfuron; planting dates
- HM 58841 transplanted single line
- May 3 and May 20 planting dates
- Phytotoxicity, broomrape emergence data recorded

| No. | Treatment | Description | Application [c] | Rate (g ai/ha) | GDD |
|---|---|---|---|---|---|
| 1 | Planting 1 | Early May (5/3) | NA | NA | NA |
| 2 | Planting 2[a] | Early May (5/3) | NA | NA | NA |
| 3 | Planting 3 | Late May (5/20) | NA | NA | NA |
| 4 | Imazamox | solo 1x | CHEM x5 | 9.6 | 400-800 |
| 5 | Imazamox | solo 2x | CHEM x5 | 19.2 | 400-800 |
| 6 | Rimsulfuron | solo chem | CHEM x3 | 22.7 | 400, 600, 800 |
| 7 | Rimsulfuron | solo foliar | FOLIAR x3 | 22.7 | 400, 600, 800 |
| 8 | Sulfosulfuron | | PPI | 37.5 | NA |
| 8 | Imazamox | 1X | CHEM x5 | 9.6 | 400-800 |
| 9 | Sulfosulfuron | | PPI | 37.5 | NA |
| 9 | Imazamox | 2X | CHEM x5 | 19.2 | 400-800 |
| 10 | Sulfosulfuron | | PPI | 37.5 | NA |
| 10 | Rimsulfuron | | CHEMx3 | 22.7 | 400, 600, 800 |
| 11 | Sulfosulfuron | | PPI | 37.5 | NA |
| 11 | Rimsulfuron | | FOLIAR x3 | 22.7 | 400, 600, 800 |
| 12 | Sulfosulfuron | Legacy imazapic | PPI | 37.5 | NA |
| 12 | Imazapic | | CHEM x5 | 4.8 | 400-800 |
| 13 | Sulfosulfuron | | PPI | 37.5 | NA |
| 13 | Imazamox | 1x alternate time | CHEM x5 | 9.6 | 500-900 |
| 14 | Sulfosulfuron | | PPI | 37.5 | NA |
| 14 | Imazamox | 2x alternate time | CHEM x5 | 19.2 | 500-900 |
| 15 | Actigard | 1X | CHEM x6 | 26.2 | 400-900 |
| 16 | Actigard | 2X | CHEM x6 | 52.4 | 400-900 |
| 17 | ~~KPAM~~ [b] | Not applied or planted | NA | NA | NA |
| 18 | Rimsulfuron | Low dose (Turkey protocol) | CHEM x3 | 12.5 | 400, 600, 800 |
| 19 | Rimsulfuron | Proposed CA 24c protocol | CHEM x3 | 22.7 | 30, 50, 70 DAT |
| 20 | Misc. Varieties | June planting | NA | NA | NA |

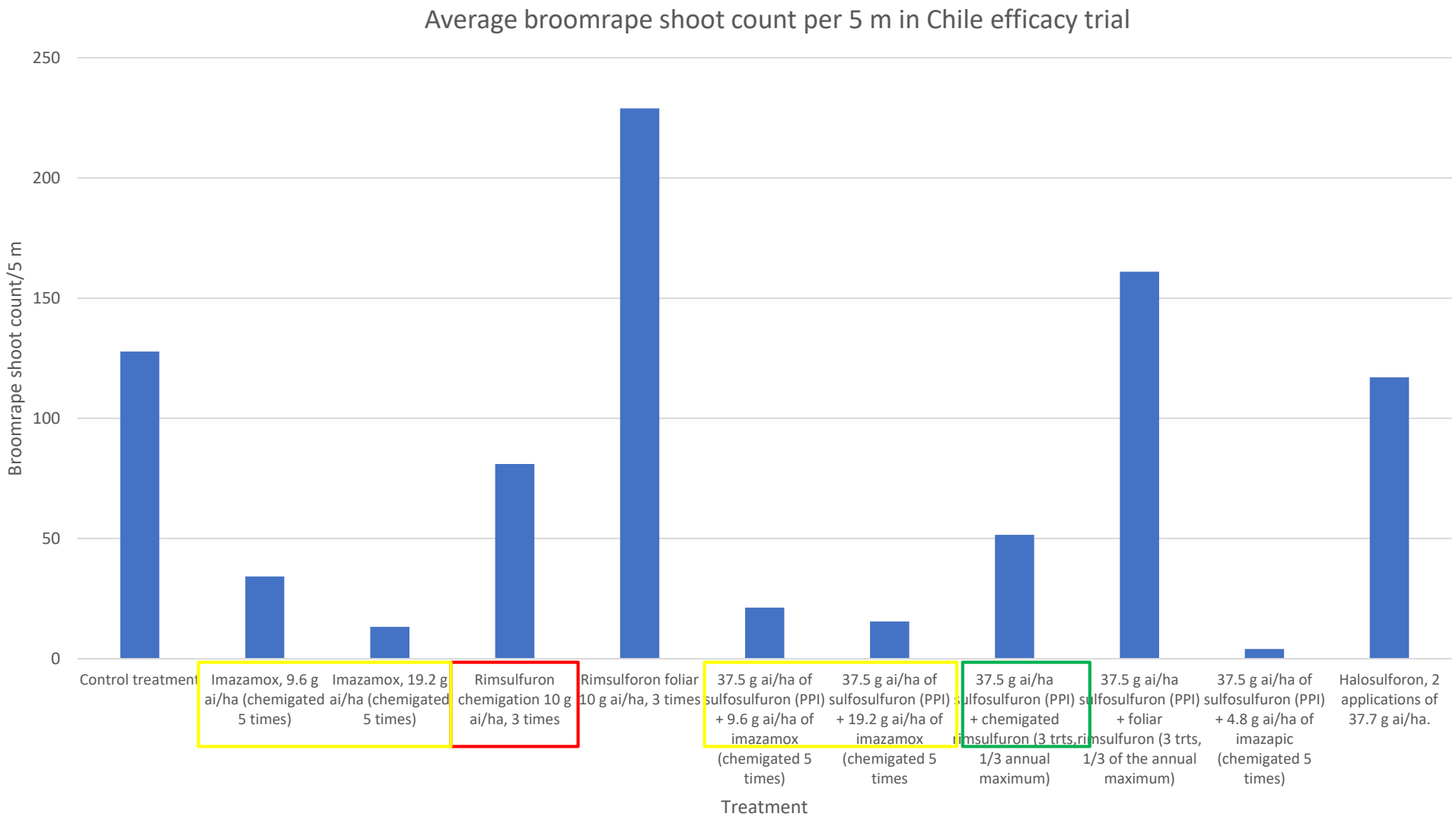
Application type

Application schedule

# Results from California trial



# Results from Chile trial



# Discussion

- Chemigated rimsulfuron alone and paired with sulfosulfuron had numerically lower broomrape emergence than control treatments.
- Recently approved 24c label for Matrix that allows for chemigated applications; growers can begin to treat suspected fields with chemigated rimsulfuron in 2023.
- The late May planting treatment was also very promising and may be fairly easy to implement by growers with at-risk fields.
- Tomato injury due to chemigated imazamox at the infested field site was severe and the discrepancy in crop safety between the on- and off-campus sites is being examined now through several soil experiments.

# Rimsulfuron 24c Special Local Need Label

AGRIAN by TELUS Agriculture

RESULTS | DETAILS

5 Results Found For: **matrix**

Matrix SG

General | Crop Specific | Documents | Safety | Registration | Mfg. Info

- Label - CD02-628-020
- MSDS/SDS - 04/01/2022 CD03-628-020

**Supplemental Documents** All States | All Commodities

- Section 24c - CA - For Management of Broomrape in Tomatoes
- Supplemental Label - FOR USE IN BLUEBERRIES, RASPBERRIES & BLACKBERRIES (Expires 2024-04-01)

CORTEVA™ agriscience

| RIMSULFURON | GROUP | 2 | HERBICIDE |
|---|---|---|---|

## FIFRA Section 24(c) Special Local Need (SLN) Label

**FOR DISTRIBUTION AND USE ONLY WITHIN THE STATE OF CALIFORNIA**

**For management of broomrape in tomatoes**

## Matrix SG

**EPA Reg No. 352-768** **SLN # 303093**

**ATTENTION**

- It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
- This labeling must be in the possession of the user at the time of application.
- Follow all applicable directions, restrictions, Worker Protection Standard requirements and precautions on the EPA registered label for Matrix SG (352-768).

**Chemigation**

# Directions for Use

- For use on processing tomato for management of broomrape (Phelipanche ramosa, aka Orobanche ramosa) and Egyptian broomrape (Phelipache aegyptiaca). For management of broomrape, apply Matrix SG through buried- or surface-drip irrigation tubing to transplanted tomato. **Apply at an application rate of 1.33 oz/A for up to 3 applications per season at approximately 30, 50 and 70 days after transplanting.**
- Refer to product label for Matrix SG for Use Precautions, Mixing and Application directions.
- Surface or buried drip irrigation applications simulate banded applications.
- The amount of water and injection time may vary depending on soil type and irrigation system used. Introduce Matrix SG into the irrigation system at approximately the midpoint of the irrigation set to limit movement of the herbicide beyond the tomato root zone, where broomrape germination and attachment occurs, which may improve broomrape control. Factors such as soil type, irrigation system, injection timing and length, drip tape placement, etc. may affect weed control when Matrix SG is used through the drip irrigation system.
- After Matrix SG has been evenly applied across the field, flush the irrigation system prior to ending the irrigation.
- **Do not apply more than a total of 4.0 oz/A Matrix SG** (0.0625 lb ai/A rimsulfuron) on tomato during the same year.
- Do not make more than 3 applications of Matrix SG per year.
- Preharvest Interval: Do not apply within 45 days of harvest.
- This label must be in the possession of the user at the time of application. Follow all recommendations and restrictions on the Matrix SG Section 3 labeling.

# Discussion and Future Work

- Future Research
  - Rimsulfuron- refining rates and timing
  - Further refinement of imazamox chemigation- safener?
  - Rimsulfuron demonstration studies in multiple trial sites in 2023
  - Planting dates
  - Variety screening for broomrape sensitivity
  - Trap crops and false hosts
  - Alternate crop sensitivity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