Potential New Weed Tools for Lettuce & Spinach

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Collaborators & support

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- Richard Smith
- Ran Lati
- Cooperating growers
- California Leafy Greens Research Program

Possible new weed control tools

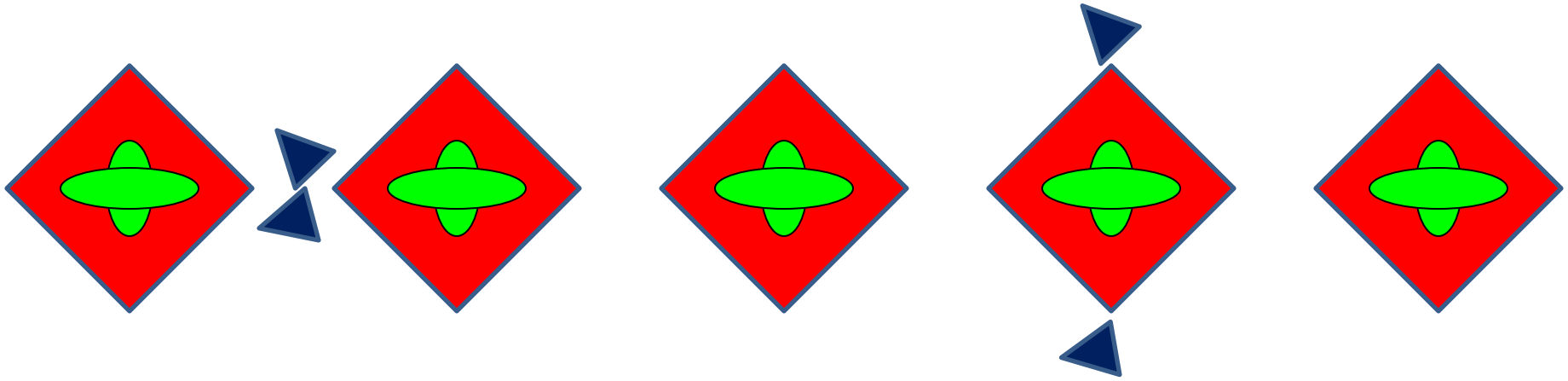
- In-row “intelligent” cultivators
- Prowl H_2O for transplanted lettuce
- Spin-Aid for spinach

Intelligent cultivators

- These cultivator sense the crop with camera recognition
- Cultivator knives move in and out of plant row – “robotic hoeing”

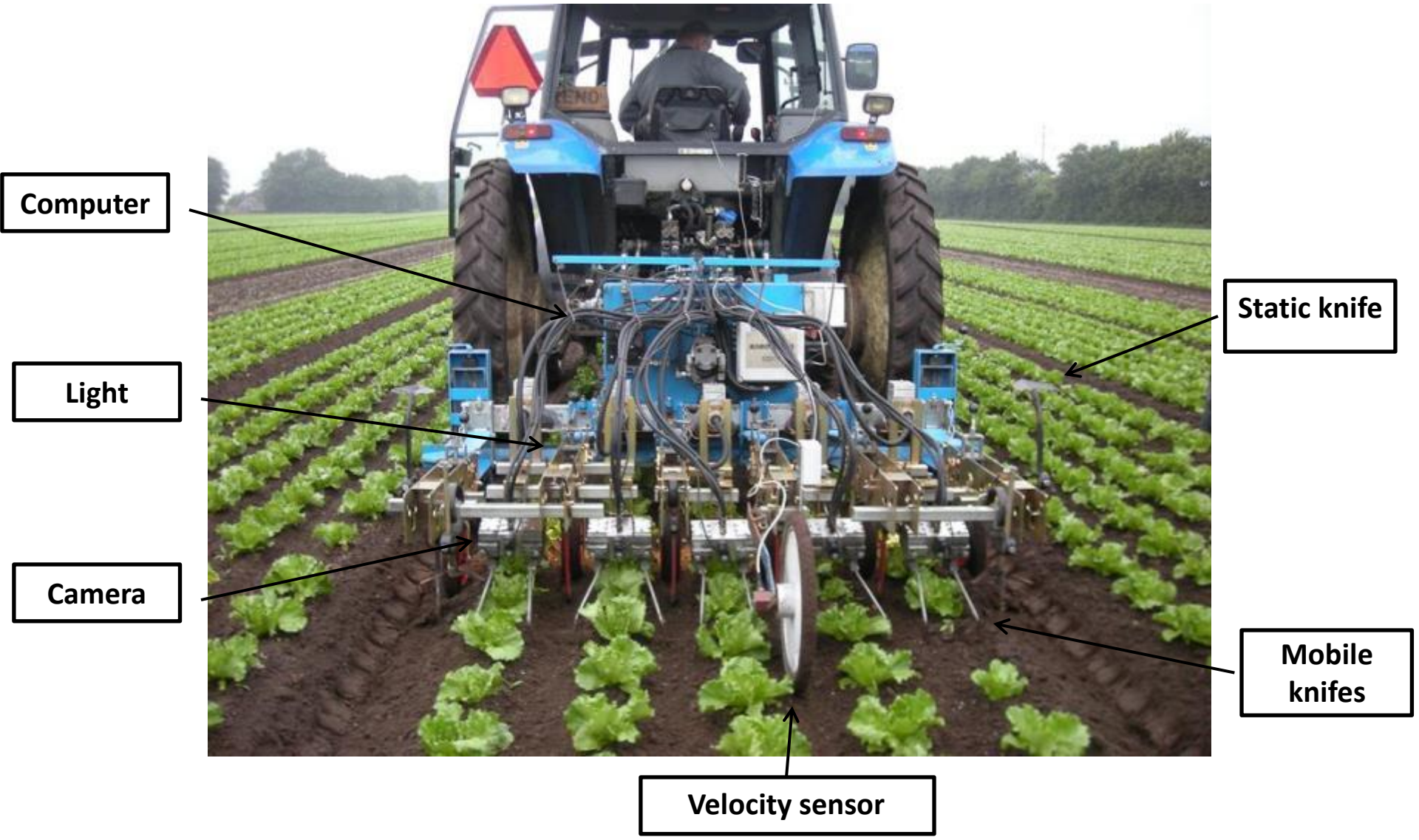
Closed

Open



Intelligent cultivator (IC)

The Robovator



Robovator
Weed removal

Sub-surface root pruning

2 hours after cultivation

2 days after cultivation

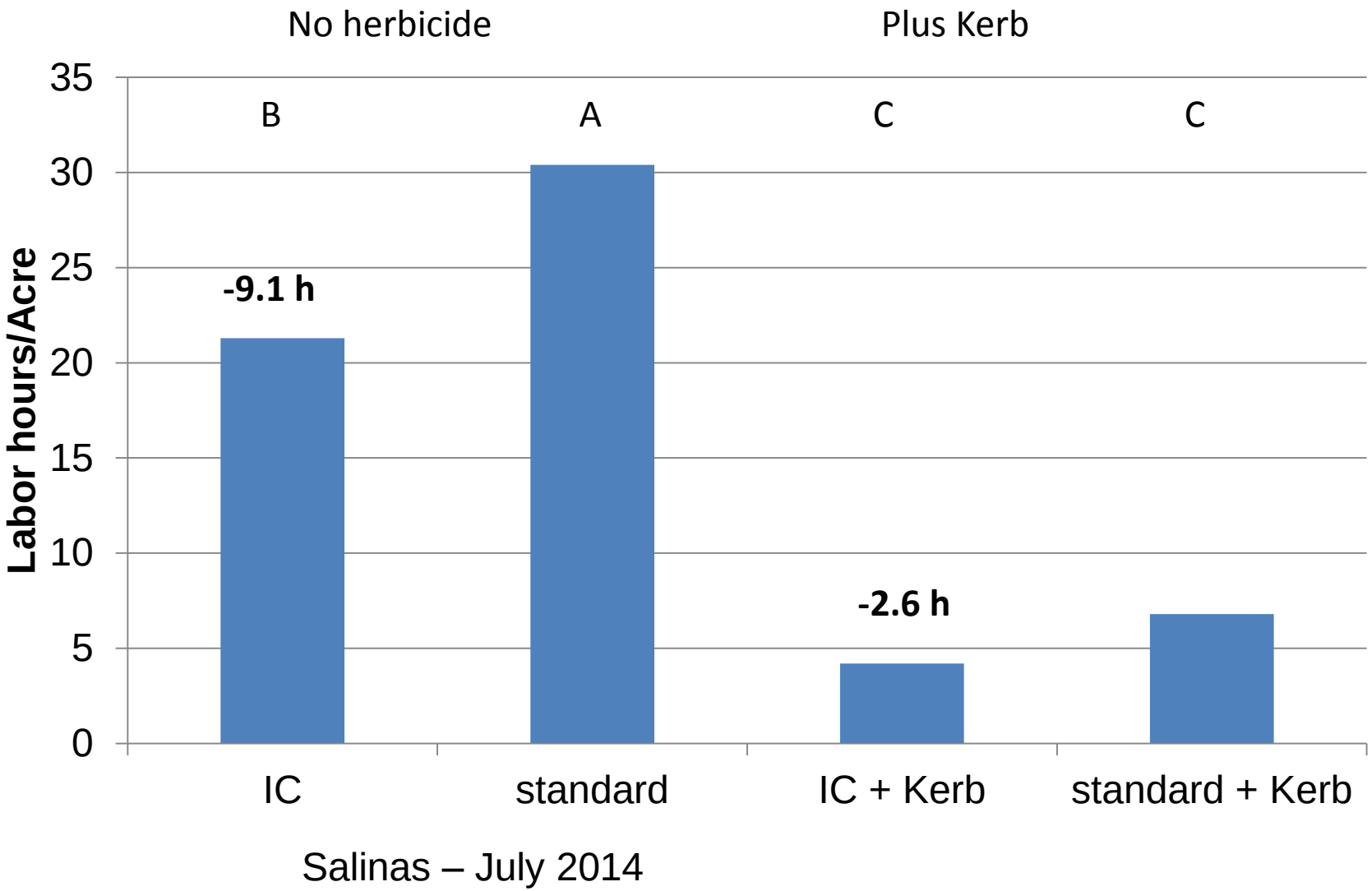
Robovator
Field evaluation

Methods

- Transplanted leaf lettuce
- Robovator and standard cultivator (SC) with/without Kerb
- One pass
- Evaluations:
  - Stand count
  - Yield
  - Weed density before/after
  - Hand weeding (HW) time

Treatment	Yield (Lb A^{-1})	Weed Control (%)
IC + Kerb	**7163 a**	**89 a**
IC untreated	**7608 a**	**78.5 a**
SC + Kerb	**7069 a**	**68.1 a**
SC untreated	**6194 a**	**42.6 b**

Hand weeding time



Salinas – July 2014

The Robovator
Limitations

High weed density\Timing

Overlapping canopies

Intelligent cultivators

- Organic vegetables are probably the most ready application of this technology

Prowl H_2O- Pendimethalin

- A food use tolerance was granted by USEPA for pendimethalin use on transplanted leaf lettuce.
- BASF has provided a proposed Prowl H_2O label for transplanted leaf lettuce.
- The Prowl lettuce rate will be 2.1 pints/A
- Proposed PHI is 20 days

Field evaluations

Preliminary evaluations

- Lettuce Safety and weed control Prowl PRE at 5 rates between 1.2 to 12.6 lb/Ac
  - Kerb at 2lb/Ac
- Application timing-
  - PRE transplant
  - POST transplant

Commercial evaluation

- Santa Maria and Las Lomas
  - Red Romaine and Lolla Rosa, respectively
  - Prowl PRE at 2.1 and 4.2 lb/A.
  - Prefar at 6 lb/Ac, Las Lomas

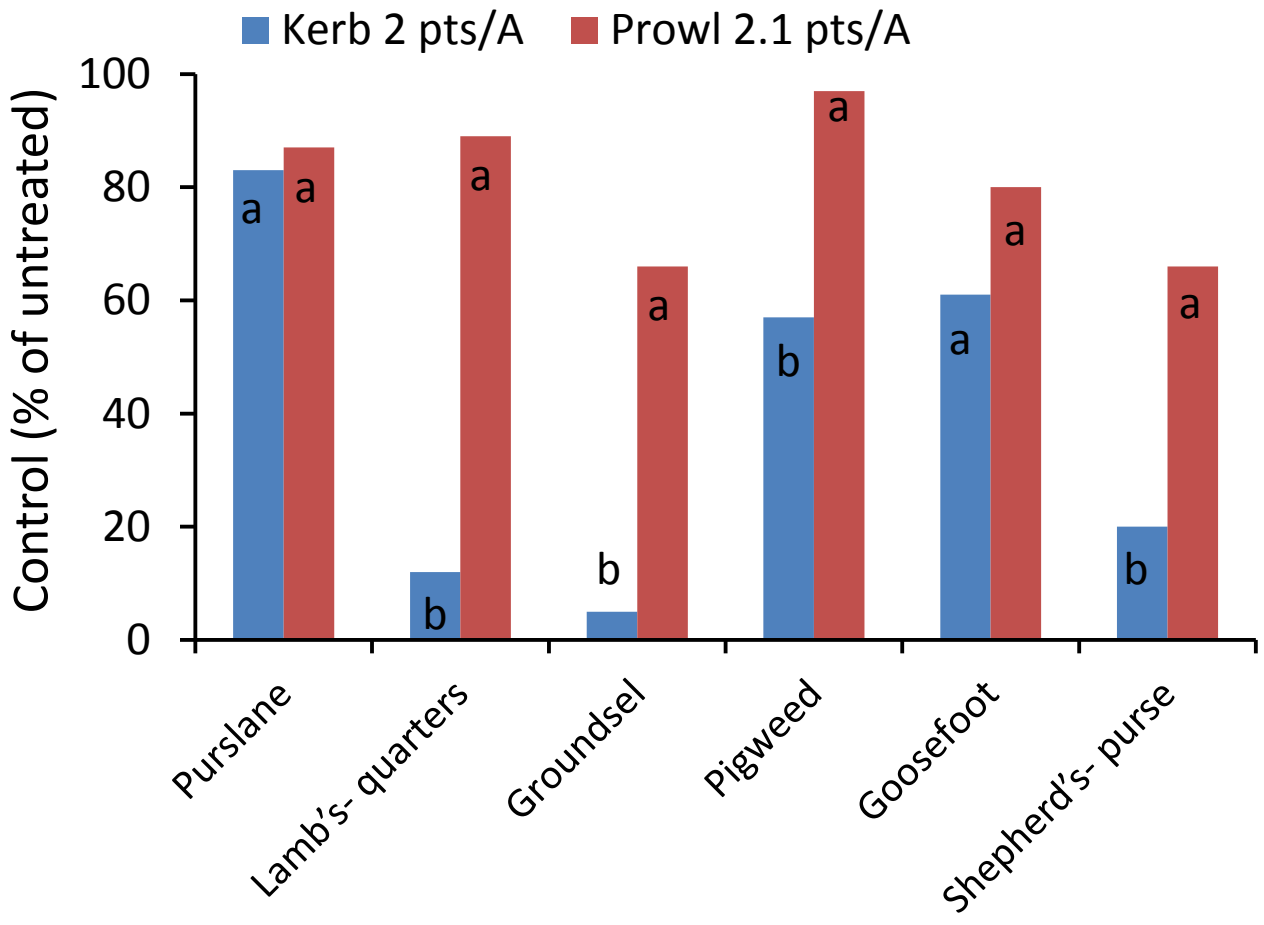
Safety of Prowl to transplanted lettuce

No herbicide

Prowl 25 pt/A (12X)

No significant difference for injury and yield values of all Prowl treatments

Weed control

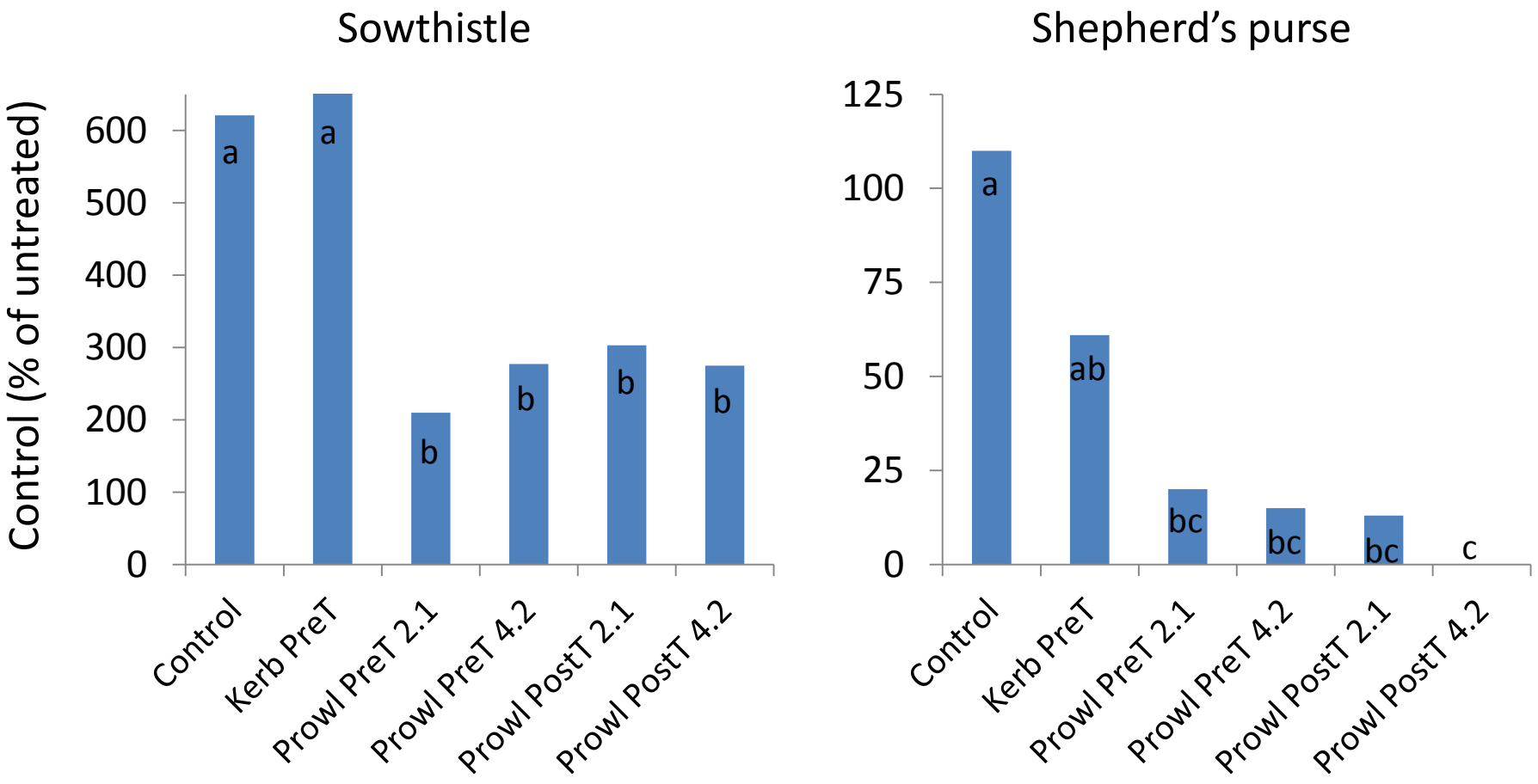


Application timing & lettuce safety

No significant difference for injury and yield values of PRE and POST treatments

Application timing

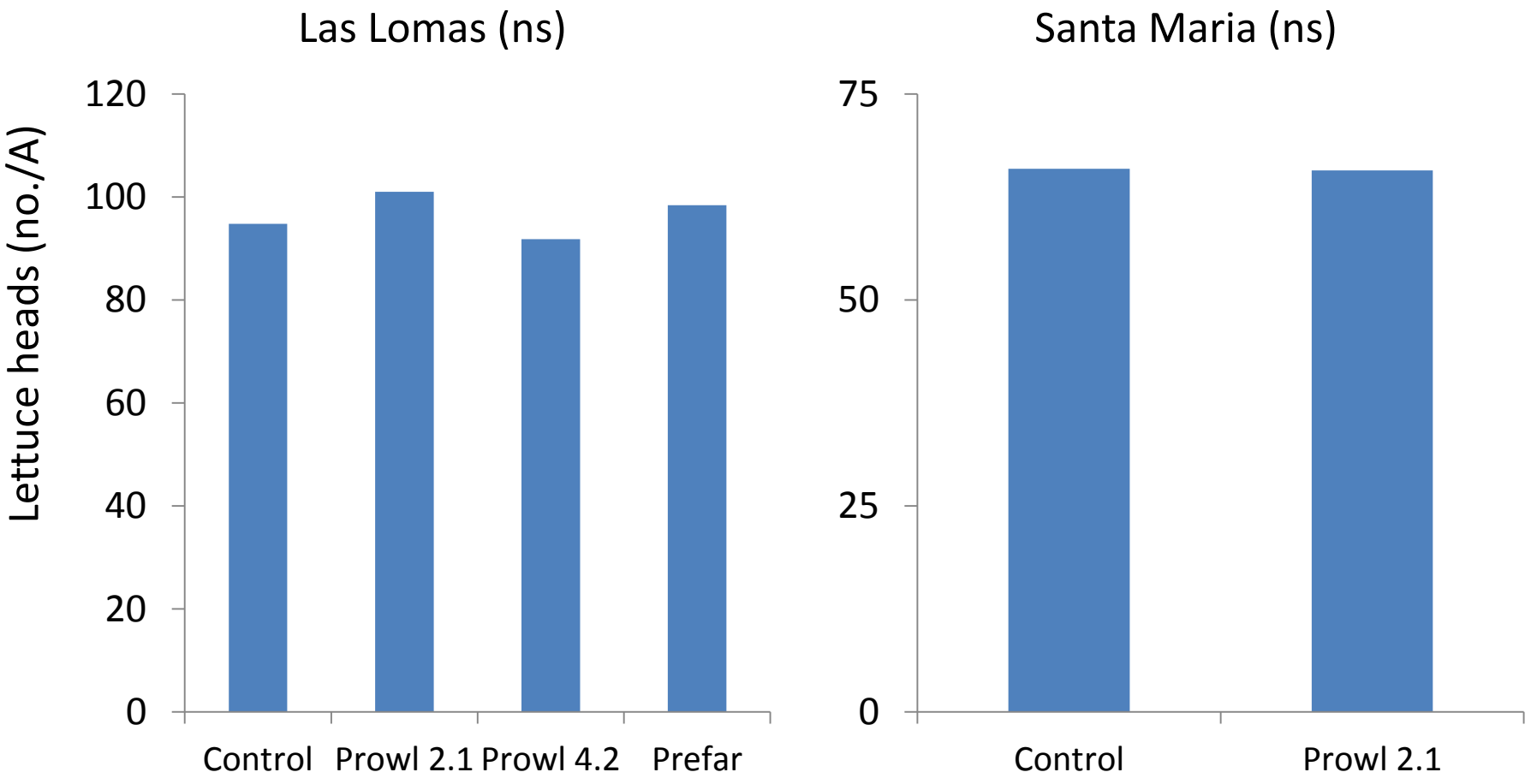
Weed control



- **Application timing had no impact on weed spectrum and control efficacy**

Commercial trials

lettuce yield



- **Prowl had no impact on harvestable lettuce heads per acre**

Prowl H_2O

Summary

- Prowl H_20 was found safe for transplanted lettuce
- Weed control at 2.1 lb/A (recommended rate) was better than Kerb
- There is no impact of application timing (PRE vs.POST) on control results
- **Useful and effective new tools for weed management in the transplanted lettuce**

Spin-Aid- (Phenmedipham)

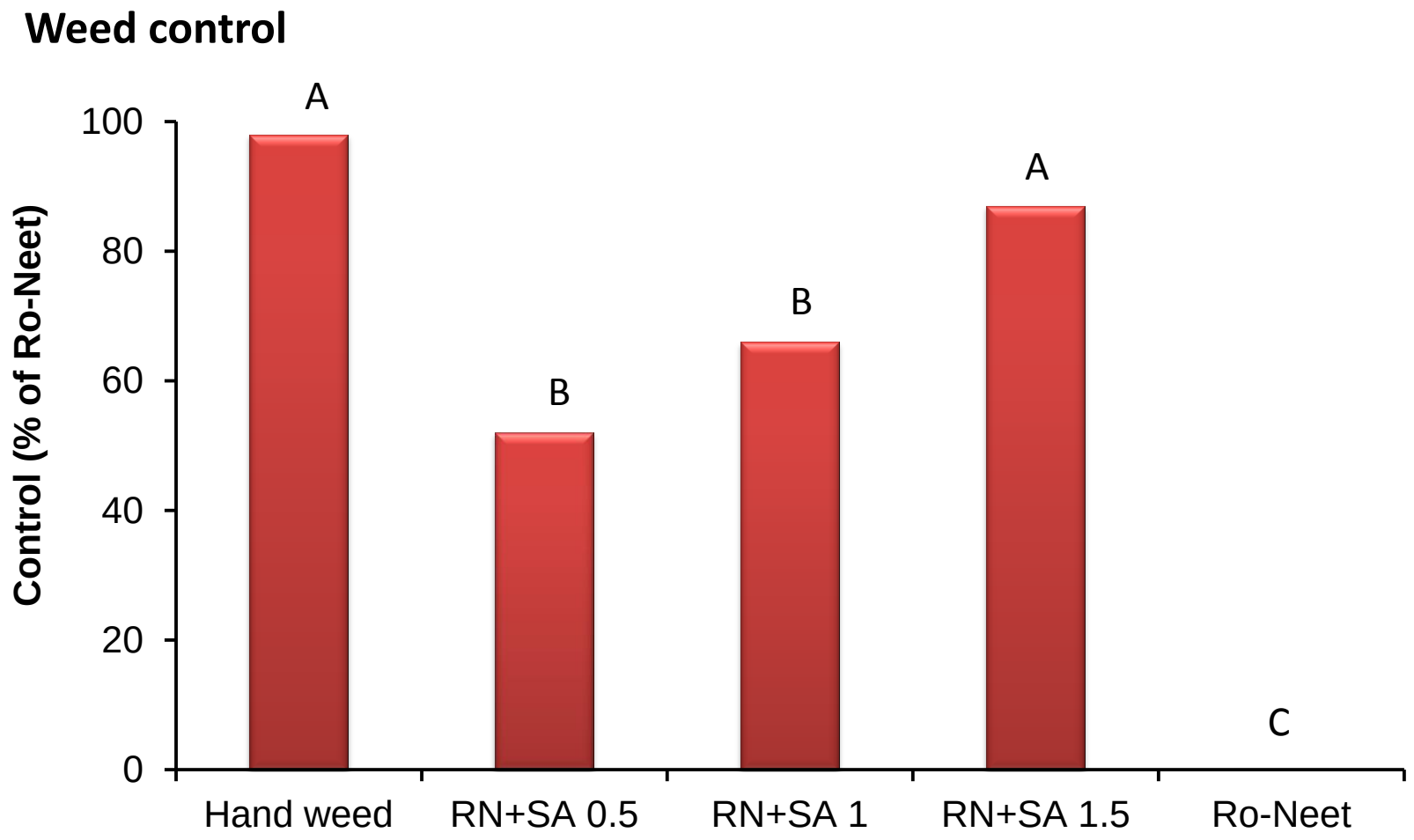
- PS II inhibitor – inhibits photosynthesis
- Control broadleaf weeds and some grasses
- May cause temporary injury
- Registered for use on processing and seed spinach but not for fresh spinach

Spin-Aid®

Field evaluations

- Ro-Neet followed by Spin-Aid
  - Ro-Neet PRE at 2 pts/A + Spin-Aid at 0.5, 1.0 and 1.5 pts/A at 4-leaf
  - Day vs. night applications

Sequential Application

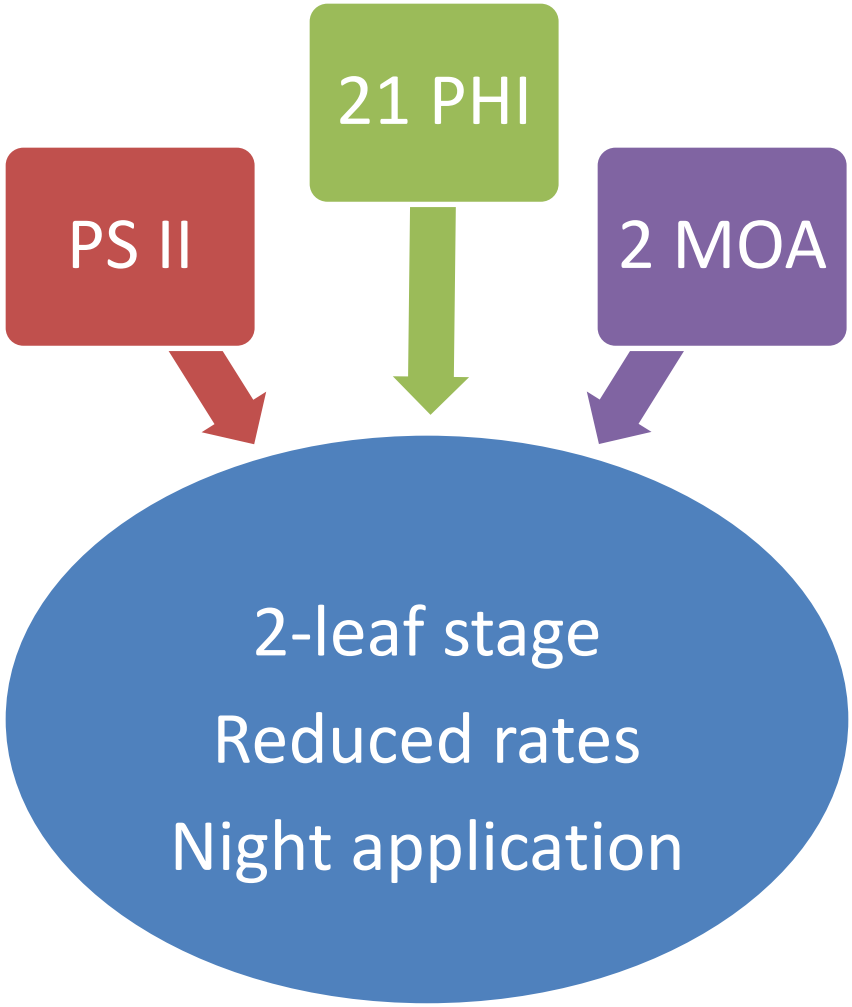


Sequential Application

Ro-Neet 2 pt/Ac

Ro-Neet 2 pt/Ac FB Spin-Aid 1.5 pt/Ac

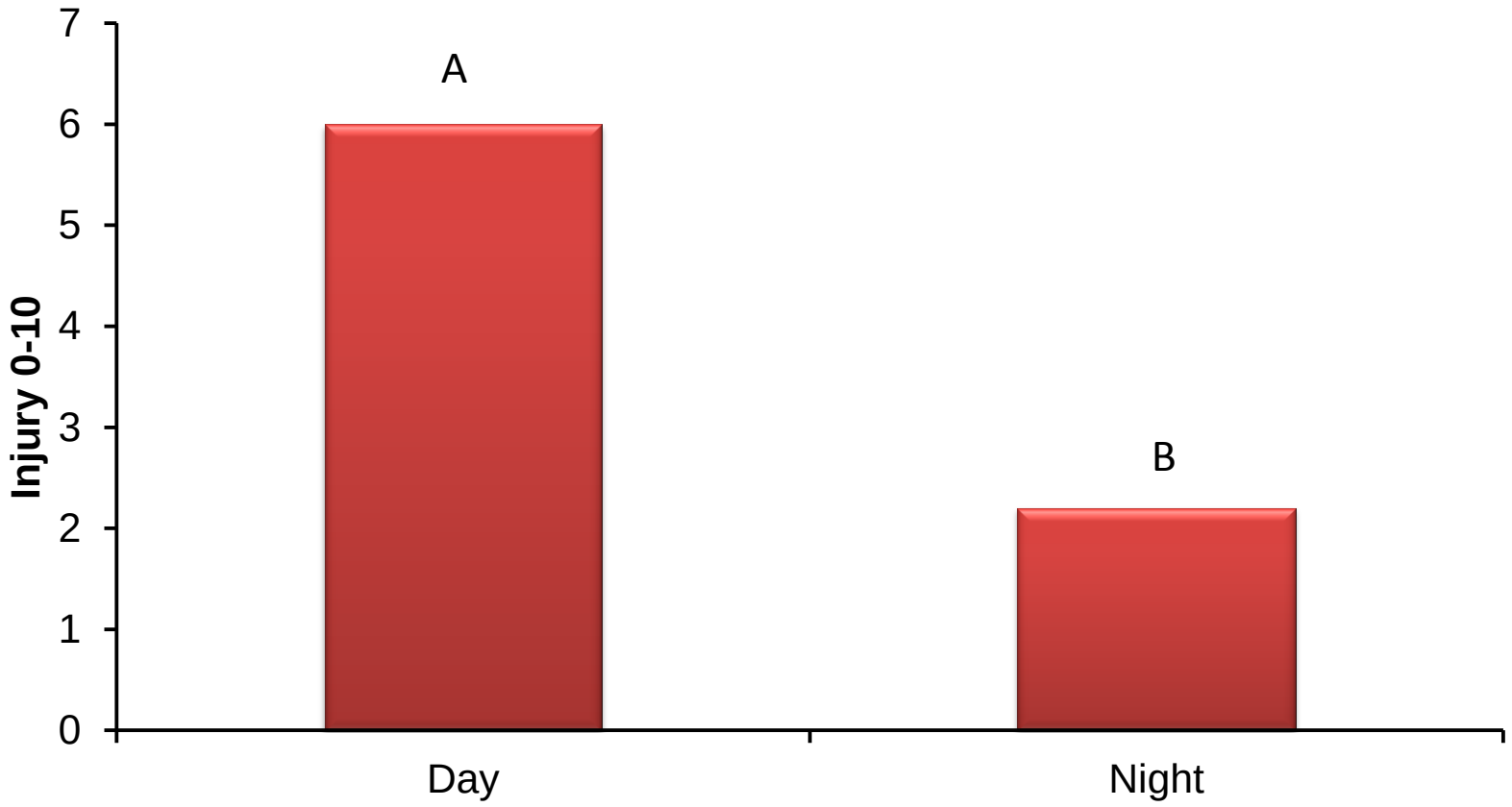
How can Spin-Aid be more useful?



- Ro-Neet PRE at 2 pt/A for all treatments
- Spin-Aid at 0.5 and 1.0 pt/A at 2-leaf
- Spin-Aid at 0.5 and 1.0 pt/A at 2-leaf + 1.5 pt/A at 4-leaf
- Spin-Aid at 1.5 pt/A at 4-leaf (standard)

Spin-Aid 3 pt/A applied at night causes less spinach injury than day applications

Spinach injury, 0 = safe, 10 = dead



Safety

- Night application of reduced Spin-Aid rates at early stages

1.5 at 4-leaf

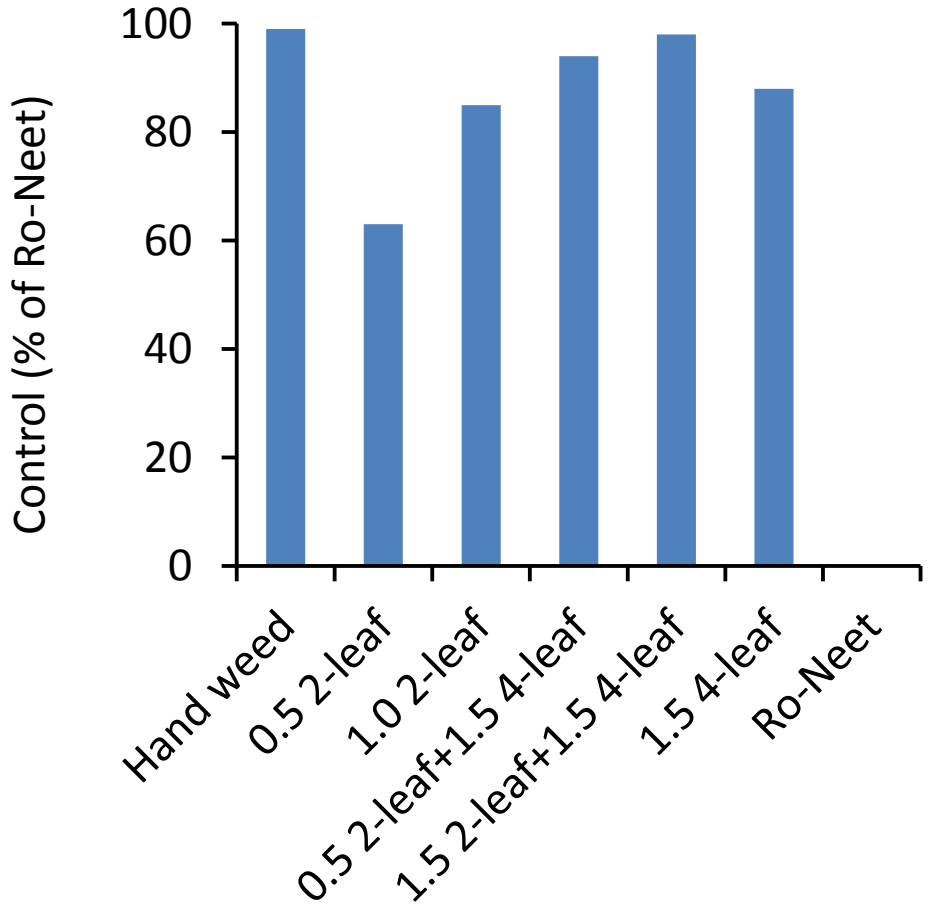
1 at 2-leaf

1 at 2-leaf + 1.5 at 4 leaf

No significant difference for injury and yield values of all spin aid treatments

Weed control

- Night application of low Spin-Aid rates at early stages



Weed control

- Night application of reduced Spin-Aid rates at early stages

Control(RN 2)

RN 2 + SP 1 at 2-leaf

RN 2 +1 at 2-leaf
+ 1.5 at 4 leaf

Spin-Aid
Summary

- Low rates of Spin-Aid were found safe and affective for spinach when applied as sequential application after Ro-Neet
- Night application is recommended
- Good weed control by Spin-Aid at 1.0 pt/Ac at 2-leaf stage
- Best weed control at 1.0 pt/Ac at 2-leaf stage + 1.5 pt/Ac at 4-leaf stage
  - 21 day PHI should be considered

Final

- Robotics and machine vision offer new possibilities for vegetable weed control
- Prowl H_2O appears to be a new tool for transplanted lettuce
- Spin-Aid could probably be useful in fresh spinach