Mugwort Response to Chemical and Nonchemical Control Tactics



Jatinder Singh Aulakh

Connecticut Agricultural Experiment Station

Valley Laboratory, Windsor

Presentation Outline

- Mugwort
  - Origin, introduction and spread in North America.
- Biology and ecology
- Mugwort control research
  - Chemical control
    - Herbicides
  - Nonchemical control
    - Woodchip mulch and plastic covers
    - Mowing



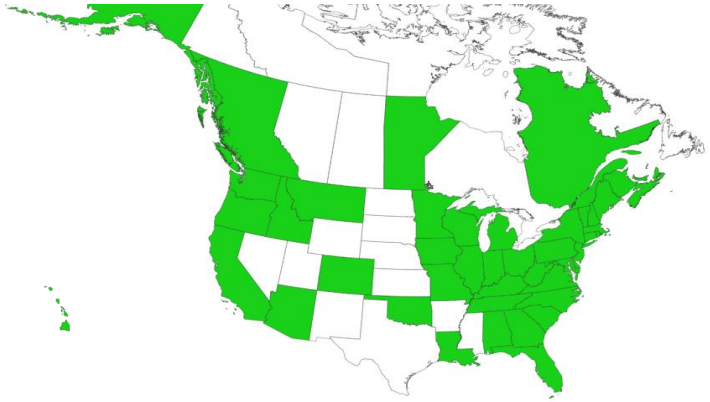
Artemisia vulgaris

Mugwort, Chrysanthemum Weed

- Origin
  - Europe and Eastern Asia
- US introduction
  - 1600s
    - Medicinal plant
- North American distribution
  - ~40 states in the US
  - 6 Canadian provinces







Biology and Ecology

- Perennial, herbaceous to semi woody plant
  - 5 - 6 feet tall
- Prefers full sunlight but grows well under partial shade
- Thrives on semi dry to moist soils
  - Does not perform well under wet conditions



Biology and Ecology Cont…

- Propagates via
  - Rhizomes
  - Stem cuttings
  - Seed
    - 35 – 83% Seed germination in CT populations
    - >250,000 seeds per plant



Mugwort rhizomes

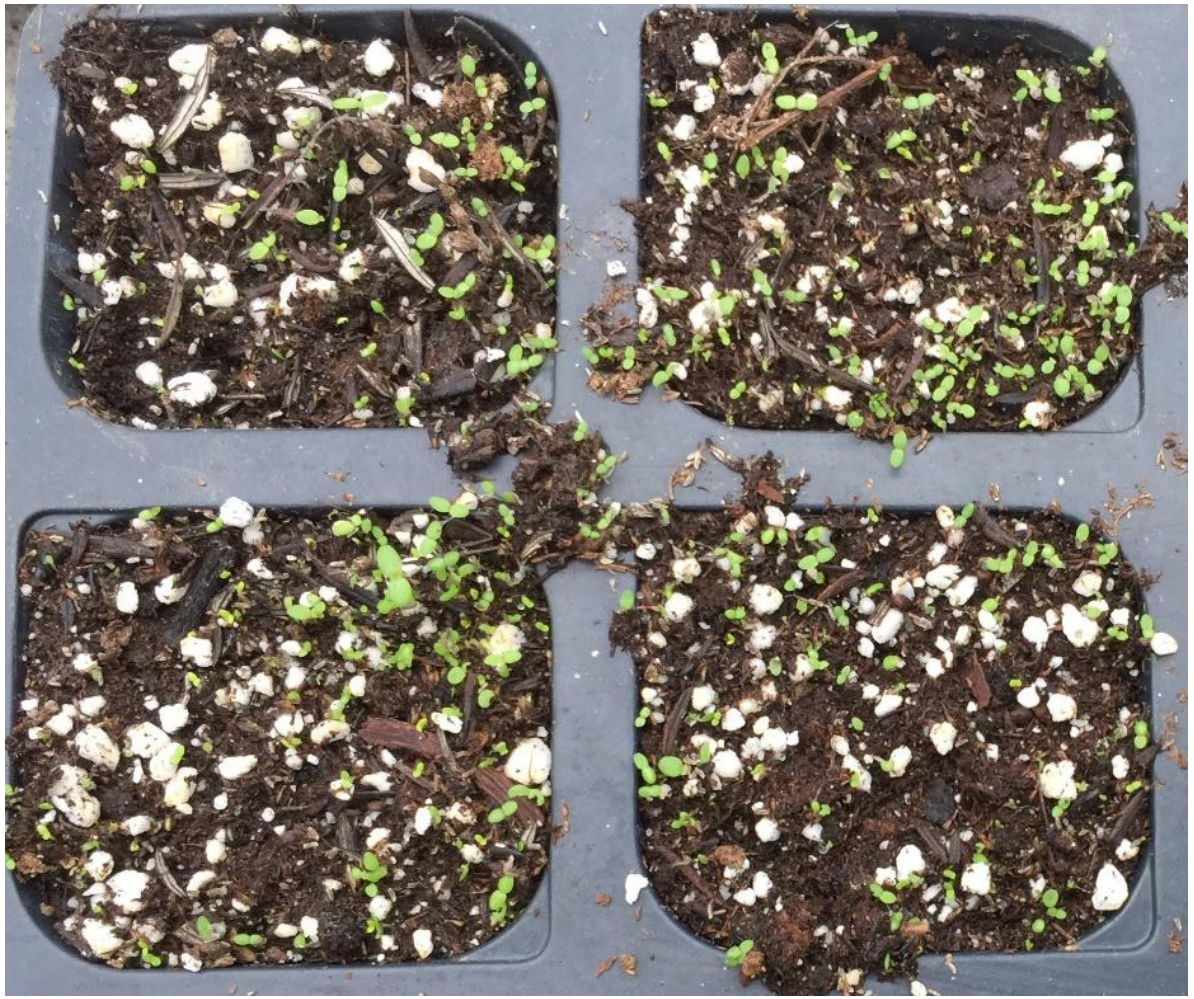


Mugwort seed



A mugwort seedling

Mugwort Seeds are Viable



Mugwort seed germination test at Windsor Valley Lab in 2016.



Mugwort seedlings from a CT population

Why is Mugwort Difficult to Control?



Mugwort rhizomes are highly persistent. Few herbicides provide rhizome kill which varies with herbicide, rate, and time of application.

Research Objectives

- Evaluate mugwort response (rhizome biomass reduction) to herbicides, mowing, and mulching



Herbicide sprays



Mowing



Mulching

Expt. 1- Chemical Control

- Aminopyralid
  - Milestone at 3.5, 7.0, or 14.0 floz/a
- Clopyralid
  - Stinger at 5.5, 11 floz/a, or 22 floz/a
- Glyphosate
  - Roundup PowerMax at 14, 28, or 56 floz/a

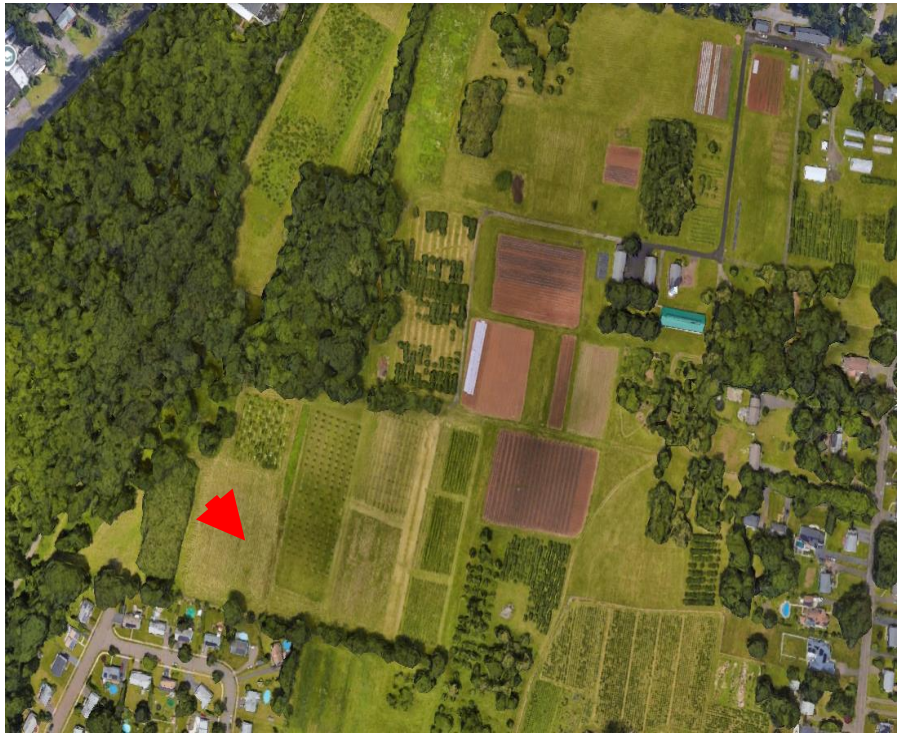






Expt. 1- Chemical Control Cont…

- Herbicides were applied on
  - October 23 in 2015,
  - October 14 in 2016,
  - October 6 in 2017
- Data were collected 9, 21, and 33 months after initial treatment (MAIT)
  - Data on % rhizome biomass reduction compared to the nontreated control will be discussed here



Experiment Location
Lockwood farm Hamden, CT

Rhizome Biomass Sampling



Rhizomes were excavated from inside two randomly placed quadrats (50 cm x 50 cm) in each plot. Rhizomes were separated from soil and fresh and dry weight was recorded.

Expt. 1- Results



A Milestone (≥ 3.5 floz/a) treated plot 33 MAIT



A Stinger treated plot 33 MAIT

Expt. 1- Results Cont..

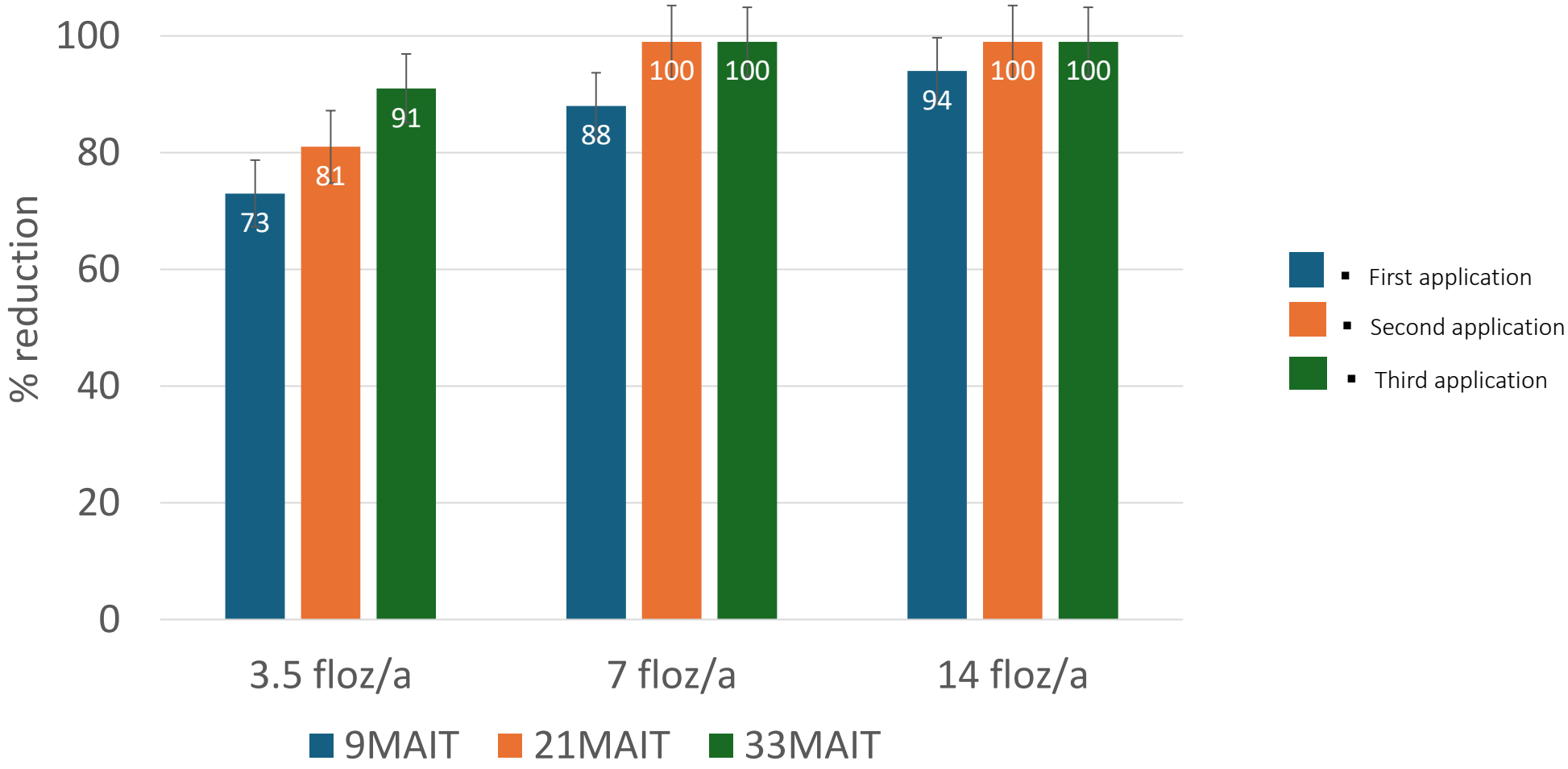


A Roundup Powermax (≥ 28 floz/a) treated plot 33 MAIT

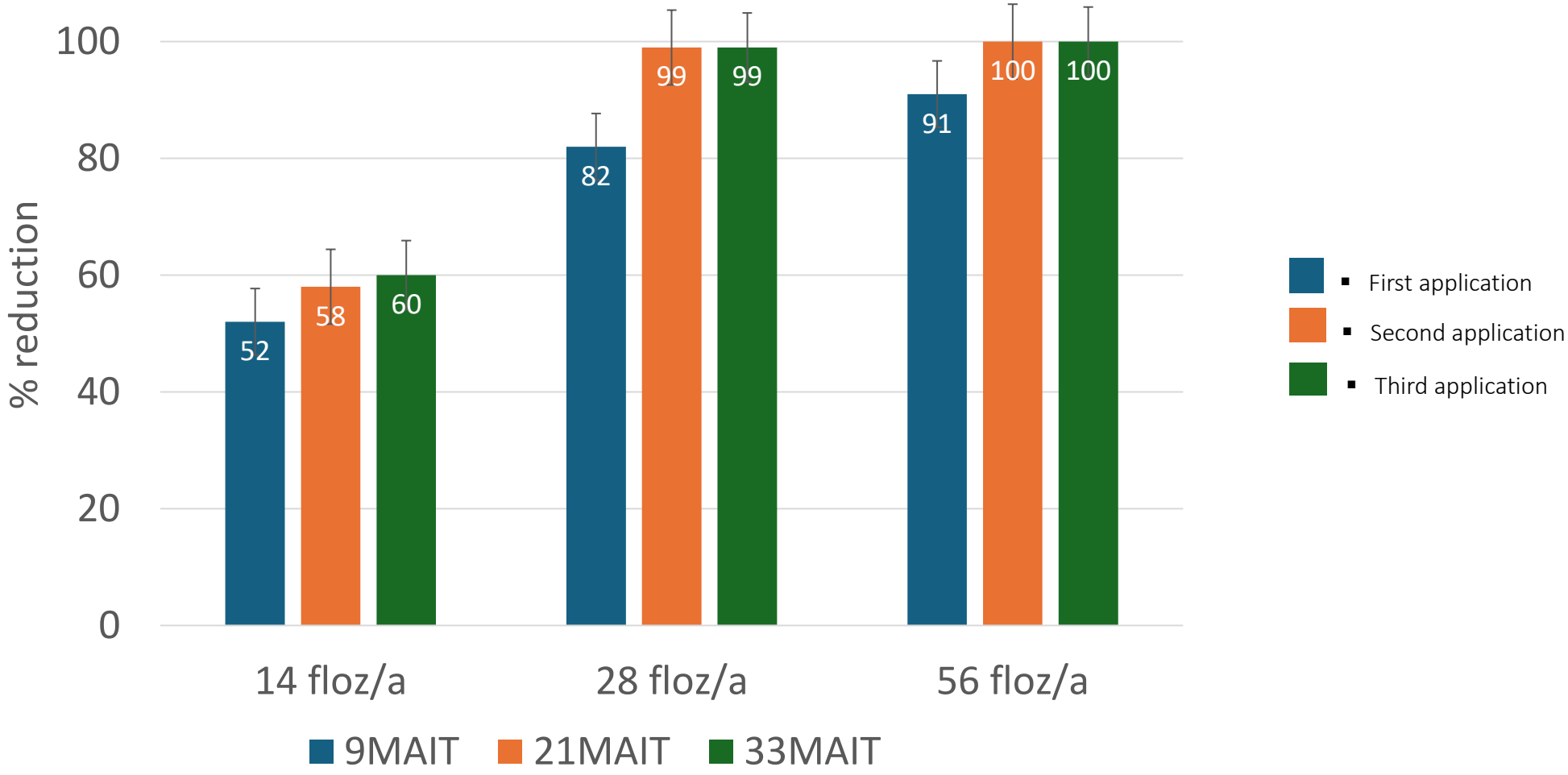


Nontreated control

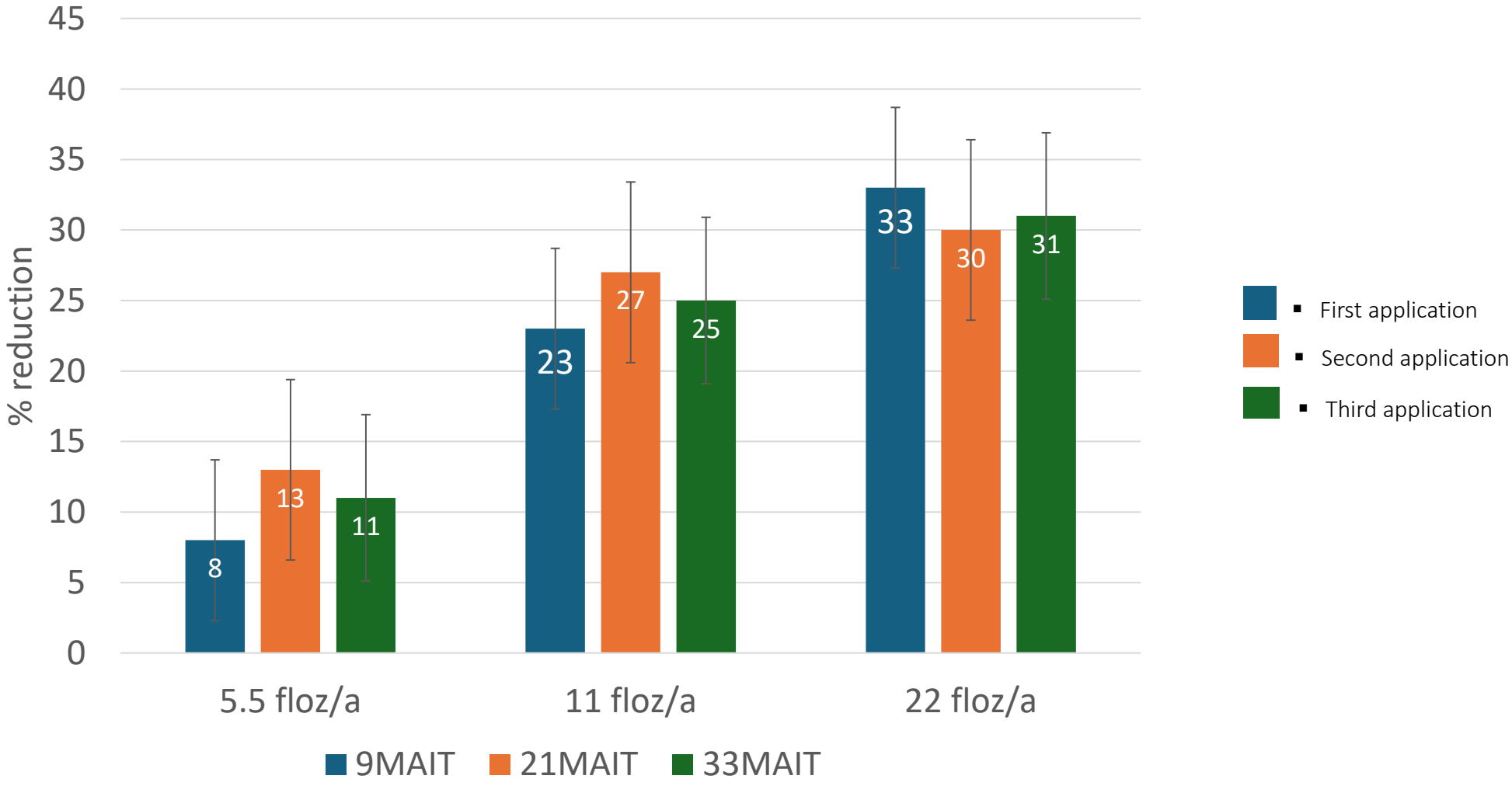
Aminopyralid (Milestone)-Rhizome Kill



Glyphosate (RoundUp Powermax)- Rhizome Kill



Clopyralid (Stinger)- Rhizome Kill



Expt. 2- Mulching

- Wood chips
  - 4-inch thick
  - 5-inch thick
- Plastic covers
  - Clear plastic (6-mil)
  - Black plastic (6-mil)

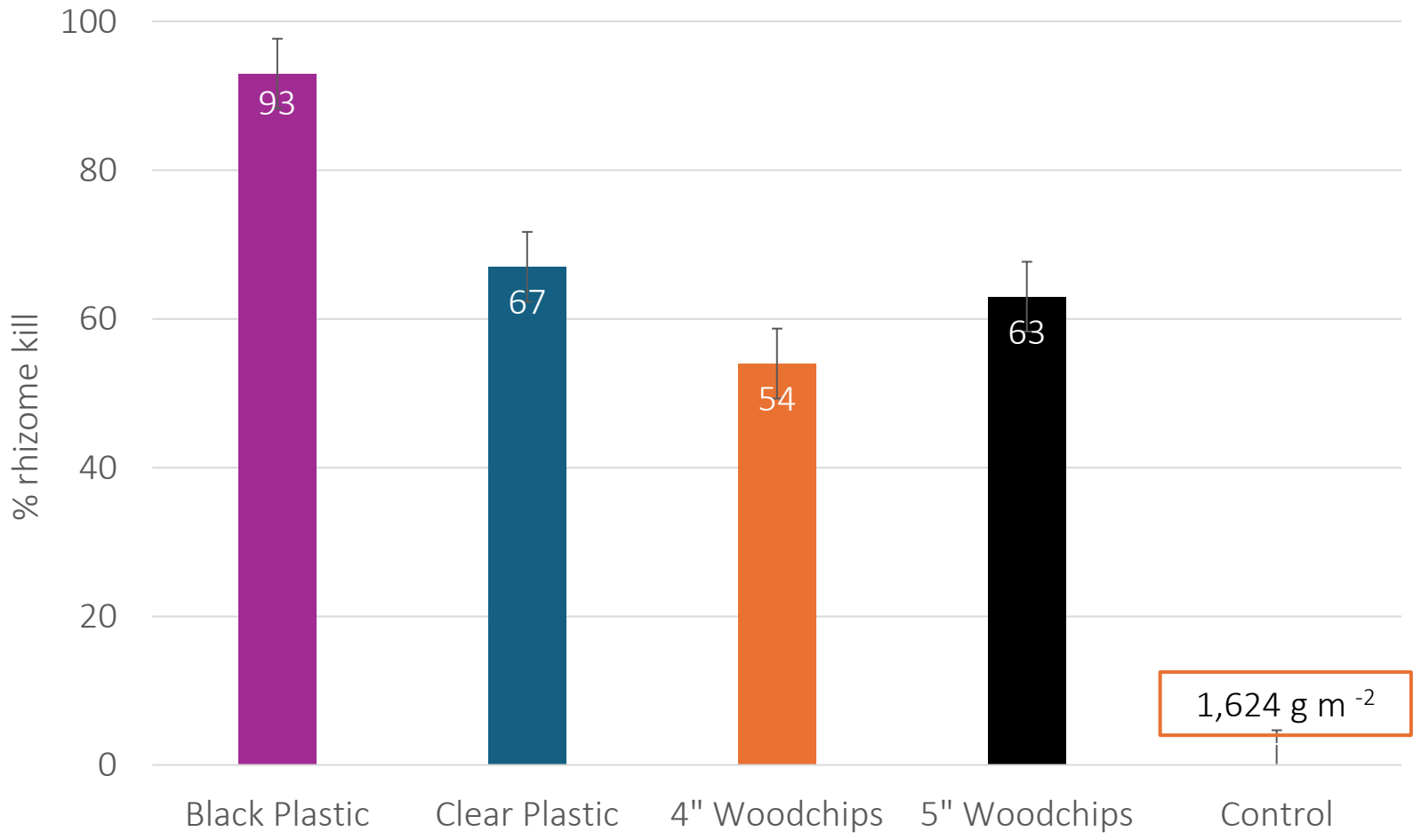


Mugwort nonchemical control research plots at Windsor Valley Lab in 2022.

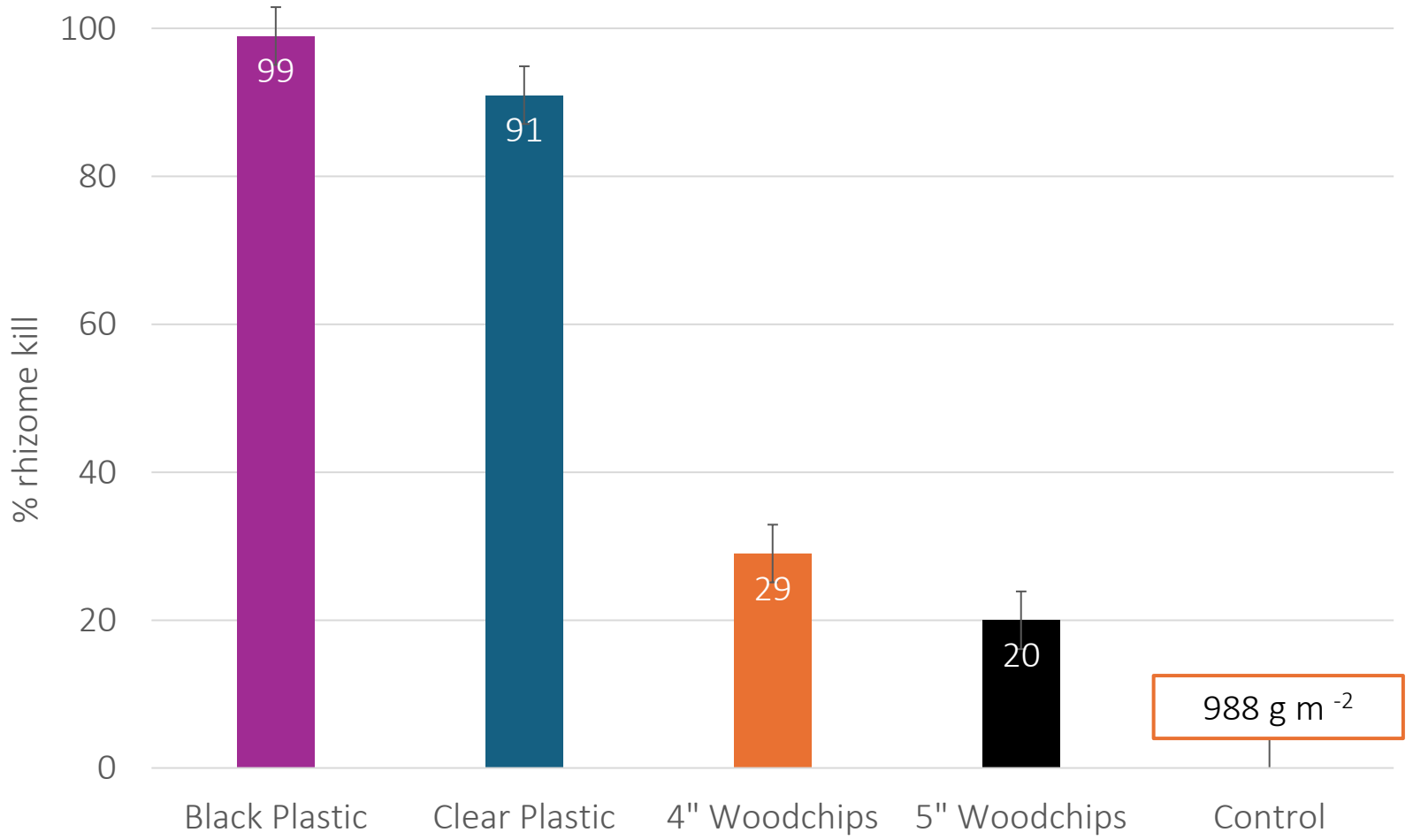
All plots were mowed to 2.4-inch height before mulching.
Mulches were applied on June 29, 2022, and again on May 3, 2023.



% Reduction in Rhizome Biomass, May 2023



% Reduction in Rhizome Biomass, May 2024



Rhizome Biomass, May 2024













Mugwort Cover, May 2024



Uncovered control



6-mil black plastic



6-mil clear plastic



4” woodchips



5” woodchips

Expt. 3- Mowing

- Experiment duration
  - Three years (2016-2018)
- Mowed to a 2.5 cm height (June-October)
  - 10-days interval
    - 15 mowings
  - 15-days interval
    - 10 mowings
  - 30-days interval
    - 5 mowings



Lockwood farm, Hamden, CT

Expt. 3- Results

Mowing effect on mugwort rhizome weight over three years.				
Mowing Frequency	Number of mowings/year	9 MAIT	21 MAIT	33 MAIT
Nontreated control	0	448 g m^{-2}	460 g m^{-2}	528 g m^{-2}
10- days interval	15	367 g m^{-2}	336 g m^{-2}	318 g m^{-2}
15-days interval	10	394 g m^{-2}	327 g m^{-2}	348 g m^{-2}
30- days interval	5	354 g m^{-2}	368 g m^{-2}	398 g m^{-2}
		< 20% reduction	< 30% reduction	< 40% reduction

Results Summary

Mugwort was effectively controlled with

- Glyphosate (Roundup Powermax)
  - 28 – 56 floz/a
- Aminopyralid (Milestone)
  - 3.5 – 14 floz/a
- At least two applications were required to achieve 99% rhizome kill
- Clopyralid was week on mugwort
  - 11 or 22 floz/a provides temporary control

Results Summary Cont…

- Glyphosate is a non-selective herbicide
  - Kills/seriously injure sensitive dicots and monocots
  - Monospecific mugwort stands
  - Has no soil activity
  - Economical (~ $7 per application at 28 floz/a)
- Aminopyralid is safe to grasses
  - Pastures and hayfields
  - Long persistence in soil
  - Costly (~ $19 per application at 7 floz/a)

Results Summary Cont…

Mugwort can be controlled nonchemically

- Black plastic cover (6 mil)
  - >93% rhizome kill (The first year)
  - ≥99% rhizome kill (The second year)
- Clear plastic cover (6 mil)
  - 67% rhizome kill (The first year)
  - 91% rhizome kill (The second year)
- 4” or 5” Woodchips applied once were not very effective
- Mowing is not a solution!

Thank you