

KEY FINDINGS: > 90% waterhemp biomass reduction was achieved with **aceto chlor** (after 1st cut) and **aceto chlor** (after 1st cut) + **flumioxazin** (after 2nd cut), but no differences in alfalfa forage yield resulted from suppression. Alternative approaches are needed to prevent waterhemp seed production as **seed production** was observed in **all treatments** in September.

Introduction

- Dairy production systems in Wisconsin rely on alfalfa as a key component in their ration. However, these systems have recently been invaded by waterhemp (*Amaranthus tuberculatus* (Moq.) J. D. Sauer).
- Given that little is known about the impacts and control of this species in established alfalfa, the objectives of this study were:
 - OBJECTIVES:** To determine: (i) the impacts of waterhemp on alfalfa productivity and quality; (ii) the effectiveness of management strategies based on residual herbicides applied at different timings; and (iii) waterhemp’s emergence patterns and ability to produce seeds in established alfalfa cropping systems.

Material and Methods

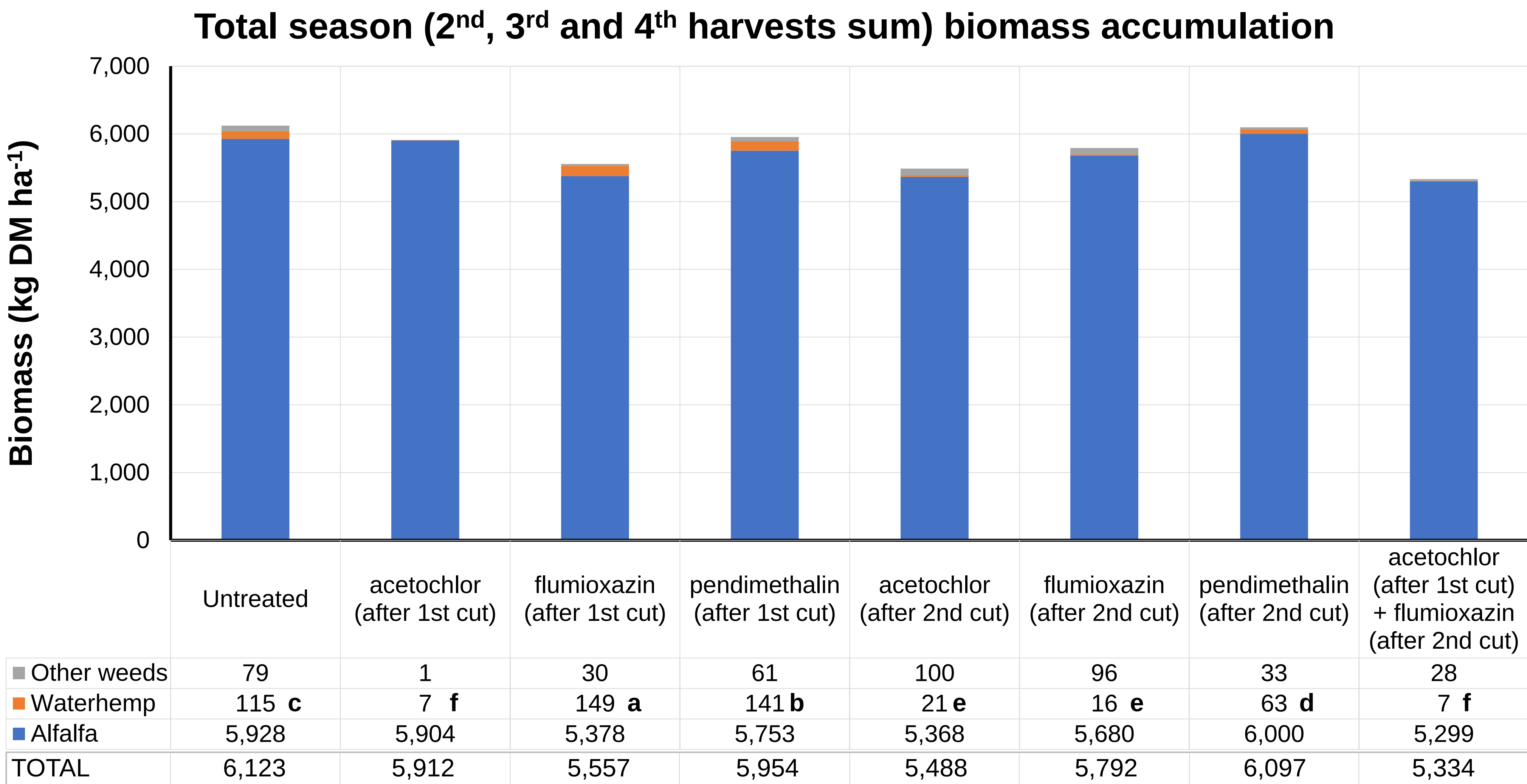
- A RCBD with four reps. was conducted on an established alfalfa field, in Omro, WI, from June to September 2019.
- Eight management strategies were tested based on 3 residual herbicides and 2 application timings (**Table 1**).
- Measurements:
 - Aboveground biomass was estimated for the 2nd, 3rd, and 4th harvest , separated into alfalfa, waterhemp, other weeds and summed.
 - Waterhemp emergence was counted after each harvest in 0.5 m² quadrats in untreated plots.
 - Waterhemp seed production was visually assessed prior to harvests and after the 4th harvest.
- Data were subjected to ANOVA and means separated using Fisher’s LSD test (α = 0.05) when appropriate.

Table 1. List of management strategies investigated in the study.

TRT N°	Active ingredient	Rate (kg ai ha ⁻¹)	Application timing
1	Untreated	-	-
2	aceto chlor (359 g ai L ⁻¹)	1.70	After 1 st cut (06/03)
3	flumioxazin (51%)	0.14	After 1 st cut (06/03)
4	pendimethalin (455 g ai L ⁻¹)	2.13	After 1 st cut (06/03)
5	aceto chlor (359 g ai L ⁻¹)	1.70	After 2 nd cut (07/07)
6	flumioxazin (51%)	0.14	After 2 nd cut (07/07)
7	pendimethalin (455 g ai L ⁻¹)	2.13	After 2 nd cut (07/07)
8	aceto chlor +	1.7 +	After 1 st cut
	flumioxazin	0.14	After 2 nd cut

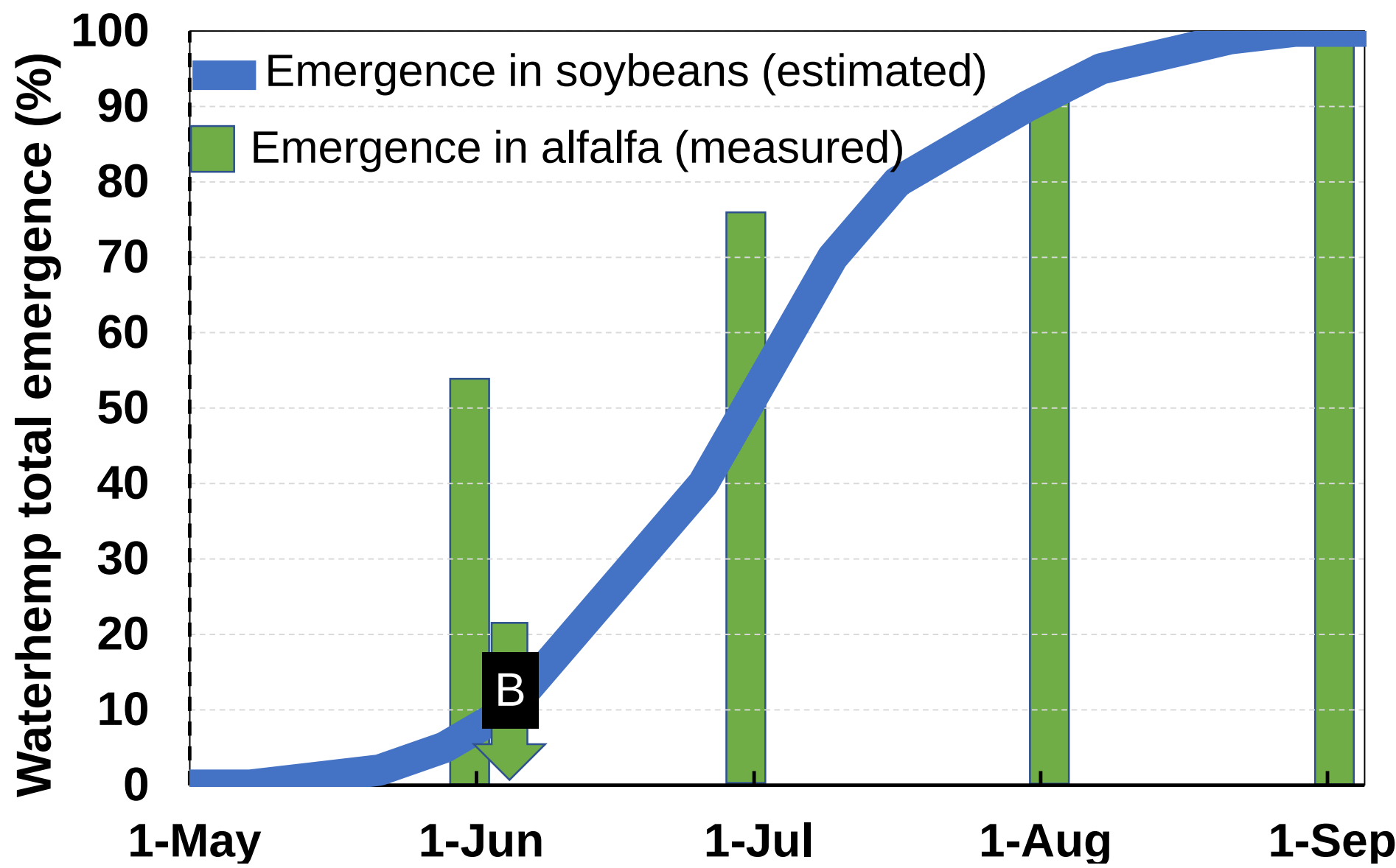
Results

- Aceto chlor applied on 6/3 or a split application of aceto chlor (6/3) and flumioxazin (7/7) resulted in the least waterhemp biomass (> 93% biomass reduction).
 - Flumioxazin and aceto chlor applied after the second harvest (7/7) resulted in 86 and 82% total waterhemp biomass reduction.
 - Flumioxazin applied after the first cut or pendimethalin applied at any timing were ineffective.
- None of the treatments reduced alfalfa or total forage production.
 - Waterhemp biomass was harvested in the 3rd and 4th cut only (data not shown).



Means within plant classes and rows followed by the same letter, or no letters, were not statistically different based on Fisher’s LSD test (α = 0.05)

Estimated waterhemp emergence and seed production patterns in established alfalfa



- >50% of waterhemp seedlings emerged immediately after the first harvest (6/2/19)
- Waterhemp plants were able to produce viable seeds after the 4th harvest in all treatments.

Conclusions

- Although treatments reduced waterhemp biomass, elimination of competition did not increase alfalfa yield compared to untreated treatments.
- Impacts on forage quality may occur during the 3rd and 4th harvest (testing).
- Lack of long-term control with flumioxazin suggests population is resistant (testing).
- Seed production was observed in all treatments suggesting other management approaches will be required to prevent waterhemp seed additions to the seedbank.
- Results will need to be repeated in space and time to confirm results (planned).