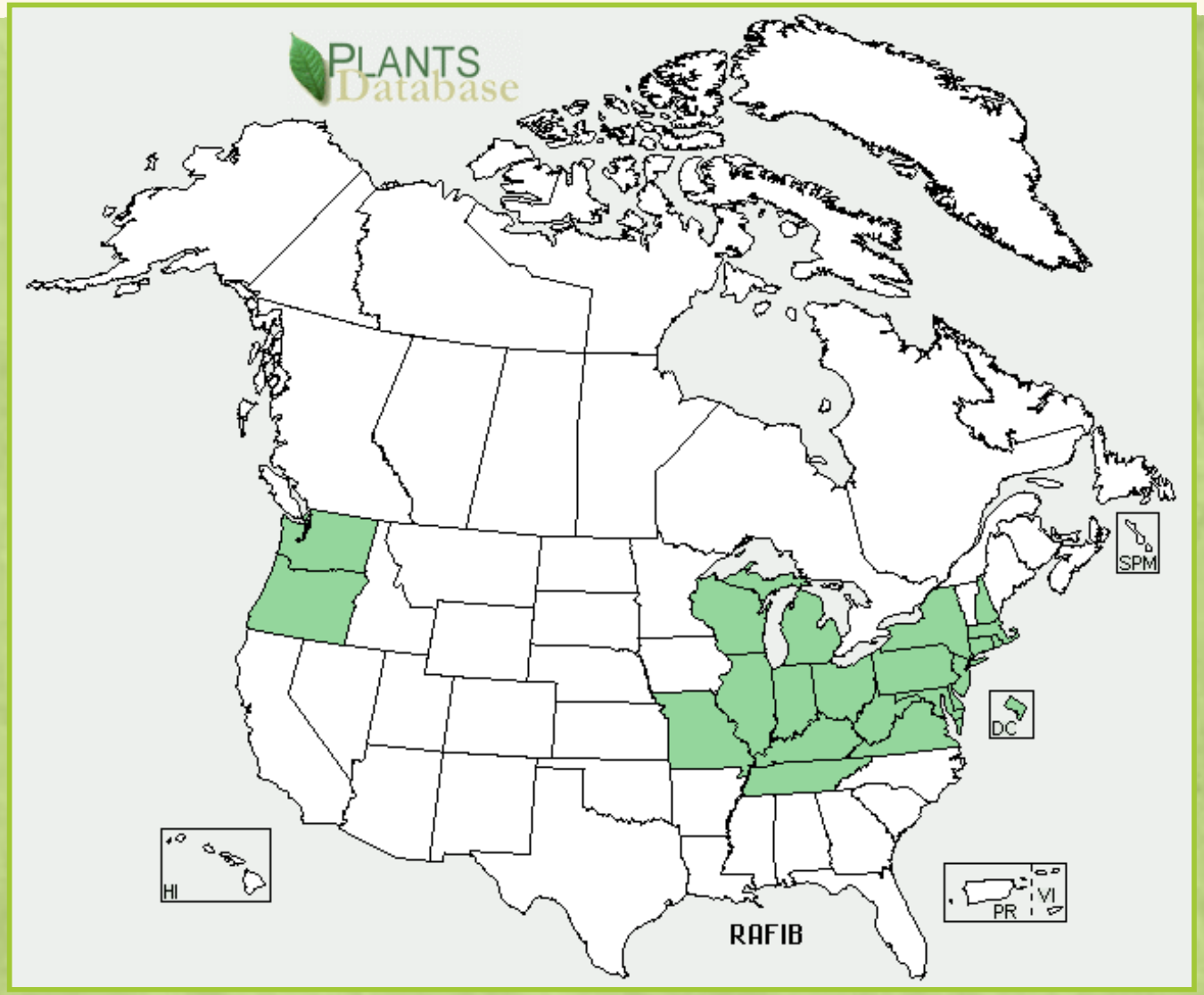
Understanding and mitigating impacts of lesser celandine (*Ranunculus ficaria*)

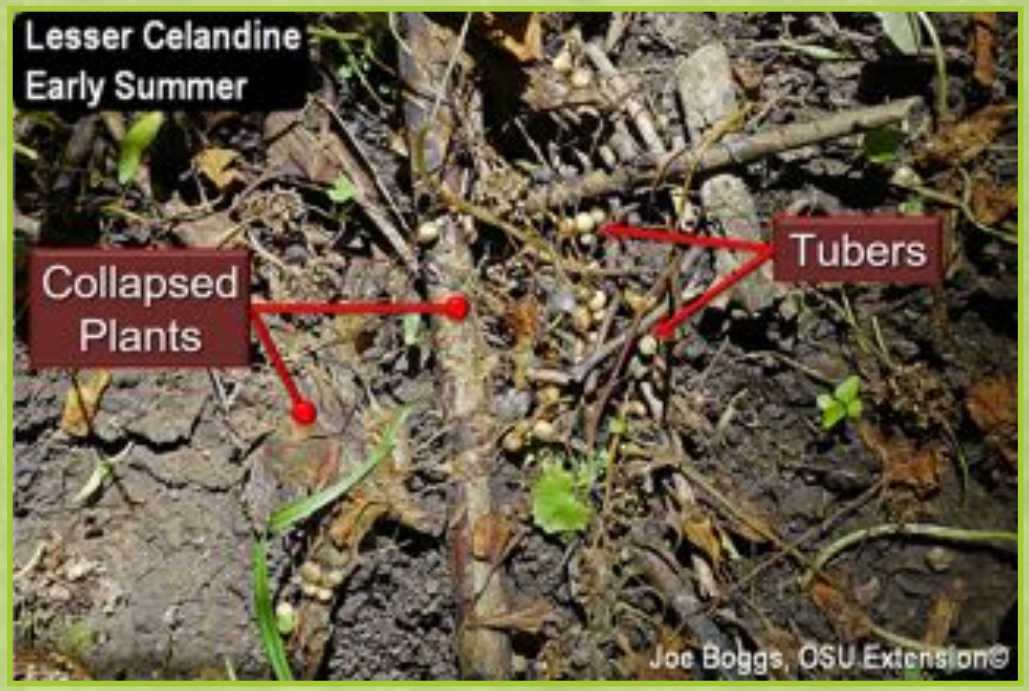
Kendra Cipollini, Wesley Flint, Anna Foote, Megan Greenawalt, Mallory Hill, Kelly Schradin, Kyle Titus, Crystal Wagner and Sarah Young

Wilmington College

HERBAL
EXTRACTS PLUS

Ranunculus ficaria var. *bulbosa* (Ranunculaceae)




Lesser Celandine
Early Summer
Collapsed Plants
Tubers
Joe Boggs, OSU Extension©

Phenology

Emergence

Senescence

February	March	April	May	June

Questions

- Does *R. ficaria* have a negative impact on native species in the field?
- Is there evidence of nutrient competition and/or allelopathy in the field?

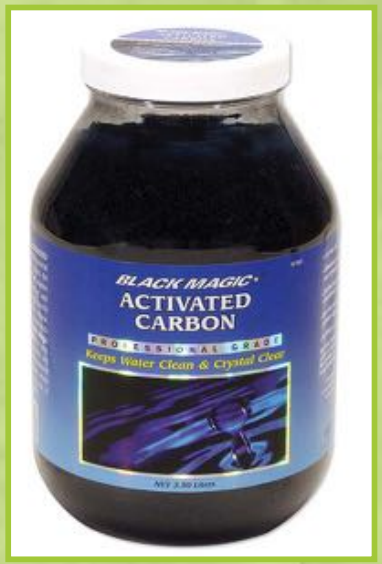
Guilty in the Court of Public Opinion: Testing Presumptive Impacts and Allelopathic Potential of Ranunculus ficaria

KENDRA A. CIPOLLINI[1] AND KELLY D. SCHRADIN

Am. Midl. Nat. (2011) 166:63–74

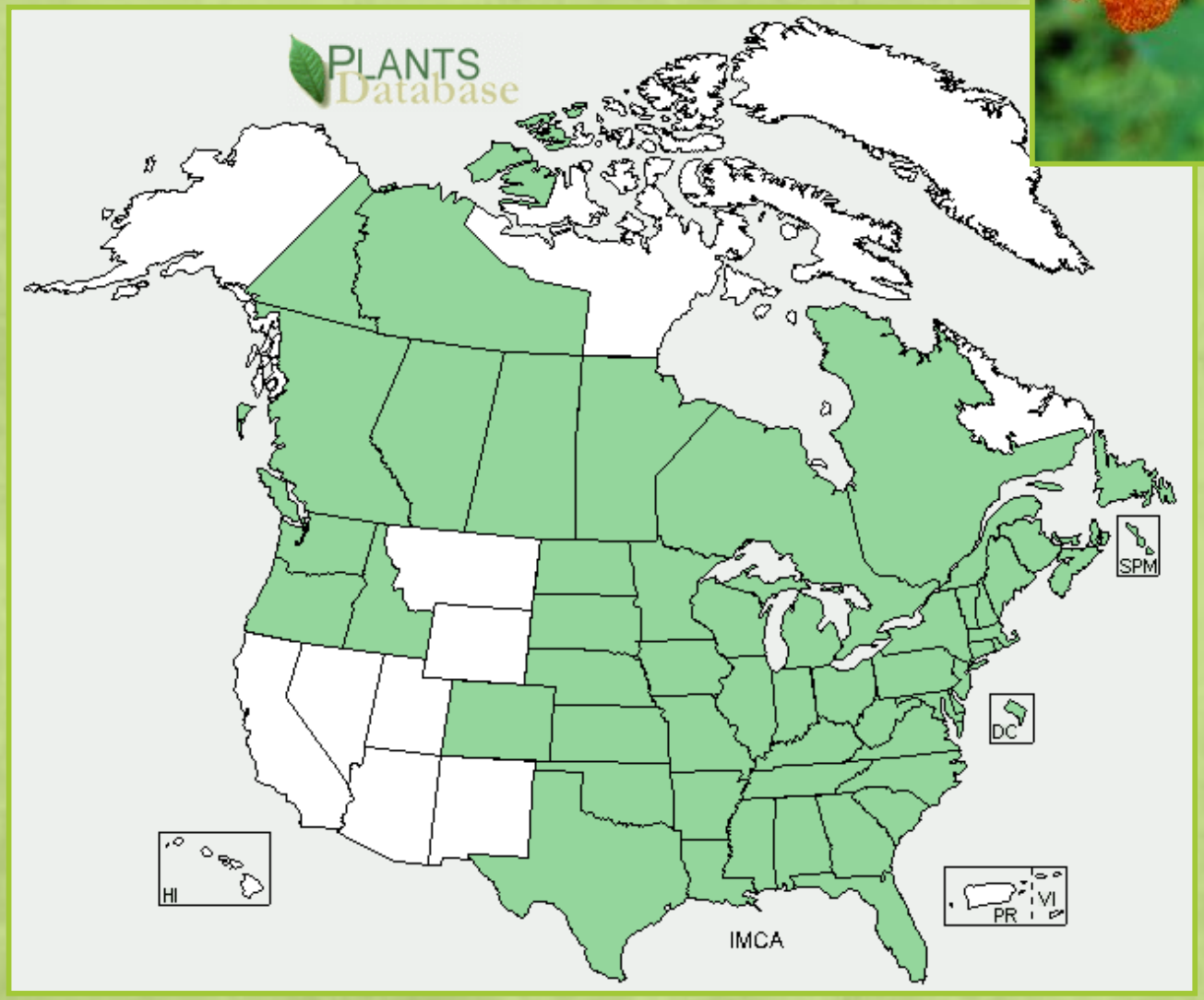
Field Experiment

- Fully factorial treatments replicated 4 times
  - *Ranunculus ficaria* (+/-)
  - Slow-release fertilizer (+/-)
  - Activated carbon (+/-)

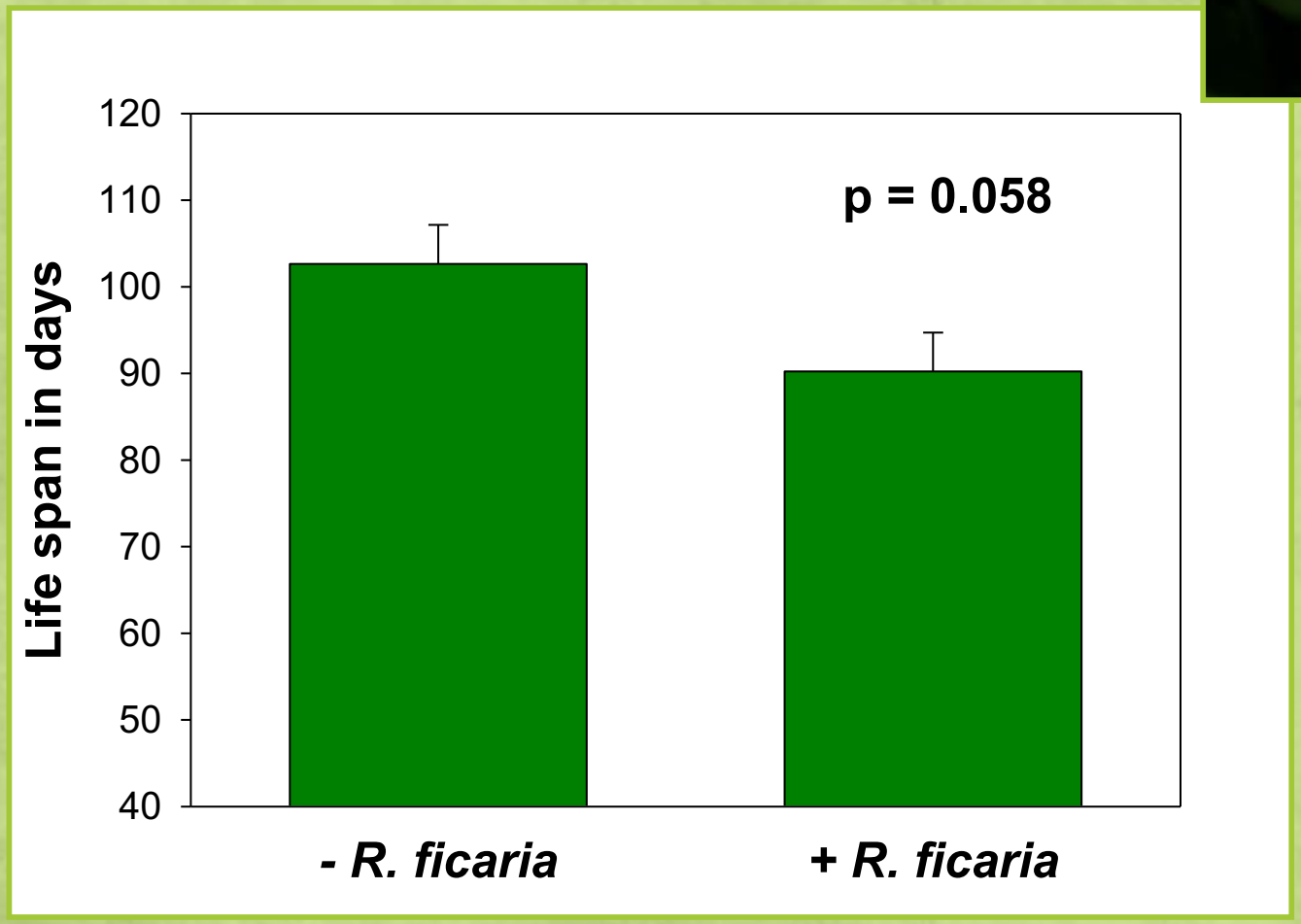


MICHIGAN
Ohio
Lake Erie
Toledo
Sandusky
Cleveland
Bowling Green
Warren
Findlay
Cuyahoga Falls
Youngstown
Akron
PA
Mansfield
Canton
Lima
Marion
Steubenville
INDIANA
OHIO
Newark
Columbus
Zanesville
Springfield
Dayton
Lancaster
Middletown
Hamilton
Cincinnati
WEST VIRGINIA
Portsmouth
0 25 50 mi
0 25 50 km
KENTUCKY
Charleston

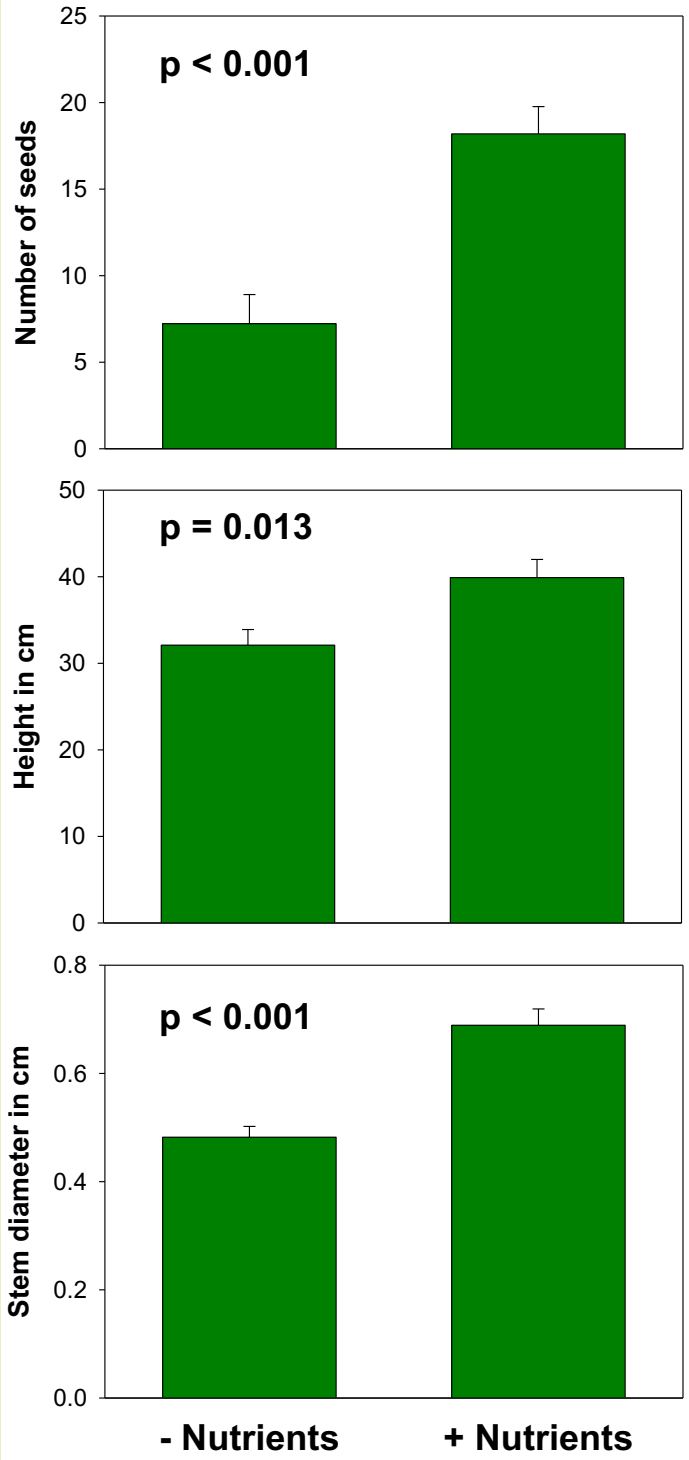
Impatiens capensis



May-August 2009

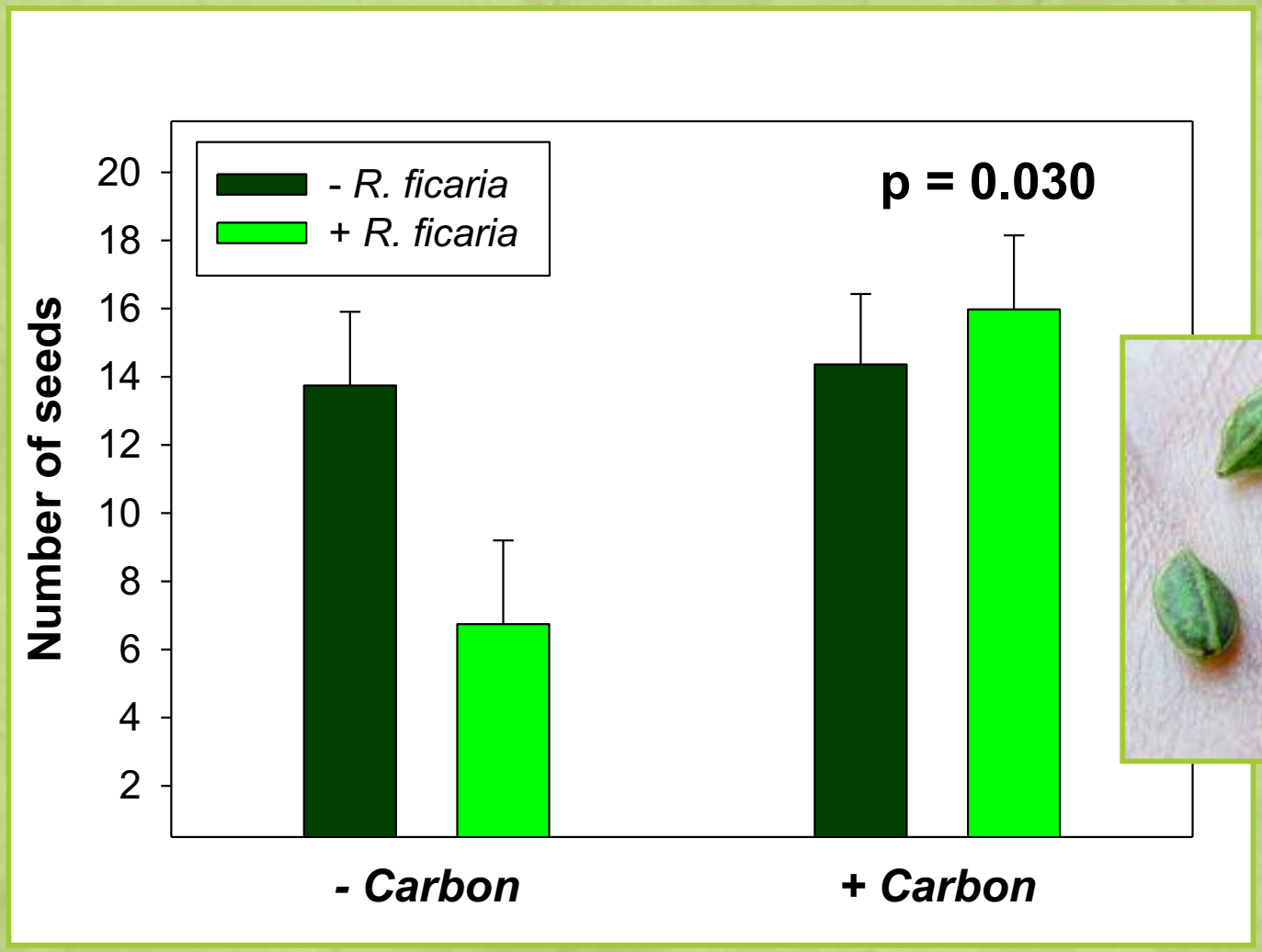


Survival tended to be reduced by presence of *R. ficaria*



Effect of interaction of presence of nutrients and *R. ficaria* is not significant

Carbon mitigates the negative effect of *R. ficaria*



Emergence

Senescence

February	March	April	May	June	July	August

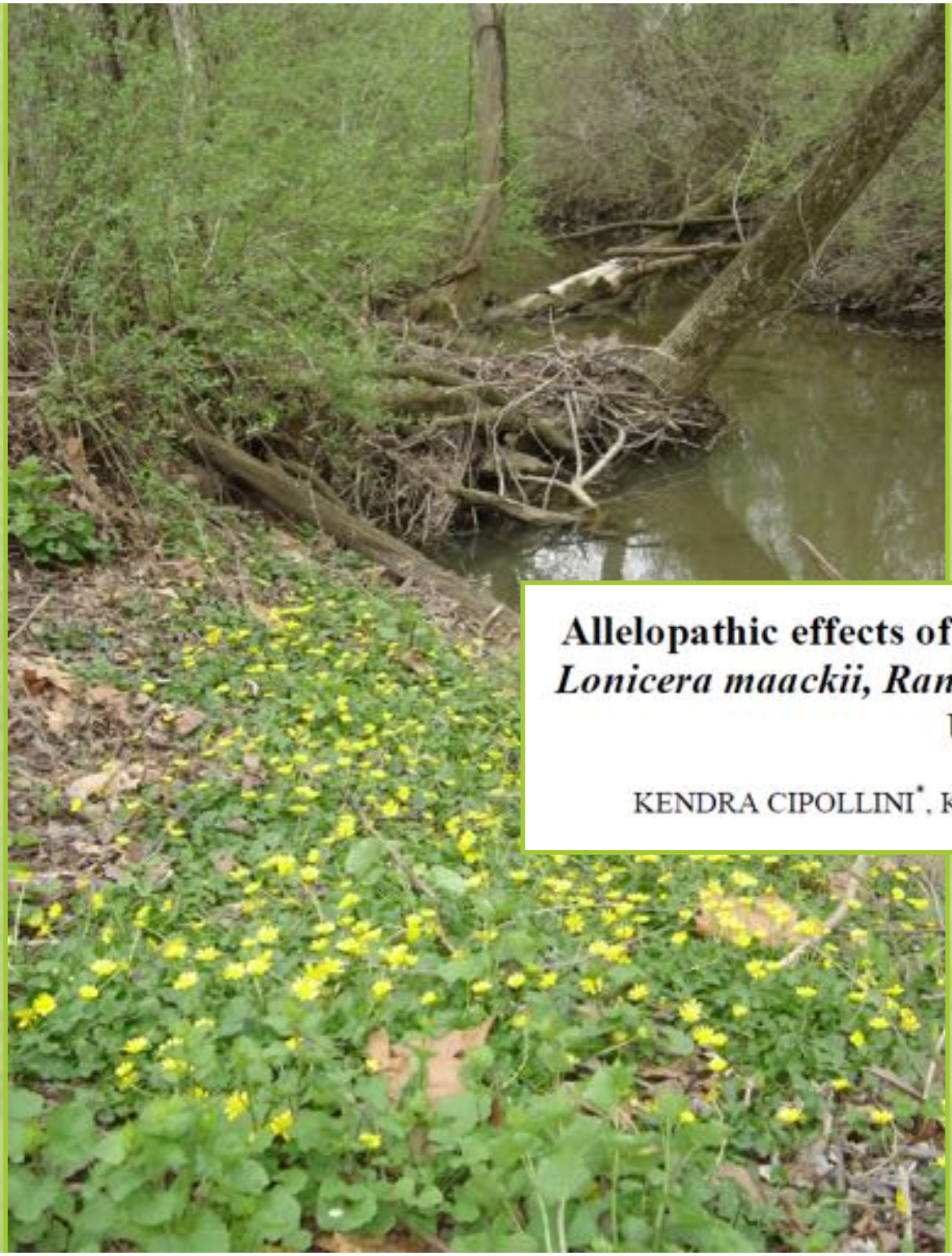
Impatiens capensis experiment

Questions

- What is the comparative allelopathic effect of *R. ficaria* in relation to known allelopathic invaders?
- Does the allelopathic effect vary with target test species and with extract type (root or shoot)?


2000 mL
PYREX
2000
KIMAX
KIMBLE
2000
KIMAX
KIMBLE


L. maakii
R. fictria
A. petiolata

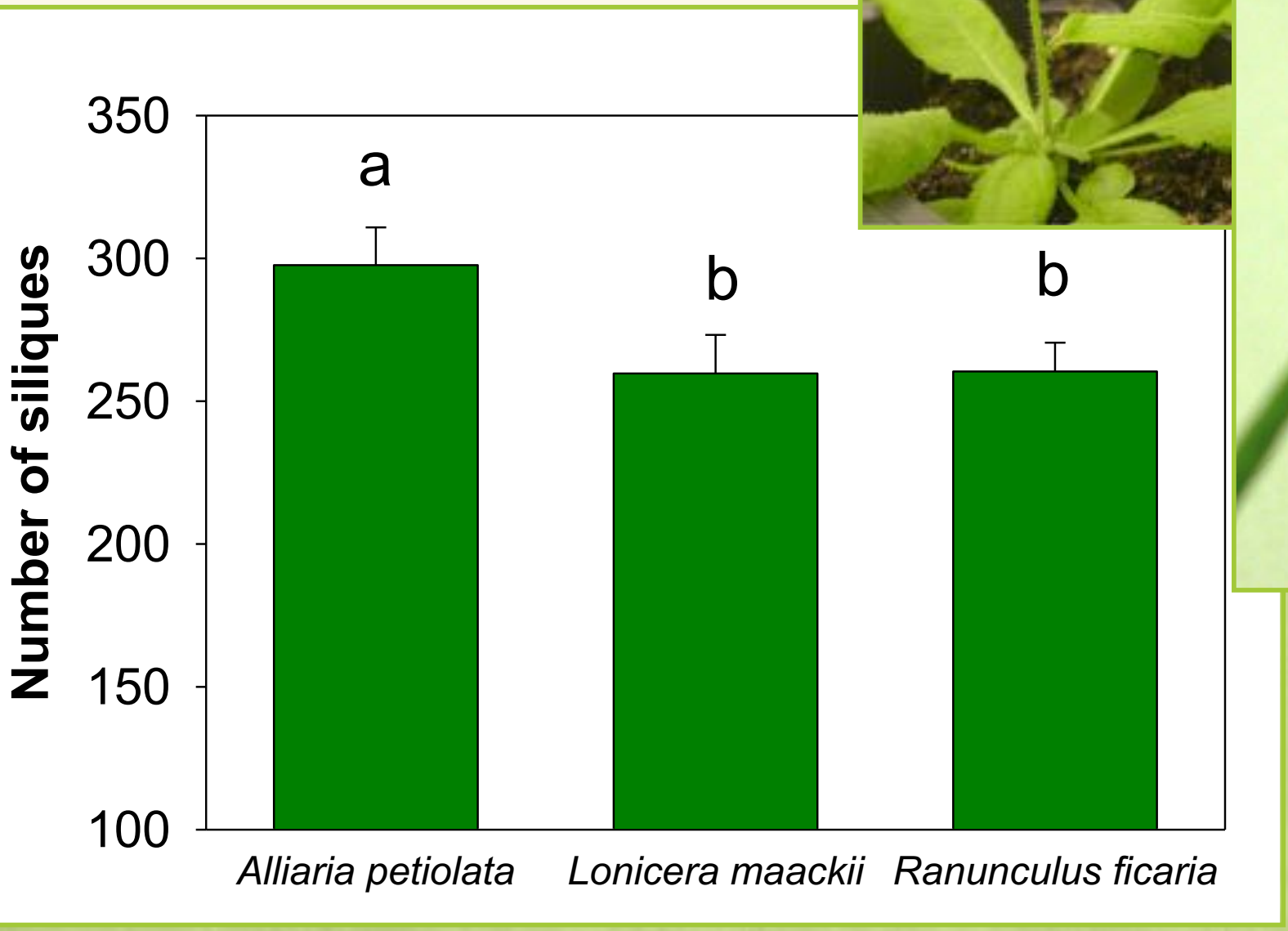


Allelopathic effects of invasive species (*Alliaria petiolata, Lonicera maackii, Ranunculus ficaria*) in the Midwestern United States

KENDRA CIPOLLINI*, KYLE TITUS[1] AND CRYSTAL WAGNER[2].

Allelopathy Journal 29 (1): 63-76 (2012)

R. ficaria reduces reproduction in field soil

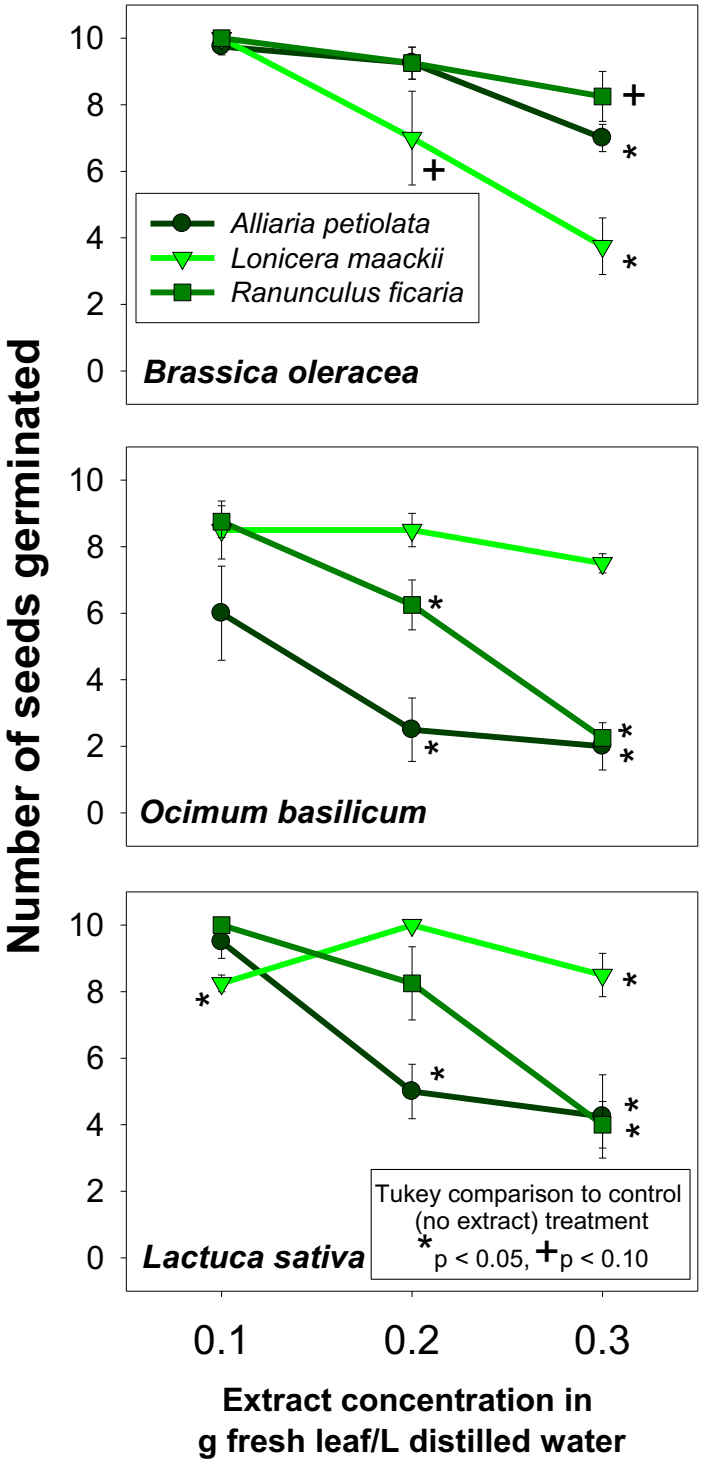


Cabbage
(Brassica olerecea)
Brassicaceae

Basil
(*Ocimum basilicum*)
Lamiaceae

Leaf Lettuce
(*Lactuca sativa*)
Asteraceae

Effect of the interaction of extract concentration, extract species and test species on germination is significant



Comparing Allelopathic Effects of Root and Leaf Extracts of Invasive *Alliaria petiolata, Lonicera maackii* and *Ranunculus ficaria* on Germination of Three Native Woodland Plants

Kendra A. Cipollini[1] and Wesley N. Flint, Department of Biology, Wilmington College, Wilmington, Ohio, USA

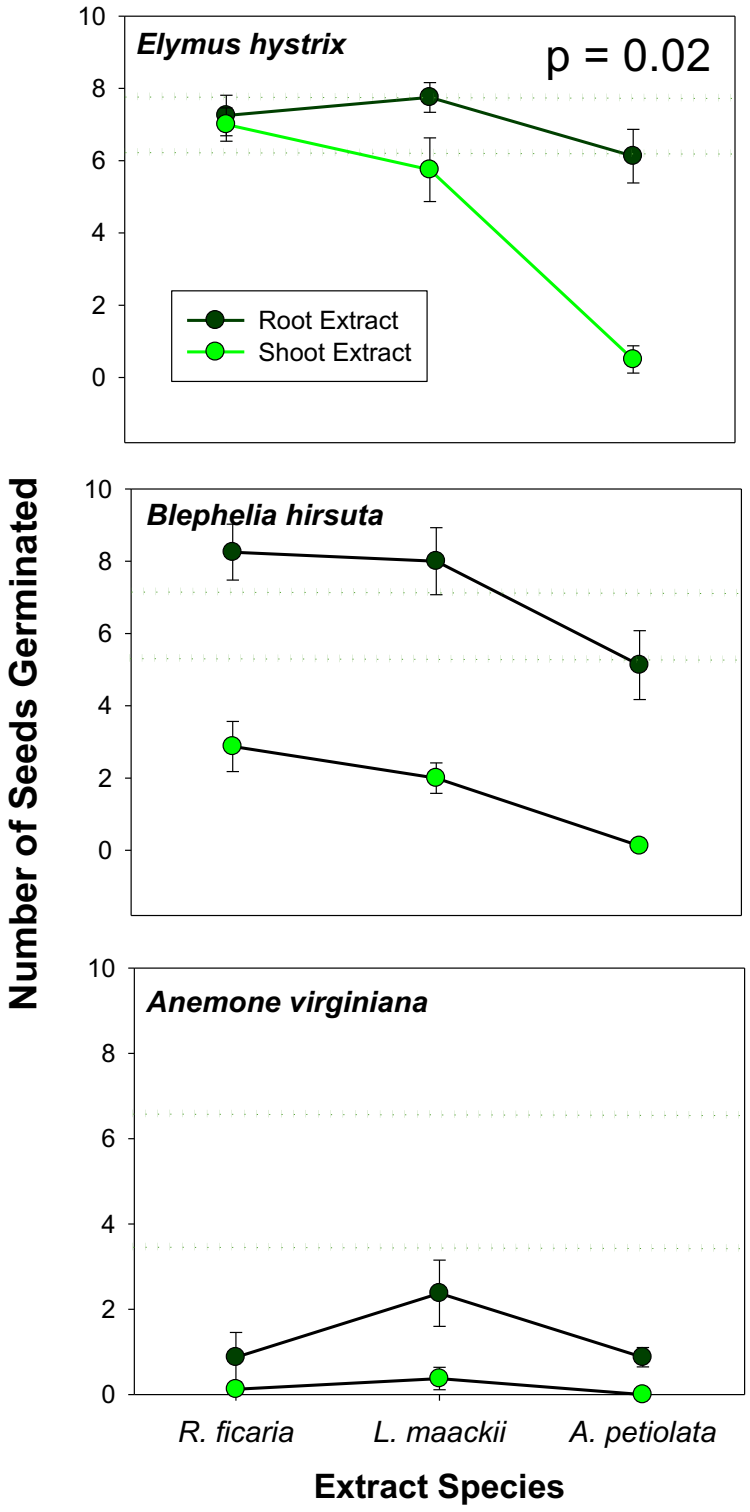
OHIO J SCI 112(2): 37-43

Bottlebrush grass
(Elymus hystrix)
Poaceae

Hairy wood mint
(*Blephelia hirsuta*)
Lamiaceae

Tall thimbleweed
(*Anemone virginiana*)
Ranunculaceae

Effect of the interaction of extract type, extract species and test species on germination is significant



Oriental bittersweet
(Celastrus orbiculatus)
Celastraceae

Lesser celandine
(Ranunculus ficaria)
Ranunculaceae

Garlic mustard
(Alliaria petiolata)
Brassicaceae

Amur honeysuckle
(Lonicera maackii)
Caprifoliaceae

Japanese stiltgrass
(Microstegium vimineum)
Poaceae

Comparison of allelopathic effects of five invasive species on two native species[1]

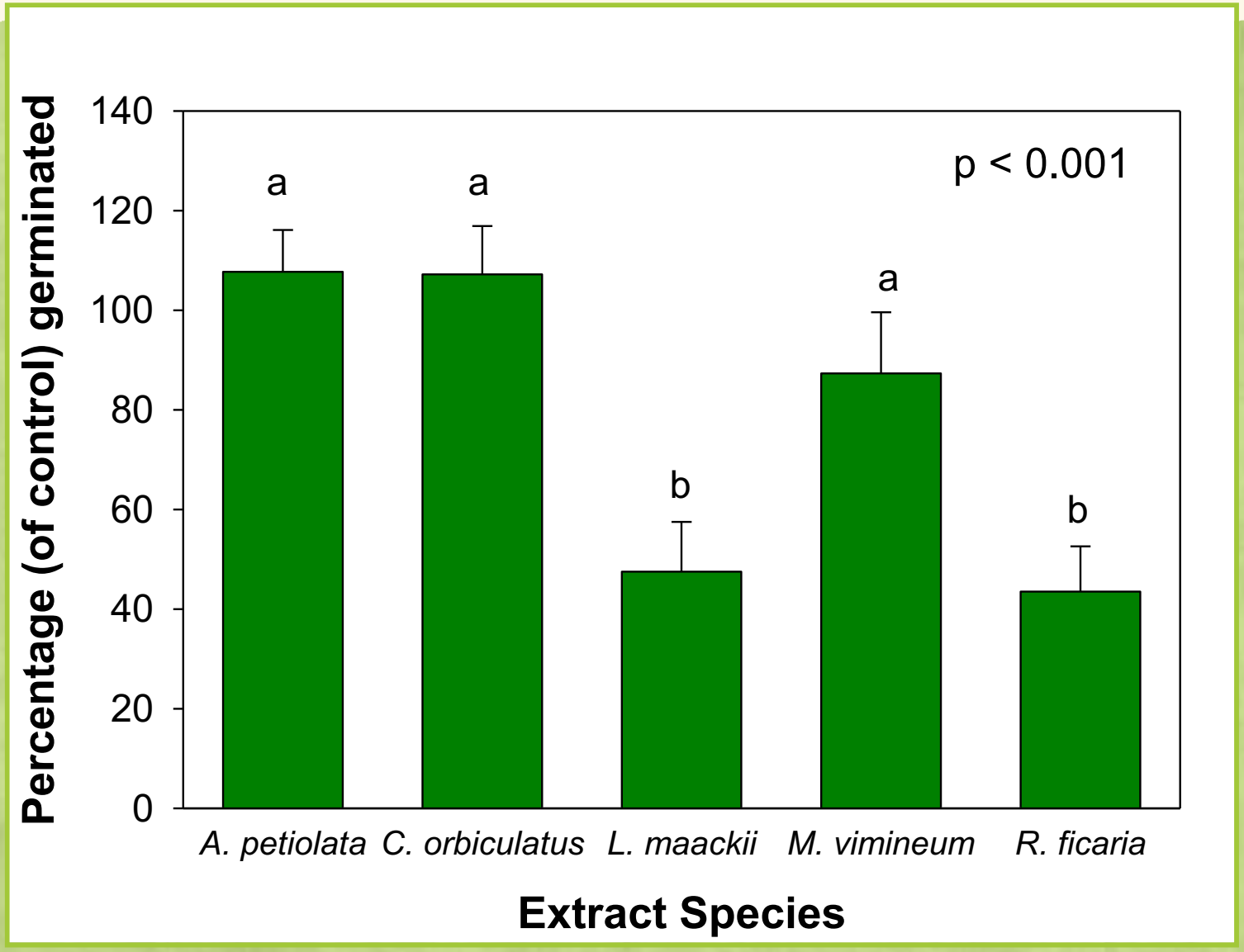
Kendra Cipollini[2] **and Megan Greenawalt Bohrer**
Wilmington College, Wilmington, OH 45177

Journal of the Torrey Botanical Society 143(4): 427–436, 2016.

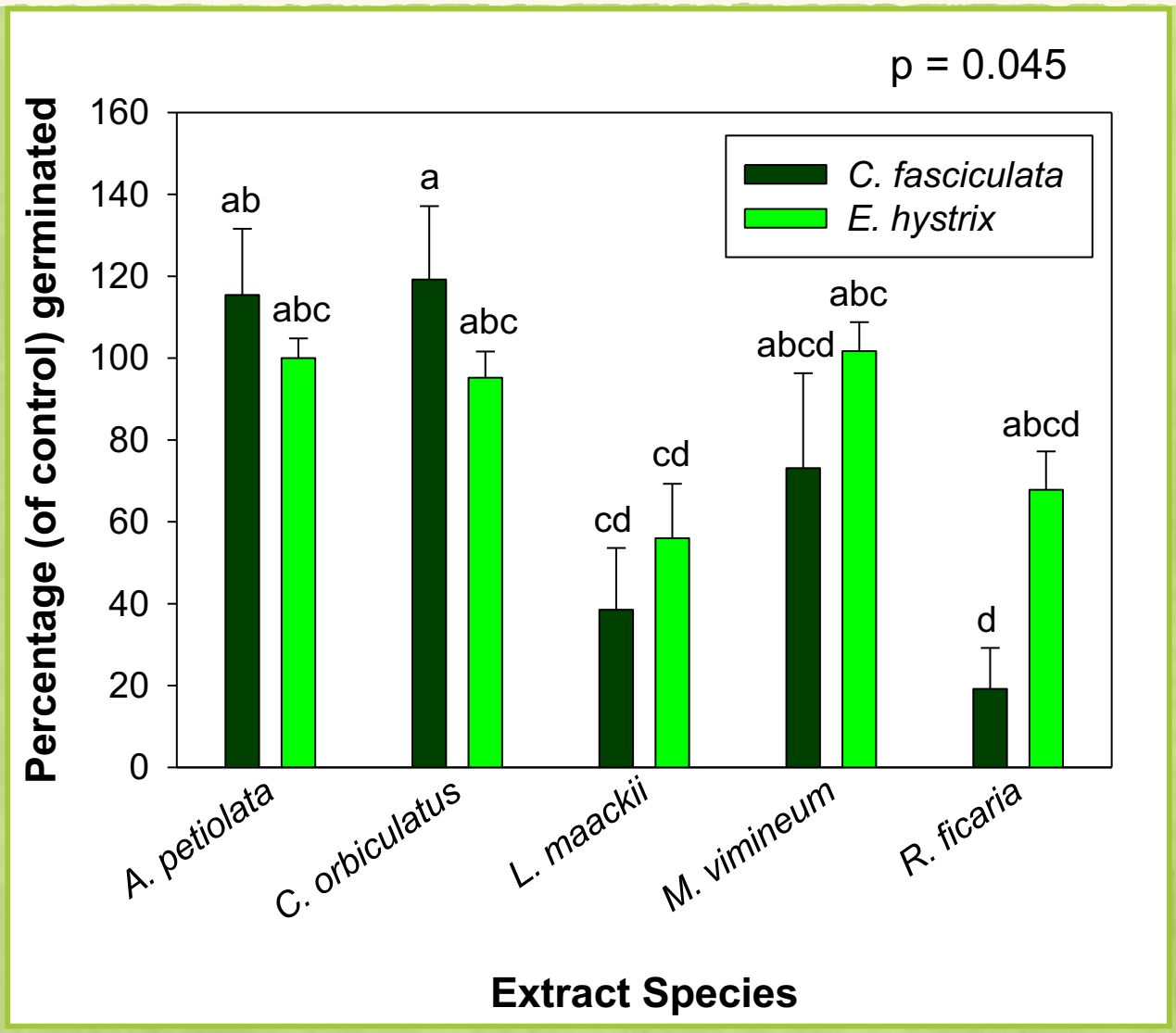
Bottlebrush grass
(Elymus hystrix)
Poaceae

Partridge pea
(*Chamaecrista fasciculata*)
Fabaceae

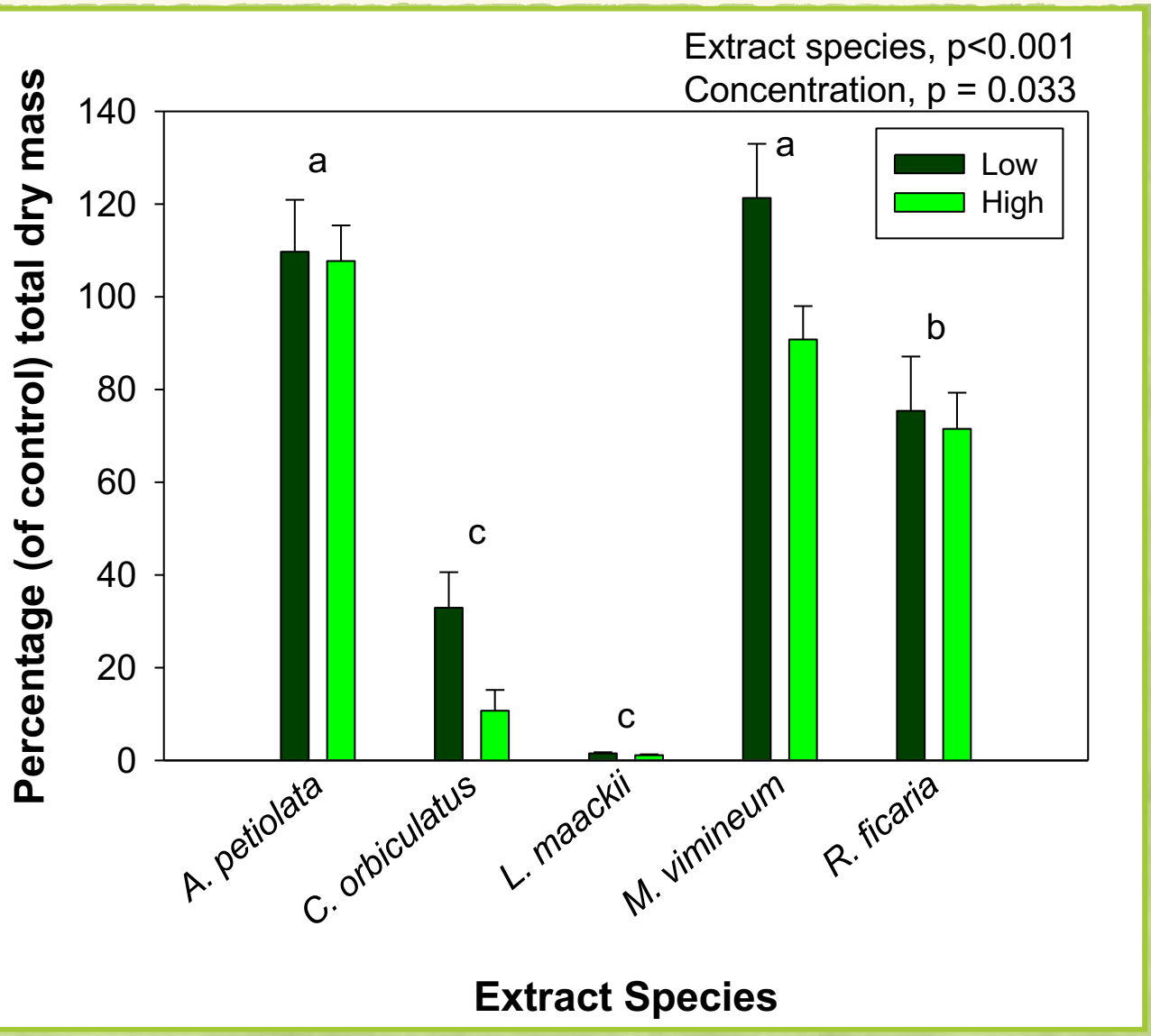
Greatest inhibition by *L. maackii* and *R. ficaria* across both test species



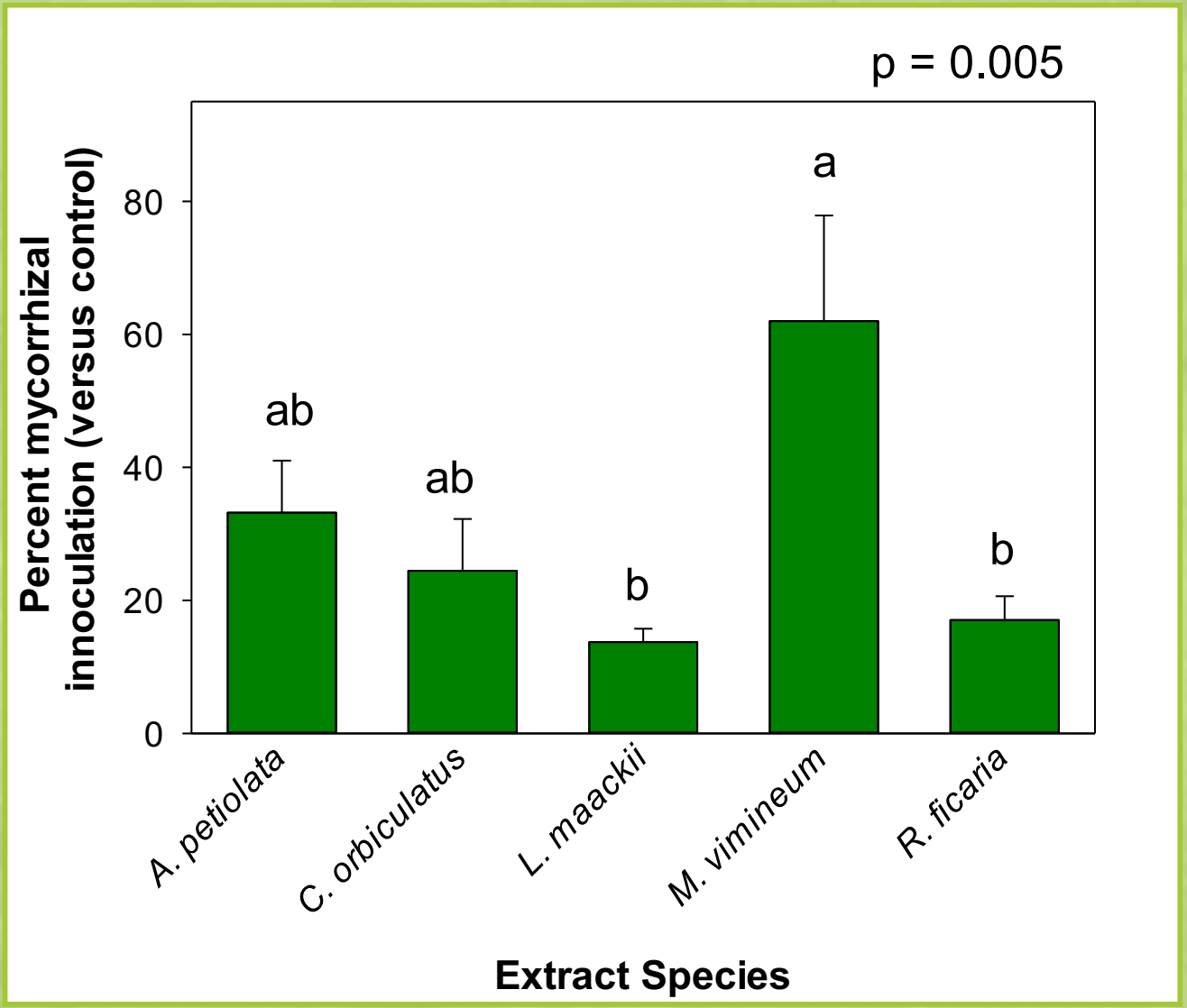
Germination of C. fasciculata was more sensitive to *L. maackii*, *M. vimineum* and *R. ficaria*

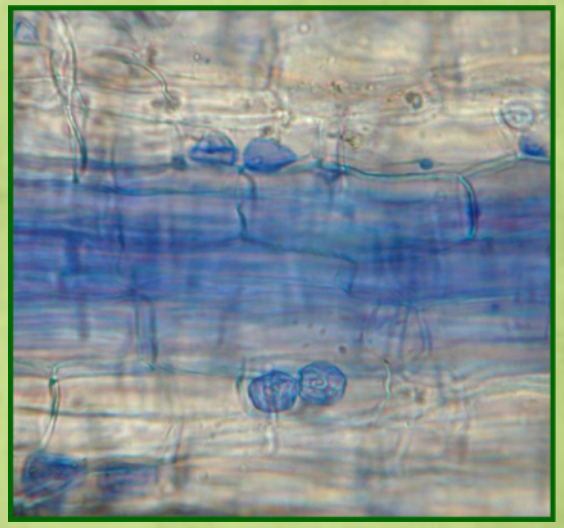


Growth of *E. hystrix* was negatively affected by *L. maackii*, *C. orbiculatus*, followed by *R. ficaria;* Effect increased with concentration overall



Less mycorrhizae with *L. maackii* and *R. ficaria*





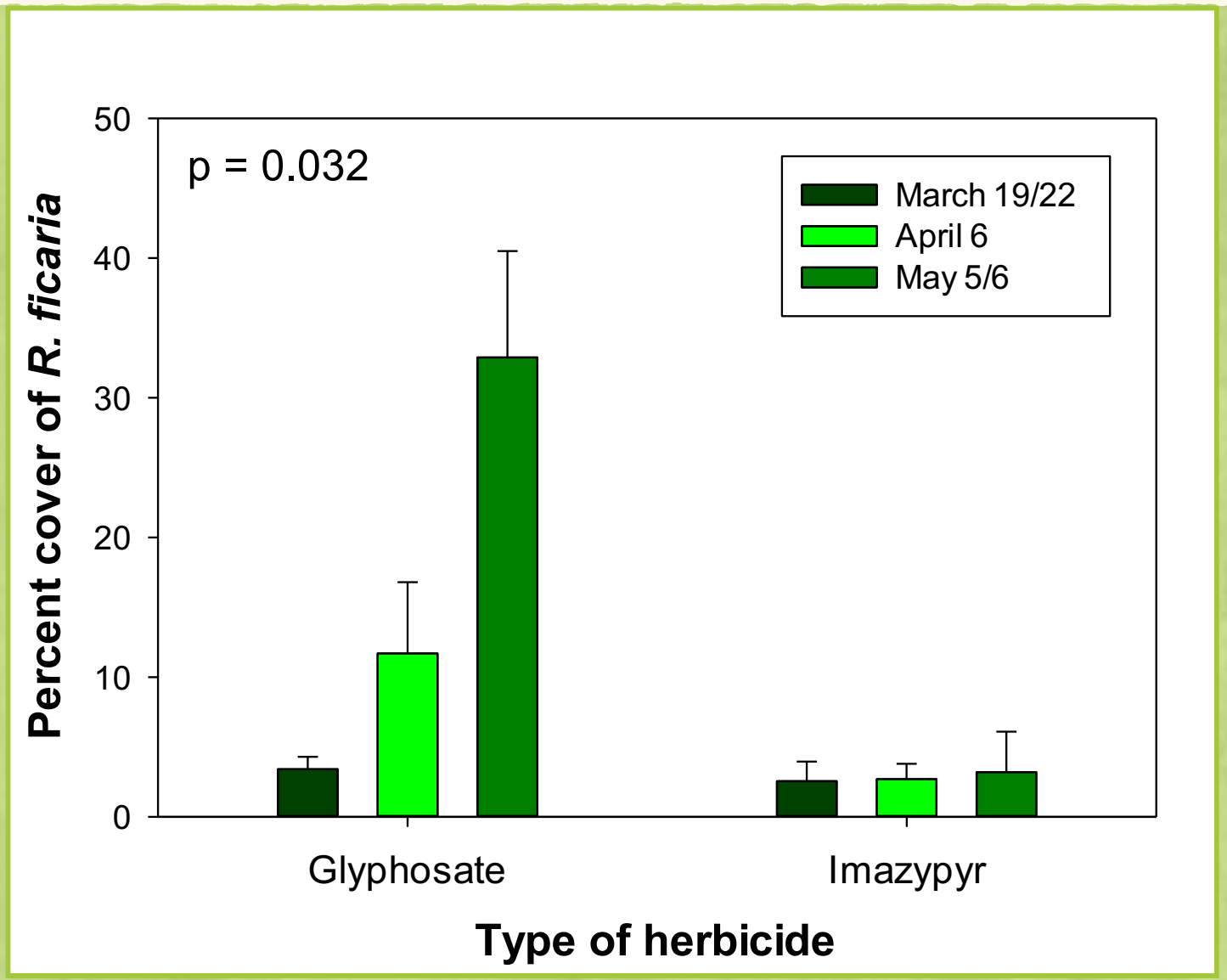
Questions

- What is the best type of herbicide, concentration of herbicide and time of application for control of *R. ficaria* and recovery of native species?

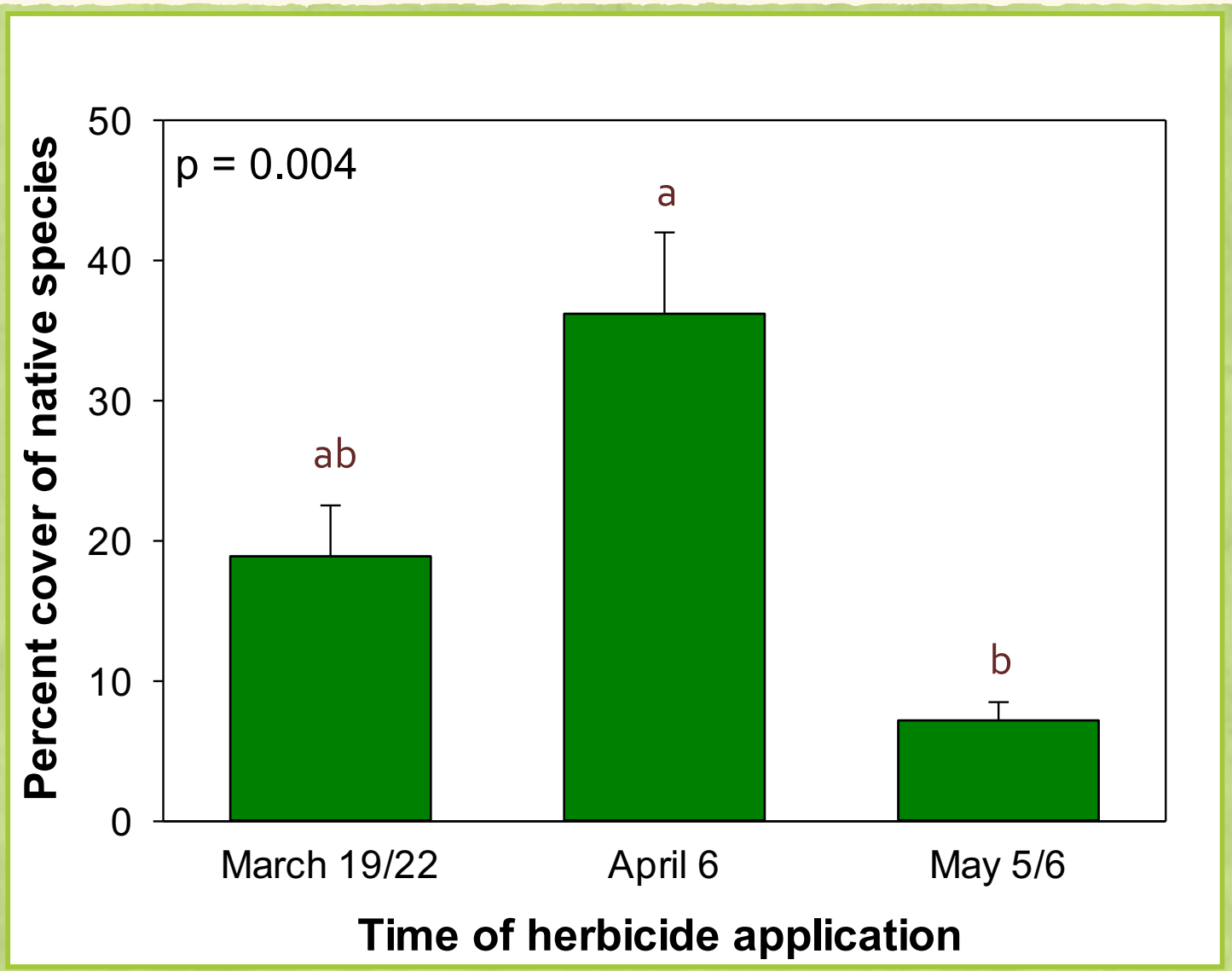
Field Experiment

- Fully factorial treatments at three invaded sites (surfactant used in all treatments)
  - Herbicide type (glyphosate/imazapyr)
  - Herbicide concentration (1.5%/3% v/v)
  - Timing of application (pre-flower, flower, post-flower)
- Measured one year after treatments for native species richness and cover of *R. ficaria*

Effectiveness of control declines with time of application for glyphosate



Across both herbicides, best native species cover with April application



Early-Season Treatment of Fig Buttercup (*Ranunculus ficaria*)

Mark N. Frey and John Paul Schmit*

Invasive Plant Science and Management 2017

Conclusions

- *Ranunculus ficaria* negatively affects survival and reproduction of *I. capensis* in the field, even with short temporal overlap in growing seasons
- Activated carbon ameliorates negative effect of *R. ficaria* in the field
- Extracts of *R. ficaria* affect reproduction, germination and growth; the effect varies with target species and type of tissue
- Best control of *R. ficaria* and recovery of native species was found using imazapyr during the flowering period (early April), followed by glyphosate or imazapyr during pre-flowering period (mid-March)
  - 1.5% works as well as 3%

Acknowledgments

- Sara Moore
- Tom Borgman

Hamilton County Park District

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