Feeding preferences of the generalist insect herbivore, *Melanoplus femurrubrum* grasshopper, on invasive and native plants

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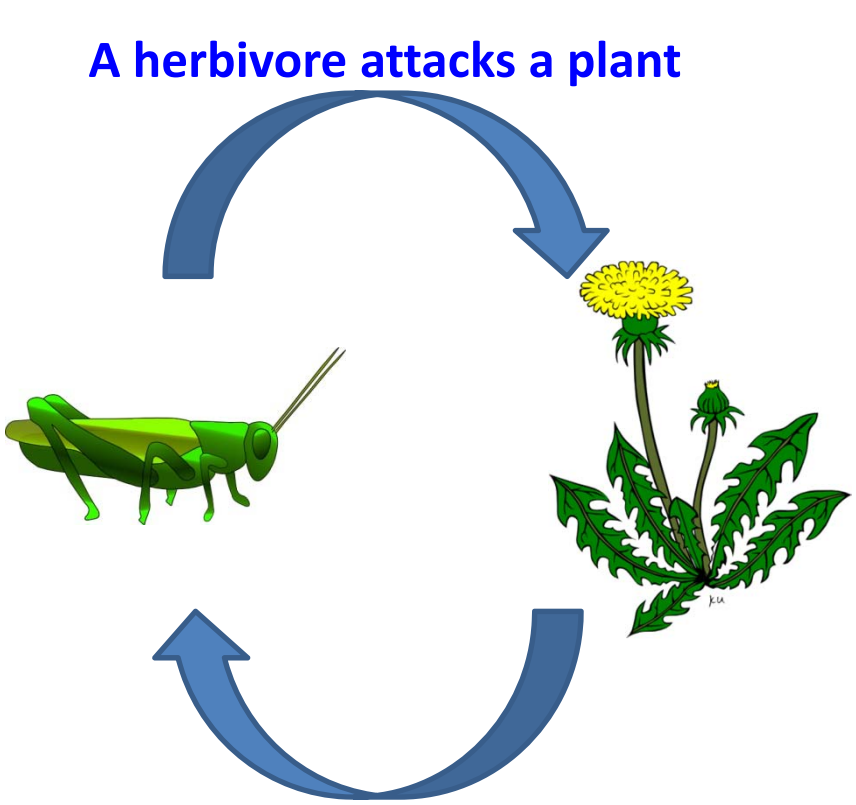
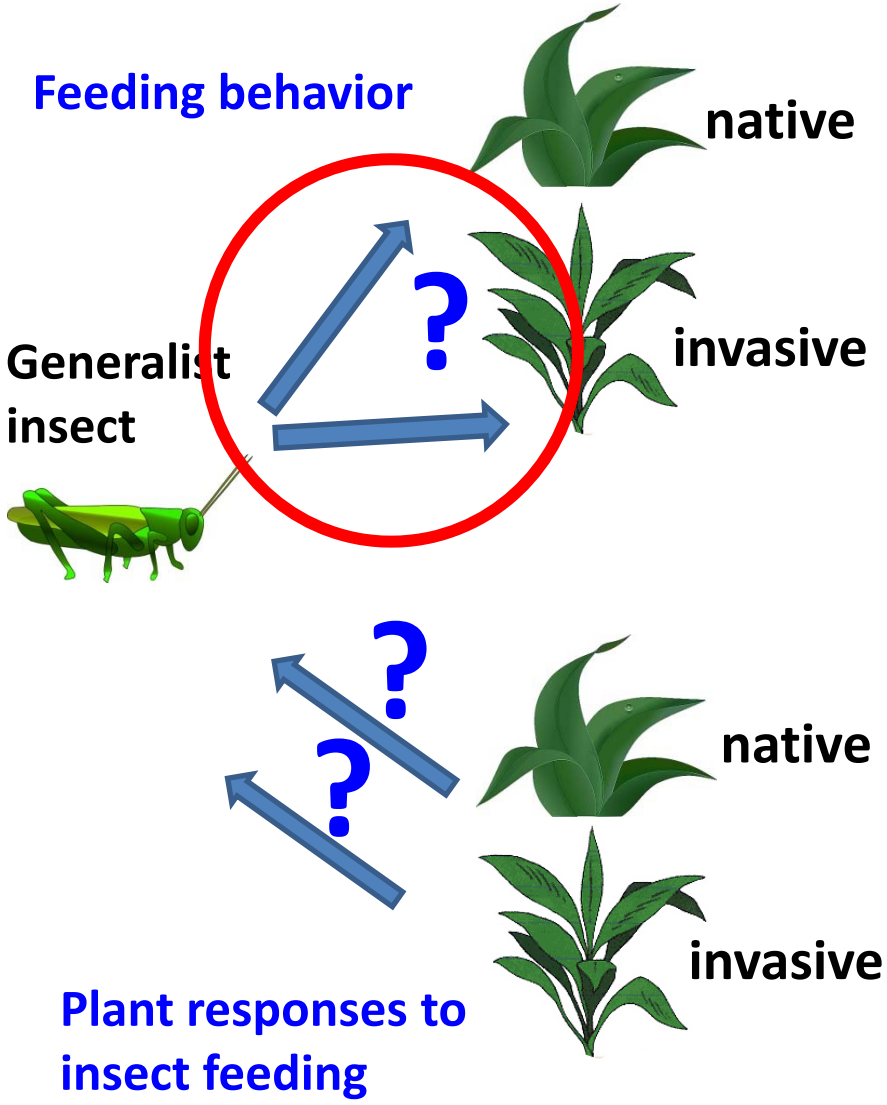
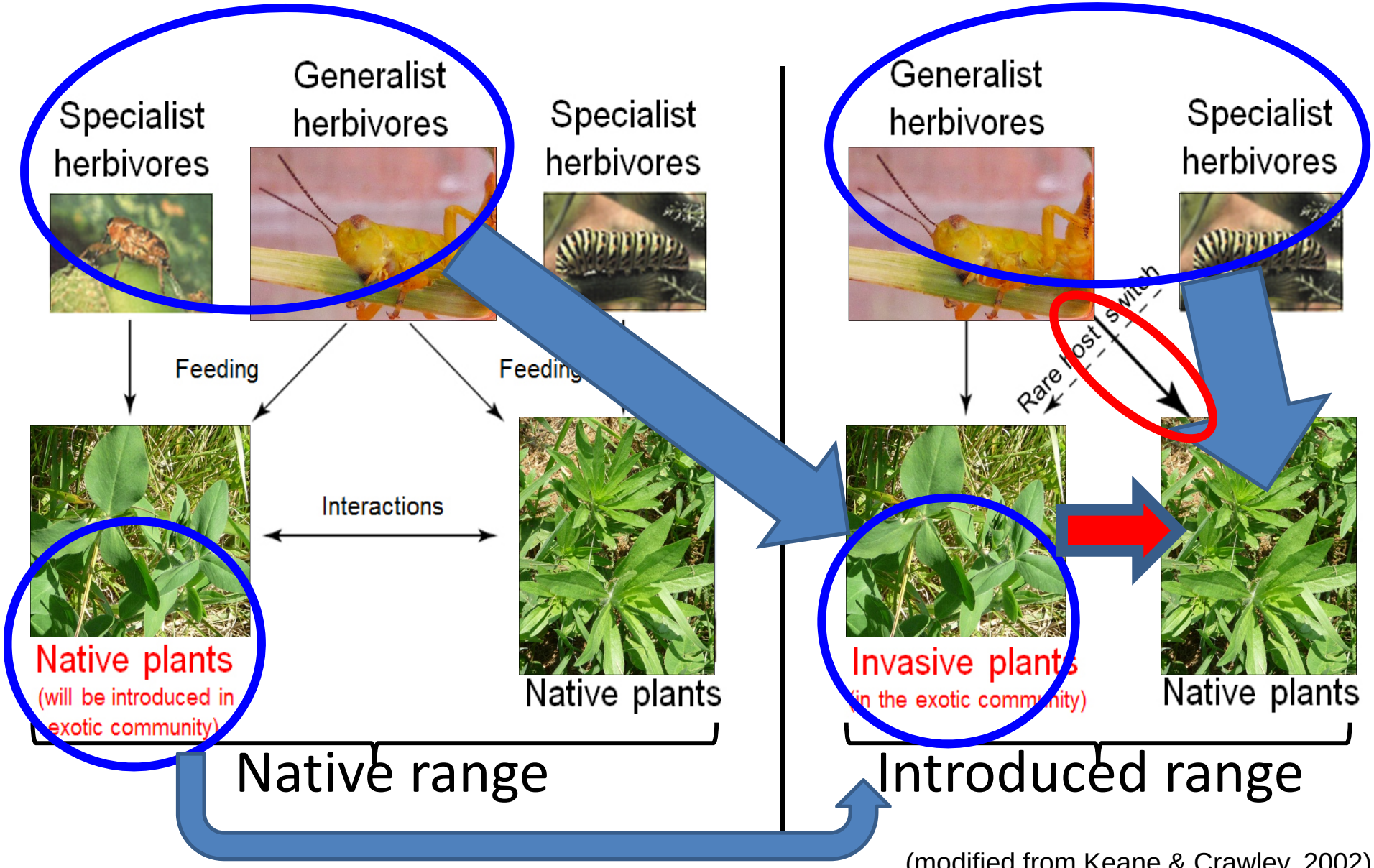
The interaction between plants and insect herbivores





Enemy Release Hypothesis

(Darwin 1859, Williams 1954, Elton 1958, Gillett 1962)



(modified from Keane & Crawley, 2002)

Main question

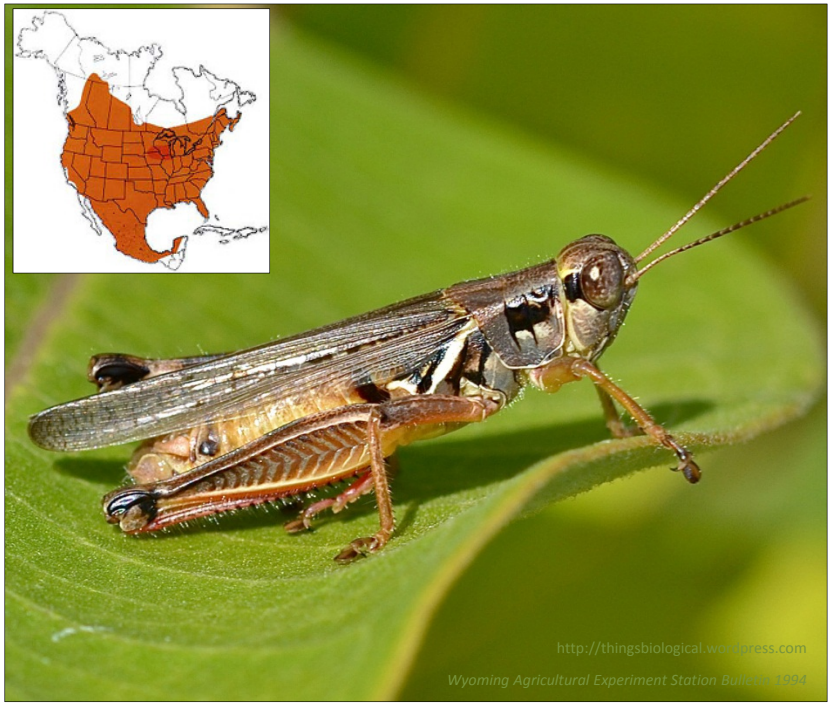
Do generalist herbivores prefer to feed on native plants rather than on invasive plants?

- Generalist grasshoppers feed on a wide variety of plants
- They often switch between plants
- They prefer new food

Main hypothesis

Melanoplus femurrubrum grasshoppers will be more active and feed more on invasive plant species.

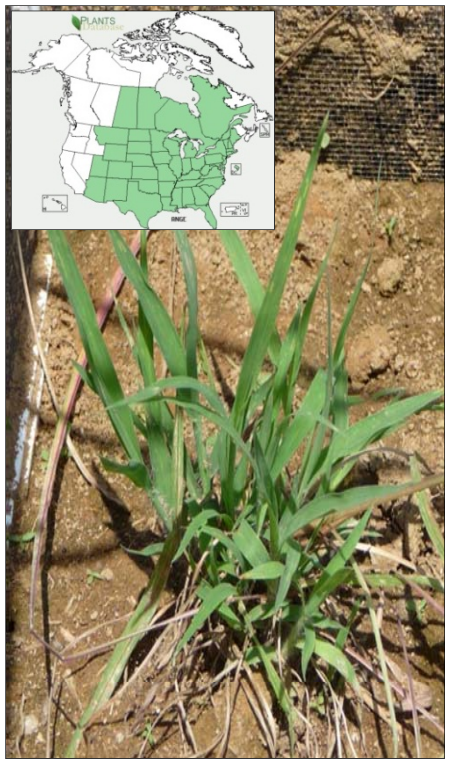
Study Organisms



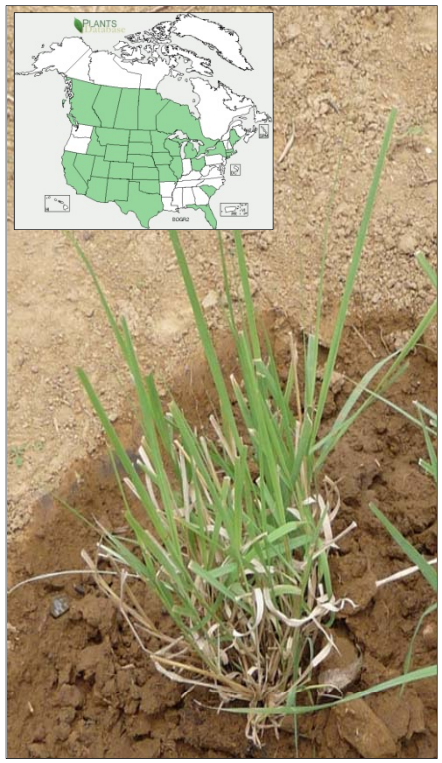
Melanoplus femurrubrum
(Orthoptera: Acrididae)

Red-legged Grasshopper

Study Organisms (cont.)



Andropogon Gerardii
Big Bluestem



Bouteloua Curtipendula
Sideoats Grama

Miscanthus sinensis 'Zebrinus'
Zebra Grass

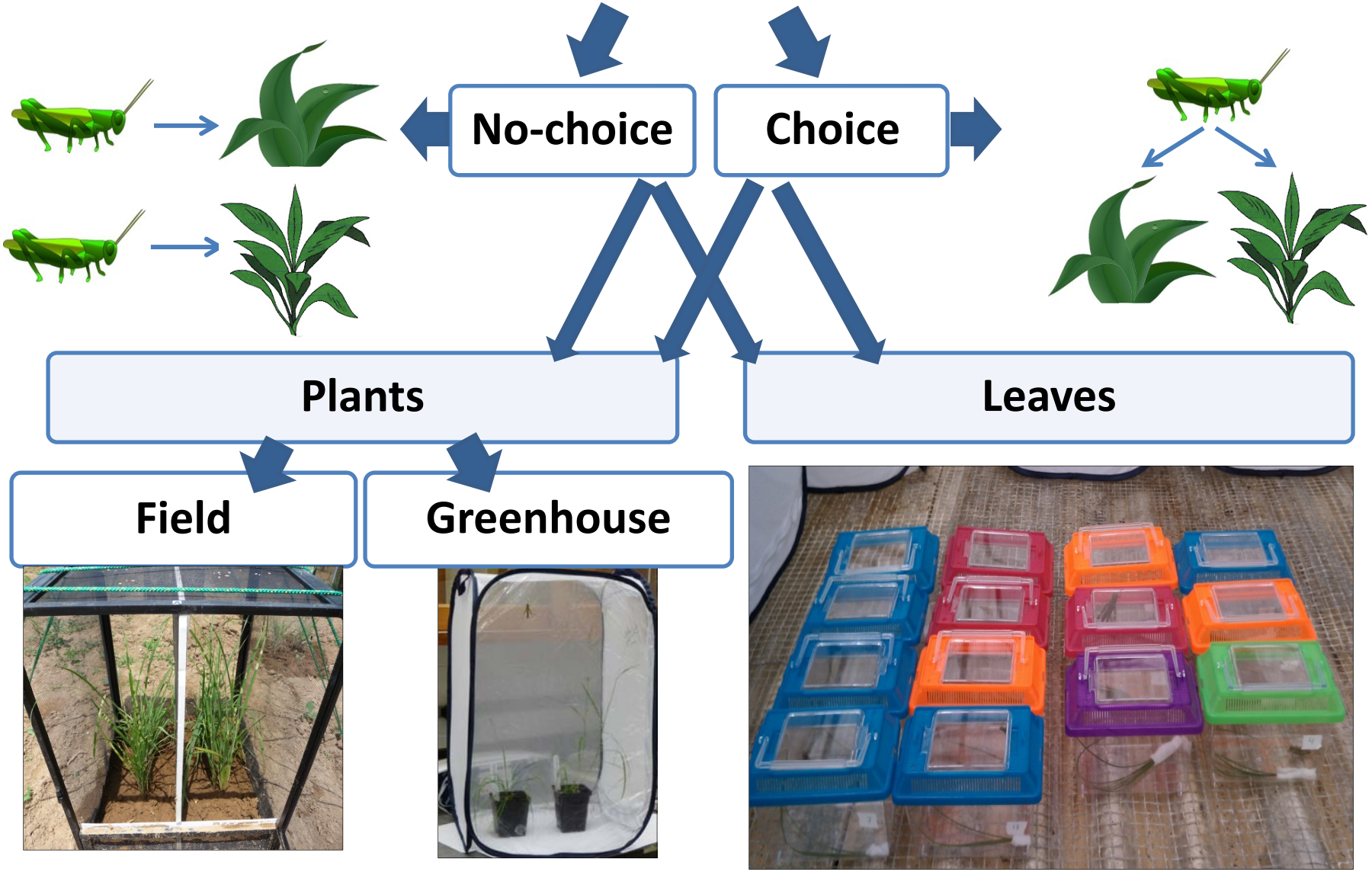
Miscanthus sinensis 'Gracillimus'
Maiden Grass

Native grasses

Invasive grasses

Family: Poaceae

Feeding experiments



Study Sites

Western Maryland Research and Education Center (MD)

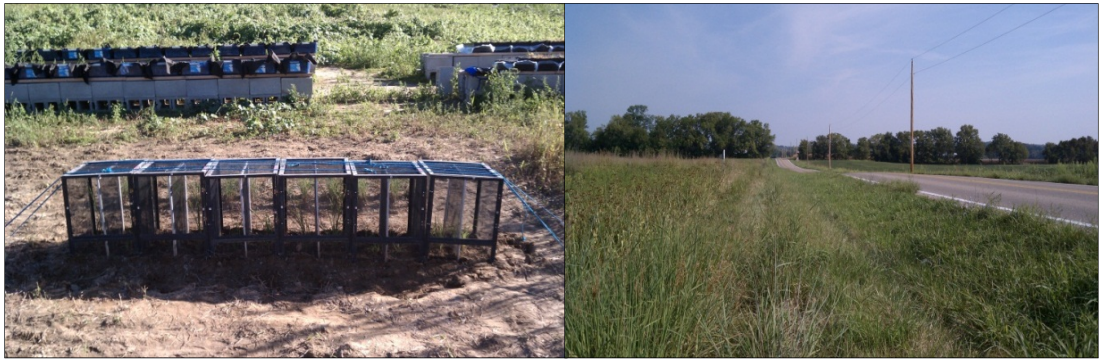
Experiments with nymphs

Cincinnati Center for Field Studies (OH)

Experiments with adult grasshoppers

University of Cincinnati Greenhouse (OH)

Experiments with adult grasshoppers

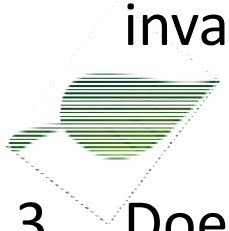


Main hypothesis

Melanoplus femurrubrum grasshoppers will be more active and feed more on invasive plant species.

Research questions

1. Does leaf damage from grasshoppers differ in native and invasive plants?
2. Does feeding activity of grasshoppers differ on native and invasive plants?



3. Does food intake of grasshopper differ on native and invasive plants?
4. Does feeding rate of grasshopper differ on native and invasive plants?

Measurements

Leaf damage: Volume of the grazed portion [length × width × depth of "scars", mm^3]

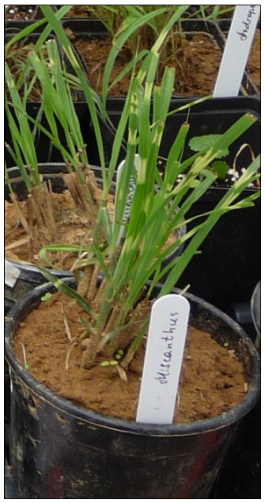
Feeding activity: Frequency of "scarring" [number of scars/number of leaves]

Food intake: Weight of food consumed [food offered-food not eaten, g]

Feeding rate: [food intake/grasshopper weight, g/g/d]

Results: Greenhouse experiments

Andropogon gerardii
Big Bluestem



Miscanthus sinensis 'Zebrinus'
Zebra Grass

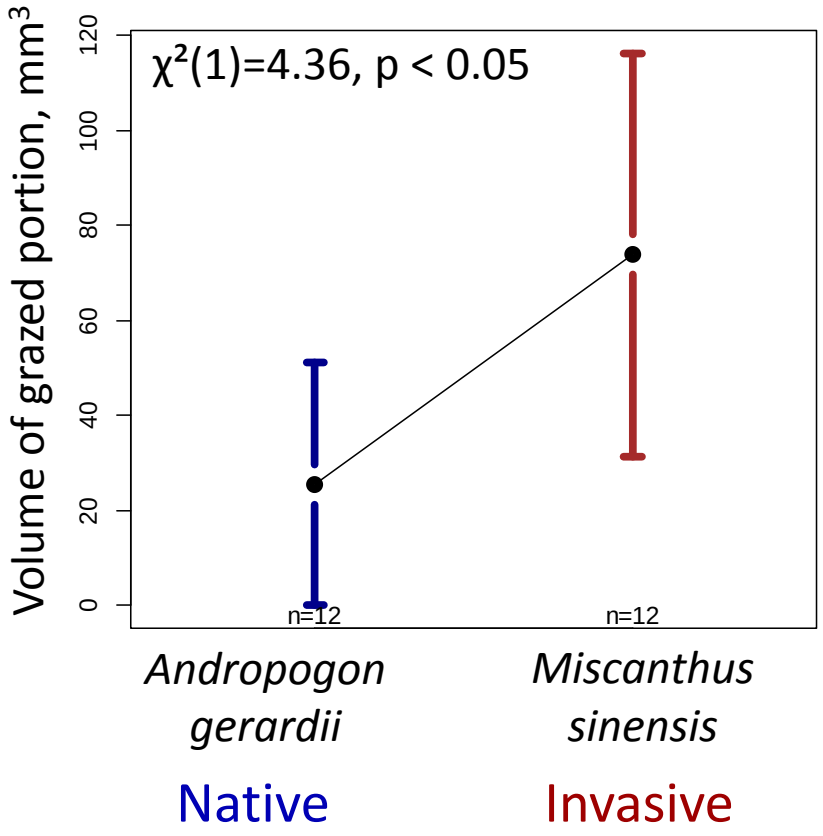
Native/invasive plant pair

5 hours

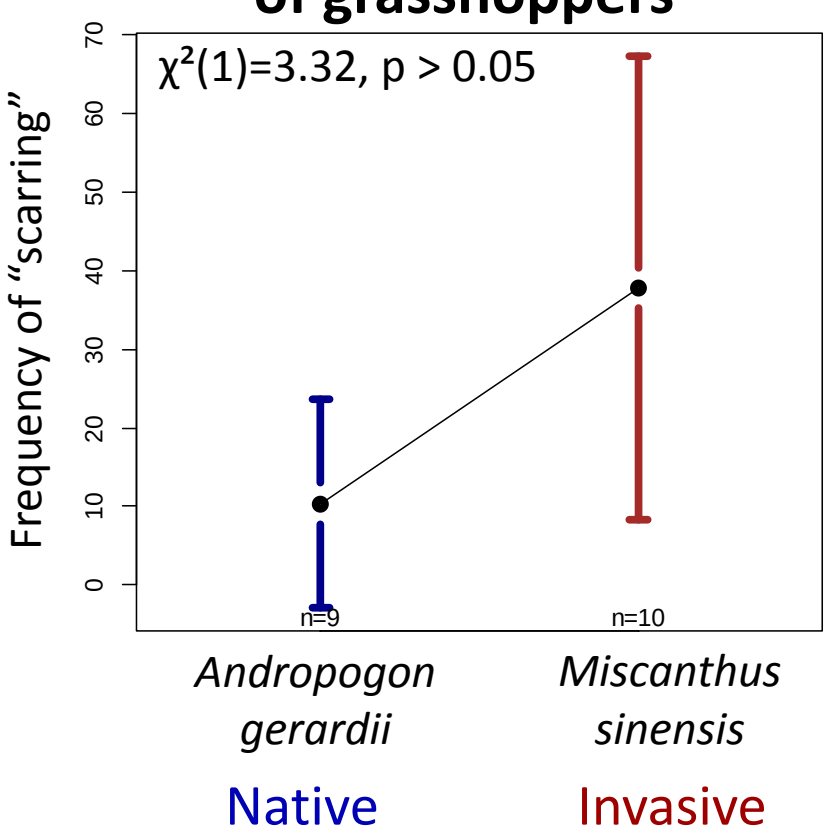
5 days

Results: Greenhouse experiments

Leaf damage



Feeding activity of grasshoppers

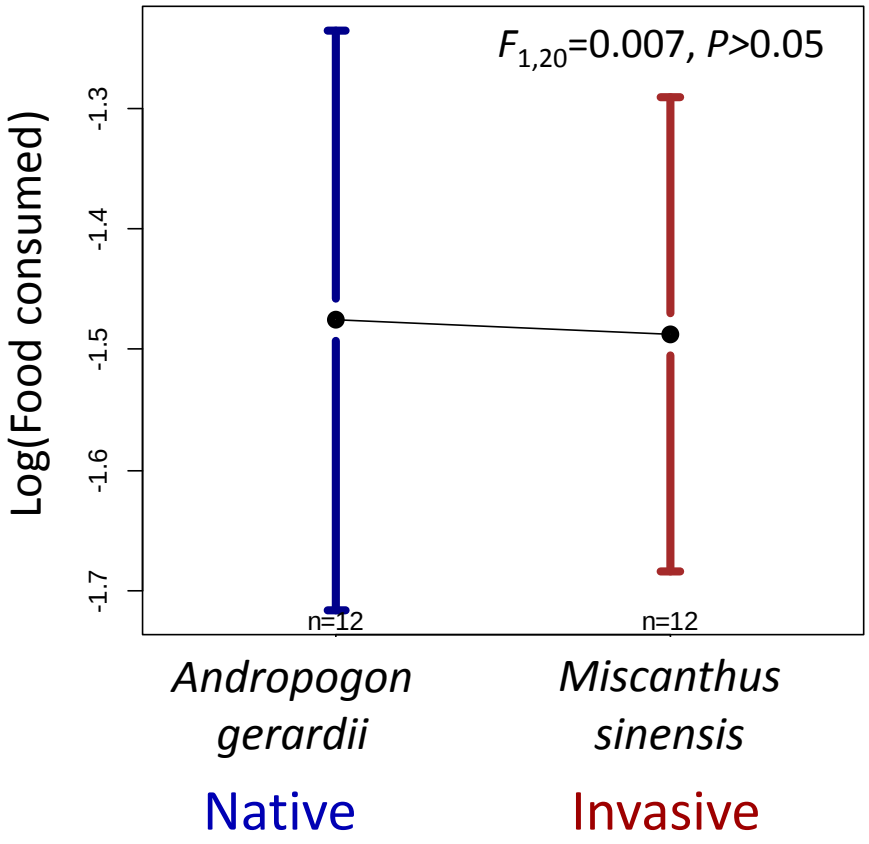


Leaf damage from grasshoppers was significantly greater on invasive *Miscanthus* plants than on native *Andropogon* plants.

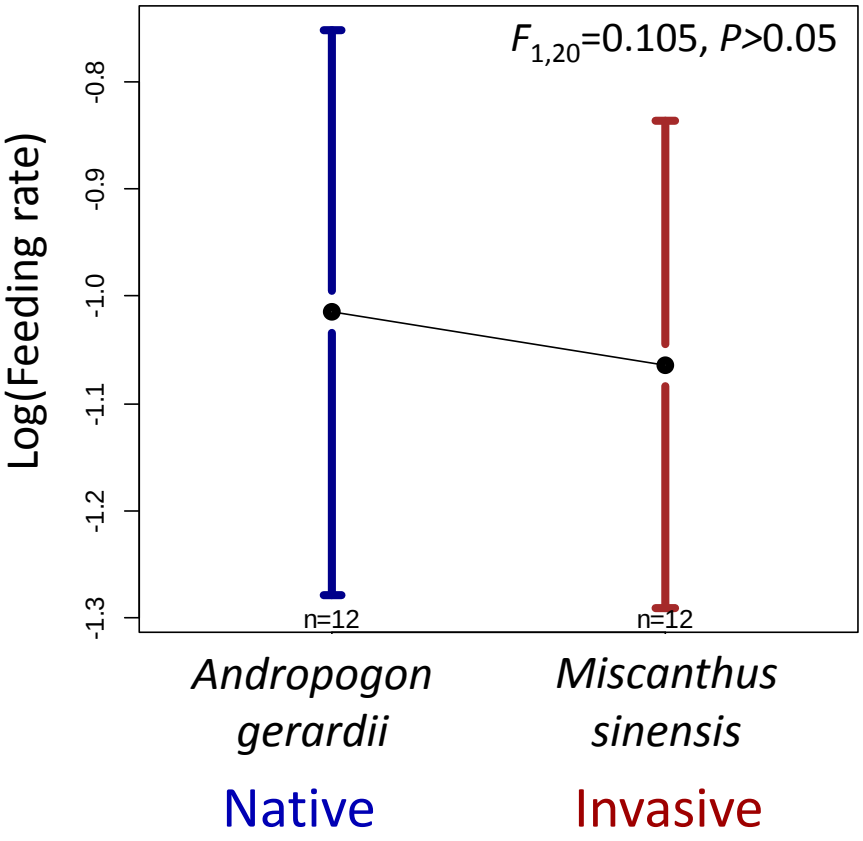
Feeding activity of grasshoppers did not differ significantly between plants.

Results: Greenhouse experiments

Food intake of grasshoppers



Feeding rate of grasshoppers



Food intake and feeding rate of grasshoppers did not differ significantly between plants.

Next:

- *Two native/invasive plant pairs included in analysis*
- *Field experiment (more similar to natural conditions)*

Andropogon gerardii

Miscanthus sinensis 'Zebrinus'

Native/invasive plant pairs

Bouteloua curtipendula

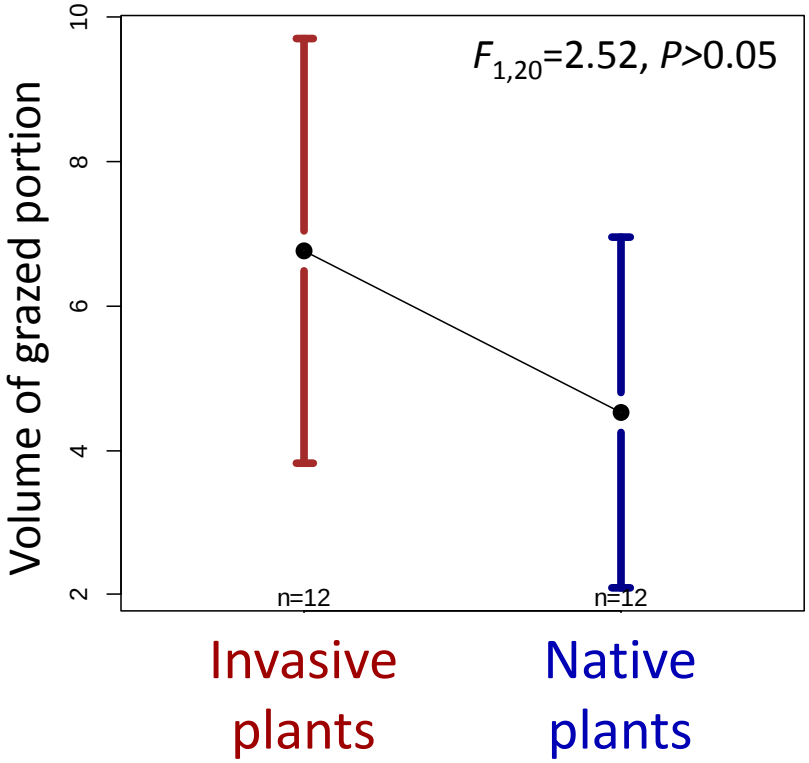
Miscanthus sinensis 'Gracillimus'

5 days

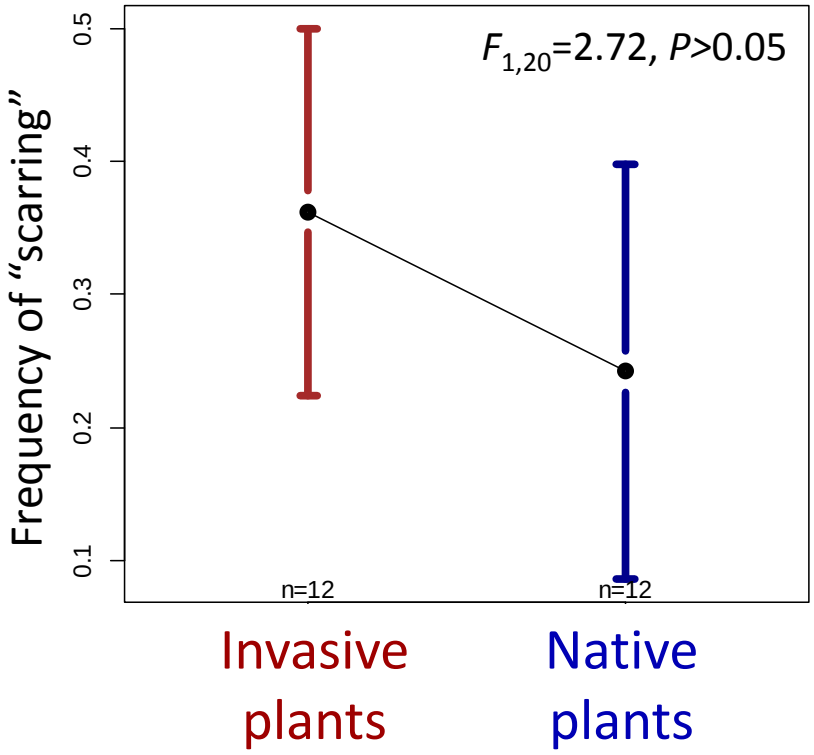
5 hours

Results: Field experiments

Leaf damage



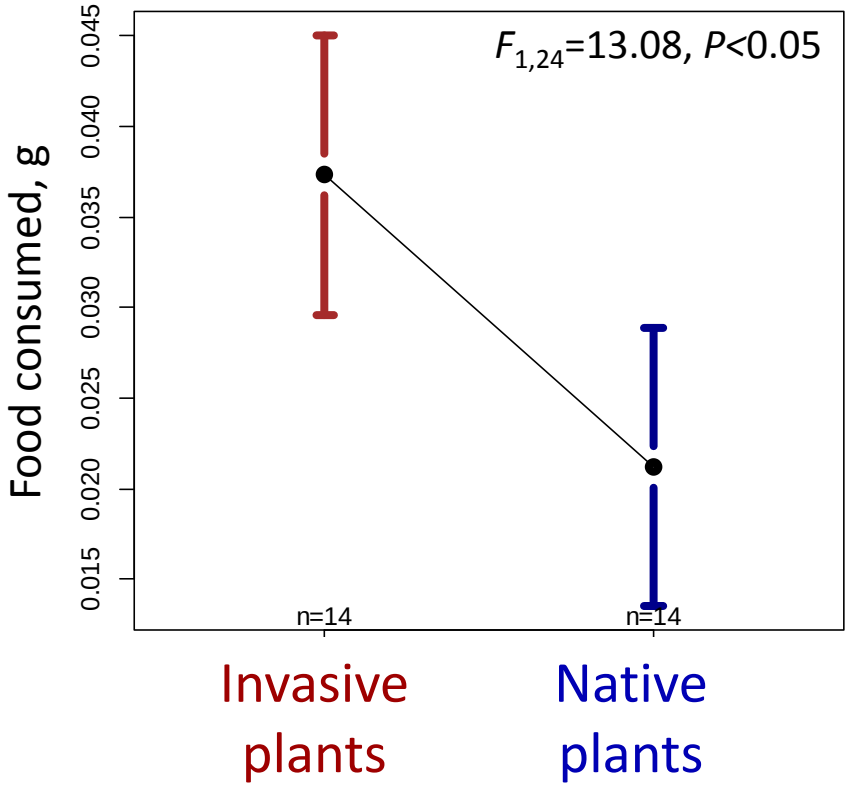
Feeding activity of grasshoppers



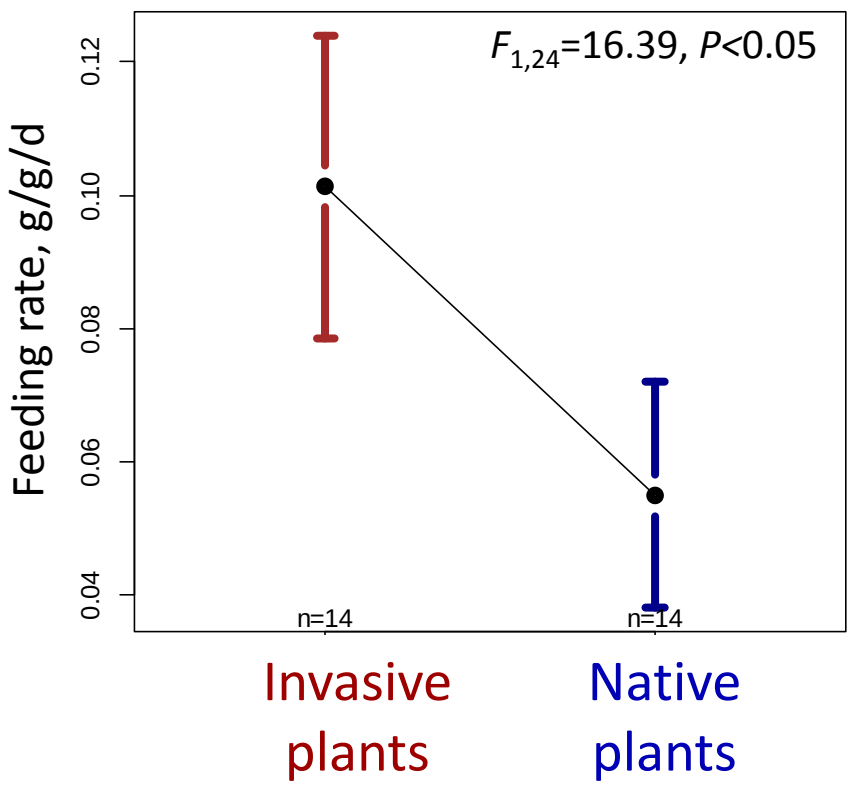
Leaf damage and feeding activity of grasshoppers did not differ significantly between plants.

Results: Experiments with leaves

Food intake of grasshoppers



Feeding rate of grasshoppers



Both food intake and feeding rate were greater on invasive plants.

Conclusions

Main hypothesis: *Melanoplus femurrubrum* grasshoppers will be more active and feed more on invasive plant species. The hypothesis was supported in the experiments with leaves but was not supported in the experiment with intact plants.

- differences in grasshopper feeding under natural (intact plants) and artificial (leaves) conditions: needs to be further examined
- decreasing in resistance of plant leaves after they have been clipped

Main question: Do generalist herbivores prefer to feed on native plants rather than on invasive plants? No. *Melanoplus femurrubrum* grasshoppers did not show any feeding preferences towards native plants.

Significance to the field of study

Invasive plants

- Economic losses
- Human health problems
- Changes in natural communities
- Loss of biodiversity etc.

Control is costly
(Pimental et al., 2005)

Feeding preferences of generalist insects regarding to invasive and native plants are still uncertain

Effective pest control strategies in order to preserve biodiversity in native communities.

The choice of grasshoppers: agricultural importance
(Hewitt & Onsager, 1983)

Convenient plant-insect model (may be used and extended in future studies)

Thank you!

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