Addressing Grasshopper (*Melanopus Differentialis*) Herbivory at the Little Big Horn College Community Garden

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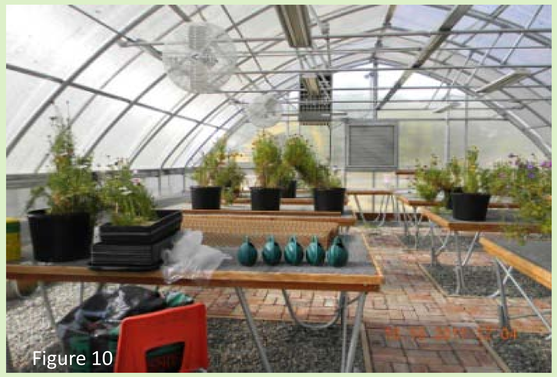
Introduction

The Little Bighorn College (LBHC) is a small institution, dedicated to higher education for Apsaalooke (Crow) native Americans, and the surrounding community of Crow Agency, Montana. The LBHC has implemented a community garden, run by Francesca Pine, to provide a local, organic and low cost way of producing fresh vegetables for community members. However, during the summer of 2011, the garden and surrounding areas underwent a significant grasshopper invasion. Much of the garden was lost to the grasshopper invasion, and the same is true for those who purchased plants from the garden. This research utilizes the 'Holistic Process' between LBHC and AGCR 465R (MSU), to address the grasshopper issue at the LBHC Community Garden.



Above - Inside the LBHC Community Garden

Hypotheses

Hypothesis 1:

- When grasshoppers are given a choice between Swiss-chard with parsley slurry treatment, and Swiss-chard with well water application (control), grasshoppers will favor control.

Ha:

- When grasshoppers are given a choice between Swiss-chard with parsley slurry treatment, and Swiss-chard with well water application, grasshoppers will favor treatment.

Hypothesis 2:

- In a controlled laboratory setting, grasshoppers will selectively favor 4 types of vegetation (Swiss-chard, spearmint, chrysanthemum flowers, chrysanthemum leafs) over parsley.

Ha:

- Grasshoppers will favor parsley when given 4 other types of vegetation, with parsley, in a controlled laboratory setting

Above - Nick Miles writes down data.

Methods

Hypothesis 1:

Two samples of Swiss-chard from the Community Garden, are placed in petri dishes where one (treatment) is doused with 5ml of parsley slurry. The remaining petri dish (control) is doused with 5ml of well water. The dishes are then placed into an aquarium with five male and five female grasshoppers from the Community Garden. Observations are taken 9 times over 30 minutes. At the end of the bioassay, photos and measurements are taken on the 'feeding hole' size (or, the amount of area eaten by the grasshoppers), as well as visual analysis of preference between the control (no parsley slurry-well water) and treatment (parsley slurry).

Hypothesis 2:

Five samples of plant material from Swiss chard, spearmint, chrysanthemum flowers, chrysanthemum leafs and parsley (all from the Community Garden) are taken and placed in petri dishes. The samples are placed in each corner of an aquarium, with parsley in center. Next, 10 female and 10 male grasshoppers from the Community Garden are placed onto the parsley dish simultaneously. Observations are made three times on Oct. 22nd and once on Oct. 24th. Upon completion, grasshopper mortality is documented, and the samples of each vegetation type are removed from the aquarium, measured and photo-documented, to observe the preferred food choice of the grasshoppers.

Above - Hoppers enjoying freedom before experiment

Above - Hoppers are dropped onto parsley

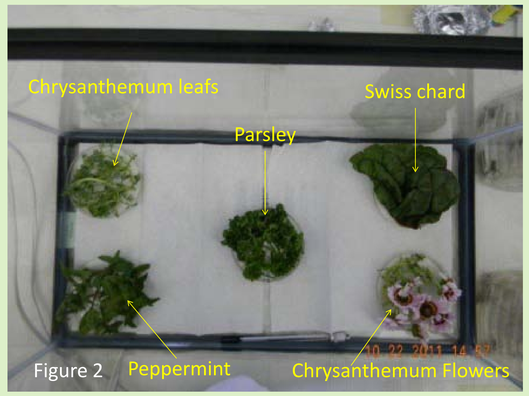
Materials

- Male and female grasshoppers from Little Bighorn College Community Garden
- Chrysanthemum, Swiss-chard, spearmint and parsley from LBHC Community Garden
- Aquariums for preliminary bioassays
- Well water
- Petri dishes
- Parsley slurry

Chrysanthemum Flowers

Chrysanthemum Leafs

Peppermint



Results

Hypothesis 1

-Grasshoppers favor Swiss-chard with parsley slurry over control.

Hypothesis 2

-Chrysanthemum flowers most preferred.
-Chrysanthemum leafs second most preferred.
-Peppermint was third most preferred.
-Swiss-Chard was fourth most preferred.
-Parsley leafs were the least preferred.

Discussion

Results from the first hypothesis favored the alternative hypothesis. That is, contrary to our assumption, the grasshoppers' consistently favored the treatment (Swiss-chard with parsley slurry-Fig.3) over the control (Swiss-chard with well water). However, in the second hypothesis, grasshoppers favored raw parsley leafs the least [Fig.4], followed by Swiss-chard the second least. Chrysanthemum flowers were favored most, with Chrysanthemum leafs second and peppermint third. Because of these results, we hypothesize that grasshoppers stay away from parsley in the garden, due either to the physical structure of parsley, or that the other vegetation provides more valuable nutrients to the grasshoppers' than the parsley can provide. Similarly, we are suspicious that our technique of grinding the parsley actually helps them digest it, so parsley may have nutrients they need/want, but just can't get because of the plant's physical structure.

Parsley Slurry

Parsley leafs

Conclusion

The use of a parsley slurry for grasshopper determent does not deter grasshoppers. In fact, the parsley slurry appears to attract grasshoppers more than deter them. However, when hoppers are given a selection of 5 food choices, one being intact parsley leafs, parsley is not preferred at all, and as such, is a sort of a repellent.

Recommendations

Further studies should be completed, to better understand the physical structure of parsley and how it affects grasshopper herbivory. Until then, the most practical and sustainable solutions for dealing with grasshoppers at the Community Garden involve hand collection of grasshoppers, and the incorporation of parsley around the entire garden. It may be possible to construct a 'parsley barrier' around the garden by lining the gardens' perimeter with parsley plants. Students, children and any community members who are wiling to devote two to three days a summer harvesting hoppers should be recruited. An incentive will likely be necessary for recruitment; this could be something as simple as giving away one plant for every volunteer willing to assist. Relations should be set up between the Community Garden and MSU to sell the hoppers for use in the "Bug Buffet." Money earned from hopper sales can be reinvested into the community garden.

References

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