Attracting Native Pollinators To Increase Potato Seed And Tuber Production

Lac Courte Oreilles Ojibwa Community College
Sustainable Agriculture Research Station
Hayward, Wisconsin

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In partnership with:
Dr. Amy Charkowski
University of Wisconsin, Madison, Wi.
Video Overview

- Extension Dept Overview
- Aerial Imagery of LSARS
Mission of LSARS

Provide opportunities and challenges for students to learn and work with staff, other students, community members, and Elders in a sustainable ag setting to increase access to healthy, nutritious foods.

Provide various modalities to improve food security for the community.

Education and research activities.

Access to land and resources.
Lac Courte Oreilles Ojibwa Community College
SUSTAINABLE AGRICULTURE RESEARCH STATION
13457 Froemel Rd

Native Plants
Seed Library
Organically Grown Gardens & Livestock Rearing
On-site Produce Sales & Farmers Market
Community Garden Plots
Community Festivals & Events
Educational & Hands-on Workshops
Aquaponics

DISCOVER FOR YOURSELF WHAT OUR FARM HAS TO OFFER!
Partnered with 1862 land grant, University of Wisconsin - Madison on other organic potato research

- LSARS site is secluded from other farms

Approached Dept. of Plant Pathology with the pollinator focus

- Dr. Amy Charkowski
- Applied for and received USDA-NIFA 1994 Increasing Research Capacity grant, 2013
  - 2* year study
Hypotheses

- I. Can LCO Sustainable Agriculture Research Station (LSARS) successfully grow true potato seed which will subsequently produce disease free/resistant fruit with better genetic resiliency?

- II. Can attracting native pollinators like the *Bombus impatiens*, the Common Eastern Bumblebee, improve and increase the production of true potato seed?
Potatoes: Planning and Site Preparation

20 cedar boxes constructed in prepared field, with 4 red and yellow varieties of seed potatoes planted in each.

Grid of potato boxes were 4 boxes across, spaced 10 feet apart and 5 long, located 20, 40, 60, 80, 100 feet away from pollinator attractor garden.
A mound garden was created with plants that would blossom throughout growing season in succession to attract pollinators to the area which in turn would also be attracted to flowering potato plants nearby.
Questions? Would pollinators which are attracted to mound garden then fly over to potato plant blossoms to forage [pollinate]? How far would they travel to do so from the garden?
Potato Plant Observations

Mid July
All 100 plants @ 1 foot tall with foliage

July 24 flowers noted

Mid August seed pods produced, @ 10 seeds per pod collected
## 2014 Potato Seed Pod Results

<table>
<thead>
<tr>
<th># Potato Seeds</th>
<th>Box 1</th>
<th>Box 2</th>
<th>Box 3</th>
<th>Box 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row 1 (20 FT)</td>
<td>18</td>
<td>10</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>Row 2 (40 FT)</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Row 3 (60 FT)</td>
<td>13</td>
<td>7</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Row 4 (80 FT)</td>
<td>16</td>
<td>10</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Row 5 (100 FT)</td>
<td>15</td>
<td>8</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
Observations:

Potatoes on sides closest to early blooming native plants produced more potato fruit overall.

Potato plants on outside areas of grid produced more potato fruit also, which may have been due to proximity of nearby highbush blueberry garden and the surrounding flowering meadows, and not necessarily from attractor garden.

Some potato varieties in study may have been more susceptible to drought conditions during the main growing season or invasion of potato beetles later in summer and not have been resilient enough to grow more seed.
The common eastern bumblebee, *Bombus impatiens*, was the most common pollinator observed.

In the sweep net collections, monarch caterpillars, *Danaus plexippus*, clouded sulphur butterflies, *Colias philodice*, mosquitoes, and common honeybees, *Apis mellifera* were also regular visitors to attractor garden mound and potato plants.

Because the new flowers from the attractor garden mounds and the flowers on potato plants bloomed approximately at the same time, it was not clear if these had much impact on attracting pollinators to the potato flowers.
Pollinator attractor mound garden now contains variety of established native plants that will bloom at various times throughout the next growing season and will have blooms that are available before potato plants begin to grow.

Seeds from the potato fruit will be planted in the cedar boxes, four plants in each box. These seeds should show marked differences in hardiness and disease resistance as a result of cross-pollination vs planting of clone seed potatoes.

More extensive pollinator observations will be made to see if more varieties and quantities are being attracted to the mound garden and subsequently to the potato plants as well.
Remember the asterisk after the 2 on the title slide?

On May 23rd, 2015...

LSARS’ barn is destroyed by fire

All contents are lost, including seed library which contained potato seeds from this project.

- LSARS staff given approval to continue
- the research in the summer of 2016
Red seed potatoes are planted into 14 cedar boxes with sandy loam soil, (did not have enough for furthest 4 boxes and 1 of the second to last row).

Pollinator attractor mound garden had early blooming varieties in flower before potatoes planted.
Weekly observation of pollinators

½ hour each week, surveying flowers for pollinators

Observations of potato plants weekly
Weather and other factors begin to affect potato growth and the formation of potato fruit & seed

After getting off to a good start the third week in June, rain and cooler temperatures settle in for two weeks without relief.

July was hot and dry, with little wind and narrow drops in temperatures at night.

August began with hot dry temperatures, but by second week these moderated and good weather conditions predominated through mid Sept.
Perfusion of wild flowers in surrounding fields and homogenetic transition zones nearby may have affected the amount of pollinators using the attractor mound garden (since there were plenty of sources for them to meet their needs)
Potato study result in 2nd year

All potato plants were devoid of flowers and subsequently no fruit borne.

Plants were small and not fully foliated.

Ultimately, only @ 7 pounds of potatoes were harvested Oct 27 by the LCO High School Science Class.
Pollinator attractor mound garden

Attractor garden grew well in second year. Several varieties established themselves throughout the growing season.
Even with the abundance of flowers beyond the attractor garden and potato plants, between 8 and 46 bumblebees were counted each week from June 15 to Sept 15 in the attractor mound garden. Other pollinators were observed as well.
During the drought-like month of July, invasive species plants were beginning to predominate the attractor garden mound. LCO Conservation Youth Group helped with removing these from the mound.
In conclusion...

For a research project of this kind, more than 2 years are necessary to allow for variables that may affect the outcome, like weather and loss of seeds [due to a fire].

In first year, plants nearest the attractor mound and the outside boxes of the raised bed grid grew the most fruit and potato seed among the 20 boxes. One can begin to conclude that easy access from wild flowers to the potato plant flowers make a difference in potato seed success.

Though this type of study may have been done elsewhere, the question was whether this synergetic relationship between potato plants, native plants, and pollinators would work for the LCO Farm.
Each of the two parts of this study had successes and challenges, together and separately from each other. It may take 2-4 more years of using these methods to make more decisive conclusions. More substantial data needs to be collected and collated to this end also.

**2016 will see:**
- the use of seed potatoes to start the plants;
- a drip irrigation system added to ensure good watering, especially in drought conditions or excessive heat;
- use of organic soil amendment as needed;
- use of computer apps to assist with plant and insect identification;
- continued use of school and community volunteers to assist with the project
Resources:


Acknowledge assistance, guidance, and sharing of information and resources by Amy Charkowski, U of Wis. Madison.