Condense for the reader what question you sought to answer, how you did it and, what answer you found. First, state the purpose of the project in one sentence, use two to four sentences to summarize the methods, and another few sentences to describe the results and your assessment of the project. Make sure you include any quantitative results. Add at the end a sentence or two about your outreach including whom you reached with the results. Tip: Write the summary after you write your full report.

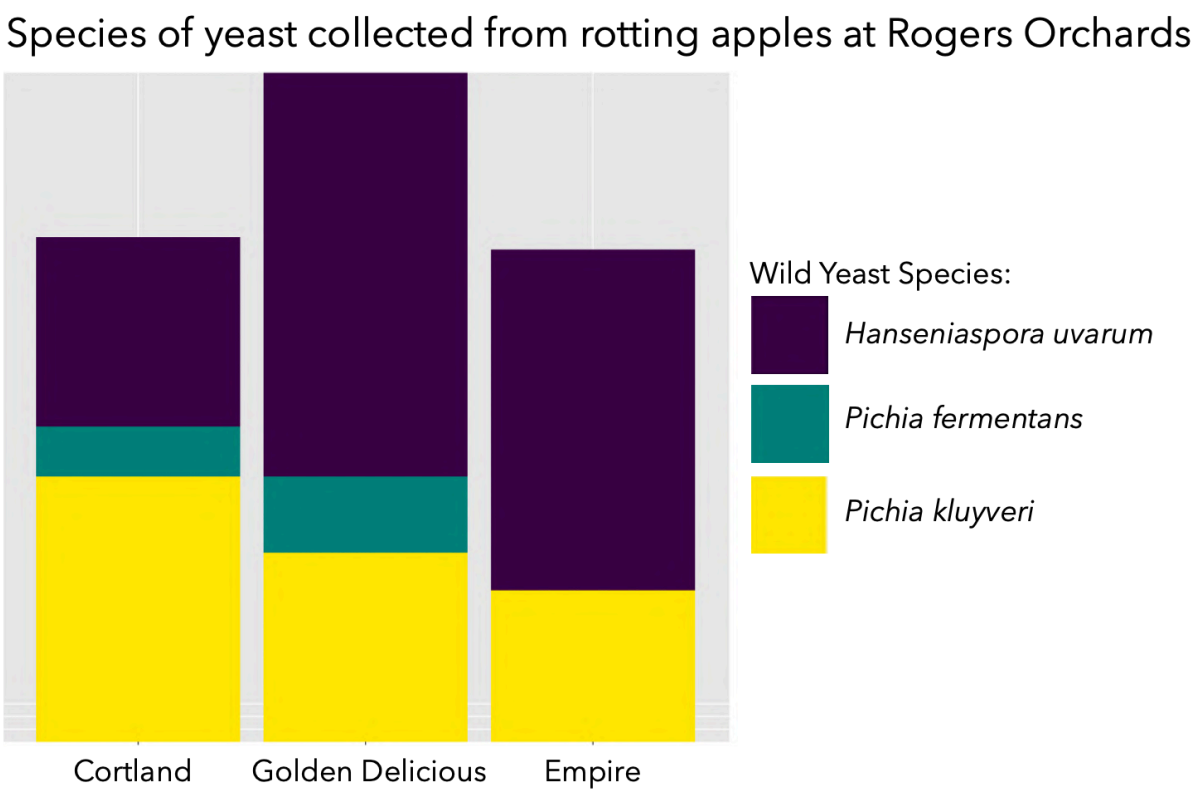
Progress Report:

Winter - Summer 2023

- Consulted with various experts in the fields of yeast and cider making
    - 4/11/23 Amy Todd : Beer Quality and Yeast Identification at Zymology Labs
    - 4/17/23 Soham Bhatt: Cidermaker and wild yeast expert at Artifact Cider
    - 4/21/23 Tim Graham: Cidermaker: Left Bank Ciders
    - 5/4/23 Clark Smith: WineSmith Wines & Consulting winemaking411.com
    - 5/11/23 Chris Gerling: Extension Associate, Sr., Cornell AgriTech Food Science
    - 5/12/23 Patrick Gibney: Yeast expert: Dept of Food Science at Cornell University
    - 6/9/23 Maitreya Dunham: Wild yeast researcher at University of Washington
    - 7/6/23 Rike Stelkens: Yeast biologist at Stockholm University

Fall 2023

- Identified wild yeast from Roger’s Orchard using Sanger sequencing



- Prepared for setting out pied de curves

    Gathered materials

    Sanitized materials

    Worked out methodology

- October 2023

    10/2/23, 10/3/23: Conducted field research in various orchards and apple growing modalities (wild, unsprayed) using the pied de cuve method of wild yeast collection

    10/6/23: Vials of wild yeast samples were collected after 3-4 days of pied de cuve set up and fermentation

    10/11/23: Vials of wild yeast samples were collected after 8-9 days of outdoor pied de cuve fermentation. Vials of wild yeast samples from both time points were transported to the laboratories at UConn

    10/12/23: Swapna stored all wild yeast samples in rich yeast media mixed with glycerol for long term storage in -80C freezer

- Consulted with Christopher Cane, Masters of Science student of Human Dimensions of Natural Resources and the Environment at University of Connecticut regarding the development, dissemination, and analysis of cider surveys.

Project Objectives:

This project seeks to:

- Establish a proper methodology for the collection, selection and propagation of wild yeast populations from both agricultural and non-agricultural environments using replicated experimental evolution and genotyping.
- Discover a number of previously unknown wild yeast strains with unique and appealing sensory attributes and selected for resistance from common faults in cider.
- Survey a statistically significant number of individuals in their satisfaction with 10 ciders inoculated from the 10 wild yeast strains described above.

Questions:

- What range of diversity among wild yeast populations can we expect from the various geographical locations and farming practices from which we will be collecting samples?
- How much variability in perceived sensory attributes is available to cider makers through utilizing wild yeast in their ciders?
- Using the tools of replicated experimental evolution, to what extent will we be able to select for advantageous traits, such as desired aromatics and flavors? Conversely, to what extent will we be able to deprive future generations of yeast of disadvantageous traits?
- What best practices in wild fermentation methods can be learned from the advanced tools in this study that can then be replicated by cider makers in the future without access to such tools?

POSTER
Backstory:

Meet Jeff: Head cidermaker and founder of Long View Ciderhouse on Rogers Orchard.

Meet Swapna: Evolutionary biology Ph.D. candidate at the University of Connecticut. She is in the 4th year of her Ph.D. funded by the National Science Foundation. In her Ph.D., Swapna is using genome sequencing on wild yeast from apple orchards and experimental evolution to study whether evolution can be predicted.

Together, we plan to create an innovative cider with experimental evolution techniques. The yeast strains that Swapna evolves will be from the same orchard as the apples that are in the cider. This pairing will hopefully yield a unique and interesting cider that can’t be found anywhere else!

Questions:
What yeast species make up the wild yeast population in Rogers Orchard?

Will wild yeast species vary between geographical locations in Rogers Orchard and apple variety?

Can we evolve yeast for desired aromatics and flavors and create a new, replicable yeast strain from wild yeast?

How unique will a cider fermented with an evolved wild yeast strain be in terms of sensory attributes and flavor when compared to a commercial yeast strain?

Swapna's Lab methods:

The pied de cuves bubbling was caused by wild yeast. We captured those yeast in vials and took them to the laboratory. Swapna froze these samples in a -80℃ freezer, where the yeast will stay in hibernation indefinitely.

Swapna used a method called "streaking" to visualize the yeast that grew in the pied de cuves. Streaking involves spreading the yeast on a plate filled with yeast media and then allowing the yeast to grow for 24 hours.

Preliminary Results:

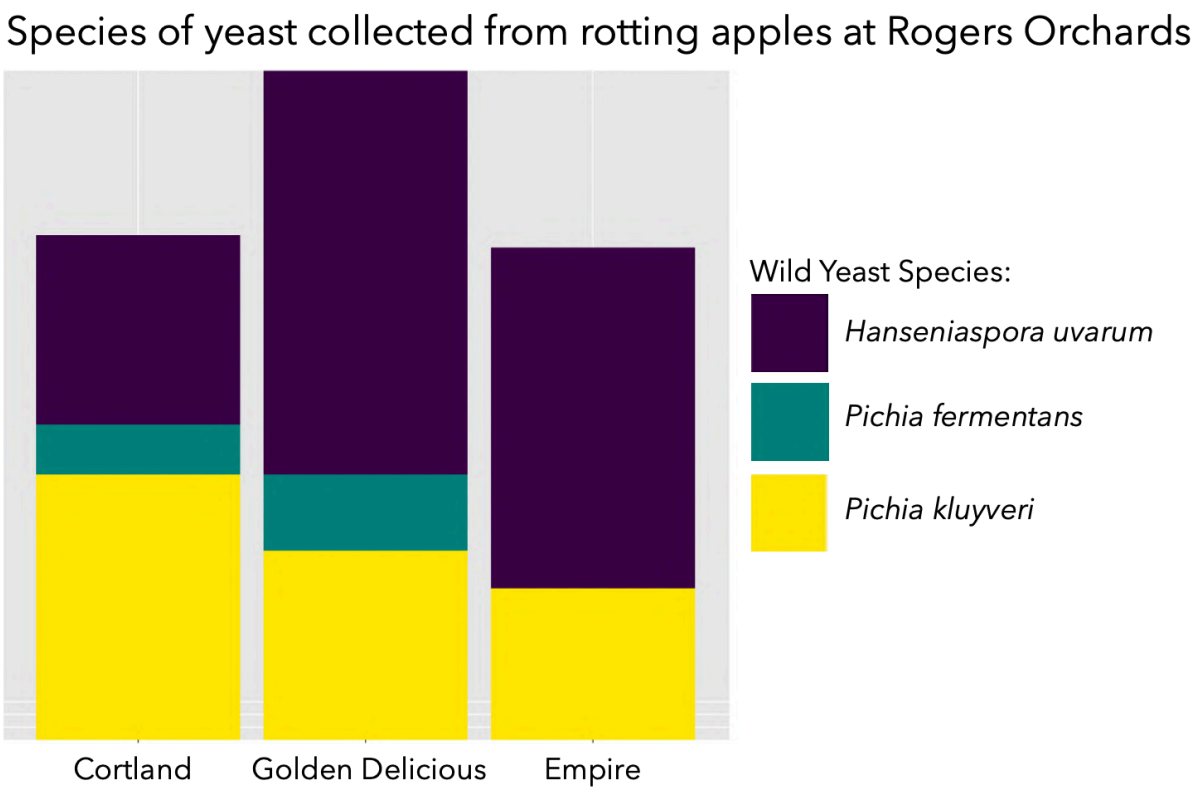
Streaked plates spread out the yeast cells so that each dot is one strain of yeast. A lot of yeast species look the same, but you might notice some visual differences in the way they grow. We sampled pied de cuves from unsprayed apples, sprayed honey crisp apples, and sprayed roxbury russet apples. We can already spot some differences right away in the starting wild yeast that are present in each of those juices!

Unsprayed apples pied de cuve yeast

Honey Crisp apples pied de cuve yeast

Roxbury Russet apple pied de cuve yeast

What could these different looking yeasts be? There are many wild yeast species. Swapna’s Ph.D. research has found that throughout eight orchards in Connecticut, there are 13 species of wild yeast. These wild yeast were found on rotting apples under the trees, and were collected from three varieties of apples, Cortland, Golden Delicious, and Empire. In Rogers Orchards, three yeast species were found.



These three might represent the species that are on our pied de cuve plates, or we could have found different yeast since they weren't collected from rotting apples and were collected from different varieties of apples.

Stay tuned for more results!