

# Honey Pollen Analysis for Daufuskie Island, South Carolina: Potential for Economic Diversification and Baseline for Environmental Conservation

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## Introduction

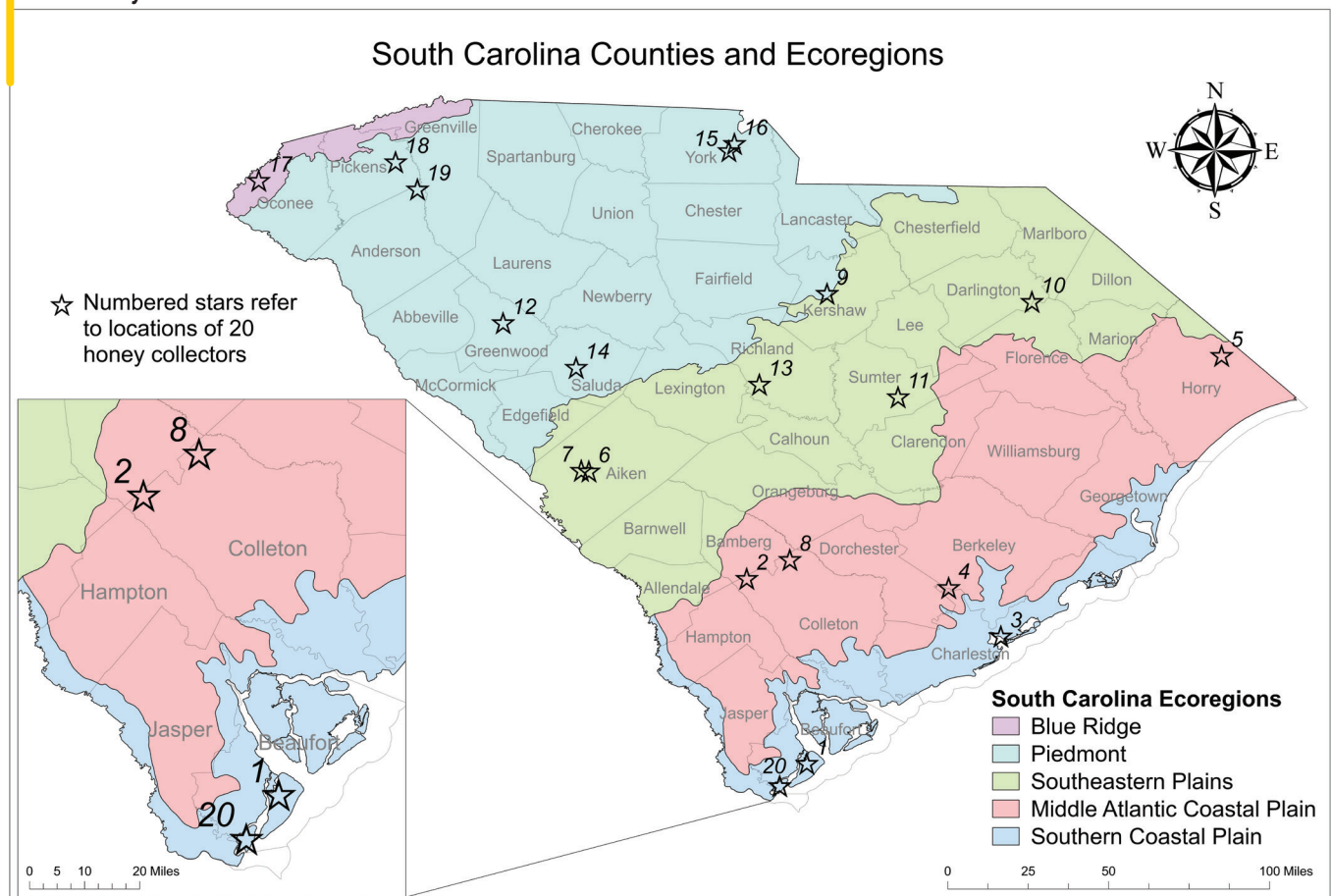
Throughout 2022, honey samples were collected from nineteen sites distributed throughout South Carolina (Figure 1, sites 1-19) for the South Carolina Statewide Honey Pollen Project. The honey samples were analyzed to determine the sources of the honey/nectar via a technique called melissopalynology (i.e., pollen analysis in honey). We determined what plants honeybees visited and published the results in a Clemson University book entitled *"Preferred Plants and Nectar Collecting Times for Honey Production"* (ISBN: 978-1-63804-167-2).

One of the objectives of the statewide project was to develop a resource beekeepers could use to inform their choices for the timing and placement of their hives in proximity to particular plants with an eye toward maximizing honey production. Indeed, monofloral honeys (those which contain >45% of pollen from a single plant

source) can be sold at a premium price. The southeast corner of South Carolina (the four counties of Beaufort, Jasper, Colleton, Hampton), is an area that has been left out of economic development. Honey production could be a new source of income for this area.

Two objectives of the Daufuskie Honey Pollen Analysis Project were to add to our data set to include an additional sample location in the Southern Coastal Plain region and to determine whether a sufficient amount of honey could be collected to make honey production an economically viable income source. In addition, Daufuskie Island is experiencing changes to its land use as more residences are being built. This study establishes a baseline to assess how future land use changes impact pollinators. Here we present the results of the analysis for this region and focus on whether or not this region can become an economic area of interest for developing beekeeping.

**Figure 1. The locations of honey collection sites in South Carolina, USA. Sites one through nineteen were the honey collection locations for the 2023 South Carolina Statewide Honey Pollen Project. Site 20 in the lower southeast corner of South Carolina is where the samples for the current study on Daufuskie Island is located.**





**Figure 2. BroodMinder weight for the Site 20 (Daufuskie Island) hive in Beaufort County, Southern Coastal Plain ecoregion, during 2025.**

### Methodology

For the Daufuskie Island study, the methodologies used in the South Carolina statewide study were replicated. A single location was chosen on Daufuskie Island. The study hive was placed on a BroodMinder scale which collected hive weight daily. The beekeeper collected honey samples every 2-4 weeks from January 2025 through August 2025. Honey samples were processed by Global

Geolab and the resulting pollen slides were sent to Dr. Sophie Warny for palynological analysis.

### Results and Discussion

**Honey Yield on Daufuskie Island (Site 20):** The nectar flow (Figure 2) occurred on Daufuskie Island, from about the second week in April until about the first of August in 2025. About 60 pounds of honey were removed from

| Month →                                          | January | February | March  |         | April  |         | May    |         |         | June   |         | July   |         | August |
|--------------------------------------------------|---------|----------|--------|---------|--------|---------|--------|---------|---------|--------|---------|--------|---------|--------|
| Beekeeper →                                      | 20      | 20       | 20     | 20      | 20     | 20      | 20     | 20      | 20      | 20     | 20      | 20     | 20      | 20     |
| Date of honey collection →                       | 1/27/25 | 2/20/25  | 3/5/25 | 3/20/25 | 4/3/25 | 4/19/25 | 5/1/25 | 5/14/25 | 5/31/25 | 6/7/25 | 6/24/25 | 7/3/25 | 7/20/25 | 8/6/25 |
| <i>Acer</i> (Maple)                              |         | 22.0     |        |         |        |         |        |         |         |        |         |        |         |        |
| Arecaceae (Palmettos and other Palm family)      | 22.7    | 5.2      | 28.1   | 38.5    |        |         |        |         |         |        |         |        |         | 11.1   |
| <i>Camellia</i> (Camellia)                       | 9.4     | 4.6      | 27.4   | 11.8    | 3.2    |         |        |         |         |        |         |        |         |        |
| <i>Lagerstroemia</i> (Crepe Myrtle)              | 3.6     |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Parthenocissus</i> (Virginia Creeper)         | 3.2     |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Ilex</i> (Holly)                              |         |          | 5.0    |         |        | 18.9    | 7.6    | 6.4     |         |        |         |        |         |        |
| <i>Quercus</i> (Oak)                             |         |          |        |         | 76.7   | 20.7    | 8.2    | 14.1    | 7.7     |        |         |        |         |        |
| <i>Salix</i> (Willow)                            |         |          |        |         | 8.9    | 9.6     | 42.3   | 5.5     |         |        |         |        |         |        |
| <i>Ligustrum</i> (Privet)                        |         |          |        |         |        |         |        | 27.2    |         |        |         |        |         |        |
| <i>Zanthoxylum</i> (Prickly Ash)                 |         |          |        |         |        | 14.2    | 7.9    |         |         |        |         |        |         |        |
| Myrtaceae (Myrtle, Eucalyptus family)            | 17.2    | 9.8      | 11.4   | 9.6     |        |         | 4.5    | 3.1     |         |        |         |        |         |        |
| <i>Nyssa</i> (Tupelo/Black Gum)                  | 4.5     |          |        |         |        | 17.3    | 7.9    | 13.5    | 6.8     |        |         |        |         |        |
| <i>Rhus/Toxicodendron</i> (Sumac/Poison Ivy)     |         |          | 3.5    | 8.0     |        | 10.2    | 3.9    | 12.2    | 6.2     |        |         | 3.2    | 5.8     |        |
| <i>Trifolium/Melilotus</i> (Red/White Clovers)   | 28.2    | 47.5     | 15.1   | 21.0    |        | 4.3     | 13.8   | 14.1    | 74.3    | 94.6   | 19.4    | 28.2   | 34.1    | 11.7   |
| Amaranthaceae (Amaranth family)                  |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| Asteraceae (Ragweed/Calendula/Solidago family)   |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Betula</i> (Birch)                            |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| Caprifoliaceae (Honeysuckle family)              |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Carya</i> (Hickory/Pecan)                     |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Citrus</i> (Citrus)                           |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Diospyros</i> (Persimmon)                     |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Liquidambar</i> (Sweetgum)                    |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Magnolia</i> (Magnolia)                       |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Phyla</i> (Creeping Frogfruit)                |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Pinus</i> (Pine)                              |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Plantago</i> (Plantain)                       |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| Poaceae (Grass family)                           |         |          |        |         |        |         |        |         |         |        |         |        |         | 53.7   |
| <i>Polygonum/Persicaria</i> (Buckwheat/Knotweed) |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Ribes</i> (Currant)                           |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Typha</i> (Cattail)                           |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Ulmus</i> (Elm)                               |         |          |        |         |        |         |        |         |         |        |         |        |         |        |
| <i>Vitis</i> (Grape)                             |         |          |        |         |        |         |        |         |         |        |         |        |         |        |

#### Key

taxon present with >3% relative abundance

taxon present with >3% relative abundance

taxon not present in honey sample

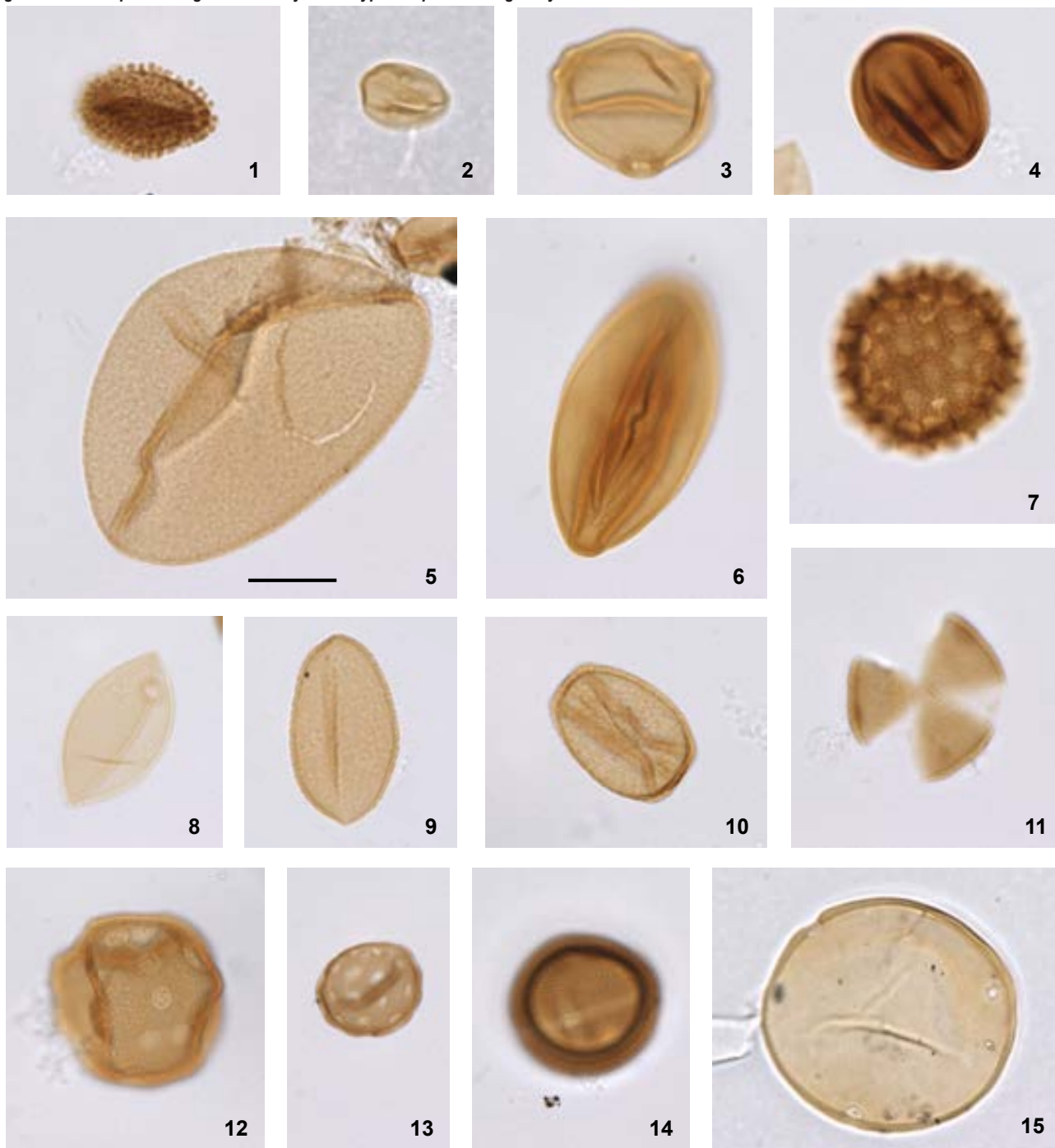
**Table 1. Plant taxa present on Daufuskie Island, S.C. (Site 20) during 2025 organized by timing at which their pollen was observed in the honey samples. The color-coding corresponds to the relative abundance of each pollen type.**

the hive: about 20 pounds in early June and another 40 pounds in mid-August. Around 40 pounds of honey were left on the hive to support the bees over the Winter. Thus, a total of about 100 pounds of honey was produced at Site 20. While BroodMinder data are not available for the site closest to Site 20 (Site 1), the typical reported honey yield for Site 1 is around 100 pounds total, but normally only 45-50 pounds are harvested, leaving about 40-45 pounds on the hive to overwinter (David Arnal, personal

communication). Similar honey yields have also been observed at Site 8 in nearby Colleton County, S.C. and Site 3 in Charleston County, S.C.

**Plant Taxa on Daufuskie Island (Site 20):** Based on the honey samples collected on Daufuskie Island during 2025, there were 32 plant taxa used by the bees (Table 1). (The term “plant taxa” is being used because, while some pollen grains were identified to genus, others were

**Figure 3. Plate representing the diversity of the types of pollen foraged by the bees.**



Examples of pollen from the Dafauskie honey project: 1. *Ilex*, 2. *Vitis*, 3. *Betula*, 4. *Nyssa*, 5. *Magnolia*, 6. *Diospyros*, 7. *Polygonum persicaria*, 8. *Poaceae*, 9. *Palmetto*, 10. *Quercus*, 11. *Acer*, 12. *Liquidambar*, 13. *Amaranthaceae*, 14. *Citrus*, 15. *Carya*. All at identical scale (scale bar = 20µm).

identified to family. “Plant taxa” is a generic term covering all levels of plant taxonomic group.) Figure 3 provides some examples of the diversity of pollen taxa found in the honey at Site 20 (Daufuskie Island). Analysis of the timing of plant taxa use by the honeybees revealed five groups of plants based on when their pollen was found in significant relative abundance in the honey. Those plant taxa which were present with at least 3% relative abundance were considered “significant.”

The first group of plants consisted of five plant taxa which contributed to the honey at significant levels only early in the season (January through March). This was the time before the hive began to put on measurable weight in early April. Maple (*Acer*) had one significant sample in February (22.0%). Various palmettos and other palms (Arecaceae) were significant contributors (high of 38.5%) from early January through March. Curiously, this pollen was also present at significant levels in the last sample collected in August. *Camellia* pollen was significant from January until early April (high of 24.7%). Crepe myrtle (*Lagerstroemia*) and Virginia creeper (*Parthenocissus*), while present throughout the Spring, were only observed in the honey at significant levels in January (3.6% and 3.2%, respectively).

The second group of plants consisted of three plant taxa that, while present throughout the year, contributed significantly to the honey only in April and May. These plant taxa included holly (*Ilex*), oak (*Quercus*), and willow (*Salix*). Holly (*Ilex*) pollen appeared in the honey at a significant level in early March, but its contribution to the honey was higher later in the season (high of 18.9%). Oak (*Quercus*) pollen was significant in all April and May samples (high of 76.7%). Willow (*Salix*) pollen was significant from early April through mid-May (high of 42.5%).

Whereas the first group of plants discussed was a significant contributor to the honey only early in the

season, there was a third group of taxa present and significant only in April or May. Privet (*Ligustrum*) was only significant in mid-May (27.2%), but present in every successive sample. Prickly ash (*Zanthoxylum*) was only present in two samples of honey (in mid-April and early May), but its abundance was significant in both (14.2% and 7.9%, respectively).

A fourth group of plant taxa was present in almost every honey sample collected (from January through August) and was significant for most of the year. Myrtle, Eucalyptus family (Myrtaceae) pollen was significant from January through mid-May (high of 17.2%). Tupelo/black gum (*Nyssa*) pollen was significant in January and from mid-April through May (high of 17.3%). Sumac/poison ivy (*Rhus/Toxicodendron*) pollen was significant in March, April, May, and July (high of 12.2%). Red/white clover (*Trifolium/Melilotus*) pollen was present in all 14 honey samples collected and was significant in all but one sample (high of 94.6%). Indeed, five monofloral honey samples were collected from the hive on Daufuskie Island in 2025 and three of them were monofloral red/white clover honeys (Table 2). Monofloral honeys have >45% of their pollen from a single plant taxon, and because of this unique property, can be sold at a premium price. Monofloral red/white clover honeys were collected in mid-February (47.5%), late May (74.3%), and early June (94.6%). The other two monofloral honeys were an oak (*Quercus*) honey in early April (76.6%) and a Grass family (Poaceae) honey in early August (53.7%).

The remaining group of plant taxa consists of plants whose pollen was observed in at least one honey sample, but never at a significant level (always <3.0%) (Table 1). This group consists of 18 plant taxa, or 56.3% of all plant taxa, and were observed at various times during the year. These taxa include: Amaranth family (Amaranthaceae), Ragweed/Calendula/Solidago family (Asteraceae), birch

**Table 2. Plant taxa present in the honey samples on Daufuskie Island, S.C.(Site 20) during 2025 compared with the plant taxa present on Hilton Island (Site 1) during 2022. The color-coding corresponds to the relative abundance of each pollen type.**

| Month →<br>Beekeeper →<br>Date of honey collection →<br>Type of Data → | January |     | February |     | March |     | April |     | May   |     | June  |     | July  |     | August |     |
|------------------------------------------------------------------------|---------|-----|----------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|--------|-----|
|                                                                        | 1       | 20  | 1        | 20  | 1     | 20  | 1     | 20  | 1     | 20  | 1     | 20  | 1     | 20  | 1      | 20  |
|                                                                        | %       | PC  | %        | PC  | %     | PC  | %     | PC  | %     | PC  | %     | PC  | %     | PC  | %      | PC  |
| <i>Acer</i> (Maple)                                                    | 18.8    | L   | 0.0      | 0.0 | 5.1   | M   | 22.0  | L   | 1.3   | E   | 16.7  | L   | 1.0   | L   | 10.4   | M   |
| Amaranthaceae (Amaranth)                                               | 0.0     | 0.0 | 0.0      | 0.0 | 0.7   | L   | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| Arecaceae (Palmettos and other Palm family)                            | 0.0     | 0.0 | 22.7     | L   | 0.0   | 0.0 | 5.2   | M   | 28.1  | L   | 0.0   | 0.0 | 38.5  | L   | 0.0    | 0.0 |
| Asteraceae (Cornflower/Golden Rod/Sunflower family)                    | 2.9     | L   | 0.0      | 0.0 | 2.5   | L   | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| Asteraceae (Ragweed/Calendula/Solidago family)                         | 0.0     | 0.0 | 1.0      | L   | 0.8   | L   | 2.6   | L   | 0.9   | E   | 16.7  | L   | 0.0   | 0.0 | 2.8    | M   |
| Brassicaceae (Mustard family)                                          | 0.0     | 0.0 | 0.0      | 0.0 | 1.3   | L   | 0.0   | 0.0 | 1.0   | L   | 0.0   | 0.0 | 1.4   | L   | 0.0    | 0.0 |
| <i>Betula</i> (Birch)                                                  | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Camellia</i> (Camellia)                                             | 49.0    | L   | 9.4      | M   | 1.3   | L   | 4.6   | M   | 27.4  | L   | 0.0   | 0.0 | 11.8  | M   | 0.0    | 0.0 |
| Caprifoliaceae (Honeyuckle family)                                     | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Carya</i> (Hickory/Pecan)                                           | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Cercis</i> (Redbud)                                                 | 0.0     | 0.0 | 0.0      | 0.0 | 2.5   | L   | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Citrus</i> (Citrus)                                                 | 0.0     | 0.0 | 0.0      | 0.0 | 0.7   | L   | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Cornus</i> (Dogwood)                                                | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Corylus</i> (Hazel)                                                 | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.5   | L   | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Diospyros</i> (Persimmon)                                           | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Ilex</i> (Holly)                                                    | 0.0     | 0.0 | 1.3      | L   | 0.0   | 0.0 | 2.6   | L   | 5.0   | M   | 0.0   | 0.0 | 1.6   | L   | 0.0    | 0.0 |
| <i>Lagerstroemia</i> (Crepe Myrtle)                                    | 1.9     | L   | 3.6      | M   | 3.4   | M   | 0.3   | L   | 1.9   | L   | 1.5   | L   | 1.3   | L   | 0.9    | L   |
| <i>Ligustrum</i> (Privet)                                              | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 3.0   | M   | 0.0   | 0.0 | 1.9   | L   | 0.0   | 0.0 | 0.0    | 0.0 |
| Liaceae (Lily family)                                                  | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Liquidambar</i> (Sweetgum)                                          | 0.0     | 0.0 | 0.0      | 0.0 | 5.1   | M   | 0.0   | 0.0 | 0.0   | 0.0 | 0.5   | L   | 1.0   | L   | 0.0    | 0.0 |
| <i>Liriodendron</i> (Tulip Poplar)                                     | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 1.4   | L   | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Magnolia</i> (Magnolia)                                             | 0.0     | 0.0 | 0.6      | L   | 0.0   | 0.0 | 0.3   | L   | 0.0   | 0.0 | 0.6   | L   | 0.0   | 0.0 | 0.0    | 0.0 |
| Myrtaceae (Myrtle, Eucalyptus family)                                  | 0.0     | 0.0 | 17.2     | L   | 0.0   | 0.0 | 9.8   | M   | 11.4  | M   | 0.0   | 0.0 | 9.6   | M   | 0.0    | 0.0 |
| <i>Nyssa</i> (Tupelo/Black Gum)                                        | 1.0     | L   | 4.5      | M   | 0.8   | L   | 0.3   | L   | 1.9   | L   | 0.0   | 0.0 | 2.9   | L   | 0.9    | L   |
| <i>Parthenocissus</i> (Virginia Creeper)                               | 0.0     | 0.0 | 3.2      | M   | 0.0   | 0.0 | 2.2   | L   | 0.0   | 0.0 | 1.0   | L   | 0.0   | 0.0 | 0.3    | L   |
| <i>Pinus</i> (Pine)                                                    | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.5   | L   | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Phyla</i> (Creeping Frogfruit)                                      | 0.0     | 0.0 | 0.3      | L   | 0.0   | 0.0 | 0.0   | 0.6 | L     | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Plantago</i> (Plantain)                                             | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| Poaceae (Grass family)                                                 | 0.0     | 0.0 | 1.6      | L   | 14.3  | M   | 0.7   | L   | 0.0   | 0.0 | 2.0   | L   | 0.3   | L   | 1.9    | L   |
| <i>Polygonum/Persicaria</i> (Buckwheat/Knotweed)                       | 0.0     | 0.0 | 1.6      | L   | 0.0   | 0.0 | 0.3   | L   | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Quercus</i> (Oak)                                                   | 0.0     | 0.0 | 1.3      | L   | 0.0   | 0.0 | 0.3   | L   | 0.0   | 0.0 | 0.3   | L   | 1.4   | L   | 76.7   | L   |
| <i>Rhus/Toxicodendron</i> (Sumac/Poison Ivy)                           | 0.0     | 0.0 | 0.0      | 0.0 | 41.8  | L   | 1.0   | L   | 3.5   | M   | 0.0   | 0.0 | 8.0   | M   | 25.6   | L   |
| <i>Ribes</i> (Currant)                                                 | 0.0     | 0.0 | 0.3      | L   | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| Rosaceae (Rose/Cherry/Plum/Peach/Blackberry family)                    | 0.0     | 0.0 | 0.0      | 0.0 | 10.5  | M   | 0.0   | 0.0 | 3.0   | M   | 0.0   | 0.0 | 2.4   | L   | 0.0    | 0.0 |
| <i>Salix</i> (Willow)                                                  | 24.5    | L   | 1.9      | L   | 3.0   | M   | 0.0   | 0.0 | 14.8  | M   | 0.0   | 0.0 | 25.1  | L   | 8.9    | M   |
| <i>Typha</i> (Cattail)                                                 | 0.0     | 0.0 | 0.3      | L   | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Trifolium/Melilotus</i> (Red/White Clovers)                         | 0.0     | 0.0 | 28.2     | L   | 0.0   | 0.0 | 47.5  | L   | 15.1  | L   | 0.0   | 0.0 | 21.0  | L   | 0.0    | 0.0 |
| <i>Ulmus</i> (Elm)                                                     | 1.9     | L   | 0.0      | 0.0 | 0.4   | L   | 0.0   | 0.0 | 30.0  | L   | 0.0   | 0.0 | 17.5  | L   | 0.0    | 0.0 |
| <i>Vitis</i> (Grape)                                                   | 0.0     | 0.0 | 0.0      | 0.0 | 3.0   | M   | 0.0   | 0.0 | 0.5   | L   | 1.0   | L   | 0.0   | 0.0 | 0.6    | L   |
| Unknowns #3 and #9                                                     | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 1.5   | L   | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| <i>Zanthoxylum</i> (Prickly Ash)                                       | 0.0     | 0.0 | 0.0      | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0   | 0.0 | 0.0    | 0.0 |
| Various Unknown Polymorphs                                             | 0.0     | 0.0 | 1.0      | L   | 4.2   | M   | 1.3   | L   | 0.3   | L   | 2.0   | L   | 0.6   | L   | 0.0    | 0.0 |
| Totals                                                                 | 100.0   |     | 100.0    |     | 100.0 |     | 100.0 |     | 100.0 |     | 100.0 |     | 100.0 |     | 100.0  |     |

(*Betula*), Honeysuckle family (Caprifoliaceae), hickory/pecan (*Carya*), citrus (*Citrus*), persimmon (*Diospyros*), sweetgum (*Liquidambar*), magnolia (*Magnolia*), creeping frogfruit (*Phyla*), pine (*Pinus*), plantain (*Plantago*), Grass family (Poaceae), buckwheat/knotweed (*Polygonum/Persicaria*), currant (*Ribes*), cattail (*Typha*), elm (*Ulmus*), and grape (*Vitis*). While the Grass family (Poaceae) was placed in this group because its contribution of the honey was 1.6% or less, there was one of the 14 honey samples in which Grass family (Poaceae) pollen was not just significant, but it was predominant (at 53.7%). This honey sample was collected in early August and given the few plant taxa present in this sample, the bees seem to be using the few plant taxa available to them.

No purple honey samples were collected from Daufuskie Island (Site 20). Purple honey is sometimes found in North and South Carolina, USA. This honey is rare and commands a premium price. An analysis of purple honey was conducted in conjunction with the original South Carolina Statewide Honey Pollen Project (Warny, et al., 2024). In that study, the hypothesis that purple honey originates from *Pueraria* species (kudzu) or berries [Ericaceae (e.g., blueberries) and Rosaceae (e.g., blackberries)] was not supported, while the contribution from wild grapes such as muscadine (*Vitis rotundifolia*) could not be tested. A possible link to the sourwood tree (*Oxydendrum arboretum*) was supported. No sourwood (*Oxydendrum*) pollen was observed in the pollen on Daufuskie Island.

**Comparison of Plant Taxa on Daufuskie Island (Site 20) and Hilton Head Island (Site 1):**

Daufuskie Island, S.C. (Site 20) is located just south of Hilton Head Island, S.C. (Site 1) (Figure 1). Both sites are located about 10 miles from each other in Beaufort County in the Southern Coastal Plain ecoregion. Given the proximity of these two sites, a comparison of the pollen types present in the honey samples was natural (Table 2). Between the two sites, the pollen of 41 plant taxa

was observed. Of these plant taxa, 53.7% (22 of 41) of the same plant taxa were the present (Table 3). Of the 19 unique plant taxa, 47.4% (9 of 19) were unique to Hilton Head Island (Site 1) and 52.6% (10 of 19) were unique to Daufuskie Island.

One of the main conclusions of the South Carolina Statewide Honey Pollen Project was that maples (*Acer*) are an important source of nectar for honeybees early in the year as the honeybees build up their brood (MacFawn et al., 2025). An example of the importance of maple can be seen in Table 2 for Site 1 (Hilton Head Island). Of the six early-season honey samples collected at Site 1 in 2022 (collected from January through April), five contained maple pollen and four had it in significant (>3%) quantities. Maple pollen was also found in the honey collected from Site 20 (Daufuskie Island) in 2025 from February to early May, but only at significant levels in a single honey sample from mid-February (22%). Thus, the timeframe for maple pollen in the honey was similar between the two sites, although maple pollen was more abundant at Site 1 (Hilton Head Island).

**Summary**

Honey yields in the 60-pound range are common in the southeast corner of South Carolina, making this area attractive for honey production. In this region, the nectar flow occurs mostly from April through August. The plant taxa found in honeys on Daufuskie Island and its near neighbor Hilton Head Island are 54% similar. Maple (*Acer*) pollen was observed in the honey from both locations, but on Daufuskie Island, maples (*Acer*) contributed to honey production at significant levels (<3%) only in March, whereas on neighboring Hilton Head Island, maples contributed significantly from January through March (high of 18.8%). Nectar sources vary from the Middle Atlantic Coastal Plain to the Southern Coastal Plain, including Daufuskie Island. Overall, Daufuskie Island produces honeys that are multifloral, as shown

| Plant Taxa Shared Between Sites 1 & 20           | Plant Taxa Unique to Site 1                         | Plant Taxa Unique to Site 20                   |
|--------------------------------------------------|-----------------------------------------------------|------------------------------------------------|
| <i>Acer</i> (Maple)                              | Asteraceae (Coneflower/Golden Rod/Sunflower family) | Amaranthaceae (Amaranth)                       |
| Arecaceae (Palmettos and other Palm family)      | Brassicaceae (Mustard family)                       | <i>Betula</i> (Birch)                          |
| Asteraceae (Ragweed/Calendula/Solidago family)   | <i>Cercis</i> (Redbud)                              | Caprifoliaceae (Honeysuckle family)            |
| <i>Camellia</i> (Camellia)                       | <i>Cornus</i> (Dogwood)                             | <i>Citrus</i> (Citrus)                         |
| <i>Carya</i> (Hickory/Pecan)                     | <i>Corylus</i> (Hazel)                              | <i>Phyla</i> (Creeping Frogfruit)              |
| <i>Diospyros</i> (Persimmon)                     | Liliaceae (Lily family)                             | <i>Plantago</i> (Plantain)                     |
| <i>Ilex</i> (Holly)                              | <i>Liriodendron</i> (Tulip Poplar)                  | <i>Ribes</i> (Currant)                         |
| <i>Lagerstroemia</i> (Crepe Myrtle)              | Rosaceae (Rose/Cherry/Plum/Peach/Blackberry family) | <i>Typha</i> (Cattail)                         |
| <i>Ligustrum</i> (Privet)                        | Unknowns #3 and #9                                  | <i>Trifolium/Melilotus</i> (Red/White Clovers) |
| <i>Liquidambar</i> (Sweetgum)                    | 9                                                   | <i>Zanthoxylum</i> (Prickly Ash)               |
| <i>Magnolia</i> (Magnolia)                       |                                                     | 10                                             |
| Myrtaceae (Myrtle, Eucalyptus family)            |                                                     |                                                |
| <i>Nyssa</i> (Tupelo/Black Gum)                  |                                                     |                                                |
| <i>Parthenocissus</i> (Virginia Creeper)         |                                                     |                                                |
| <i>Pinus</i> (Pine)                              |                                                     |                                                |
| Poaceae (Grass family)                           |                                                     |                                                |
| <i>Polygonum/Persicaria</i> (Buckwheat/Knotweed) |                                                     |                                                |
| <i>Quercus</i> (Oak)                             |                                                     |                                                |
| <i>Rhus/Toxicodendron</i> (Sumac/Poison Ivy)     |                                                     |                                                |
| <i>Salix</i> (Willow)                            |                                                     |                                                |
| <i>Ulmus</i> (Elm)                               |                                                     |                                                |
| <i>Vitis</i> (Grape)                             |                                                     |                                                |

Table 3. Comparison of plant taxa present in Sites 1 (Hilton Head Island) and Site 20 (Daufuskie Island).

by the long list of plant taxa recovered in each honey sample (Table 2). Despite this, monofloral honey samples do occur as three clover (*Trifolium/Melilotus*) honeys, one oak (*Quercus*) honey, and one grass (Poaceae) honey were collected (Table 2). Predominant and secondary foraging plant taxa (present at >15% relative abundance) were identified, and include maple, palmettos and other members of the palm family, camellia, holly, privet, myrtles and other members of the eucalyptus family, tupelo/black gum, grasses, oak, willow, and clovers. In addition to these, some less abundant but still important types (3-15% relative abundance) were discovered; these are crepe myrtle, sumac/poison ivy, and prickly ash. Some plant taxa contribute significantly (>3%) to the honey mostly early in the year (January through March) such as maple, palmettos and other members of the palm family, crepe myrtle, and Virginia creeper, while other plant taxa contribute significantly to the honey in March and April such as holly, oak, willow, privet, and prickly ash (Table 1). It's also important to note that myrtle and other members of the eucalyptus family, tupelo/black gum, sumac/poison ivy, and clovers contribute significantly to the honey throughout the year. While clover honey is desirable, some plants do not provide a pollen source for honey, and care should be taken to place hives in close proximity to the plants listed herein as they are clearly favored by bees. The results of the Daufuskie Honey Pollen Analysis Project make it clear that sufficient honey yields can be obtained in this region of South Carolina to make honey production an economically viable proposition and further information presented herein guide beekeepers as to the best practice in plant types/hive proximity for improved honey production.

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#### Notes:

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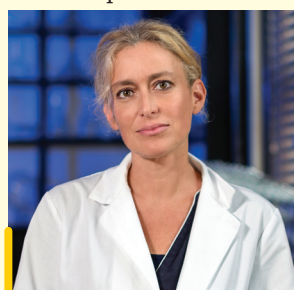
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#### Notes about the authors:



**Figure 4. David E. MacFawn** (photo courtesy of David E. MacFawn).

EVVY™ Awards Book Second Place Competition Winner and has published six books and twenty YouTube videos.



**Figure 5. Dr. Sophie Warny** (photo courtesy of LSU).

David Elgie MacFawn is a North Carolina Master Craftsman Beekeeper (October 16, 1997), Eastern Apicultural Society Master Beekeeper (2019), Co-Founded the South Carolina Master Beekeeping Program, awarded 1996 & 2020 South Carolina Beekeeper of the Year, and published over 60 articles in the *American Bee Journal*, *Bee Culture*, and *Beekeeping: Your First Three Years*. David is a 2021 CIPA EVVY™ Awards Book Second Place Competition Winner and has published six books and twenty YouTube videos.

Sophie Warny is the AASP Endowed Chair Professor in Palynology and a curator at the Museum of Natural Science (MNS), all within Louisiana State University in Baton Rouge, Louisiana. She is the director of the AASP-The Palynological Society Center for Excellence in Palynology (CENEX). CENEX focuses on various aspects of palynological research, from the use of pollen, spores and algae in biostratigraphic studies (biosteering applications) in collaboration with the industry, to the use of pollen in forensic applications and melissopalynology when she partners with the USDA or beekeepers. Her research also focuses on using palynological records for paleoceanography and paleoclimate reconstruction, including investigations of the palynological record to decipher past sudden climatic events and climate variability to help constrain their triggering mechanisms. She has published in journals such as *Science*, *Nature*, *Nature Geoscience*, *PNAS*, *Geology*, *Gondwana Research*, *Climate of the Past*, and of course the society's journal, *Palynology*. She served as the President of AASP-The Palynological Society from 2023 to 2025. She has supervised 30 theses and dissertations since starting at LSU in 2008. The majority of Warny's former graduate students are employed in the oil and gas industry in Houston and London, with the Federal Government or as instructors. Communication to: **Louisiana State University Department of Geology and Geophysics CENEX Palynology Lab (Sophie Warny)** E235 Howe Russell Geoscience Complex Louisiana State University Baton Rouge, LA 70803, email: [swarny@lsu.edu](mailto:swarny@lsu.edu).



**Figure 6. Dr. Carol Wymer** (photo courtesy of Carol Wymer).

Carol Wymer divides her time between teaching, melissopalynology, and volunteer endeavors. She received Bachelor of Science and Master of Science degrees in Biology at the University of Dayton and a PhD in Plant Physiology at The Pennsylvania State University. She completed post-doctoral research at The Pennsylvania State University and

in a joint appointment at the University of East Anglia and the John Innes Centre in England. In 1998, Carol established her own lab at Morehead State University (MSU), where she studied different aspects of plant growth including propagation and rooting of the invasive plant species Japanese knotweed. Over time, her professional focus moved to Biology Education, and she served as a leader on multiple grants; this allowed her to play a role in the improvement of regional K-12 science instruction. After 16 years at MSU, she retired as a full professor and her family moved to northwest Ohio. Since that time, she has taught at several local universities and is an adjunct faculty at MSU and Bowling Green State University. In addition to teaching and a little research, Carol plays an active role in local plant conservation. She volunteers in the Wild Toledo program at the Toledo Zoo & Aquarium and Wood County Park District growing native plants that support butterfly conservation, local habitat restoration, and the expansion of native species in residential neighborhoods.



**Figure 7. Dr. Jen O'Keefe**  
(photo courtesy of Jen O'Keefe).

Jen O'Keefe is a Professor of Geology and Science Education at Morehead State University in eastern Kentucky. She received a Bachelor of Arts degree in Geology from Cornell College in Iowa, a Master of Science in Geology at Texas A&M, and a PhD in Geology from the University of Kentucky. She studied palynology under the late Dr. Vaughn M. Bryant, Jr. at Texas A&M, where she was introduced to melissopalynology as part of her training, and the late Dr. William C. Elsik, who introduced her to fungal palynology. Jen leads the OPaL Lab at Morehead State University, which focuses on training high school and undergraduate students to answer a wide variety of questions about past ecosystems and climates and environmental issues using palynology, organic petrography, and geochemistry, as well as pollen typing of local and regional honey samples. She publishes collaborative research in several journals, including *Science of the Total Environment*, *International Journal of Coal Geology*, *Climate of the Past*, and *Palynology*. Dr. O'Keefe is a Fellow of the Geological Society of America and served simultaneously as chairman of the Energy Geology Division of the Geological Society of America and as President of AASP-The Palynological Society (AASP-TPS) in 2015. She is currently a member of the Board of Trustees of the AASP Foundation, which is tasked with supporting palynological research and dissemination. For these and other efforts she received AASP-TPS's Distinguished Service Award in 2023. In that same year, Dr. O'Keefe received an Apple Award from the Morehead State University Student Council for mentoring students both in and outside of the classroom and was named the Morehead State University Distinguished Researcher.

The authors wish to thank the beekeepers without whom this research would not have been possible; in particular, Jeffrey Grunninger and Courtney Grunninger Bonney whose hives on Daufuskie Island were used in this study. Jeffrey Grunninger, a former naval aviator and

retired airline captain, moved to Daufuskie Island in 2021 with his wife, Tracy. His eldest daughter, Courtney, is his collaborator in beekeeping. Dr. Courtney Grunninger Bonney, PhD, AICP, is the President and co-founder of Rhowe Design + Build, a multi-faceted commercial construction firm. Courtney has a broad range of experience from roles as a professional urban planner and university professor, specializing in historic preservation and community revitalization. Courtney began beekeeping as a hobby while living in upstate South Carolina. After taking a break following moving to Savannah, Courtney was able to begin beekeeping again with her dad, Jeff. Her parents' new home on Daufuskie Island was the perfect spot to start beekeeping again in 2022. Jeff has become a great (if reluctant) beekeeper in his own right and keeps everything on track.

They had mixed success initially, but after meeting David and following his guidance, they were able to establish two strong colonies. Jeff states that, "Being a novice beekeeper involved in the study was certainly an enlightening and enjoyable experience. Starting from scratch with these hives and worrying about completing the year created a steep learning curve for this amateur. We harvested a surprising amount of wonderful honey, and we look forward to next year's harvest. Thank you for the opportunity to participate in the study."



**Figure 8. Jeff Grunninger** (photo courtesy of Jeff Grunninger).



**Figure 9. Dr. Courtney Grunninger Bonney** (photo courtesy of Courtney Grunninger Bonney).



To view the charts/graphs used in this article at a larger scale, scan this QR code or visit: [https://drive.google.com/drive/folders/1yEsKhLfQNeAcRb-nBBnVjEFtkxwr6\\_VDz?usp=sharing](https://drive.google.com/drive/folders/1yEsKhLfQNeAcRb-nBBnVjEFtkxwr6_VDz?usp=sharing)



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