

## 2021-2022 Outdoor Variety Trials

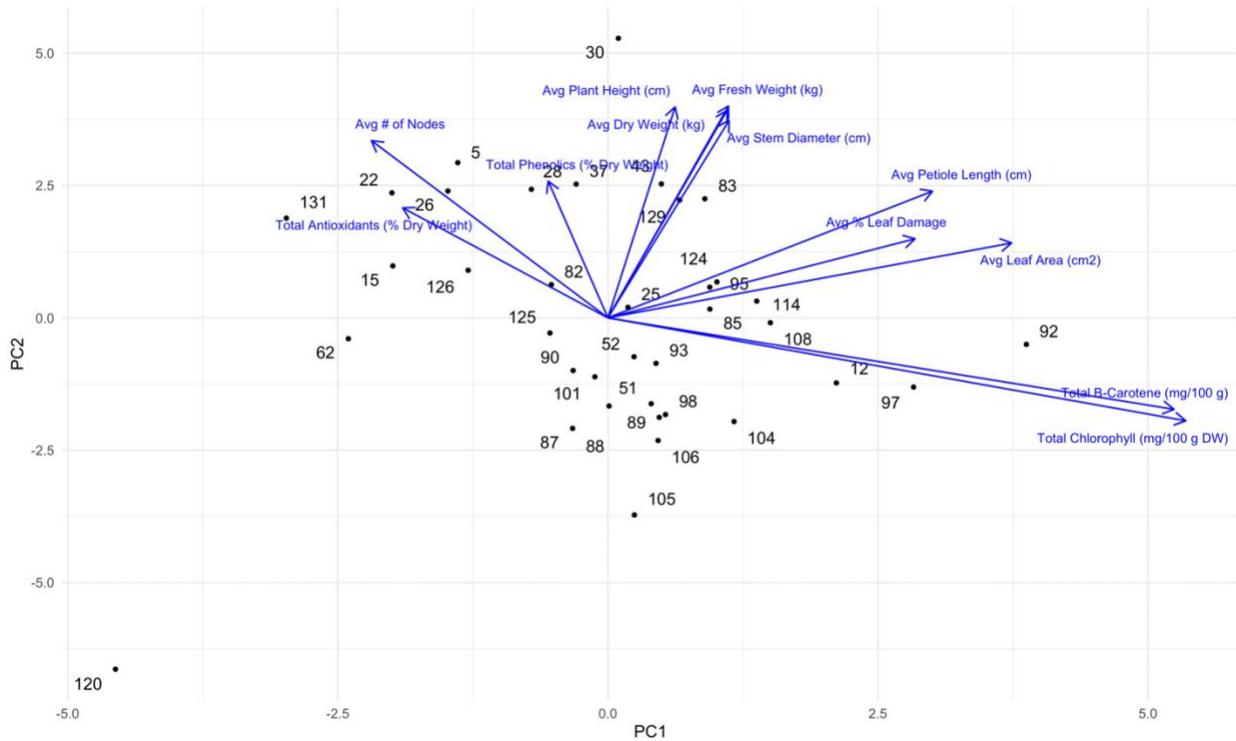


Fig. 1 – PCA of agronomic and nutritional traits measured in summer variety trials

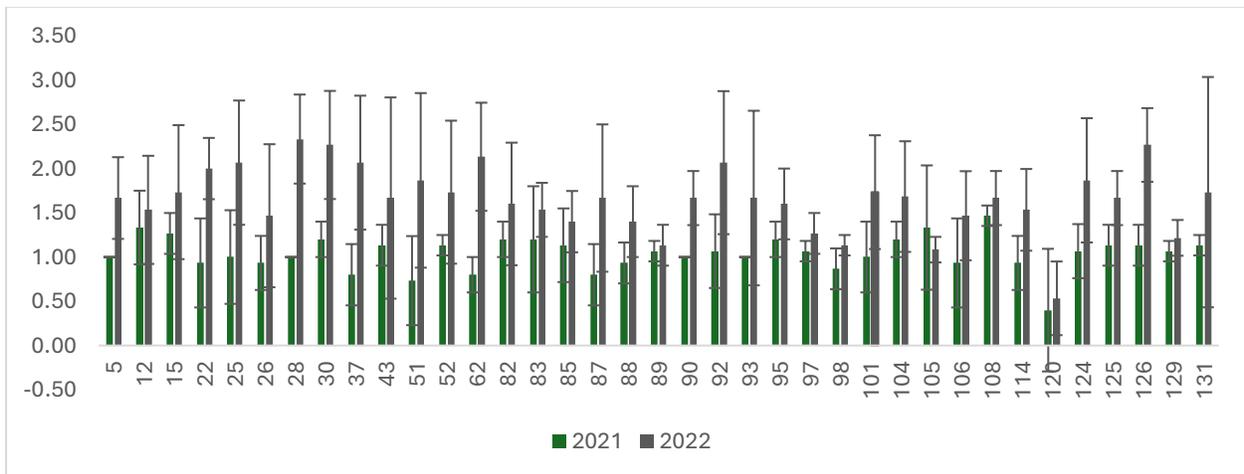


Fig. 2 – Insect pressure between amaranth varieties, 2021 and 2022. Leaves of multiple plants of each variety were rated 1-5 based on % of a leaf missing due to insect pressure. Rating 1 is the least insect pressure and 5 is the most.

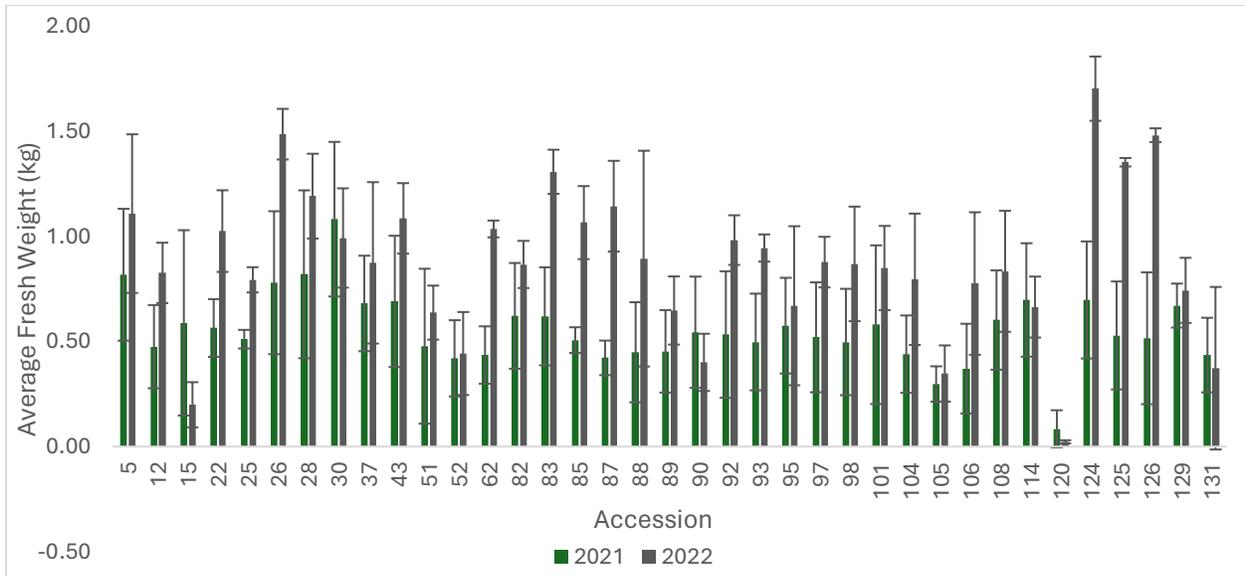


Fig. 3 – Average fresh weight between amaranth varieties, 2021 and 2022. Plants were harvested 3 nodes up from the roots and weighed in kg.

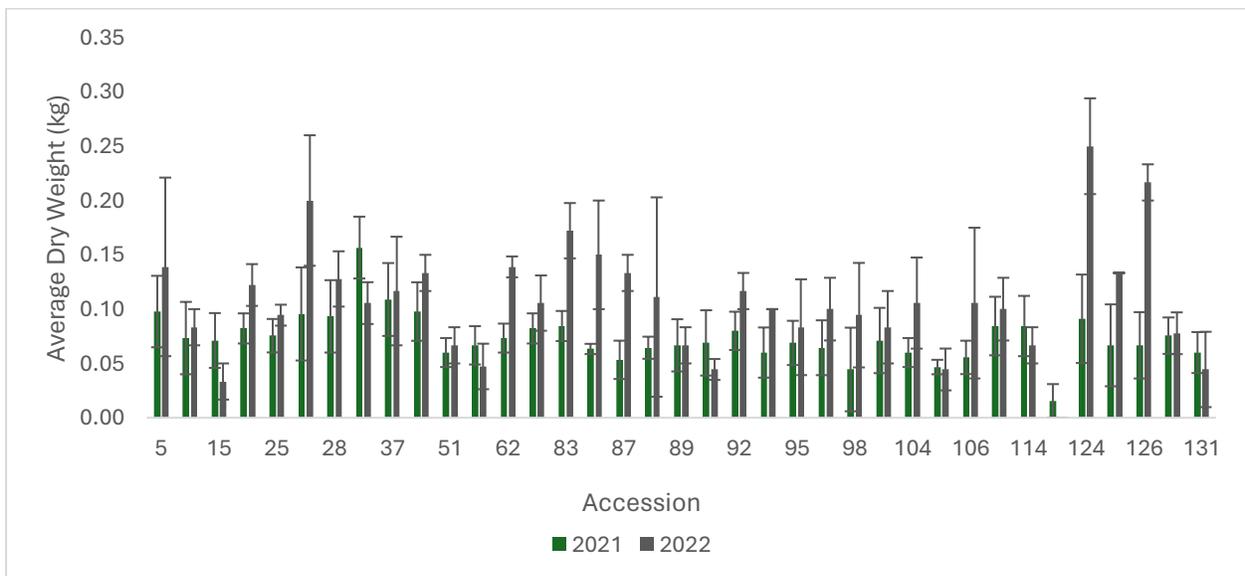


Fig. 4 – Average dry weight between amaranth varieties, 2021 and 2022. Plants were dried at 35°C for 2 weeks and weighed in kg.

The above figures show yield and nutrition results from our first two amaranth variety trials in 2021-2022. This research began before the duration of this grant, but it was able to be completed in year 2 and nutritional analysis was done through the grant, as anticipated in objective 1.

## 2023 Indoor Supplemental Lighting Study

Figure 2.1: Waterfall Graph of PAR Values in Room A4

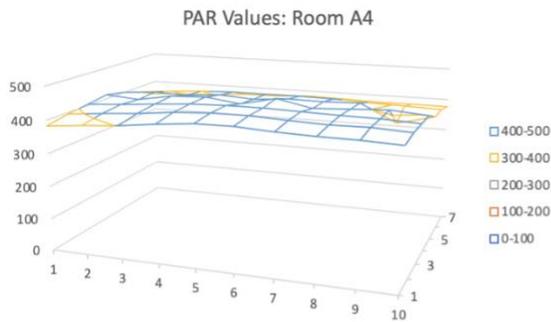


Figure 2.2: PKR Spec Sheet

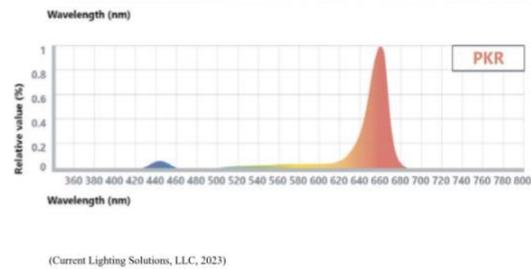


Figure 2.1 (left) is a visual representation of PAR values that were recorded in the greenhouse. The Y axis shows the PAR values ranging from 0 to 500. The X axis represents six inch increments within the area on the greenhouse bench that was measured. Figure 2.2 (right) is the spec sheet from Current Lighting Solutions, LLC which demonstrates the spectra of the PKR lights used in this greenhouse room.

Figure 2.3: Waterfall Graph of PAR Values in Room A6

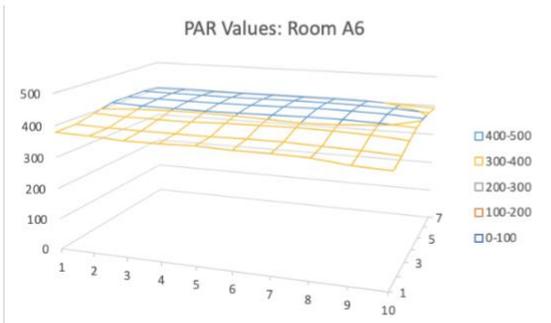


Figure 2.4: PKB Spec Sheet

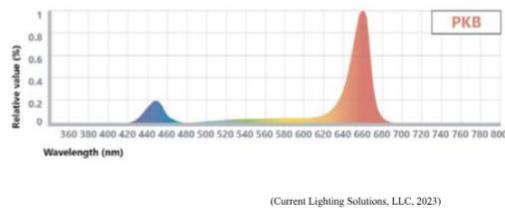


Figure 2.3 (left) is a visual representation of PAR values that were recorded in the greenhouse. The Y axis shows the PAR values ranging from 0 to 500. The X axis represents six inch increments within the area on the greenhouse bench that was measured. Figure 2.4 (right) is the spec sheet from Current Lighting Solutions, LLC which demonstrates the spectra of the PKB lights used in this greenhouse room.

Figure 2.5: Waterfall Graph of PAR Values in Room B8

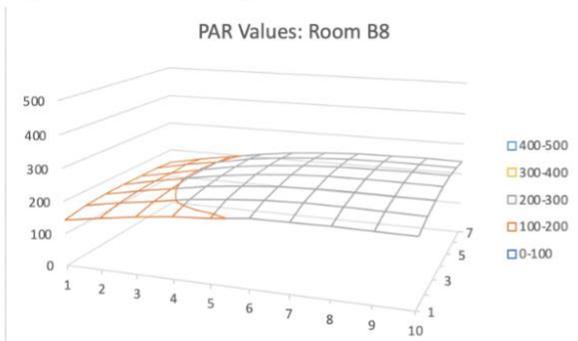


Figure 2.6: SPYDR 2 Spec Sheet

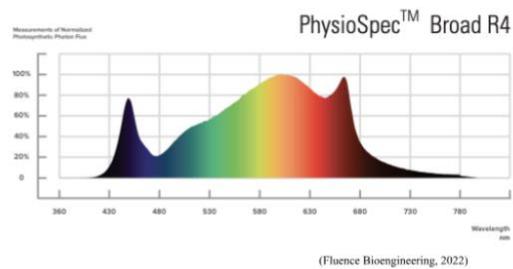


Figure 2.5 (left) is a visual representation of PAR values that were recorded in the greenhouse. The Y axis shows the PAR values ranging from 0 to 500. The X axis represents six inch increments within the area on the greenhouse bench that was measured. Figure 2.6 (right) is the spec sheet from Fluence Bioengineering which demonstrates the spectra of the SPYDR 2 lights used in this greenhouse room.

Figure 3.1: Sample Fresh and Dry Weights 2 Weeks After Sowing

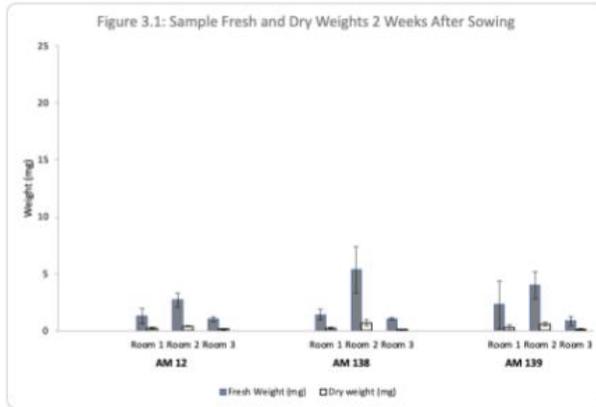


Figure 3.2: Pictures of Samples 2 Weeks After Sowing



Figure 3.3: Sample Fresh and Dry Weights 4 Weeks After Sowing

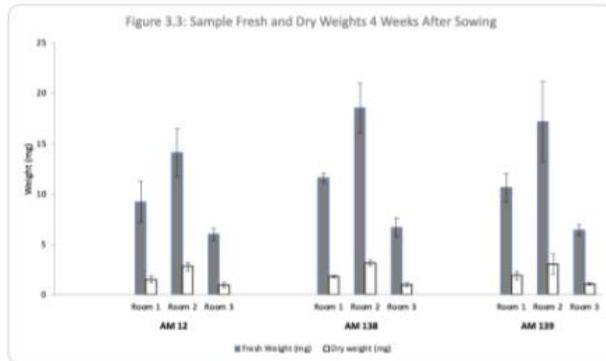


Figure 3.4: Pictures of Samples 4 Weeks After Sowing

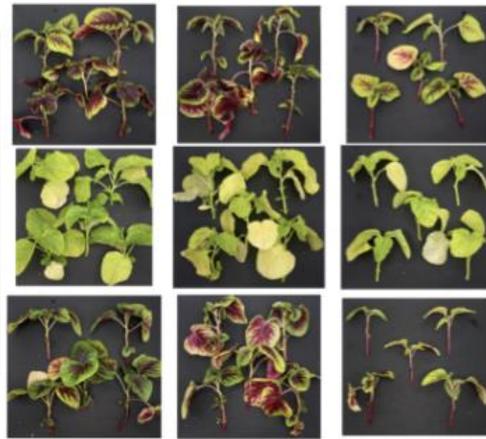


Figure 3.5: Sample Fresh and Dry Weights 6 Weeks After Sowing

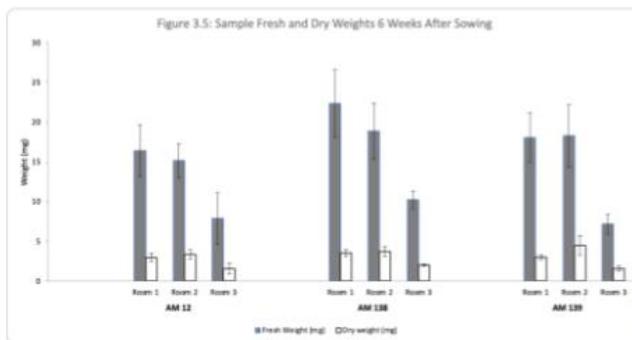
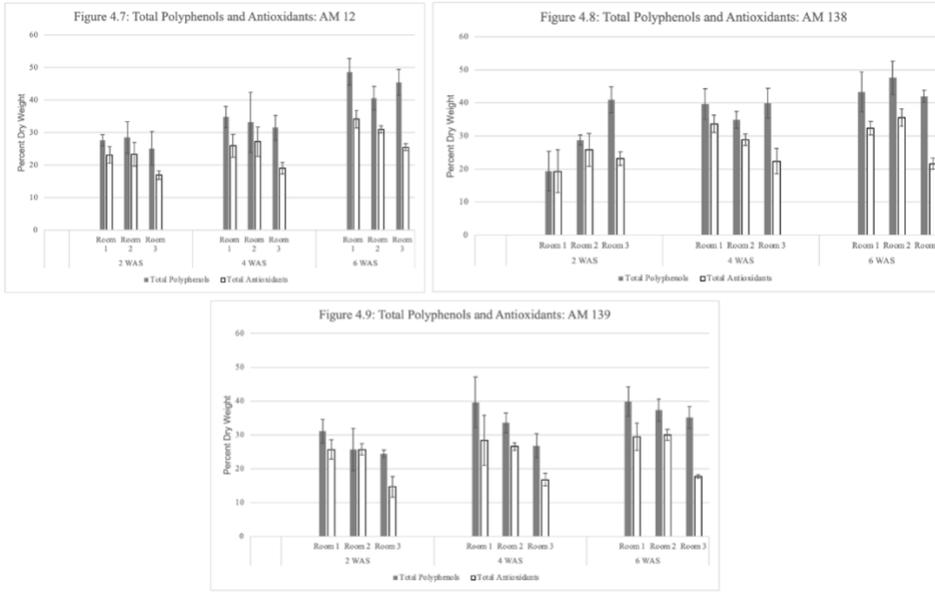


Figure 3.6: Pictures of Samples 6 Weeks After Sowing



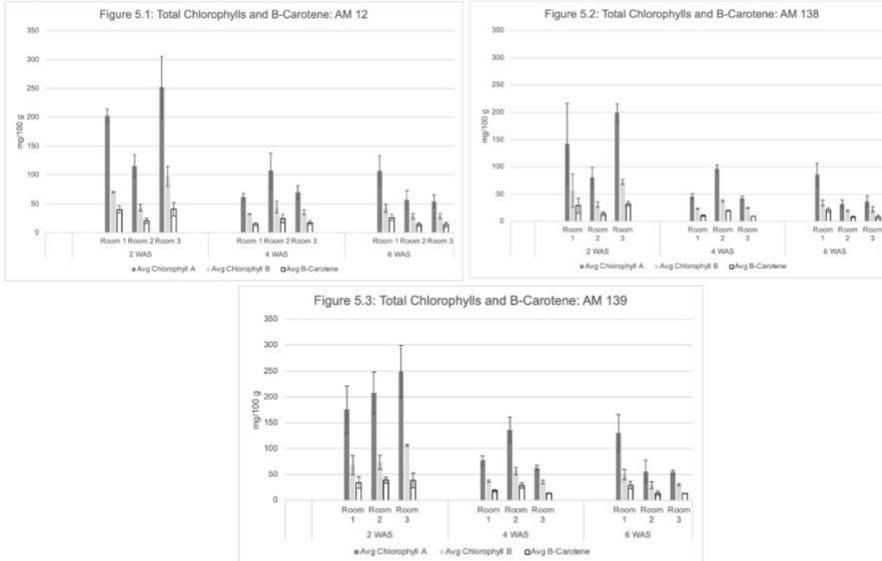
Figures 3.1, 3.3, and 3.5 show a graphical representation of the fresh and dry weights (in mg) of the five samples taken from each amaranth variety in each room 2, 4, and 6 weeks after sowing, respectively. The gray bars represent the fresh weights of the samples, and the white bars represent the dry weights. The error bars represent the standard deviations for each sample. Figures 3.2, 3.4, and 3.6 are a series of nine pictures of the five samples taken from each variety in each room. In all of the figures, the top row is AM 12, the middle row is AM 138, and the bottom row is AM 139. In each row, from left to right, the pictures show samples taken from rooms A6, A4, and B8.

Figures 4.7-4.9: Total Polyphenols and Antioxidants for Each Amaranth Variety



Figures 4.7 - 4.9 represent the percent dry weights of polyphenols and antioxidants in each sample, in each room, and at each week after sowing. Figure 4.7 shows the results for AM12, Figure 4.8 for AM 138, and Figure 4.9 for AM 139. Standard deviations are represented by the error bars.

Figures 5.1-5.3: Total Polyphenols and Antioxidants for Each Amaranth Variety



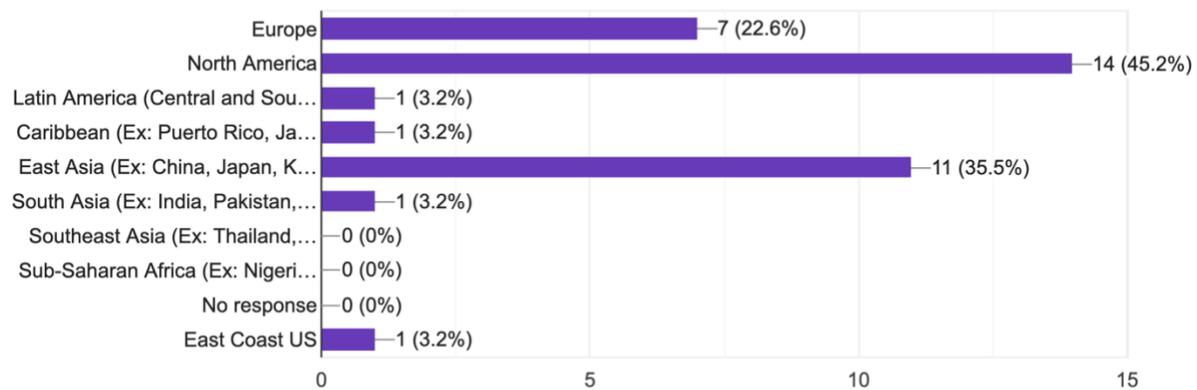
Figures 5.1 - 5.3 represent the percent mg/100g of Chlorophyll A, B and B-Carotene in each sample, in each room, and at each week after sowing. Figure 5.1 shows the results for AM12, Figure 5.2 for AM 138, and Figure 5.3 for AM 139. The dark gray bar represents the average amounts of chlorophyll A, the light gray bar shows the average amounts of chlorophyll B, and the white bars show the average amounts of B-carotene. Standard deviations are represented by the error bars.

The above figures show data collected in evaluating amaranth varieties grown indoors, as part of objective 1, with the use of different supplemental lighting options and harvested at different growth stages. Room 2 with PKB lights had the greatest fresh and dry weight compared to the other two rooms. Total antioxidants and polyphenols increased with time in each room, while total chlorophyll and Provitamin A was the most concentrated 2 weeks after sowing compared to 4 and 6 weeks after sowing.

## 2023 Market Survey Data

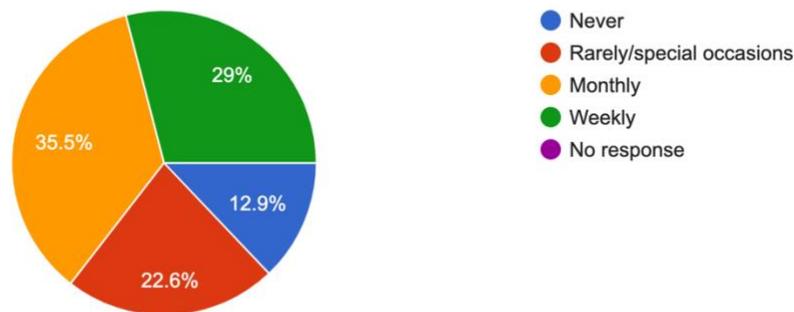
With which region of the world do you culturally affiliate yourself?

31 responses



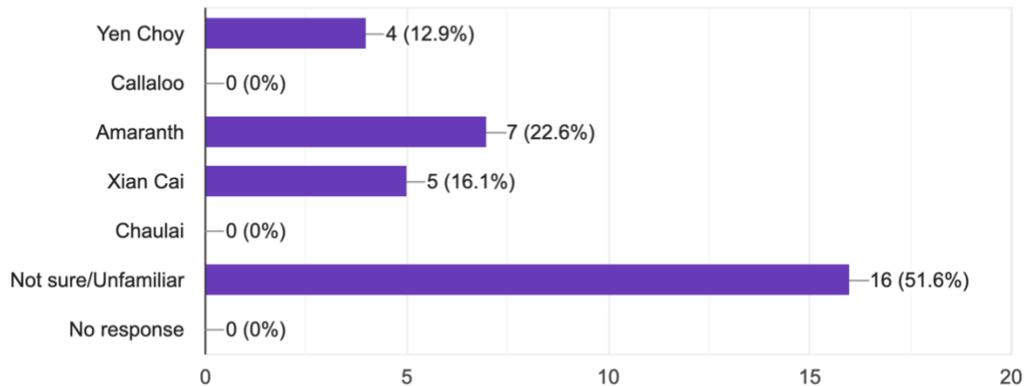
How often do you buy food representative of your cultural affiliation?

31 responses



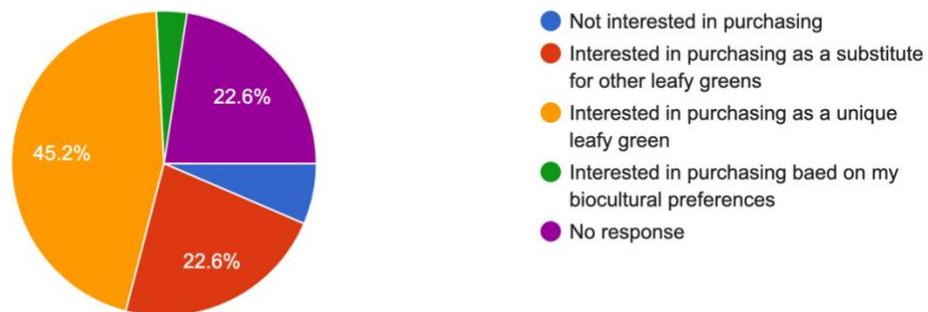
### Our researchers call this plant amaranth, by what name(s) do you recognize it?

31 responses



### Would you be willing to purchase amaranth in the future?

31 responses



The above figures represent demographic information and willingness to purchase amaranth among 31 participants. As we continue these surveys in the coming summer, we will focus on diversifying our participant demographic information and greatly increasing the number of participants to ensure that this consumer information reflects New Jersey's diverse population.

2023 Early vs Late Summer Harvest Study

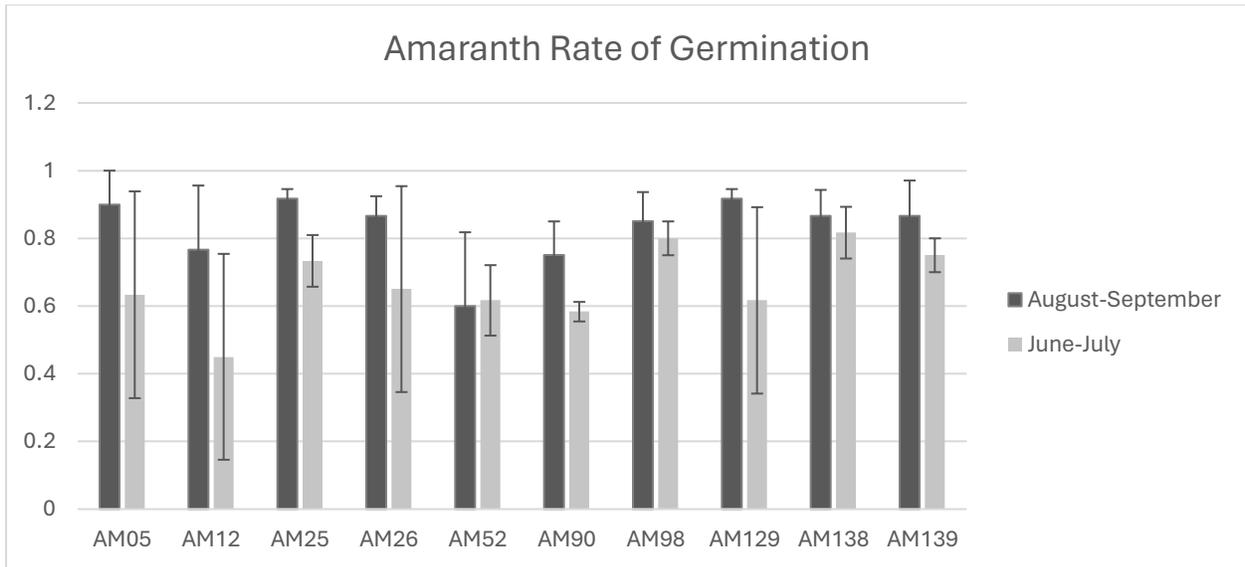


Fig. 1 – Compared rate of germination between June-July and August-September growing season. 5-10 seeds were directly sown in 20 holes per plot in the field, replicated 3 times across 10 varieties. % of holes that germinated after 7 days was used to calculate rate of germination.

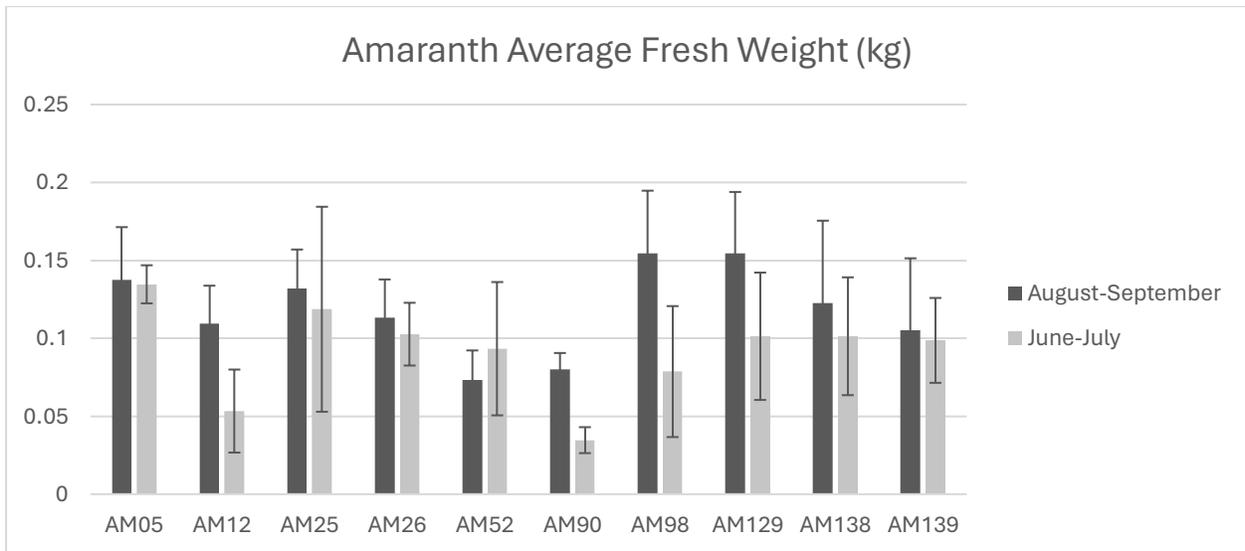


Fig. 2 – Fresh Weights of Amaranth Varieties Between July and September Harvests. Amaranth plants were harvested 6 weeks after seeds were sown by clipping plants right above the soil. Fresh weight was recorded in kilograms.

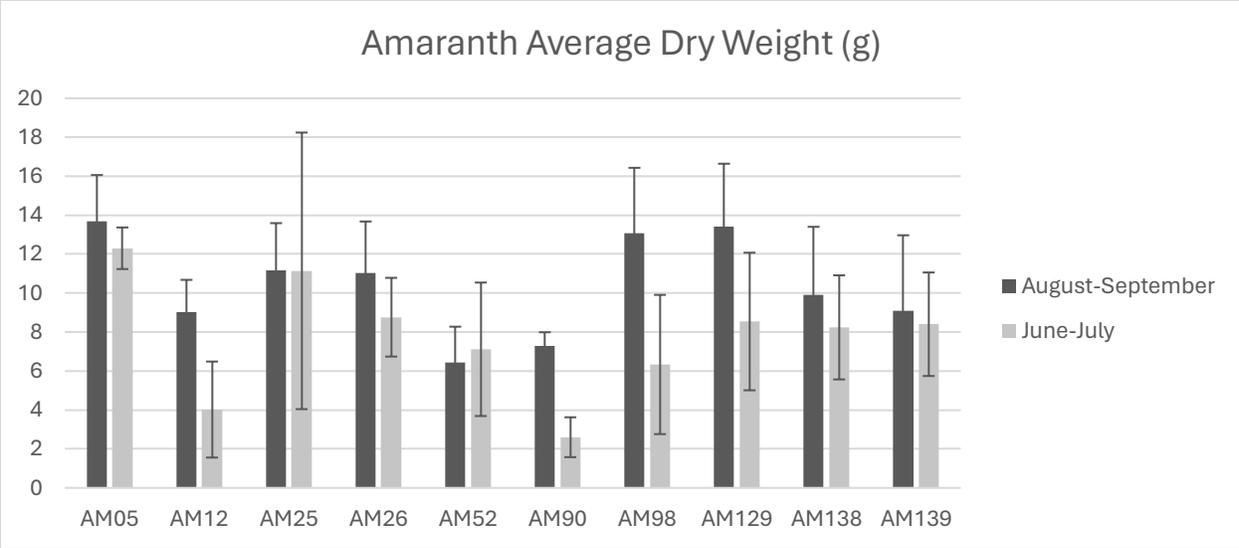


Fig. 3 – Dry Weights of Amaranth Varieties Between July and September Harvests. Plants were dried in an industrial tobacco drier at 35°C for one week. Dry weight was recorded in grams.

The above figures are representative of our research in Summer 2023, in which we began to evaluate optimal growing conditions for amaranth. We found that in terms of germination, fresh and dry weight, a later summer planting and harvesting was beneficial. We are continuing to evaluate nutritional data from this study to get a greater sense of production strategies that will increase the nutrition of this crop.