Jose Fernandez Chair

Annual Report, 2019-2020

Summary

The field for the Jose Fernandez Garden (JFG) was established at the Heritage Farm, beginning with planting of a winter rye cover crop for soil building in the fall and installation of sub-surface drip irrigation in the late winter. The first cool season vegetable trial is complete; the warm season vegetables are partially harvested; and the second season of cool season crops has been planted. Varietal results to date are summarized in this report. Due to the global health emergency, we did not conduct the planned field day, however we have pivoted to social media to publicize the JFG project. Highlights in the project's first year include:

-The Jose Fernandez project supported Valerie Bailey, NMSU Cooperative Extension Intern, Summer 2020, as well as several other student assistants.

-Ms. Bailey initiated and maintains an Instagram account (https://www.instagram.com/nmsu_vegetableext/?hl=en**) that provides updates on JFG activities.**

-Celtuce proved to be a productive crop that was also thoroughly enjoyed in taste and quality by the crew. The variety "Green Mountain Winter" was deemed to be best.

-Five different okra varieties were trialed. Although not as commonly grown as the green pod varieties, the two red pod varieties ("Carmine Splendor" and "Jing Orange") were optimum performers in both yield and flavor.

-We discovered that Malabar spinach and bitter melon are highly susceptible to curly top virus; yard-long beans are highly susceptible to alfalfa mosaic virus.

Spring 2020

The first set of crops planted in the JFG consisted of spring greens and heat tolerant leafy vegetables. Due to a delay caused by multiple rain events, the beds were ready for transplanting relatively later (Mid-April) than the desired time in February. This resulted in some stunting in mature plants and root-bound seedlings. A number of crops were able to be grown to harvest successfully. This late planting was advantageous in the fact that it highlighted the vegetables that exhibited heat tolerance in late spring.

- ***Lettuce***

The main goal of the lettuce variety trial was to identify lines with the highest heat tolerance. Farmers and gardeners alike strive to have lettuces that resist bolting and bitterness as far into the warmer months as possible. We selected eight different varieties claimed to be heat tolerant from multiple seed sources/companies (Table 1). To push the boundaries of heat tolerance, we planted a second trial of the same varieties to measure performance under higher heat in late spring/early summer. Each variety was grown in three replicated plots of 20 ft., organized in a randomized complete block design.

Table 1: Lettuce varieties, sources, and planting dates

Assigned Accession	Variety	Seeding #1	Transplant #1	Seeding #2	Transplant #2	Source
1JFG20	Parris Island Cos	1/13/20	4/20/20	3/23/20	5/8/20	Baker Creek
2JFG20	Marvel of 4 Seasons RG	1/13/20	4/20/20	3/23/20	5/8/20	Brad Tonnessen
3JFG20	Mikola RG X	1/13/20	4/20/20	3/23/20	5/8/20	Brad Tonnessen
4JFG20	Tropicana	1/13/20	4/20/20	3/23/20	5/8/20	Johnnys
5JFG20	Muir	1/13/20	4/20/20	3/23/20	5/8/20	Johnnys
6JFG20	Sparx	1/13/20	4/20/20	3/23/20	5/8/20	Johnnys
7JFG20	Anuenue	1/13/20	4/20/20	3/23/20	5/8/20	Wild Garden Seed
8JFG20	Deer Tongue Lettuce	1/13/20	4/20/20	3/23/20	5/8/20	Richard Heerema

Figure 1: Lettuce Varieties. Each number corresponds to the accession shown on Table 1.

Table 2: Yield, size, quality, and bolting rates of the two lettuce successions

A) 1st Trial

				1st Bolting Date		50% Bolted Date		
Variety #	Total Weight (kg)	Avg Dia (cm)	Avg Height (cm)	Earliest	Latest	Earliest	Latest	Bitterness Scale Avg.
1JFG20	1.99	21.30	19.20	5/26	6/1	5/28	6/3	1.3
2JFG20	0.97	16.03	14.00	5/19	5/21	5/26	5/28	1.3
3JFG20	1.24	16.33	13.33	6/1	6/3	6/3	6/4	1.3
4JFG20	1.47	21.00	14.37	5/20	5/25	5/26	5/28	1.5
5JFG20	1.23	14.70	11.50	6/1	6/1	6/3	6/4	1.2
6JFG20	1.87	22.30	18.80	5/25	6/1	6/1	6/3	0.5
7JFG20	1.71	17.30	16.47	5/15	5/26	5/28	5/28	0.5
8JFG20	1.68	15.53	17.57	5/15	5/23	5/26	5/28	3.5

B) 2nd Trial

				1st Bolting Date		50% Bolted Date		
Variety #	Total Weight (kg)	Avg Dia (cm)	Avg Height (cm)	Earliest	Latest	Earliest	Latest	Bitterness Scale Avg.
1JFG20	2.09	22.33	18.67	6/16	6/17	6/23	6/23	2.5
2JFG20	0.93	13.23	10.57	6/16	6/22	6/22	6/25	1.5
3JFG20	1.32	16.27	12.20	7/1	7/3	7/9	7/10	0.5
4JFG20	2.05	21.40	16.00	6/16	6/17	6/23	6/26	3.0
5JFG20	1.62	15.13	11.37	7/1	7/2	7/7	7/10	1.0
6JFG20	2.37	22.63	18.90	6/22	6/23	6/26	6/26	1.0
7JFG20	2.05	16.70	13.07	6/16	6/17	6/22	6/23	0.0
8JFG20	2.39	15.53	17.07	6/16	6/17	6/22	6/23	3.0

Total Weight from 10 cut lettuce heads. Averaged across 3 replicate plots. Bolting rates based on observation of 10 heads left unharvested.

Lettuce yields were greater in the second trial. Lettuce size at maturity did not differ between successions. The improved performance of the second planting is most likely due to the correct timing between seeding and transplanting. The first trial, as mentioned earlier, had a severe delay in planting time due to weather conditions. Looking at both plantings, some varieties stood out for particular characteristics. Taste notes on each variety at harvest across both successions proved 7JFG20 (Anuenue) as the sweetest and least bitter of the eight varieties. In terms of heat tolerance, measured by latest time to bolting, the best performer was 3JFG20 (Mikola RG X). Two other varieties, 1JFG20 (Parris Island Cos) and 6JFG20 (Sparx), were scored relatively high across all variables.

Along with variety trials, the JFG project focuses on promoting seed saving strategies for gardeners and farmers. Thus, for the un-patented varieties, we left the best lettuce performers to bolt and set seed. Due to high self-pollination in lettuce, short distance isolation is enough to keep seed pure. This fact allows us to save seed directly in the field (Figure 2). We have collected this seed and will plant it the following spring. As studies on epigenetics illustrate, environmental adaptation can happen within one season. We will test this hypothesis by planting our saved seed along with the original varieties and compare their quality and yield in 2021.

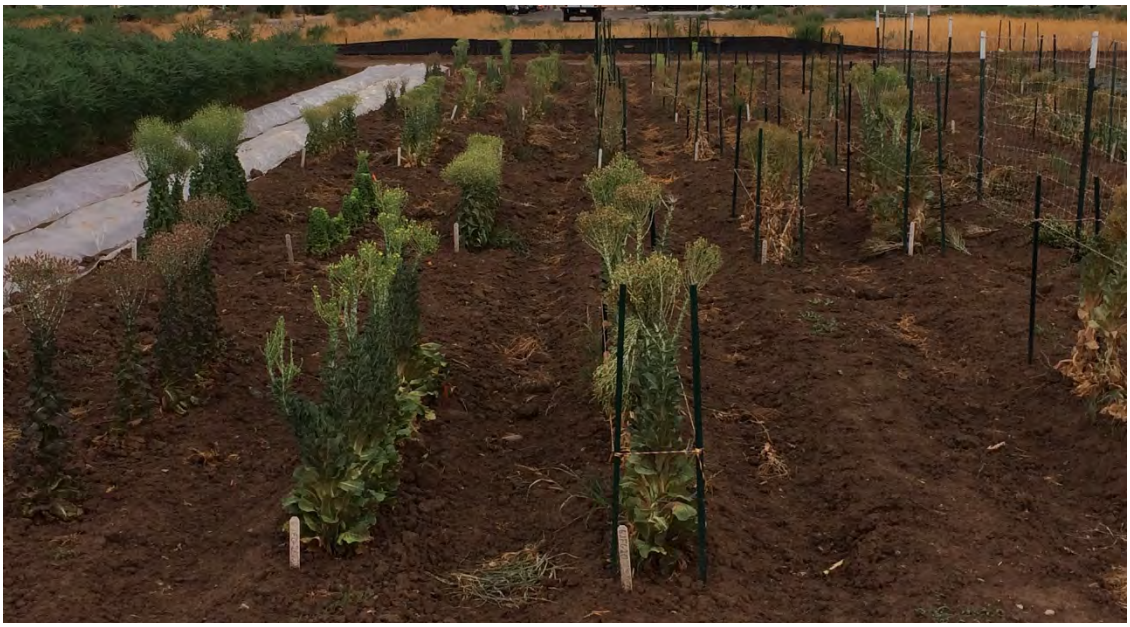


Figure 2: Seed-saving of best performing un-patented lettuce varieties. Trellises prevent lodging during the bolting and flowering process.

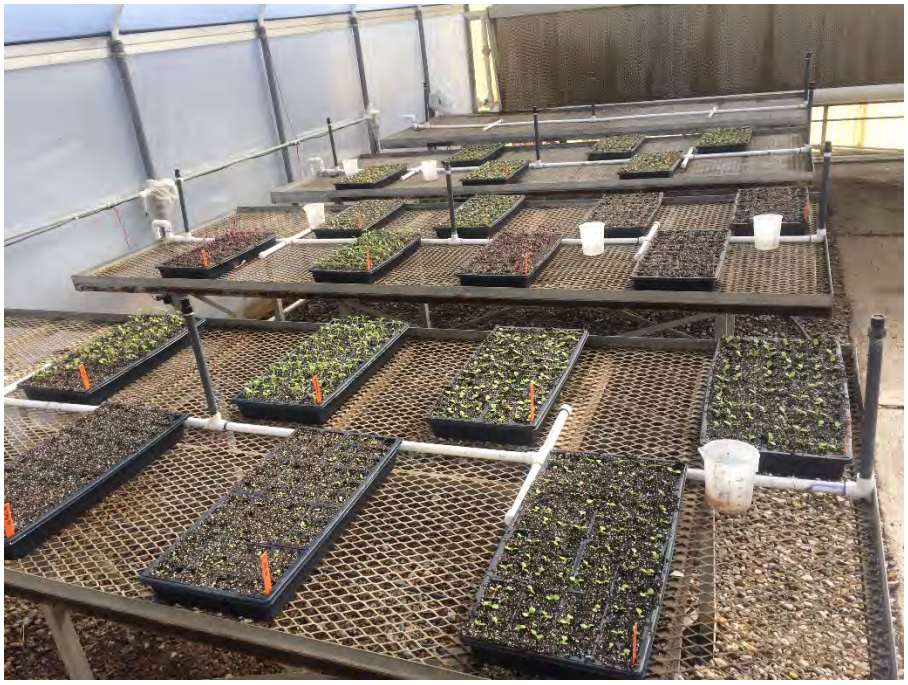


Figure 3: Seed starting greenhouse at Leyendecker Plant Science Research Center. Automatic misters on irrigation timers keep the trays moist throughout the day.

- ***Bok Choy***

Bok Choy, also known as Chinese cabbage, is a member of the *Brassicaceae* family. Unlike typical cabbage, this type of brassica does not form a large head, but rather a tight cluster of upward leaves that taste similar to mustard greens. Two separate varieties of Bok Choy were transplanted into the field in three replicate plots (Table 3). The dark purple variety, "Purple Lady," did poorly in each of the three plots and did not survive to maturity. Conversely, "Suzhou Baby" performed relatively well, allowing for a harvest on 5/29/20. The yield was low, averaging 1.64 kg per plot. At time of harvest, 10% of the plants were bolting and flowering. Due to the late planting and root bound nature of the transplants, it was difficult to achieve a period of steady vegetative growth. Most plants were stressed and bolting shortly after placing in the field. In conclusion, even in stressful conditions, the "Suzhou Baby" variety was able to survive where "Purple Lady" could not, indicating this surviving variety as a good candidate for further study in 2021.

- ***Orach/Amaranth family***

Orach, a spring green of the Amaranth family, serves as a warm weather alternative to traditional spinach varieties. In this trial, we planted three different varieties of Orach (Table 3,

Figure 4). They were transplanted in mid-late April after being seeded in the greenhouse about 3 months earlier. Due to this long delay in transplanting, these particular vegetables did not survive the process. Every single variety perished in the field within 2-3 weeks of the transplant date. We cannot conclude that these plants are unsuitable for the environment until we execute correct timing in the spring of 2021 with these same varieties.

Figure 4: Two varieties of Orach seedlings in the greenhouse. "Red Orach" (left) and "Purple Orach" (right).

Additional vegetable varieties in the amaranth family were grown: "Strawberry Spinach" and "Red Aztec Spinach (Huauzontle)." These are both heat-tolerant, edible leafy vegetables. Germination of this seed was poor, and a reseeding produced enough health plants to fill three plots in the field. Similar to the effect of transplant delay on Orach, these two varieties did relatively poor in the field. "Red Aztec" did not survive more than a month, whereas "Strawberry" continued to grow for a longer period. Yield was unmeasurable on "Strawberry" due to a scattered survival of the plants across plots, rendering a replicated trial to be futile. However, the hardiness of "Strawberry Spinach" gives promise, and will be planted again in spring 2021.

Table 3: Spring greens planted in 2020

Cultivar / Accession	Plant type	Seeding Date	Re-seeding	TP Date	Source
Red Orach	Orach	1/13/20		4/20/20	Baker Creek
Triple Purple Orach	Orach	1/13/20		4/20/20	Wild Garden Seed
Golden Orach	Orach	1/13/20		4/20/20	Wild Garden Seed
Strawberry Spinach	Spinach	1/13/20	1/27/20	4/20/20	Wild Garden Seed
Red Aztec (Huauzontle)	Spinach	1/13/20	1/27/20	4/20/20	Wild Garden Seed
Corn Salad	Caprifoliaceae	1/13/20	1/27/20	Failed	Reimer Seeds
Red Mountain	Celtuce	1/13/20		4/20/20	Baker Creek
Green Mountain Winter	Celtuce	1/13/20		4/20/20	Baker Creek
Batavian Full Hearted	Endive	1/13/20		4/20/20	Reimer Seeds
Salad King	Endive	1/13/20		4/20/20	Reimer Seeds
Green Curled Ruffec	Endive	1/13/20	1/27/20	Failed	Reimer Seeds
Early Mizuna	Mizuna	1/13/20	3/1/20	4/20/20	Baker Creek
Beni Houshi	Mizuna	1/13/20	3/1/20	4/20/20	Baker Creek
Red Malabar Spinach	Basellaceae	2/7/20		4/20/20	Baker Creek
Suzhou Baby	Bok Choy	2/7/20	3/1/20	4/20/20	Baker Creek
Purple Lady	Bok Choy	2/7/20	3/1/20	4/20/20	Baker Creek

- ***Celtuce***

Another uncommon vegetable included in the study is a member of the *Asteraceae* family, Celtuce. Developmentally similar to head lettuce varieties, Celtuce is a form of the plant bred to produce a tall, thick stem that is edible with a crunchy and sweet taste. Two varieties were planted at 10" spacing, "Red Mountain" and "Green Mountain Winter" (Table 3). Every replicate plot (3 each) survived despite the late transplant date. Bolting started when stem thickness was half the expected diameter, thus the recorded yields are not optimal. The stress of late transplanting caused this, and is illustrated in Figure 5. It is important to note that "Red Mountain" exhibited a delayed flowering phenotype relative to "Green Mountain Winter," suggesting a higher stress tolerance. Plants were harvested (5/28/20) and the edible stem portion was weighed and measured (Table 4). "Green Mountain Winter" exhibited the highest yield, while both varieties had exceptional taste with little to no bitterness.

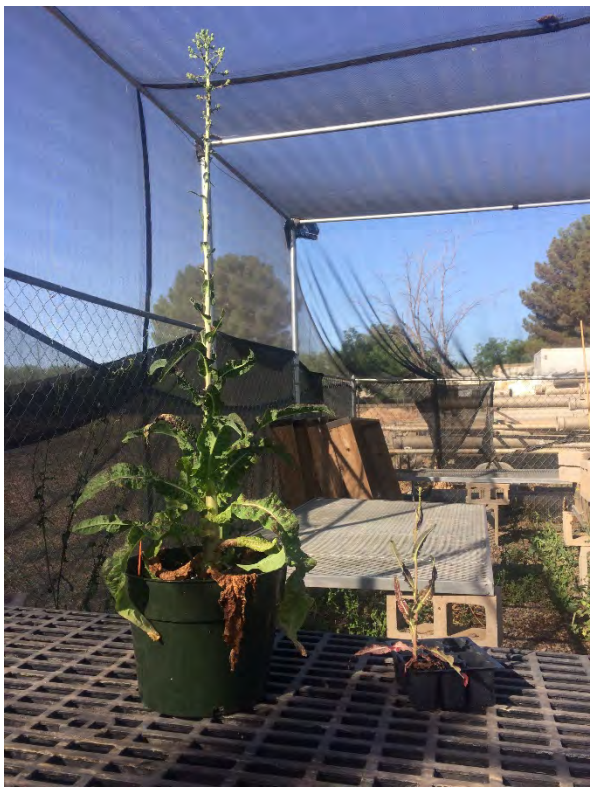
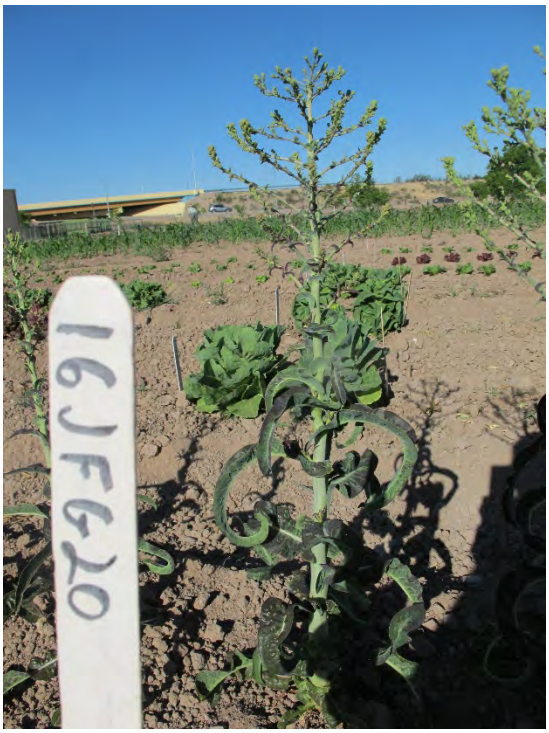


Figure 5: A drastic example of how root growth restriction during development impedes biomass accumulation. These two Celtuces were seeded at the same time, but one was kept in its 1" pot where the other was transplanted. Due to the late transplant date (~1 month later than needed) into the field, all Celtuce stems were much smaller than expected for the variety's known phenotype.



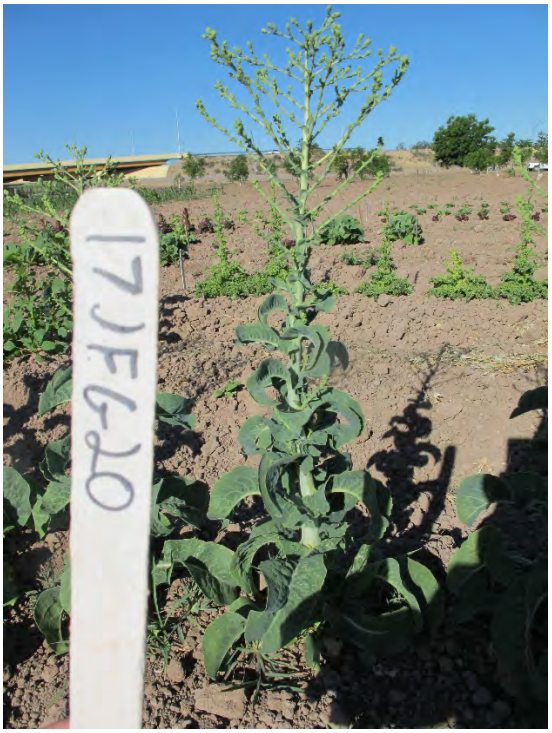


Figure 6: "Red Mountain" (left) and "Green Mountain Winter" (right) Celtuce varieties at maturity.

Table 4: Yield, quality, and stem measurements of Celtuce varieties (Spring 2020).

Variety	Total Weight (kg)	Upper Stem Diameter (cm)	Base Stem Diameter (cm)	Edible Stem Length (cm)	Flavor and Bitterness Scale 0-5 (5: most bitter)
"Red Mountain"	1.01	11.7	19.4	28.9	Good crunch, buttery, salty and sweet notes, cucumber-y (0)
"Green Mountain Winter"	1.53	13.1	23.4	25.7	Very sweet, bready, buttery (0)

*Averages across 10 plants per plot, 3 replicate plots.

Due to the lack of popularity of this crop, we wanted to show an example of preparing this vegetable. Thus, the stems were peeled to remove the bitter outer layers, and cut into pieces. These prepared stems were pickled in vinegar and salt brine (Figure 7). The result is a crunchy, well-balanced flavor. This sort of demonstration can assist in familiarizing people with these new types of plants.

In addition, we have saved the seeds of the best-looking plants from each variety (also seen in Figure 2). These seeds will be grown in the following spring of 2021 to assess improvements compared to the original variety.

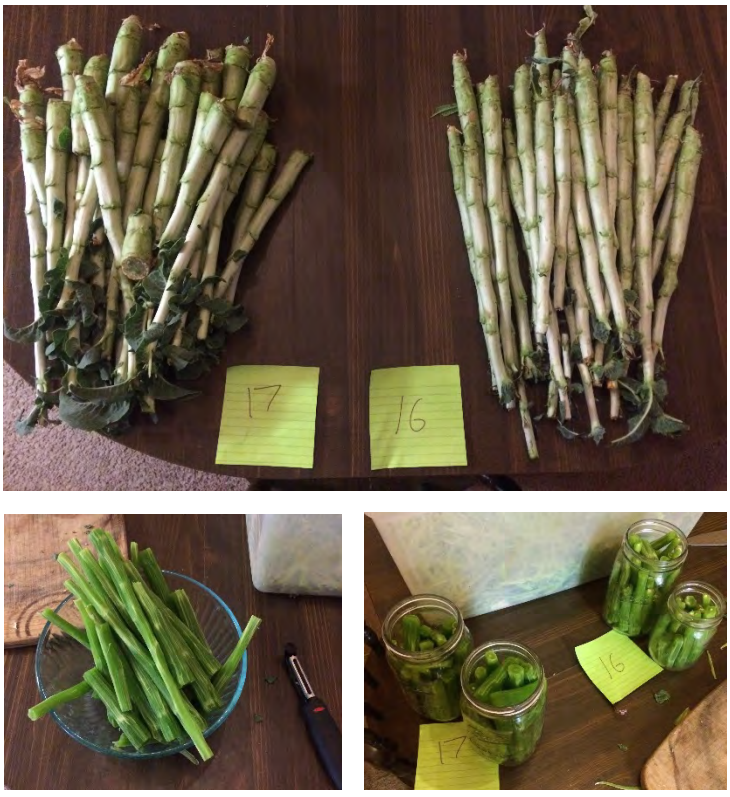


Figure 7: Pickling of Celtuce stems after peeling of the 0.5 cm thick "skin."

- ***Other greens***

The frequent rainfall in February and March of 2020 resulted in the late transplanting and ultimate crop failure of most spring green plantings. This includes the Endives, "Batavian Full Hearted" and "Salad King," as well as the two Mizunas, "Early Mizuna" and "Beni Houshi." It is important to note that seed sources may have been unreliable for "Corn Salad" and "Green Curled Ruffec Endive." These two failed to germinate in the greenhouse.

One interesting result involved "Red Malabar Spinach," which is a perennial vining plant of the family *Basellaceae* (Table 3). This leafy vegetable is heat tolerant, and should survive throughout the spring, summer, and fall months in southern New Mexico. Due to the late transplanting of this crop, it entered the field in stress, and subsequently succumbed to beet curly top virus, as diagnosed by the NMSU Plant Diagnostic Clinic (Figure 5).

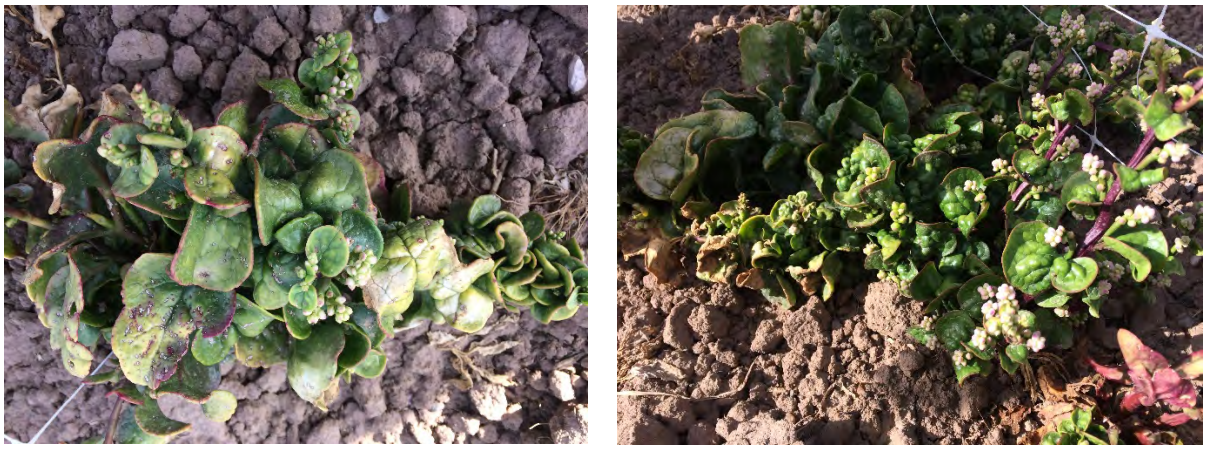


Figure 5: Red Malabar Spinach. A healthy, yet slow growing plant climbing up a trellis (right), and one infected with the curly top virus (left).

Summer 2020

- ***Cucurbits***

Bitter Melon

Bitter melon (bitter gourd) is a vining cucurbit usually grown in tropical climates, especially in Southeast Asia. The fruit resembles a small cucumber with bumps and deformations (Figure 6). Fruits are harvested early in development to prevent any further bitterness that comes through as it matures. Five different varieties of bitter melon were direct seeded into the field with 3 ft. spacing in 3 replicate plots of 20 ft. (Table 5). The varieties exhibited relative uniformity and successful germination. Trellises allowed for climbing of the vines. First harvest began on 7/13/20, with some fruit exhibiting yellowing (Figure 6).

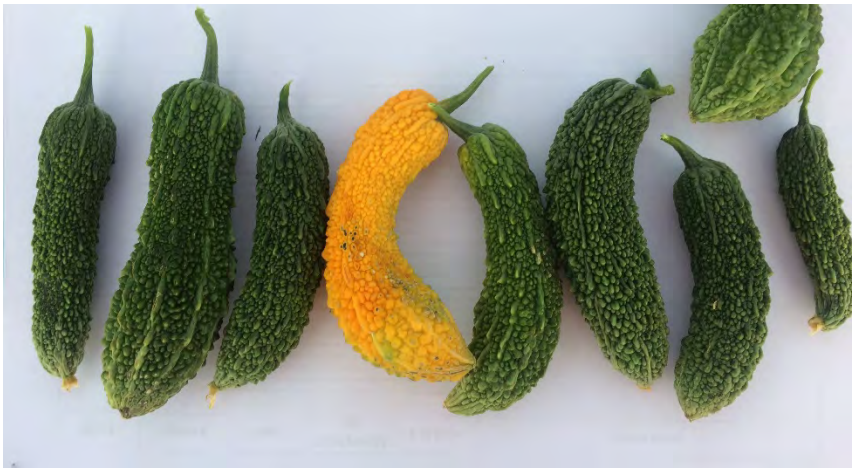


Figure 6: Bitter Melon. Harvested fruit from the "Big Top Bitter" variety. Yellowing fruit are stressed, most likely due to early onset of curly top virus.

Table 5: Varieties planted in the JFG of the *Cucurbitaceae* family.

Variety	Plant type	Seeding Date	Source
Cassabanana Melocoton	Melon	1/27/20	Baker Creek
Armenian Yard-Long	Cucumber	4/29/20	Baker Creek
Abashi Bitter Gourd	Bitter Melon	4/29/20	Baker Creek
Ganjyu	Bitter Melon	4/29/20	Baker Creek
Satuma Ohnaga Bitter	Bitter Melon	4/29/20	Baker Creek
Jyunpaku Okinawan Pure White	Bitter Melon	4/29/20	Baker Creek
Big Top Bitter	Bitter Melon	4/29/20	Baker Creek
Albinus	Summer Squash	6/12/20	Felipe Mena
Africanus	Summer Squash	6/12/20	Felipe Mena

Shortly after initial harvest, many leaves began to curl and showed a mottled yellowing. Diagnosed by the NMSU Plant Diagnostic Clinic, 90% of the bitter melon plants were infected by the beet curly top virus (Figure 7). Thus, yield data could not be collected, but the varieties were left in the field for observation. Currently (9/10/20), one variety has healthy plants scattered across the plots, "Satuma Ohnaga Bitter." To date, evidence of genetic resistance to this viral disease is scarce to non-existent, but this variety may show promise in another planting in 2021.

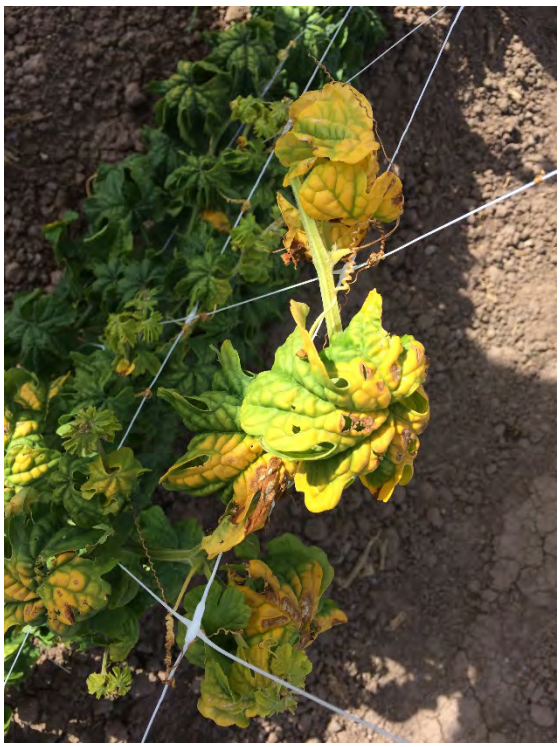


Figure 7: Bitter Melon vine exhibiting symptoms of beet curly top virus. Young leaves showed yellowing, curling, and localized necrosis. Flowering halted and growth of the plant discontinued. Incidence in all plots was ~90%.

Cucumber

This year, one variety of cucumber was planted in the JFG, "Armenian Yard Long." This variety produces a very long, sometimes curved fruit, with a light green hue (Figure 7). The plant was direct seeded at 3 ft. spacing intervals within 20 ft. plots and 3 replicates. Harvesting began on 7/1/20, and subsequently on a weekly basis. Harvest has not finished; thus, total yield is incomplete. A number of the plants (~40%) succumbed to beet curly top virus, but some plants continued on a steady and productive pace. Three of the fruits from the most productive vines are selected for seed, and are being left to ripen on the vine to full maturity. We will plant these seeds next year to further develop an adapted "Armenian Yard-Long" for this microenvironment.

Figure 7: "Armenian Yard-Long" Cucumber. Example of mature fruit and the vining plant with flowers upon a trellis in the JFG field.

Melon

The variety, "Cassabanana" was an unsuccessful planting in the JFG. Seeds were started in the greenhouse in late winter. Germination was poor, and the plants quickly perished when transplanted out into the field. Many factors could have contributed, including a late transplanting and temperature stress. Greenhouse pests, including thrips and aphids, were detrimental to development as well. Mitigating these issues in 2021 may yield a better result for this crop.

Squash

The two varieties of squash planted in the JFG came from Felipe Mena, a farmer who has been saving his own seed for many years, selecting for best tasting fruit. He contacted NMSU about sharing his material and we were gifted the seeds to observe and bring forward the lines in our breeding and seed-saving program. The two types are bell-shaped albino ("Albinus") and more zucchini-like green ("Africanus") squash (Table 5). The seeds were planted into the field relatively later than typically done for squash (Mid-June instead of April-May). Each variety had one 20 ft. plot for observation. Germination was almost 100%, and the entire plots were healthy and vigorous (Figure 8A). As fruit began to develop, the diversity in form and color became apparent (Figure 8B). Harvest began on 7/28/20. Each plant had unique qualities. The various fruits were assessed for taste and texture as they came out of the field. The best plants

in terms of taste and aesthetics were self-pollinated by applying the pollen to an isolated female flower of the same plant (Figure 8C-D). We now have a selection representative of the phenotypic diversity, and the selfed seed will be planted in replicated plots for trials in 2021 (Figure 8E-I).

Figure 8: Observation and seed-saving trial of "Africanus" and "Albinus" summer squash. Example of healthy squash plants mid-summer (A). Example of genetic/phenotypic diversity within the population (B). Male open blossoms (C). Selfed and tied female flower for selfed seed development (D). The five plants with exceptional characteristics selected for selfing and subsequent 2021 trials (E-I).

- ***Solanaceae***

  Naranjilla Orange

Naranjilla Orange is a member of the *Solanaceae* family from sub-tropical regions in Colombia. In these climates, it is a perennial, and produces small, round orange fruits with sweet taste. These were seeded in the greenhouse during winter (Table 6). Germination was 40%. A subset of the plants was placed in a shade house for observation, and the rest were

transplanted in the JFG within a 20 ft. plot with 2 ft. spacing. Growth has been extremely slow in the field, and the fruits will not develop before the coming frost. One variable attributable to this issue would be the late transplant date. Performance may improve if transplant occurred earlier in April.

Table 6: Solanaceous plants in the JFG

Variety / Accession	Seeding Date	Transplant Date	Source
NuMex Sundog	3/3/20	4/24/20	Stephanie Walker
NuMex Sundog-1	3/3/20	4/24/20	Stephanie Walker/Brad
NuMex Sundog-2	3/3/20	4/24/20	Stephanie Walker/Brad
Bella Rosa Hybrid	3/3/20	4/24/20	Totally Tomatoes
Naranjilla Orange	1/13/20	4/24/20	Baker Creek

Tomato

A trial was designed to evaluate a current breeding line from the vegetable extension program, “NuMex Sundog.” This is a determinant, large fruited tomato bred for tolerance to heat and intense sunlight. “NuMex Sundog-1” and “-2” are single plant selections made in the field in 2019 that were the hardiest in the field conditions at Leyendecker Plant Science Research Center. As a control, “Bella Rosa Hybrid” was planted due to its known productivity and similarity in phenotype to “NuMex Sundog.” Seedlings started in the greenhouse, and then transplanted in three replicate plots for each variety/breeding line at 2 ft. spacing. Timing of seeding and transplanting aligned with recommended guidelines for the region. However, yellowing and stunted growth began in mid-May. By the end of June, all plants were dead or yellowing. No plants produced viable fruit. Samples were sent in to the Plant Diagnostic Clinic at NMSU, and the results came back to show *Fusarium* wilt as the causal agent. This is a vascular wilt disease caused by the fungus, *Fusarium oxysporum*. No treatments are available, but mitigating this issue will involve addition of soil organic matter and crop rotation for the 2021 growing season.

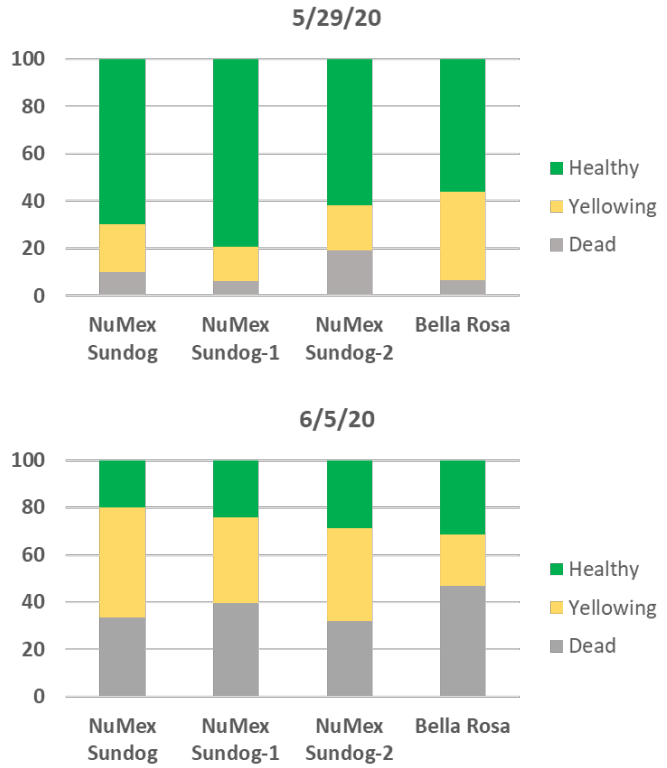


Figure 9: (A) Tomato plots. Picture taken on June 13, 2020. Most plants dead and/or yellowing. **(B) Tomato health progression.** The condition of tomato plants averaged across three replicate plots. Survivability of plants were no different between lines/varieties. Values given as percentage of total number of planted individuals.

- ***Okra***

Okra is a heat-loving plant that produces fruit continuously during the summer months. We designed and implemented a variety trial consisting of five different varieties diverse in color and fruit shape (Table 7). The goal is to see which varieties produce the most and grow most efficiently in our field conditions at the JFG. Seeds were planted in the field in three replicated plots of 20 ft. in length. Spacing was 1 ft., and thinned to 2 ft. after emergence. Due to the clay content of the soil, a crust formed after watering, which needed to be broken by a rotary hoe before plants were able to emerge.

Table 7: Okra varieties included in the trial.

Variety	Seeding Date	Emergence	Source
Eagle Pass	4/29/20	10%	Baker Creek
Jing Orange	4/29/20	90%	Baker Creek
Star of David	4/29/20	10%	Baker Creek
Clemson Spineless	4/29/20	50%	Johnnys
Carmine Splendor	4/29/20	90%	Johnnys

Percent emergence amongst the types showed high variation (Table 7, Figure 10). Harvesting of the fruit (2-4 inches in length) began on 7/1/20, and continued on a weekly or biweekly basis for two months. Fruit were counted at each harvest, along with the number of plants harvested that day. Totals are averaged across replicates for each month (July and August) (Table 8).

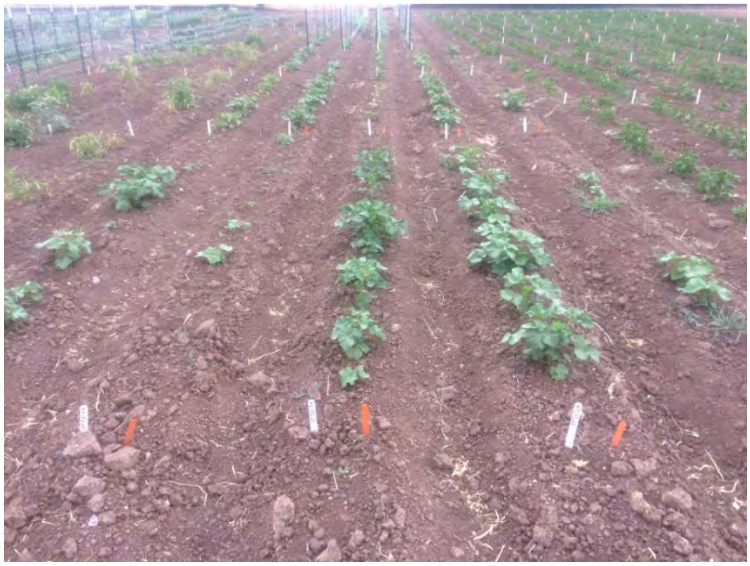


Figure 10: Okra emerged in the field on June 13th, 2020.

The top performing varieties were "Jing Orange," "Clemson Spineless," and "Carmine Splendor." In terms of total yield, "Jing Orange" was behind the other two leading varieties, but yield per plant placed the variety above "Clemson Spineless." Even though germination was high in "Jing Orange," fewer plants made it to maturity and full productivity than the other two varieties. This is the reason for the higher yield per plant, yet smaller total yield.

Table 8: Okra variety trial yield data.

	Total Yield		Yield per plant	
Variety	**July**	**August**	**July**	**August**
Eagle Pass	77	255	15	48
Jing Orange	117	336	26	89
Star of David	72	224	18	37
Clemson Spineless	123	475	25	81
Carmine Splendor	271	667	28	91

To continue with seed saving initiatives for these vegetables, harvesting of the okra stopped after august, so any remaining fruit could mature into viable seed pods. Varieties that did not succeed in terms of yield were terminated. The three plots of the top three varieties were screened, and the best three plants of each plot were stripped and bagged using a cloth mesh material. By doing so, pollinators are prevented from contacting the newly developed flowers, and we will obtain selfed seed from the top plants of "Jing Orange" and "Clemson Spineless." Due to the fact that "Carmine Splendor" is a hybrid, we decided to let the fruits develop without an isolation bag, since the offspring will already be highly variable and segregating. The offspring from these top plants will be evaluated in the 2021 growing season.

- ***Fabaceae***

Three varieties of yard-long, pole bean were evaluated in the JFG (Table 8). Seeds were planted 2-3 per spot, spaced 6 in. apart along a plot length of 10 ft. with three replicate plots. All varieties emerged in a full stand within one week. Trellises were established to facilitate the climbing of the tendrils. Before the initiation of flowering across the varieties, at about mid-June the plants began to show signs of necrosis and mosaic patterns of yellowing (Figure 11). Samples were submitted to the Plant Diagnostic Clinic, and the results came back positive for Alfalfa Mosaic Virus. This is not surprising, because alfalfa, another leguminous crop, has inhabited this land for several years before this planting of the JFG. This information is pertinent to anyone considering planting beans after alfalfa. It may be wise to choose a different crop to lessen the disease pressure over time.

Table 8: Pole bean varieties

Variety	Seeding Date	Source
Chinese Red Noodle Bean	4/30/20	Baker Creek
Chinese Light Green	4/30/20	Baker Creek
Gita	4/30/20	Johnnys

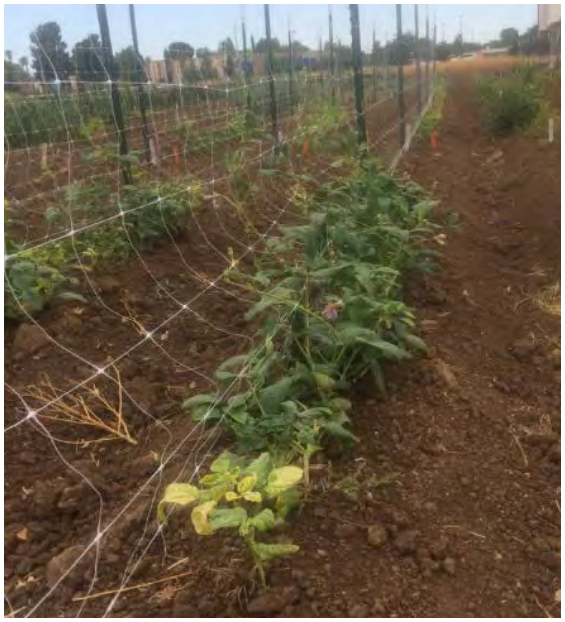


Figure 11: Pole beans beginning to climb trellises are showing signs of alfalfa mosaic virus.

- ***Artichokes/Cardoon***

Artichokes and Cardoon are members of the *Asteraceae* family. Artichokes produce an edible flower, whereas Cardoons grow large midribs on their leaves that can be boiled/blanched and eaten. These varieties will be treated as a perennial to observe the survivability through the winter (Table 9). The artichoke variety, "Green Globe," was seeded in the greenhouse, then transplanted in the field 4 ft. apart in three plots 20 ft. in length. The three Cardoon varieties were transplanted in the field at 2 ft. spacing, also with three replicate plots each. Plots are being maintained and regularly watered, and harvesting has not yet started. Each variety is performing well thus far (Figure 12).

Table 9: *Asteraceae* family (Artichoke/Cardoon) variety trials

Variety	Plant type	Seeding Date	Transplant Date	Source
Rouge d'Alger	Cardoon	2/7/20	4/24/20	Baker Creek
Gobbo Di Nizzia	Cardoon	2/7/20	4/24/20	Baker Creek
Porto Splineless	Cardoon	2/7/20	4/24/20	Johnnys
Green Globe	Artichoke	2/7/20	4/24/20	Baker Creek

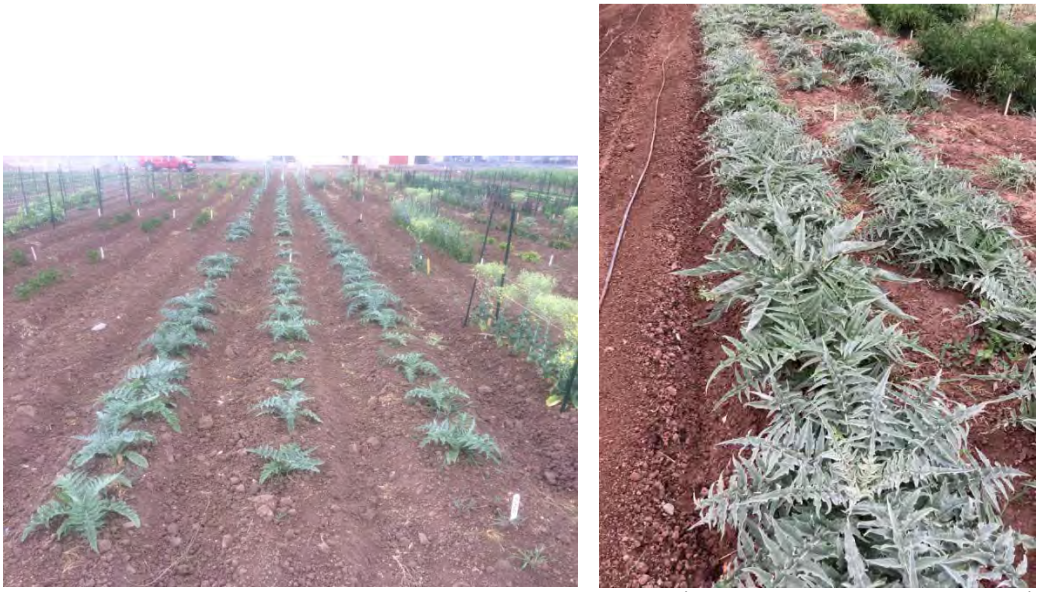


Figure 12: Progression of Artichoke/Cardoon plots. June 13th (left), and September 10th, (Right)

- ***Corn***

Seed from a purple-leafed, purple-kernel corn selection made by Dr. Walker several years ago was sown in the JFG 4/28/20. Seeds were planted at 4-6 in. spacing. Seedling emergence was complete on 5/6/20 (Figure 13). Irrigation to encourage germination involved a 12-hour cycle immediately after sowing. This watering was sufficient to allow for seedling development. Stands stayed relatively green and productive until 6/30/20, when tasseling started and the plants began to exhibit stress symptoms. Chicken manure was applied in bands along the rows at a rate of 30 lbs./1000 ft^2. The plants did not fully recover from the event, and tasseling was finished, with pollen expended, before silking started on most of the plants (Figure 13E). Ultimately, no viable seed was produced. According to the Plant Diagnostic Clinic, a disease/pest did not cause this, and may have been drought stress early in the season. If planted again next year, soil moisture will be continuously monitored to ensure an adequate irrigation throughout the lifecycle of the plants.

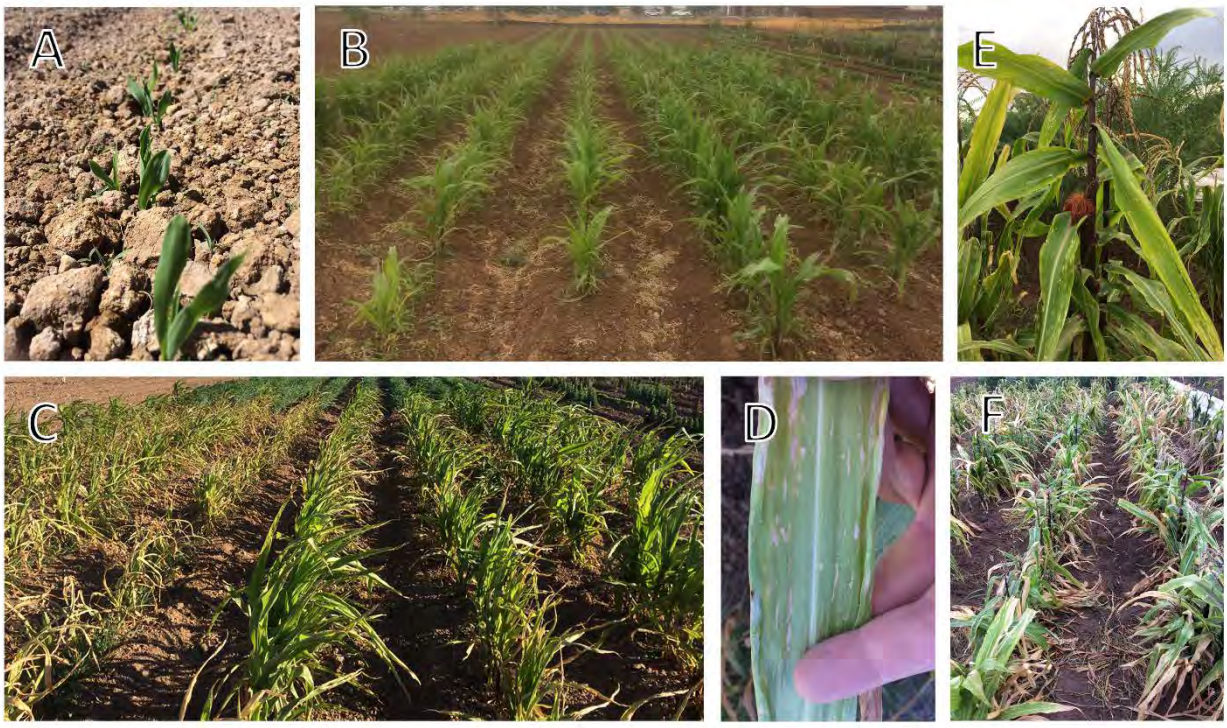


Figure 13: Progression of purple-leaf corn throughout the season. Seedlings emerge, 5/6/20 (A). Stand is healthy and dark green, 6/13/20 (B). Stand began to look dry and stressed, 6/30/20 (C-D). Tassels no longer contain pollen as silking begins, 7/23/20 (E). Ears fail to develop, little to no viable seed, 7/30/20 (F).

Fall 2020

An array of autumn crops are being planted in the field after application of chicken manure pellets and compost at 8 tons/acre and 25 tons/acre, respectively (Table 10).

Table 10: Autumn planting list for JFG.

Variety	Plant type	Seeding Date	Seed Loc.	Notes
Tatsoi	Brassica	8/17/20	Ley GH	Reimer Seeds
Komatsuma Tendergreen	Brassica	8/17/20	Ley GH	R. Heerema/Baker Creek
Mammoth Sandwich Island	Salsify	9/14/20	Field	Johnnys
Enorma	Scorzonera	9/14/20	Field	Johnnys
Hollow Crown	Parsnips	9/14/20	Field	Reimer Seeds
Brilliant	Celeriac	8/24/20	Ley GH	Reimer Seeds
Giant Prague	Celeriac	8/24/20	Ley GH	Reimer Seeds
Giant Red	Celery	8/17/20	Ley GH	Baker Creek
Chinese White	Celery	8/17/20	Ley GH	Baker Creek
Amazing	Cauliflower	8/17/20	Ley GH	Baker Creek
De Jesi	Cauliflower	8/17/20	Ley GH	Baker Creek
Cheddar F1	Cauliflower	8/17/20	Ley GH	Johnnys
Graffiti F1	Cauliflower	8/17/20	Ley GH	Johnnys
Fioretto 70 F1	Cauliflower	8/17/20	Ley GH	Johnnys
Romanesco Italia	Broccoli	8/17/20	Ley GH	Baker Creek
Gold Nugget F1	Carrot	9/14/20	Field	Johnnys
White Satin F1	Carrot	9/14/20	Field	Johnnys
Deep Purple F1	Carrot	9/14/20	Field	Johnnys
Hercules F1	Carrot	9/14/20	Field	Johnnys
Purple Leaf Corn	Corn	4/28/20	Field	Walker
Sesbania	Legume	4/28/20	Field	Hancock Seeds
Albinus	Cucurbit	6/12/20	Field	Felipe Mena
Africanus	Cucurbit	6/12/20	Field	Felipe Mena
Piracicaba RG IV	Broccoli	8/17/20	Ley GH	Brad Tonnessen
Red Mountain	Celtuce	8/24/2020	Ley GH	Baker Creek
Green Mountain Winter	Celtuce	8/24/2020	Ley GH	Baker Creek
Magenta Sunset	Chard	9/14/20	Field	Johnnys
Bright Lights Decorticated	Chard	9/14/20	Field	Johnnys
Fordhook Giant	Chard	9/14/20	Field	Johnnys
Bright Yellow Decorticated	Chard	9/14/20	Field	Johnnys

*Ley GH – greenhouse planted for later transplanting. *Field – Direct sown

Outreach/Education

Due to the current pandemic, outreach activities have been greatly reduced. Though, our social media presence is continuing to gain attention. The Instagram account: https://www.instagram.com/nmsu_vegetableext/?hl=en is showcasing the work being done in

the JFG on a regular basis. We are also hosting an online workshop series this fall provided by WSARE, where Bradley Tonnessen and Stephanie Walker will be presenting on achievements made in the JFG.

Future plans will involve a Community Supported Agriculture (CSA) model to distribute produce harvested to participating members of the public. Criteria for membership is to return with a completed taste-testing questionnaire to be used in our reporting and variety trials. Logos for the garden, printed shirts, and distribution methods (Logo-printed bags/Farm stand) are being planned to ensure this new avenue of outreach becomes successful. We also plan to investigate potential seed sharing with interested clientele from our selections and seed saving efforts in the JFG.

Conclusions

The first year of production for any field transitioning from fallow/pasture can be difficult in terms of organic matter presence, pest/disease presence, high weed pressure, and overall soil quality. Plants are tending to produce well this year so far, although we'll be on the lookout for latent viruses or fungal diseases, and continue to build soil quality in the field. Beet curly top virus may continue to be an issue due to the fallow field next door to the JFG. Crop rotation, compost application, and soil covers will continue to be implemented to mitigate fungal disease in the soil.

As optimum land management practices are continued (soil solarization to destroy the weed seed banks, cover cropping to conserve nitrogen and organic matter, and application of organic materials such as compost and manure), we will continue to increase the productivity of this garden and improve its impact on the scientific and local communities. We look forward to increasing our outreach activities, including regular in-person field demonstrations, as soon as pandemic dangers come to an end.