



Evaluating Cowpeas for Aphid Resistance at The Huntington Ranch Experimental Garden

May 19-Sept. 23, 2023



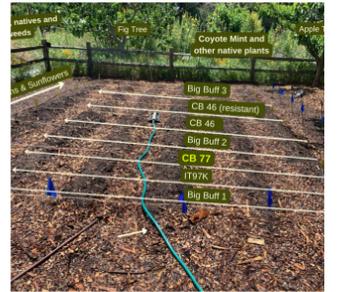
Site Prep

May 7-15th: The site was cleared of sorghum which was growing for at least a year as a cover crop which might also manage root knot nematodes. The sorghum residue was cleared, and we created mounds, placing drip irrigation lines in the furrows to encourage deep tap root growth. No amendments added. Note: the site is located on a slight slope (**SEE SLIDESHOW, BELOW FOR MORE**)



Day 1 Planting Day

May 19th: The trial was designed to evaluate UC Riverside's aphid resistant cowpeas (CB77) against another aphid resistant variety (IT97K SS6-6) and three non-resistant varieties (Big Buff 1,2 and 3 and two CB46's, one nematode resistant.) We also wanted to learn how to conserve water by irrigating less often but deeply (slides 3-6, Slide 4 for layout.)



Day 5 Emergence

May 24th: Cowpeas start to emerge in all sub-plots (slides 7-8.)



Day 22 Aphids

June 8th: Aphids like tender young leaves and shoots. We are starting to observe aphids in most sub-plots, especially Big Buff 1 and 3. **Ants** are farming the aphids. **Ladybugs** are aphid predators, but we are not observing many of them. Signs of plant stress begin to appear on the leaves in all subplots. Most sub-plots have entered the trifoliolate stage (slides 9-11.)



Day 27 Gophers

June 15th: Two plants in CB 46 have been lost to **gophers**. We observe various signs of **plant stress** in most sub-plots including yellowing leaves, brown spots and holes in leaves. This is especially the case across on all subplots along the southwest border. The highest number of aphids is on Big Buff 1 and 3 (slides 12-17.)



Day 32 Site Visit

June 22nd: Dr. Bao-Lam Huynh visits the site. He tells us the signs of plant stress we observe are likely due to **insufficient irrigation**. He also identifies **thrips** on some of the plants. He tell us the cowpeas have likely been growing slowly due to cool June temperatures, and they might start to flowers in about 20 days (slide 18 and slides 33-34 for temp. during the trial.)



Day 37 Irrigation Problems

June 24th: An **irrigation** line that runs along the southwest side got disconnected. There have been several other problems getting the automatic irrigation system to work properly. **Plants failing to thrive in Big Buff 3**; some didn't emerge or are missing, possibly due to gophers; others plants in this sub-plot are poorly developed. **Soil here is very dry** (slides 19-21.)



Day 41 CB77 Looking Good

June 29th: **CB77s are growing well with few aphids**. Also growing well are IT97K. The non-resistant varieties have many aphids and are developing poorly. Gophers are targeting CB 46's and Big Buff 2 and 3. We still haven't sorted out all our **irrigation problems**, including the possibility that some lines may be clogged (slide 22-24.)





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Day 57 Mysteries

July 15: Are these new leaves or flower buds? We could use some **training** on identifying cowpea plant growth stages as well as aphid stages. **Irrigation** mistakenly not properly re-set; we are still at 30 minutes twice a week (slide 25-27.)



Day 66 Tendrils

July 23rd: After weeks of slow growth, things are moving fast. Most of the sub-plots have plants with **tendrils**. IT97K is growing taller and leggier than others with no tendrils and few aphids. CB77 has almost no aphids but lots of ants. Big Buff 3 has flowers and a couple of small beans. More plants have been destroyed in CB46's, Big Buff 2 and 3 due to gophers; those remaining have lots of aphids (slide 28.)



Day 70 Flowers and Beans

July 29th: Many plants have flowers with beans starting to develop on a few. Cowpeas are self-pollinating, but we wonder how pollinators, like native bumble bees, might improve crop yield. We demonstrate how a bumble bee would pollinate a cowpea flower (slide 29-30.)



Day 78 Pods & Problems

August 6th: CB77 has lots of flowers and pods and is looking healthy. Big Buff 2, CB46, CB 46 (nematode resistant) and Big Buff 3 all have plants that look stressed with heavy **aphid and ant** populations on beans, stems and leaves. Big Buff 3 plants are small and under-developed. The most aphids in the sub-plots on the southwest side. (slide 31-32.)



Day 82 Critters Win, Almost

August 10th: 40% of all cowpea plants have been lost to gophers. Almost all are Big Buff and CB46; those in these subplots that remain have beans covered in aphids. This can be demotivating for the team, but we are still collecting data. CB77 is growing well with few aphids, but IT97K-556-6 is overtaking them with their leggy, vining growth. Note: IT97K-556-6 is very late flowering (slide 33.)



Day 122 Site Visit

Sept 17th: Dr. Bao-Lam Huynh and Dr. Tra Duong visited the site and identified root knot nematodes in some of the plants. This could be one reason why some of the plants in the sub-plots are failing to thrive. The two researchers joined the pot luck we hosted the same day, all dishes made from at least one climate friendly heritage crop (slide 34.)



Day 128 Terminated

Sept 23rd: Cowpeas were cut down, leaving the roots intact (no till.) They produced a lot of biomass (green manure) which Greer cut into smaller pieces and left on top of the soil to decompose. Ideally, we might have planted our succession (edible) fall crops at this point but the temperature was still too hot (slide 35-36)



Lessons Learned

We have learned at least as much from our "failures" as from our successes. UC Riverside's CB77 performed well and did a good job resisting aphids, but IT97K-556-6 was planted too close, so it dominated CB77 with its leggy, vines. We conclude that IT97K-556-6 will make an excellent warm season cover crop that would keep the soil covered during the hottest months of summer. CB77 is a good choice. It is available for production under PVP license. Interested parties should contact the UCR Research and Economic Development. For more on **lessons learned**, see this link:

https://drive.google.com/file/d/18FVyHui4_py1pDfkCQcDG1EXGhfKmxCO/view

