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UC Works with Blackeye Farmers to Improve Varieties for the California Industry

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Black-eyed peas, also called cowpeas, are a bean species native to Africa in the *Vigna* genus of legumes. Cowpeas were introduced to the United States as early as the 16th century by Spanish colonists and in the trans-Atlantic slave trade. “Blackeyes,” as they’re called locally and for the rest of this article, are grown by CA farmers on approximately 8,000 acres each year to produce a nutrient rich food for people. Most production in CA goes to the dry bean sector for canning and bagging. A small amount of the crop is produced for fresh consumption, similar to green beans or snap peas, and may be sold at farmers’ markets.

Blackeyes are an important crop in the San Joaquin and Sacramento valleys where diverse crop rotations are common. A relatively drought tolerant crop, blackeyes are usually flood or furrow irrigated. Farmers rarely fertilize with nitrogen since blackeyes efficiently fix nitrogen from the air due to the plant’s symbiotic relationship with a root-inhabiting *Rhizobia* bacteria species. Additionally, blackeyes are moderately-tolerant of salinity and can grow in conditions where yield declines would be expected for other summer annuals, like corn and tomatoes. These characteristics of blackeyes can be an economic incentive to grow them in some years and will be important in California, particularly under hotter and drier conditions expected with climate change.

Plant Breeding for the Future

As the CA climate shifts toward drier and more extreme weather, blackeyes, like most cultivated plants, will experience new pressures that farmers will be first to manage. Heat stress and drought vulnerability, emerging and invasive insect pests, increased weed competition, and the evolution of endemic and invasive diseases are some of these pressures. Plant breeding that considers these stresses will help the industry stay ahead of the curve.

The University of California has a long history of variety development for the California blackeye industry. The current standard variety is CB46, which was released in 1990. CB46 is high-yielding and has Fusarium wilt race 3 resistance, but it is susceptible to virulent and aggressive races of root-knot nematodes, Fusarium wilt race 4, aphids, lygus, and late-season diseases known collectively as ‘early cut-out.’ Additionally, the market now prefers larger seed and whiter grain than what CB46 provides.

To support plant breeding efforts, new breeding lines and cultivars are trialed at research facilities and then on commercial farms to evaluate material across environmental conditions. New materials are evaluated against commercial standards for yield, quality, and pest resistance. The cultivars and advanced lines that have been trialed across regions and years are described in Table 1. UC Cooperative Extension Farm Advisors have collaborated for more than 10 years with

UC Riverside plant breeders to test improved lines, and over the last five years, have conducted 21 trials across 7 locations in the Central Valley.

The variability in precipitation and average air temperature down the Central Valley can influence blackeye phenotypic traits. For example, in Five Points (southern San Joaquin Valley) from 2020 to 2025, the mean annual precipitation was 7.6 inches, whereas Davis (southern Sacramento Valley) had a mean annual precipitation of 17.1 inches. Similarly, average daily air temperature in June, July, August and September over the same five-year period in Five Points was 78°F but was 73°F in Davis. It is important to test experimental lines across regions to understand how they will perform in different environments.

California growers who serve on the California Dry Bean Advisory Board have identified high yield, seed quality, and disease resistance to be top priorities for plant breeding efforts. They have also emphasized the importance of regional acclimation. The following are some highlights from research funded by the CA Dry Bean Advisory Board, USAID Feed the Future Innovation Lab for Legume Systems Research, and California Crop Improvement Association and made possible through the generous support of numerous farmers, bean harvesters, and bean handlers.

Regional Trial Results

Yield results from 2020 to 2024 trials are summarized for the Sacramento and San Joaquin valleys (Table 2), where average yields ranged from 1,091 to 3,582 lb/acre. The lowest yield occurred in 2020 and the highest in 2024, both in the Sacramento Valley. Interestingly, yields in the San Joaquin Valley were 27% lower than in the Sacramento Valley in 2024. While yields are usually higher in the San Joaquin Valley, the lower yields may have resulted from a prolonged heatwave and above-average nighttime temperatures, which caused significant crop losses.

Seed size is an important quality factor in blackeye production related to consumer preferences. Average seed size, reported as the weight of 100 seeds, for the last five years of trials are shown in Table 3. Seed size ranged from 20.0 grams/100 seeds for CB77 (2020, Sacramento Valley) to 27.8 grams/100 seeds for CB50 (2024, Sacramento Valley). CB5 and CB50 consistently have the largest seed size across sites from year to year, while the experimental lines tend to have smaller seed size, similar to CB46 and CB77. Over the last five years, average seed size in the San Joaquin Valley was approximately 7% smaller than in the Sacramento Valley.

An important insect pest of blackeyes is lygus, which kills fruits before they develop resulting in direct yield loss. Lygus feeding, called “stings”, also damages and discolors seeds after pods develop (Figure 1), which reduces yield and diminishes the quality of the beans. The results for lygus damage, shown as the percent of seed with lygus stings, are shown in Table 4. The average lygus damage ranged from 2% for CB77 (2020, Sacramento Valley) to 43% for CB5 (2021, Sacramento Valley). Average lygus damage in the Sacramento Valley over the last five years was 20%, while in the San Joaquin Valley, it was 7%. Importantly, under the heavy lygus pressure in the Sacramento Valley, the five-year average lygus damage was lower for experimental line 07KN-74 and newly released CB77 compared to the commercial cultivars CB5 and CB46. This demonstrates a high yield potential and reduced need for insecticides to control lygus with the newer material. With little development of new insecticides for use in dry beans, the importance of insect-resistant varieties cannot be overstated.

New material is also evaluated for disease resistance (data not shown). The evolution of Fusarium wilt provides an example of why plant breeding is critical to disease management. CB5 is an older blackeye variety that is susceptible to Fusarium wilt race 3. CB46 was released as a commercial variety with Fusarium wilt race 3 resistance. However, after years of production, CB46 started showing susceptibility to Fusarium wilt race 4. CB50 was then introduced as a new variety with resistance to both Fusarium wilt race 3 and race 4. During trialing, advanced breeding lines are grown alongside traditional cultivars (like CB5, CB46, and CB50) to quantify how new material compares to varieties already on the market. Lines are evaluated over multiple years to capture variability in pest pressure, weather, and other yield-limiting conditions.

Research Outcomes

Recently developed varieties show resistance to disease and aphids, while new breeding lines show great promise for nematode or lygus resistance. Recently, CB77 was publicly released as an improved variety with similar yield and quality to

CB46 but with resistance to cowpea aphid (Figure 2). It also has a brighter white color than CB46 (Figure 3). The California Crop Improvement Association currently holds foundation seed of CB77 and will distribute it to growers who successfully apply to grow certified seed for commercial production.

Lines N2 and 07KN-74 will be ready for public release within a year. Line N2 is a root knot nematode resistant line with high yields in the San Joaquin Valley. Root knot nematodes damage roots, which diminishes water uptake and yield. As fumigants are phased out through regulatory processes, host resistance and alternative strategies for reducing root knot nematode damage must be taken into consideration. Line 07KN-74 is a lygus tolerant variety with moderate yield, similar to or slightly lower than commercial standard CB46.

Conclusion

This article summarizes the plant breeding and trialing efforts to improve blackeyes for the California industry. Yield, quality, and pest resistance are important traits for plant breeding efforts, and this article summarizes years of data across multiple locations in the Central Valley. These evaluations are ongoing and provide growers with first-hand information on how new genetic material performs under commercial farming conditions. Growers who are interested in learning more or hosting on-farm trials should contact the authors, who would be glad to help make those arrangements.

Table 1. Descriptions of California blackeye cultivars and new breeding lines.

Cultivar or breeding line	Current status	Notable traits
CB5	Legacy commercial standard	Cultivar with large seed, resistance to *M. incognita* nematode but is susceptible to aphid and Fusarium wilt diseases
CB46	Current commercial standard	Cultivar with resistance to *M. incognita* nematode and Fusarium wilt race 3 but is susceptible to aphid and Fusarium wilt race 4
CB50	Current commercial standard	Cultivar with large seed and resistance to Fusarium wilt races 3 and 4, but is susceptible to aphid
CB77	Newly released	Cultivar with CB46 background and resistance to aphid, *M. incognita* nematode, and Fusarium wilt race 3
N2	Advanced breeding line, soon to be released	CB46 background with stronger nematode resistance than CB46
07KN-74	Advanced breeding line	Lygus tolerance

Table 2. Annual blackeye bean cultivar and advanced breeding line yield (lb/ac) in the Sacramento and San Joaquin valleys.

				Year			Five-year avg.
Region	**Cultivar or breeding line**	**2020**	**2021**	**2022**	**2023**	**2024**	**2020-24**
Sacramento Valley	N2	1091	1427	-	-	3162	1893
	CB5	2340	1390	-	-	2939	2223
	CB46	1471	1418	-	-	2637	1842
	CB50	-	-	-	-	3582	3582
	07KN-74	2416	1446	-	-	3494	2452
	CB77	3031	1363	-	-	3018	2471
San Joaquin Valley	N2	2539	3465	2607	2988	2582	2836
	CB5	-	-	1988	2428	1812	2076
	CB46	2923	3505	2750	2819	2332	2866
	CB50	-	-	2678	2399	2225	2434
	07KN-74	2059	2999	1375	2697	2042	2235
	CB77	2975	3504	2363	3033	2593	2894

Table 3. Annual blackeye bean cultivar and advanced breeding line seed size (100 seed weight in grams) in the Sacramento and San Joaquin valleys.

Region	Cultivar or breeding line	Year 2020	2021	2022	2023	2024	Five-year avg. 2020-24
Sacramento Valley	N2	21.2	22.8	-	-	24.1	22.7
	CB5	27.7	26.2	-	-	27.6	27.2
	CB46	21.1	22.7	-	-	23.8	22.5
	CB50	-	-	-	-	27.8	27.8
	07KN-74	21.6	24.4	-	-	27.0	24.3
	CB77	20.0	22.5	-	-	23.5	22.0
San Joaquin Valley	N2	21.2	22.2	20.9	21.9	22.0	21.6
	CB5	-	-	25.1	25.3	25.2	25.2
	CB46	21.7	22.2	22.2	22.3	21.9	22.1
	CB50	-	-	26.7	26.1	25.0	25.9
	07KN-74	22.5	23.5	21.4	22.9	23.3	22.7
	CB77	21.3	22.2	21.0	21.1	21.1	21.3

Table 4. Annual blackeye bean cultivar and advanced breeding line lygus damage (% of seed damaged) in the Sacramento and San Joaquin valleys.

Region	Cultivar or breeding line	Year 2020	2021	2022	2023	2024	Five-year avg. 2020-24
Sacramento Valley	N2	30%	20%	-	-	14%	21%
	CB5	7%	43%	-	-	21%	24%
	CB46	38%	22%	-	-	18%	26%
	CB50	-	-	-	-	19%	19%
	07KN-74	19%	19%	-	-	17%	18%
	CB77	2%	18%	-	-	16%	12%
San Joaquin Valley	N2	4%	13%	6%	11%	4%	8%
	CB5	-	-	8%	11%	6%	8%
	CB46	5%	16%	7%	8%	4%	8%
	CB50	-	-	9%	9%	5%	7%
	07KN-74	4%	10%	6%	11%	4%	7%
	CB77	4%	11%	6%	10%	3%	7%

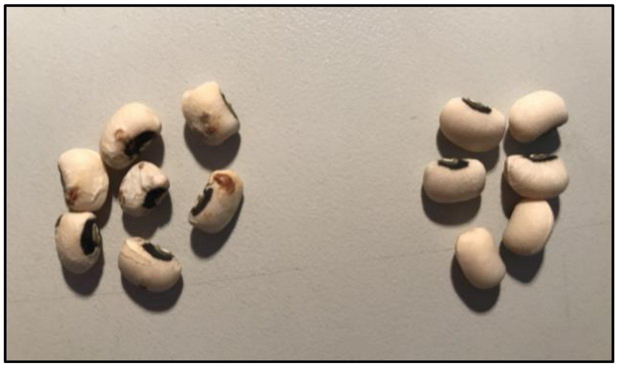

Figure 1. Lygus susceptible (left) and lygus tolerant cowpea (right).

Figure 2. CB77 with resistance to cowpea aphid (left), and CB46 which is susceptible to cowpea aphid (right). Photos courtesy Rachael Long (UCCE).

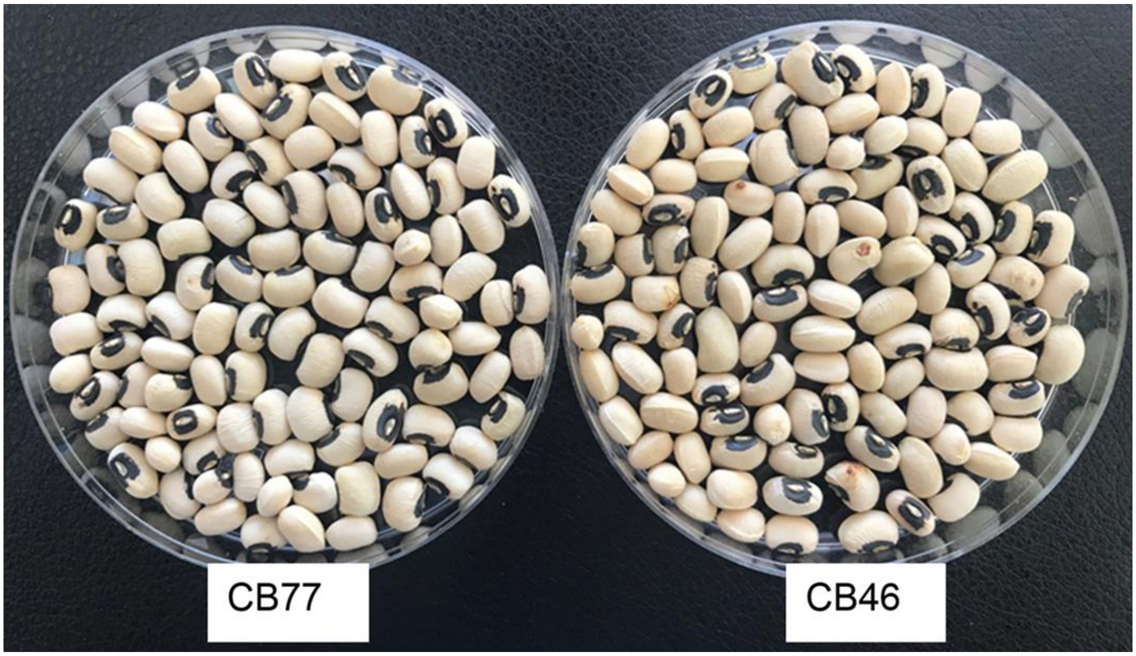

Figure 3. Recently released CB77 has a slightly larger, whiter seed compared to CB46. More lygus stings are visible in CB46. Photo courtesy Bao-Lam Huynh, UC Riverside.

2024 Colusa County Garbanzo Bean Variety Trial

Sarah Light, UCCE Agronomy Advisor
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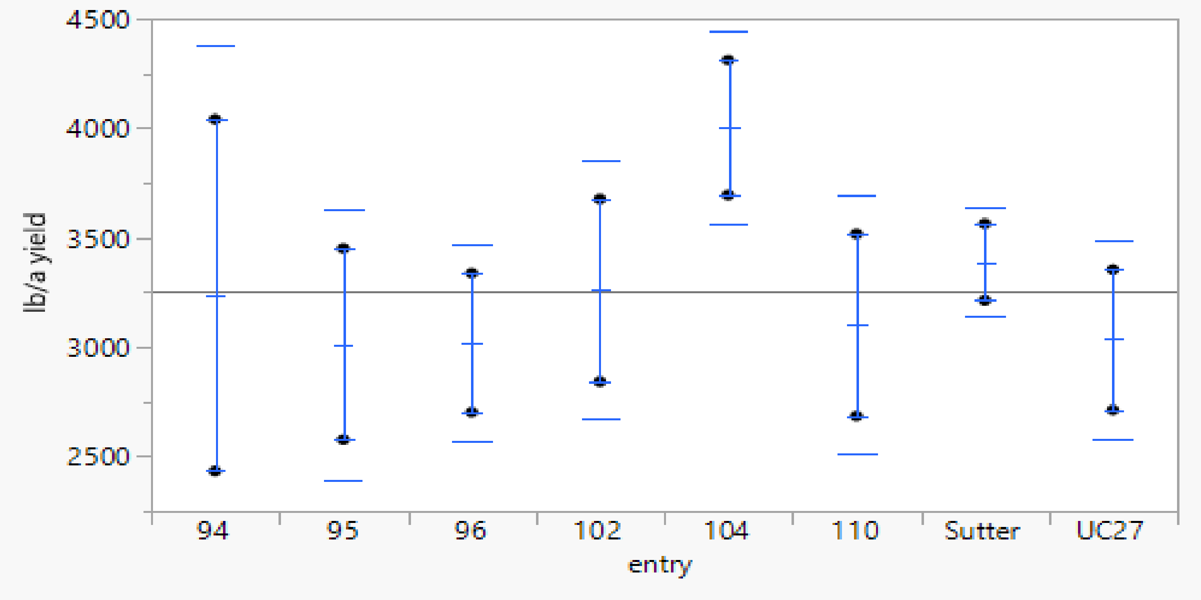
Clair Akin, formerly UCCE Cover Crop Tool Coordinator

Project overview:

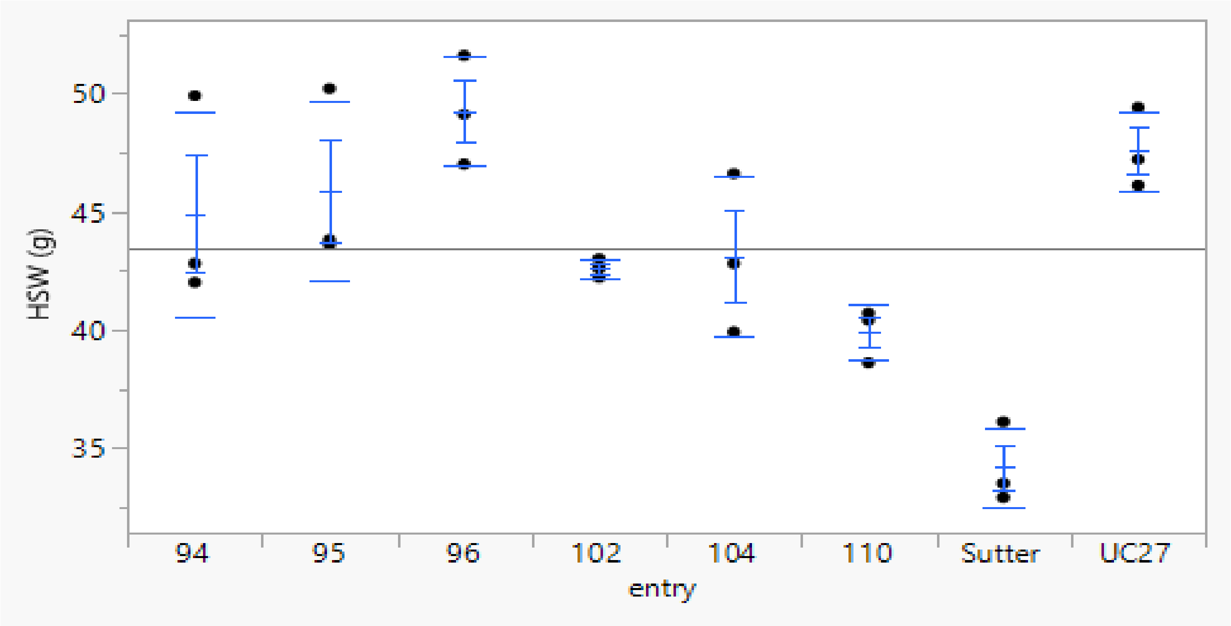
UCCE began evaluating garbanzo varieties in Central Valley regional trials in 2024. Varieties had been evaluated at UC Davis for multiple years, but these lines had not previously been tested in commercial field conditions. Variety trials were conducted in Colusa, San Joaquin, Kings, and Siskiyou counties to see how the advanced lines performed in various California climates. Plots were also planted at UC Davis. This rest of this article summarizes the data from the Colusa location.

Six advanced lines from the UC Davis garbanzo breeding program were planted on April 9th, 2024, alongside two standard commercial varieties (UC 27 and Sutter). Seeds were planted at 4 seeds per foot on a 30" spacing with two rows per bed. An industry-standard fungicide seed treatment was applied to the seed before planting and seeds were inoculated with a rhizobial inoculant. The plots were in a commercial garbanzo field where the field variety was Air-way Farms. Garbanzos were planted into moisture with no pre-irrigation. The field was irrigated with subsurface drip irrigation during establishment. Fertility and pests were managed by the grower uniformly throughout the field. Quadris was applied when plants were 6-8" tall. A low nitrogen starter fertilizer was applied at planting and 15 gal/acre of UN32 was sidedress applied during cultivation at layby. Weeds were managed with a pre-plant herbicide application and hand weeding in season. The previous crop was sunflower.

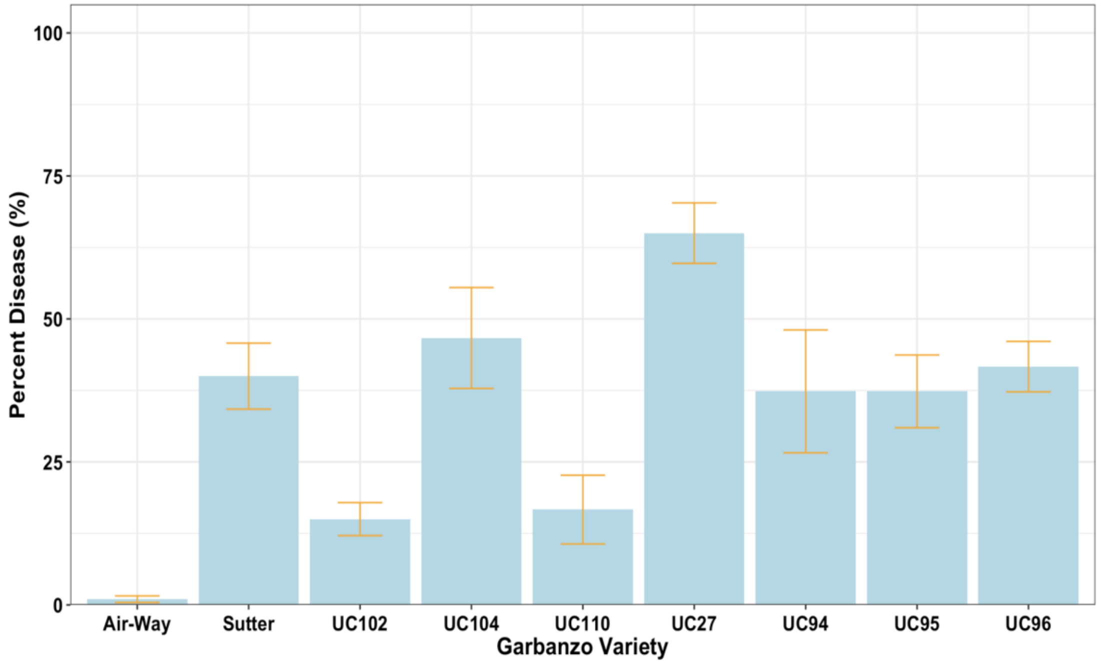
Yield data: This was a non-replicated evaluation; therefore, no statistical analysis is presented. In Colusa, advanced varieties did not consistently yield higher than the commercial lines, though some did have larger seed size. The field was harvested on August 12-14, 2024. Two 10-foot-long stretches of 1 bed were harvested by hand of each variety. Plots were harvested in areas with minimal disease and a full plant stand. Some experimental lines yielded better than the commercial lines, but this was not consistent for all lines. The field variety, Air-way Farms, yielded 3,059 lb/acre.



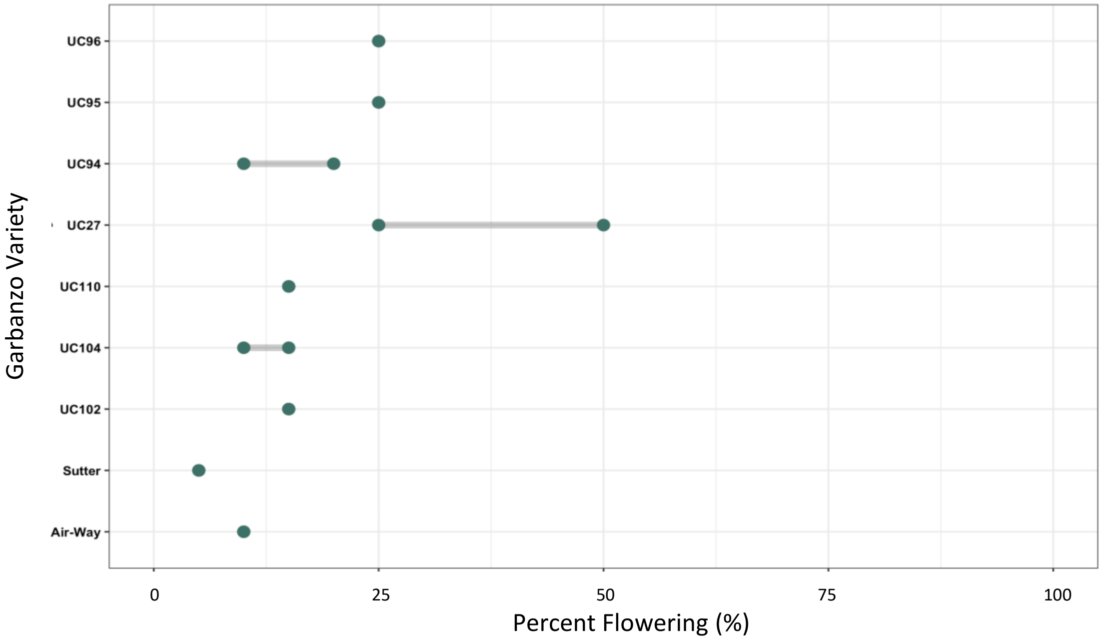
Hundred-seed weight: Three subsample of 100 seeds each from harvested garbanzos were weighed. All commercial varieties had larger seed size than Sutter. UC27 had larger seeds than several of the experimental lines.



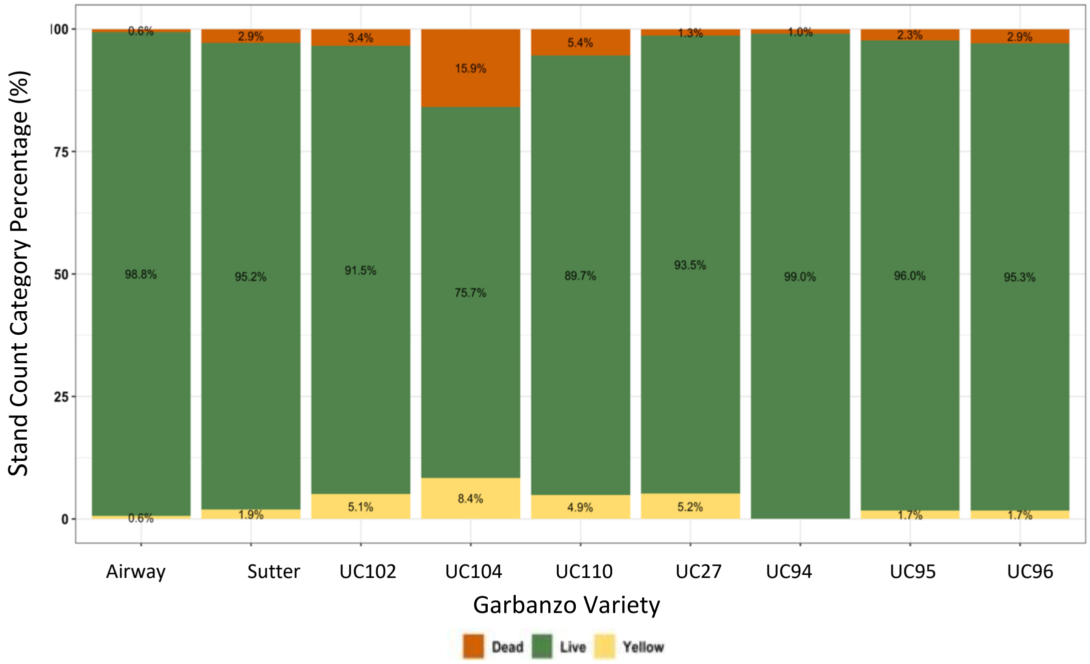
Percent Disease: These data were collected using a visual assessment of a 10-foot long stretch of one bed per variety. Three replications were collected per treatment. Plots were ranked according to visual disease symptoms. Field was diagnosed with southern blight. Data were collected on June 17, 2024.



Percent Flowering: Three replicated 10-foot long stretches of each plot were visually assessed for percent flowering to determine if any varieties were early or late flowering relative to commercial lines. Data were collected on May 21, 2024.



Stand Counts: The number of live, yellow, and dead plants were measured in three replicated 10-foot long stretches of one bed of a plot. Data were collected on May 2, 2024.



This trial was one of the first on-farm evaluations of new garbanzo lines on California farms. Because the field was hand-harvested, and areas of the plot with strong stands were selected, yield data does not reflect the disease pressure in the field. Experimental line 104, for example, yielded the highest but also had the highest number of dead plants during stand-counts. We replicated this trial in various sites throughout the state and collectively these data help evaluate how experimental lines perform in commercial production. On-farm field trials of these varieties will continue in future seasons with the goal of identifying new varieties for the California industry.

Thank you to our grower collaborator for working with us on this project. This project was supported with funding from the California Crop Improvement Association. The California Dry Bean Advisory Board assisted with statewide research.

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A nitrogen fertilizer calculator for annual crops

Daniel Geisseler, UC Davis Cooperative Extension Specialist
Sarah Light, UC Cooperative Extension Agronomy Advisor

Applying the right amount of nitrogen (N) fertilizer at the right time can be challenging because many field-specific factors affect the amount of fertilizer N needed. The University of California Cooperative Extension has developed a new online tool that adds up sources of crop available N and calculates how much remaining N fertilizer needs to be applied. This tool has been calibrated for grain corn, silage corn, sunflower, spring planted wheat, and processing tomatoes.

How much N a crop takes up depends on the seasonal uptake pattern and yield potential. However, fertilizers are not the only source of crop-available N. Residual soil nitrate, nitrate in the irrigation water and N mineralized from soil organic matter during the growing season also contribute to the available N pool. Over the last several years we have worked on projects where we monitored N uptake of different crops in commercial fields. We also determined the amount of N that is mineralized during the growing season from soil organic matter and investigated the factors affecting N mineralization. The goal of our efforts was to develop a user-friendly online N fertilization calculator that can be used by producers and consultants.

Nitrogen demand

Plant samples were collected throughout the season at 3-week intervals in commercial fields. Plants were cut at the base, dried in an oven, and analyzed for total N content. The resulting seasonal N uptake curves, shown in Figure 1, provide valuable information about the optimal timing of N fertilizer applications. Little N is taken up during the first month after seeding or transplanting. A moderate pre-plant of starter fertilizer application can generally supply enough N during the initial 3-4 weeks of the growing season. A large pre-plant N application should be avoided, if possible, as the N is at risk of being moved to soil layers below the root zone with early-season irrigation water or late rain falls.

The initial period of slow N uptake is followed by a period of rapid uptake. Towards the end of the season N uptake commonly slows down. As silage corn is harvested at an earlier stage than grain corn, the period of low N uptake before harvest is less pronounced than for grain corn (Figure 1). The S-shaped uptake curve is typical for crops where mature seeds are harvested. Some crops, including strawberries, lettuce or melons do not exhibit this period of low N uptake before harvest. Examples for these and other crops can be found at http://geisseler.ucdavis.edu/Guidelines/N_Uptake.html. An adequate N supply is crucial during the period of rapid uptake. In contrast, late applications may not be taken up by the plants and will be at risk of being leached during the winter.

For many crops, the total N uptake is well correlated with yield. Therefore, the expected yield can be used to calculate total N uptake, provided the yield estimate is realistic.

Nitrogen sources

The N demand of a crop can be met with fertilizer, residual soil nitrate, nitrate in the irrigation water, and N mineralized from soil organic matter during the growing season. These sources need to be considered when determining the N fertilizer application rate.

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[1] Daniel Geisseler is a Cooperative Extension Specialist for nutrient management at UC Davis, Sarah Light is the UC Agronomy Farm Advisor for Sutter and Yuba counties.

Funding for this project was provided by the CDFA Fertilizer Research and Education Program (FREP).

Residual nitrate-N

Residual soil nitrate is very variable and depends on factors such a previous crop, amount of winter rainfall, as well as the distribution of rainfall during the winter. Therefore, a reliable estimate needs to be based on a soil test. Nitrate-N can be quantified by sending samples to a lab for analysis or measured on your own using nitrate test strips, which can be purchased online. Soil nitrate values from lab analyses can then be converted to lb N/ac for a 1-ft layer by multiplying ppm nitrate-N by a factor of 3.5 to 4.0. The conversion factor depends on bulk density. As an example, a lab analysis indicates that the nitrate-N concentration in a soil sample taken from the top foot of the profile is 10 ppm. Therefore, this soil contains between 35 and 40 lb N/ac in the form of nitrate, which is a directly plant-available form of N.

Irrigation water N

While surface water generally has negligible nitrate concentration, a considerable amount of N may be applied with well water. To convert nitrate-N concentration in the water to lb N/ac, ppm nitrate-N in the water is multiplied by 0.226 and by the number of acre-inches of water applied. For example, with 12 ac-in of water containing 10 ppm nitrate-N, 27.1 lb N/ac are applied.

Nitrogen mineralization from soil organic matter

Based on our field trials in the Central Valley, 25-60 lb N/ac are commonly mineralized from soil organic matter during the growing season. This estimate would be higher for Delta soils and soils under organic management. The exact value depends on the length of the season, soil temperature, soil moisture, as well as soil organic matter content and to a lesser degree soil texture. Higher organic matter contents lead to higher mineralization rates. Sandy soils generally have lower soil organic matter contents than clay rich soils; however, when comparing two soils with the same soil organic matter content, more is mineralized in the sandy soil.

Fertilizer

The difference between crop N demand and the non-fertilizer sources discussed above needs to be covered by fertilizer. Not every pound of N applied with fertilizer will be available to crops. Nitrate is very mobile in the soil and moves with the water from rainfall and irrigation. Therefore, an important factor determining N use efficiency is irrigation management. Overirrigation can result in water movement below the root zone.

Calculating N fertilizer needs

As is evident from this summary, determining the amount of fertilizer N needed for a specific field requires a lot of calculations. To simplify the process, we incorporated the results from studies into an online fertilizer calculator (Figure 2). The calculator is available online at http://geisseler.ucdavis.edu/Crop_N_Calculator.html and currently includes data for grain and silage corn, sunflowers, processing tomatoes and spring-grown wheat. More crops will be added as we collect more data. The calculator can help users plan N fertilization based on field specific input. It is easy to use and requires few readily available inputs. However, this tool cannot capture all the factors that affect growth and yield of the crop in individual fields. While the estimates of N credits from non-fertilizer sources are conservative and provide a safety margin, it is crucial to monitor the fields during the growing season. Soil nitrate testing and/or leaf analyses are valuable tools to determine N availability and crop N status during the season. These tools allow for adjustments when the calculated N application rates do not match the plants' demand.

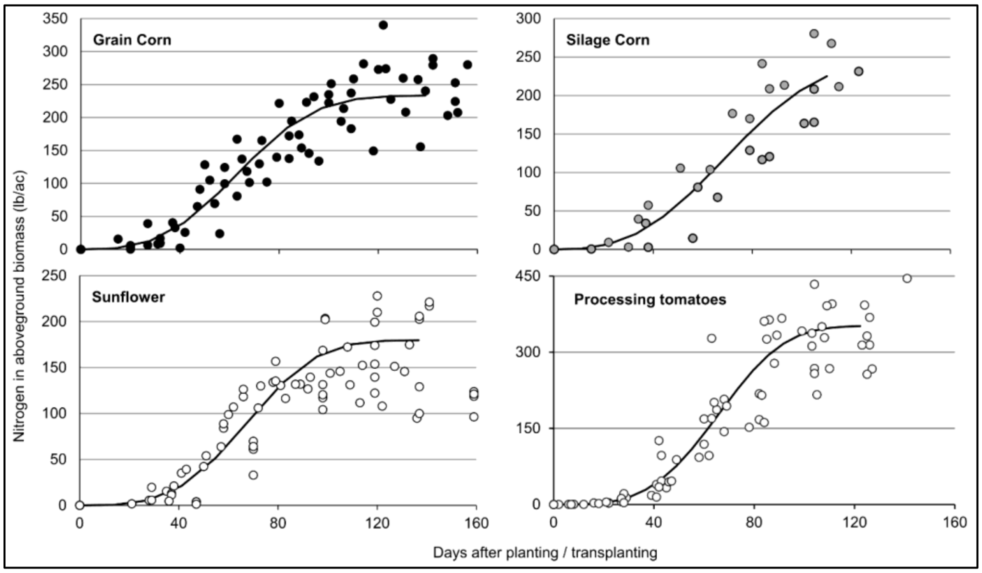
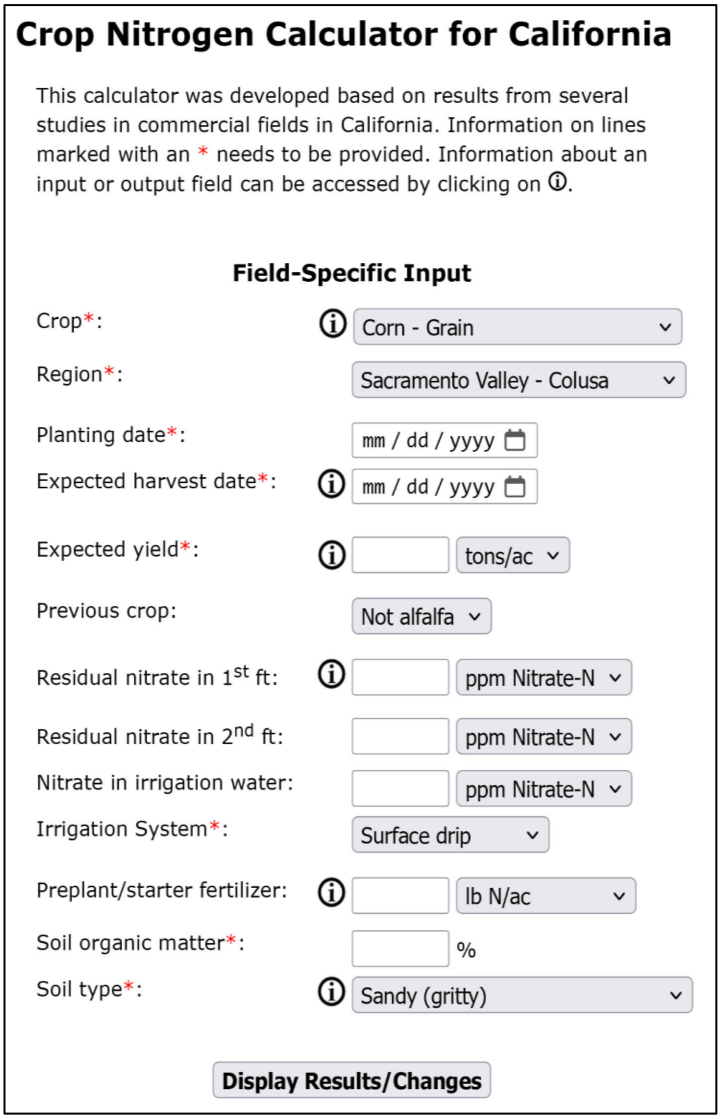


Figure 1: Nitrogen uptake curves of selected crops grown in California.



Crop Nitrogen Calculator for California

This calculator was developed based on results from several studies in commercial fields in California. Information on lines marked with an * needs to be provided. Information about an input or output field can be accessed by clicking on ⓘ.

Field-Specific Input

Crop*: Corn - Grain
Region*: Sacramento Valley - Colusa
Planting date*: mm / dd / yyyy
Expected harvest date*: mm / dd / yyyy
Expected yield*: tons/ac
Previous crop: Not alfalfa
Residual nitrate in 1st ft: ppm Nitrate-N
Residual nitrate in 2nd ft: ppm Nitrate-N
Nitrate in irrigation water: ppm Nitrate-N
Irrigation System*: Surface drip
Preplant/starter fertilizer: lb N/ac
Soil organic matter*: %
Soil type*: Sandy (gritty)

Figure 2: Screenshot of the N fertilizer calculator at http://geisseler.ucdavis.edu/Crop_N_Calculator.htm

More Than Just Chemistry: The Hidden Role of Weather in Herbicide Performance

Giuliano Galdi UCCE Merced, Stanislaus and San Joaquin Counties

Herbicides have played a vital role in agriculture for decades, helping growers improve yields and profitability by controlling weeds efficiently. With the wide range of herbicide types available (i.e. contact and systemic, pre- and post-emergent, with or without residual activity) farmers have flexibility to design weed control programs that suit their specific conditions. But one unpredictable and often underestimated factor can greatly impact herbicide performance: the weather.

Herbicide applications are commonly made in the fall or spring—seasons known for fluctuating weather conditions. Unfortunately, many herbicides depend on precise environmental factors to work effectively, and anything outside those ideal conditions can reduce efficacy or even cause unintended crop injury. For instance, rainfastness is a critical concept: this refers to the amount of time required after herbicide application before rainfall or irrigation occurs. Depending on the product, this can range from 30 minutes to over six hours. Spraying during this window is crucial to ensure the herbicide is absorbed and performs as expected.

Another important consideration is temperature inversion. Herbicide labels often warn against applications during this phenomenon, where a layer of warm air traps cooler air near the ground. This creates a stable atmosphere that allows fine spray droplets to remain suspended, dramatically increasing the risk of off-target drift. Volatility, the tendency of a herbicide to evaporate and move after application, is also closely tied to weather. Higher temperatures and lower humidity levels increase the risk, especially with products like dicamba or 2,4-D esters. Wind plays a significant role as well, contributing to both physical particle drift and vapor drift. Most product labels advise spraying only when wind speeds are between 3 to 10 miles per hour. Finally, cold weather and frost can also influence herbicide behavior in ways that affect both weed control and crop safety.

One striking example of weather-herbicide interaction comes from research on Roundup Ready alfalfa. In a multi-year study conducted across California and Utah, following the initial Steve Orloff findings, we found that glyphosate applications followed by frost events could cause noticeable crop injury. Symptoms included stunting, chlorosis, and the “shepherd’s crook bending of stems” (Fig. 1), closely resembling bacterial stem blight caused by *Pseudomonas syringae*, a frost-associated pathogen. Injury was most pronounced at higher glyphosate rates and when applications were made to taller plants. While this issue isn’t commonly observed in warmer areas like the San Joaquin Valley, it is a growing concern in cooler climates and during cold springs. To minimize risk, growers should avoid spraying just before frost events, apply glyphosate to shorter alfalfa, and consider rotating herbicide modes of action.

Figure 1. Shepherd's Crook symptoms in alfalfa after applications of glyphosate to Roundup-Ready alfalfa.

Another case involves Italian ryegrass, one of the most herbicide-resistant and genetically diverse weeds in California. Research conducted by former UCCE advisor Konrad Mathesius examined management strategies in wheat fields and revealed that the timing of weather events can make or break herbicide efficacy. In one trial, Italian ryegrass was sprayed at the ideal growth stage (1–3 tillers), but a period of drought followed the application. Without moisture, the ryegrass was not actively growing and decreased herbicide effectiveness. Common products like Simplicity and Axial underperformed, and none of the 11 tested treatments provided full control- only limited suppression at 38 days after application (Fig. 2). However, when rainfall finally arrived, herbicide activity improved. This highlights the importance of weed physiology, soil moisture, and timing in achieving effective weed control.

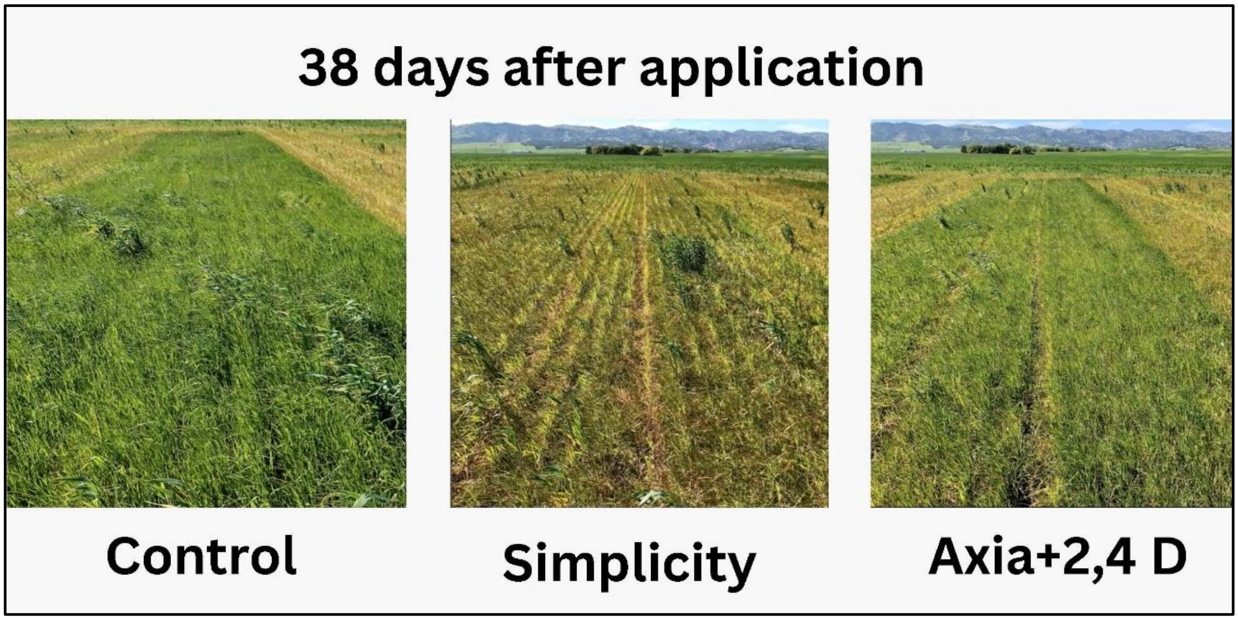


Figure 2. Italian ryegrass control/ suppression 38 days after herbicide application

A third case comes from Colusa County, where UCCE Advisor Sarah Light investigated baby lima bean fields that showed unusual seedling symptoms after a cold spell. The crop had been planted on April 28, 2022, and treated with a pre-plant mix of Brawl (S-metolachlor) and Sonalan (ethalfluralin). Following several nights of low temperatures near 37°F, the seedlings exhibited twisted or U-shaped stems, swollen hypocotyls, and rust-colored lesions near the soil line (Fig.3). Lab analysis ruled out pathogens, indicating the injury was abiotic. Cold, moist conditions prolonged the germination period, increasing seedling exposure to herbicides in the soil. Soil crusting due to high magnesium also contributed to the problem. Fortunately, the plants recovered, and the field yielded well, but the case illustrates how cool weather at emergence can increase crop sensitivity to otherwise safe herbicide applications.

These examples underscore a critical point: herbicide performance is not solely determined by chemistry or application rate. Environmental conditions before, during, and after application play a major role in determining whether a product will control weeds effectively or cause unintended crop damage. Understanding how weather interacts with herbicides can help growers make more informed decisions, reduce risks, and ultimately protect both crop health and yield.

Figure 3. Lima bean symptoms: twisted and U-shaped stems

Cover Cropping in California's Water Scarce Environments!

New publication outlines practical considerations for managing cool-season cover crops with maximal water benefits and minimal water use.

This publication can be found at http://tinyurl.com/sacagronomy

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