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Post emergent weed control management in beans

Mariano Galla, UCCE Agronomy & Weed Science Advisor, Glenn, Butte, Tehama Counties

Weed control is a particularly important aspect of bean production. Weeds can reduce bean seed yield by 10% to 50%. Not only do weeds compete for water and nutrients, but they can also shade beans, which reduces yield, and attracts vertebrate and insect pest. If present in the field at harvest, nightshade (*Solanum spp.*) and groundcherry (*Physalis* spp.) berries can reduce the quality of beans (especially light-colored varieties), staining them with their dark juice.

Troublesome weeds generally include summer broadleaves and grasses, such as hairy and black nightshade (*Solanum spp.*), groundcherries (*Physalis spp.*), nutsedges (*Cyperus spp.)* and barnyardgrass (*Echinocloa crus-galli*). Some perennial weeds like, field bindweed (*Convolvulus arvensis*), bermudagrass (*Cynodon dactylon*) and Johnsongrass (*Sorghum halepense*), can also cause problems in bean fields.

Getting a good crop stand and cultivating early before row closure are usually the best ways to limit weed issues. However young recently emerged bean plants are quite sensitive to weed competition, thus it is particularly important to keep the field weed free for the first 30 – 40 days of bean growth.

The standard practice is to apply a combination of pre-emergent herbicides prior to planting. These combinations are generally able to control a wide spectrum of broadleaf and grass weeds. However, the efficacy of these herbicides may start to decrease during the growing season and a new flush of weeds can emerge.

There are not many herbicide options for emerged beans. In addition, different varieties may also have different sensitivities to herbicides, so it is important to always check the label before deciding what herbicide to apply. Select Max, an ACCase inhibitor, is a good option for grass weed control in blackeyes (cowpeas), baby and large lima, and common beans such as kidney beans. Fusilade DX is a similar herbicide that can be used in the same crops with the exception of blackeyes. Sandea, an ALS inhibitor herbicide, is a good option for the control of nutsedge and certain broadleaf species for use in common beans, small and large lima beans, and blackeyes. However, it has to be applied with a hooded sprayer to avoid contact with bean plants, as it could cause injuries.

Save the Date!

Mark your calendars for the UC Dry Bean Field Day, Thursday August 23, 2018 at UC Davis. More information will be available later this summer. For meeting updates and other dry bean news, subscribe to our UC Dry Bean Blog at http://beans.ucannr.edu/.

Shark and Basagran are available for broadleaf control. While Basagran cannot be used in blackeyes, it is also limited to bean varieties grown only with sprinkler irrigation. Shark is registered for use in blackeyes, baby and large limas, and common beans. Shark, however, will damage the beans and needs to be applied as a directed spray or with a hooded sprayer to avoid foliage burn.

It is really important to keep monitoring the fields and to correctly identify emerging weeds. As a rule of a thumb, post-emergent herbicides are most effective when the weeds are still small, approximately about 3 inches size or smaller. Both Basagran and Shark are contact herbicides and in order to work effectively they need to reach the weed foliage with adequate coverage.

Therefore, it is important to act early, as it might be hard to ensure a good spray coverage when the weeds are dense and covered by the bean canopy. Increasing the volume of application may help with denser weed stands but it also may be more expensive. Once the beans rows close and the canopy is fully developed it will be too late for an adequately effective and cost efficient herbicide application.

Remember to always check the label before selecting an herbicide treatment and deciding the rate. More information on common weed management is available online at the UC IPM Guidelines for Dry Bean Production: http://ipm.ucanr.edu/PMG/selectnewpest.beans.html and in the Common Bean Production manual (UC ANR 8402) and the Lima Bean Production manual (UC ANR 8505).

UC IPM Guidelines for Dry Beans for Diseases and Abiotic Disorders

The Diseases and Abiotic Disorders section of the UC IPM Pest Management Guidelines for Dry Beans has been recently revised and updated for 2018 and is now available online at: http://ipm.ucanr.edu/.

Authors include Farm Advisors Carol Frate (emeritus) and Rachael Long and UC Davis Professor Paul Gepts. Two new diseases were added, including Pythium wilt in established plants and chocolate blotch on limas. The Fusarium wilt sections were also consolidated and new photos were added throughout the guidelines. This includes an updated photo page to compare common diseases and abiotic symptoms to help identify them.

These guidelines can help with managing diseases in your fields. Worried about southern blight? Yes, beans are susceptible and you'll need to rotate to a non-host crop, including corn or grains for at least 2-years to reduce the inoculum. How about alfalfa mosaic virus? This disease is transmitted by aphids from alfalfa fields, so avoid planting beans adjacent to alfalfa. This information and much more are available through the newly revised UC IPM Dry Bean guidelines. The remaining pest management sections, including insect pest and weed management, are in the process of being revised and will be published soon.

Avoiding and Managing Soil Compaction

Sarah Light, Agronomy Advisor, UCCE Sutter, Yuba, Colusa Counties

Soil compaction is often a problem in field crop production and occurs when soil particles are pressed together, reducing available pore space for air and water. About half the soil volume is composed of particles, the other half is soil pores. At field capacity, these pores are roughly filled to equal parts with water and air. Pores are the spaces where roots grow, microbes live, and water and nutrients move through the soil. For this reason, compaction can lead to poor water infiltration, increased water runoff and soil erosion, restricted root growth, reduced nutrient uptake, and ultimately poor plant growth and lower yields. For example, last spring we visited a dry bean field where there was about an acre of beans along a road that were stunted. When we checked the soil in the affected area, we found it was heavily compacted and root growth was reduced. The areas with healthy plant growth did not show soil compaction problems. Upon talking to the farmer, we learned that the affected area was where water pooled during heavy rains. This was further evidence that there was poor drainage and compacted soil in that part of the field.

Soil compaction can occur at the soil surface or in the subsoil. Surface compaction is caused by water hitting tilled soil, which forms a crust. This can be managed by ring-rolling to break the crust and can be avoided by keeping soil covered during the rainy season, either with plant residue or a winter cover crop. This article will focus on subsoil compaction, which is more challenging to manage. Compaction in the subsoil can be in the form of a hardpan layer or deep compaction. A hardpan forms when the tillage implement presses soil directly below it together, forming a compacted layer. Deep compaction occurs further down in the soil profile and is caused by excessive weight on soil, particularly when soil is wet. It can be hard to break up soil once deep compaction occurs.

How can soil compaction be avoided?

- Do not work or drive over soil when wet. Wet soils are much more susceptible to compaction and depth of compaction can increase with soil moisture.
- Reduce tillage when possible. Tillage breaks up soil aggregates and disrupts soil microbial communities.
- Vary the depth of tillage to avoid a hardpan layer from forming.
- Distribute tractor weight over a larger surface tire area by decreasing tire pressure and/or using radial tires. This will reduce the pressure on specific points in the field.
- Reduce axel load for all machinery.
- Reduce the number of trips over a field. Do not drive over the field unnecessarily.
- Incorporate crops with different rooting depths and types into your rotation.
- Increase soil organic matter with compost, cover crops, or crop residue.

Once compaction occurs, it can be very challenging and costly to fix the problem. One can mechanically break up a compacted layer by ripping or chiseling, which will help improve crop growth in the current growing season, but this will not improve soil structure over time. Additionally, if this practice is repeated year after year, compaction will be made worse. Ripping or chiseling should never be done when soil is wet.

Good soil aggregation is required to prevent and alleviate soil compaction in the long term. Soil aggregates are clumps of soil particles that are bound together, leaving more available space for air and water. Aggregates are held together by organic matter (like roots), organic compounds (produced by soil microbes), and fungal hyphae. Microbes get nutrients and energy from the carbon found in soil organic matter. This is the reason that increased

soil organic matter can make soil more resistant to compaction—it provides food for soil microbes which increases their activity and population.

Finally, gypsum can increase water infiltration in soils that are high in sodium (sodic soils) but does not alleviate soil compaction. Sodium ions disrupt the clay structure in soil which causes the clay particles to destabilize and clog available pore space, resulting in slower water infiltration. The calcium in gypsum will replace the sodium in the soil, which helps improve water infiltration. Therefore, gypsum can improve soil structure, but cannot reduce compaction of existing hardpans. Other management practices discussed above need to be implemented to improve and prevent soil compaction problems.

COMING THIS FALL!

Cover Crop and Soil Health Demonstration Project in Sutter County

UC Farm Advisors Amber Vinchesi and Sarah Light are excited to announce the launch of a state-wide Healthy Soils project supported by CDFA. This project will include a cover crop demonstration and research site on a farm in Sutter County, and will evaluate incorporating cover crops into annual production in the region. The impact of cover crops on soil carbon levels will be quantified. **Stay tuned for a field day to kick-off this project in Fall 2018!** Two additional field days will be held throughout the course of this project. We look forward to seeing you there! Contact Amber (acvinchesi@ucanr.edu) or Sarah (selight@ucanr.edu) with any questions.

Spider Mites in Corn

Konrad Mathesius, Agronomy Advisor, UCCE Sacramento, Solano, Yolo Counties

As is the case with most springs in the Southern Sacramento Valley, high winds, not to mention increased activity on dry service roads, can kick up a good deal of dust. This comes at a less-than-ideal time for corn growers as dust on corn leaves can often facilitate the growth of spider mite colonies. Spider mites can be problematic, reducing leaf productivity and yield if their populations grow too large, but there are several simple tactics that can be used to monitor, repress, and manage populations before their numbers become significantly damaging.

Spider mites can be identified by their small size (on average 0.06”) and certain anatomical characteristics visible through a hand lens: round translucent eggs, eight legs, black spotting, and green or pinkish coloration.

Figure 1, 2, 3: left to right, Adult two-spotted spider mite, two-spotted spider mite nymph, adult pacific spider mite

Due to their small size, they are perhaps easiest to identify via their damage and webbing. Corn leaves will often appear as if they've been roughed up by sandpaper (leaf stippling, Figure 1) and leaf undersides will appear grayish due to webbing.

Figure 4: Leaf stippling on corn leaf due to spider mite infestation.
Photo: University of Wisconsin, Madison

As with most crops keeping corn healthy can help stave off damage from mite populations. Closely monitoring ET, soil moisture, and plant stress can help plants defend themselves more effectively.

When populations are present, they are typically greatest at field edges and as such may not be representative of the rest of the field. This also means that if treatment is necessary, limiting applications to the outside of the field can reduce the chances of infestation deeper into the block while maintaining the possibility for some amount of beneficial insects to make a comeback if mite populations start to rise again. Eliminating beneficial insects, such as the minute pirate bug, big-eyed bug, or predatory mites can lead to severe subsequent secondary outbreaks.

Figure 5 and 6: left to right, adult minute pirate bug, big-eyed bug

Fields may benefit from treatment if young corn plants (between 2 and 4 feet, roughly between V3 and V8) are infested in their lower canopy and those mite populations appear to be increasing rapidly over the course of several days. Spraying after the crop is taller than four feet usually leads to poor control due to a closed canopy and subsequent poor spray penetration. Growers and PCAs can monitor mite damage in the field over the course of several days to see if beneficial populations are controlling mites effectively. Beneficial populations of predators will often lag behind their prey until reaching equilibrium. This means that damage may appear before any sign of beneficial control, but it also means that mite populations may return in much greater numbers if beneficials are

eliminated. If mite populations are not on the rise, spray applications may end up being useless or counterproductive as populations may have already declined, left the area, or tapered to equilibrium with predators.

Later plantings can be more susceptible to mite damage as mite generational times will be shorter as the weather becomes warmer and the day lengths longer.

More information on integrated pest management and spray options for spider mite infestations can be found on the UC IPM website. The UCCE AgRIC contains additional information about spray trials in field and silage corn. Growers and PCAs should also feel free to reach out to their local Cooperative Extension Agronomy and Pest Management Advisors with any questions they have regarding spider mite infestations.

Disease issues in garbanzo production in the Sacramento Valley

This year we found a number of diseases in garbanzo beans in the Sacramento Valley, including charcoal rot, Fusarium root rot, alfalfa mosaic virus, and Ascochyta blight. The root rot diseases are favored by plant stress, which may have occurred during the long dry period of no rain this winter. Aphids vector alfalfa mosaic virus and flights might have occurred during the particularly warm spell in early February when temperatures were in the high 70's. Ascochyta blight is favored by cool, wet conditions, which occurred during our fairly wet spring. More information on managing Ascochyta blight can be found in our Dry Bean Blog from February 2018, titled, "Ascochyta blight found in garbanzo beans in the Sacramento Valley", at http://ucanr.edu/blogs/beanblog/index.cfm. Following is a description of the root rot diseases and viruses and how to manage them.

Charcoal rot

Sarah Light, Agronomy Advisor, UCCE Sutter, Yuba, Colusa Counties

A field in Sutter County was confirmed to have charcoal rot, also known as dry root rot or ashy stem blight, which is caused by the fungus *Macrophomina phaseolina*. The disease generally occurs under dry soil conditions paired with high temperatures and can be especially problematic when irrigation is delayed during periods of drought stress. This pathogen infects the crown and stem of garbanzo plants near the soil line and produces black cankers, which are sunken with distinct margins and often contain concentric rings. The disease is usually scattered in the field and often occurs during the flowering and pod stages (although infection can occur at all growth stages). The pathogen infects the stems of seedlings at the base of the developing cotyledon near the soil line. In older plants, symptoms include stunting, leaf chlorosis, early defoliation, and ultimately plant death. A sudden drying of whole plants scattered in the field is observed. Additionally, a "charcoal dust" can appear near the soil line on the surface of roots and stems of older plants. Canker development may kill the plant's growing tip and weaken the stem, causing stems to break, separating roots from the rest of the plant when plants

Garbanzo field with charcoal rot

are removed from the field. Infection can move into the hypocotyl and root region, as well as primary leaf petioles. The plant taproot often becomes dark, necrotic, and devoid of lateral and fine roots.

Garbanzo field with charcoal rot

Cankers on garbanzo roots affected by charcoal rot

Management options in California are limited. This disease affects other legumes like common beans, blackeyes, and limas, and inoculum survives in both seeds and soil. A 3-year rotation with a cereal grain (except corn and sorghum) is recommended to reduce soil inoculum levels. The dry, warm weather in the winter months earlier this year were conducive to drought stress for garbanzos, which increased the risk of disease. If possible, irrigate to avoid drought stress conditions. Garbanzos grown in soils that are high in organic matter tend to have more problems with this disease, however, garbanzos in other soil conditions are at risk if the plants are stressed and the environment is conducive to disease development.

Fusarium root rot and Alfalfa mosaic virus

Rachael Long, Pest Management & Agronomy Advisor, Sacramento, Yolo, Solano Counties

Fusarium root rot, caused by *Fusarium solani*, is a fungus that attacks the underground stems and roots of plants. The above ground plant symptoms include yellowing, wilting, stunting, and dieback. Early infection is characterized by elongated reddish streaks. Eventually a reddish-brown lesion will surround the entire root causing root decay. This *Fusarium* root rot is very specific to garbanzos (and field peas). Plants are more susceptible to this disease when they are stressed, such as under drought or water logging conditions. Use of seed treatments will help manage this disease (see the newly revised UC IPM dry bean guidelines for a list of treatments). Several garbanzo fields were also infected with alfalfa mosaic virus, a disease that's vectored by aphids. Plant symptoms of viral infections include yellowing (brighter than Fusarium root rot), wilting, stunting, and dieback. The degree of plant loss and yield decline will depend on the timing of the infection (later infections may not be as damaging). A common theme for viral infections in garbanzos is that there is no pattern to the disease incidence in the field. That is, individual plants scattered throughout the field will show dieback. This is because the infection depends on where the aphids land

Garbanzo field with alfalfa mosaic virus

and feed. Aphids do not colonize (reproduce) on garbanzo plants due to the acids secreted by the plants that generally kills them, so there is minimal lateral spread of the disease from the point of infection.

To identify alfalfa mosaic virus and other viral infections in garbanzos, cut a stem longitudinally and observe any discoloration in the vascular tissue (xylem and phloem). If the discoloration (brownish) runs along the edges of the cut stem, then it is likely the phloem (sugar conducting tissue) and caused by an aphid-transmitted virus, which moves down into the plant from the leaves. To manage alfalfa mosaic virus, avoid planting garbanzo fields next to alfalfa fields where they can pick up and transmit the virus (lima beans are also very susceptible). It is not economical to spray for aphids because by the time you see the plant damage, the aphids will be gone. In addition, plant garbanzos during cooler months (December to January), after or before aphid flights occur in spring and fall.

If the discoloration is in the center of the stem (xylem or water conducting tissues), it is likely Fusarium wilt which moves up into the plant from the roots and stains the xylem tissues dark-brown to almost black. Fusarium wilt is different from Fusarium root rot and we have not yet seen *Fusarium* wilt in the Central Valley, although it has been found in the Central Coast of California in some of the older garbanzo growing areas. In fields with a history of Fusarium wilt, plant resistant cultivars such as UC-27, which is adapted to Central Valley growing conditions.

New UC ANR Cost and Return Study for Garbanzo Beans

Rachael Long, Pest Management & Agronomy Advisor, Sacramento, Yolo, Solano Counties
Sarah Light, Agronomy Advisor, UCCE Sutter, Yuba, Colusa Counties

The UC ANR Agricultural Issues Center has released a new study on the costs and returns of producing garbanzo beans (chickpeas) in the Sacramento Valley. Although statewide acreage is relatively small (about 10,000 acres), garbanzos are an important crop because we produce the large, cream-colored seed for the canning industry, destined for garnishes at salad bars. Authors include Farm Advisors Sarah Light and Rachael Long.

This garbanzo cost study is currently being used to help secure USDA crop insurance garbanzo production, expected in 2020. This study, as well as other sample cost of production studies for many commodities are also available through UC ANR. They can be downloaded from the UC Davis Department of Agricultural and Resource Economics website at http://coststudies.ucdavis.edu.

Abiotic disorders to watch for in hybrid sunflower seed production

Rachael Long, Pest Management & Agronomy Advisor, Sacramento, Yolo, Solano Counties
Sarah Light, Agronomy Advisor, UCCE Sutter, Yuba, Colusa Counties

Last year, we saw a number of disorders in sunflower that were mainly related to a heat stress by parental line interaction. Despite extensive testing by the USDA and UC ANR for pathogens in many affected sunflower plants, no causal agents were found. Overall, symptoms were found only on the female lines and were fairly uniform in plants in the heat-stress affected fields, which is another clue that the cause was abiotic or environmental, not due to a disease problem. A disease would be more random and affect both male and female lines (unless one line has resistance to the disease).

One disorder observed was foamy head rot of sunflower, a malady that produces copious white frothy material that exudes from the leaf petioles, main stem, and flower heads, causing yield and quality losses. There were no obvious wounds, though insects, such as stink bugs and ants, were attracted to the sweet, alcoholic smelling frothy sap. This condition usually occured during hot, dry spells with ample soil moisture present. Possibly, excessive heat caused splitting or micro-wounds that allowed the ingress of organisms which otherwise would not be harmful, much like

Rhizopus head rot (a fungus) following insect or bird damage to flower heads. This disorder has only been observed in the female lines, indicating that certain specific genetics predispose sunflowers to this problem. We observed this malady in the same female parent lines in 1993 and 2014, where it was fairly uniformly distributed in fields. Similar symptoms were found in some female plants in 2017 (likely a different parent line as the symptoms were not as widespread as in previous years).

Sunflower with foamy head rot

Another disorder we observed last year was where flower buds turned brown and did not develop or only partially opened with some seed set, or the fully open sunflower heads were scalded. This injury occurred after an excessive heat wave last June (100°F to 106°F for 8 consecutive days). Again, the damage was only observed in the female lines (not the males). In addition, some female lines at the same stage weathered the heat wave, indicating differences in parental line susceptibility. There was some indication that heat injury to sunflowers was worse where there were gravel streaks in the fields (holding less moisture). This suggests that it's critical to be prepared with good irrigation management practices before heat waves hit to ensure sunflowers have adequate water during hot periods.

In other fields observed last summer, the female sunflowers set seed (hull present), but the seed did not fill (no kernel) due to poor pollination from a lack of honey bee activity due to excessive heat. Another malady observed was where the sunflower heads did not drop after pollination, resulting in sunburn and high seed predation by birds, which is entirely varietal and physiological. Let's hope that we have favorable growing conditions for hybrid sunflower seed production this coming year. Watch for predicted heat waves and be prepared with good soil moisture going into them, especially in the early bloom stages.

Heat induced damage to budding sunflower heads

Sunburn damage to sunflower

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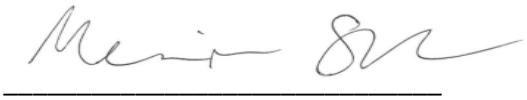

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