

Field Check

A Cotton Management Update from UC Cooperative Extension

Late-Season Crop Status – early September, 2004

Bob Hutmacher, Extension Agronomist
UC Davis Plant Science Dept. and UC Shafter REC

As with most years, there are ranges of crop situations out there as we enter the first few days of September. Many fields, however, are very advanced in maturity, with many ready for first harvest aid applications within the next week. Looking out across fields seen in the past week or so, the situations include fields fitting each of these descriptions:

1. hard vegetative cutout with no recent growth of new leaves, no second wave of growth:
(fair number of fields recently reaching this stage)

A lot of these fields don't have a top crop that will much influence yield. One reason that they have quit growing is that they have a good fruit set that is quite high for a low to moderate vigor plant. Foliage in many fields is declining and not showing much vigor for any continued growth. Plants set fruit through early and mid-season, lost squares and small bolls during hot weather the past month, didn't start up a second wave of growth due to relatively low vigor or depleted soil water or nutrients, and will be ready for harvest aids soon. Consider using nodes above cracked boll methods or other tools to help decide harvest aid timing. If these fields are low on nitrogen or water, with open mid-canopy bolls and mature upper canopy fruit, don't wait too long to defoliate. You'll probably be well set up to get harvests started and cut down on the chances of needing a longer period of protection from whitefly and aphids.

2. fields that have been cutout for two weeks or more, recently showing new leaf growth. *(fair number of fields this year follow this pattern)*

Hot weather in early August followed by irrigations and more moderate weather conditions the past few weeks have produced conditions favorable to new growth in some fields. If it has been a while since these fields went into vegetative cutout, many plants will translocate needed photosynthate and nutrients to fill out and mature earlier-set bolls. Where there is soil water and nitrogen available, these plants have started up some vigorous new growth that can complicate defoliation, make plants more attractive to late-season pests, and in many cases, there still will not be enough heat units to turn this late growth into much additional yield. Advice would be to manage water to mature out the bolls that are 10-15 day old or older that have a good chance of opening, and avoid later irrigations to limit new growth that can cause problems for timely defoliation. In some of these fields with new vegetative growth, open bolls are widespread and in some cases, so are adult whitefly, increasing risks of developing sticky cotton.

3. fields with substantial numbers of fallen / lodged plants: *(Quite a few fields that look like this in some areas and varieties).* We saw a lot of this field condition in 2002 – hopefully less this year. High plant populations and spindly plants with good middle and upper canopy fruit set can lead to this problem. Variety plays a role, especially if a heavy top crop exists. As bolls mature and crack open, many plants will “pop” back up at least part way if plants aren't too big. Lodged plants make penetration of pesticides and harvest aids considerably more difficult. Defoliations will require more applications, harvests may be delayed and slower. Any late irrigations applied in these fields will further delay defoliation, can cause additional vegetative growth, and may increase incidence of boll rots.

4. fields that are still growing (no cutout yet, tall, vigorous). (*There are fewer fields in this condition than we typically see this time of year in the SJV.*)

There are some large, vigorous plants out there in recently irrigated fields, but above-average early and mid-season fruit set has made these fields uncommon compared with many other years. Some fields fitting this description were later-planted Pima in heavier soils, and continued growth and some flowering is still going on the past week. Although we are still in ok shape in these fields, it remains a good idea to think about how late a harvest you are willing to risk. With concerns for late harvests and the threat of whitefly and late aphids, it is certainly about time to close things down and avoid additional irrigations in these fields. There is no doubt that some of these fields are going to yield well and still are setting fruit. Monitor progression of nodes above white/yellow flower, and look at a calendar occasionally as a reminder that on the average these late-season bolls are going to take nearly 70 days from flowering to open boll.

5. hard cutout, no new growth or regrowth, and mild to severe leaf loss associated with Potassium deficiency, Verticillium wilt, or some COMBINATION of factors leading to late-season foliar decline (*much larger number of fields looking like this in 2004, both in Pima and Upland/Acala varieties*)

Various types of late-season foliar decline have been seen in both Pima and Acala/Upland fields this year. Most observations are that this type of problem has been much more widespread this year, occurring in many areas in addition to the “usual places” where it has been seen in other years (Merced and Madera Counties along parts of Hwy 33 and 152 and east of Firebaugh; Tulare - Waukena area west towards Corcoran and Hanford areas of Tulare and Kings Counties). Fields we are describing as having “foliar decline” may look different to each of us working in cotton, but I would characterize it as having some or several of the following symptoms: upper canopy stem reddening, leaf reddening and bronzing, greatly reduced internode lengths in the upper canopy as growth stops, death of mid- to upper-canopy stem and leaf tissue, and in more cases than usual this year, the abscission of many leaves in the mid and upper canopy. In the worst of these fields, still-developing bolls in the upper canopy will not fully develop, with some never opening but others eventually opening, but with poor quality fiber since they are starved of nutrients and carbohydrates as the plants decline

Some Observations on “Foliar Decline”

Is there one cause to these late-decline problems? Although we have looked at a lot of fields with similar symptoms in recent years, we have no clear answer as to any one cause at this point. In many fields we might describe as showing some variation on foliar decline this year, there are a mix of things going on, including the following observations:

- ❑ plants can have widely variable severity of damage, all in the same field – the timing and degree of leaf loss may be highly variable
- ❑ some dead plants with obvious Verticillium wilt symptoms (including vascular staining) are part of the problems seen in many fields this year (less so in other years)
 - There have been more reports of Verticillium wilt evident this year
 - while some varietal differences are apparent, few widely-planted varieties are immune to Verticillium wilt when inoculum is present and conditions are “right” – the number of infected plants will vary with varietal resistance and conditions that favor the organism
 - Based on evaluations of cut stems and vascular discoloration, Verticillium wilt is likely involved in damage in many locations, but is not thought to be the sole cause of decline
- ❑ Leaf damage from other pathogens (such as leaf spotting with *Alternaria*) is often seen as leaves decline, but UC pathologists have described these generally as secondary pathogens affecting plants that are in decline, not causal organisms that initiate and bring about a general decline

- ❑ Many of the worst-affected fields are those where there is a heavy fruit set for the size of the plants and leaf area (this doesn't mean that it only happens in 3+ bale/acre fields, just that the fruit load is generally heavy for the size of the plant and leaf area supporting the boll load)
 - In some affected fields, areas of the fields with lighter boll loads either don't show the foliar decline, or there is a delay in the onset of the problem in those areas
- ❑ In affected plants, leaves turn red or bronze in color, followed by early, significant leaf loss
 - many Uplands go ahead and abscise leaves after they turn red or bronze, then brown
 - some Pima varieties do not abscise many of the leaves after they redden and die
- ❑ with more severe decline, late-developing bolls will cease further development (in part due to limited carbohydrates and nutrients to finish development)
- ❑ just selecting a variety that "stays green" may not be a good strategy either, as some of the worst leaf loss and decline problems have been seen where boll loads are heavy – if you are comparing varieties based on visual symptoms, make sure that greener plants are not just associated with lower yields
- ❑ by late in boll development, most plants we have evaluated that show severe symptoms have been very low in petiole and leaf potassium, but as might be expected from declining plants, they are also low in other nutrients (N, P, etc.)
 - in some cases with late-season foliar damage, soils in the upper 18 inches test out as deficient or borderline deficient in potassium, and that may be in fact the primary cause
 - in other areas, soil test values for exchangeable K have tested well above deficient levels according to UC K guidelines, and they still show leaf symptoms and leaf loss
- ❑ in Pima fields with similar foliar decline symptoms in recent years, we have measured that tissue nutrient levels were lower and foliar damage and loss was more extensive and severe in areas of fields where plants had shorter tap roots and less evidence of extensive lateral root development
 - this has led some of us to suggest that any combination of factors that restricts sustained root growth could also affect mid- to late-season nutrient uptake (such as compaction, tillage or other practices that could "prune" roots, or water or salinity stresses that limit effective area of soil explored by the roots *(While an attractive hypothesis, this does not always fit with observations in fields)*)

What To Do About Foliar Decline? It is not clear at this time that this problem can be eliminated or even reduced adequately through something as simple as higher N or K fertilizer applications. In some cases, that might just be the ticket if you haven't done any soil sampling in a while and have backed off on soil nutrient management, it might be very useful to note or take GPS readings of where you have the worst foliar decline problems in your fields this year and concentrate some sampling efforts in those areas.

In order to better describe and characterize some of the late-season conditions that are correlated with fields with some variation of this foliar decline, several of us in UCCE have been working with several Agronomy consultants and growers in soil and plant sampling in affected fields. If you are interested in working with us this year (or more likely next year) in trying to get a better "handle" on this problem, please contact us and take note of locations within fields both (1) where the problems were the worst; and (2) where they were the least. These notes will come in handy if you or we try to get a better handle on what factors increase problems of late-season foliar decline.

Comments on Low Vigor Fields in 2004 – for your consideration

In some fields, if you were not pleased with the relative vigor level of the plants this year, some things to consider with potential to impact plant vigor in future crops might include:

- ❑ split N applications to improve the timing of when N is available
- ❑ improvements in soil fertility
 - K is a likely target in some fields
 - where vegetables are not in the rotation we have also seen some low Phosphorus levels, but still relatively uncommon
 - N availability can be a problem if practices encourage leaching losses and fruit loads are high
- ❑ extent of soil physical problems such as compaction
- ❑ decisions on irrigation timing (particularly delayed irrigations producing significant stress during late squaring through peak bloom)
- ❑ decisions on use of plant growth regulators (PGR's)

A couple of observations related to PGR use this year:

- (1) the UCCE guidelines for mepiquat chloride (or the PGR “PIX” and other brands) might be useful to review
- (2) the role of the guidelines is to indicate potential for positive or negative impacts of use of mepiquat chloride (PIX).
- (3) Mepiquat chloride (PIX) is a great tool for cotton growers, but should be used when necessary and where there is a good chance for a positive impact
- (4) a fair number of fields with relatively low vigor plants probably still received one or more PIX applications this year, or perhaps higher application rates than necessary. Past research has consistently shown potential for yield improvements with PIX when plant indicators show growth regulation is necessary – and research has also shown that unnecessary PIX applications when plant growth is already held back strongly by growing conditions (or heavy, early fruit set) can reduce yield.
- (5) For PGR decisions, consider using either the guidelines or whatever “plant indicators” you think work, but make the decisions based on how plants are growing on a field by field basis.