



Water Management for Defoliation

There are several factors which are important to consider in managing defoliation. Factors such as plant-water relations, nitrogen (N) fertility status, the extent of honeydew deposits on the leaves from insects such as the sweetpotato whitefly or aphids, and weather conditions following the defoliant application are all important in terms of the final defoliation results.

The timing of the last irrigation puts into motion the final steps that lead to defoliation. The most important consideration in making the last irrigation should be based upon maturing the fruit intended for harvest. From our recent research in Arizona, we have found that approximately 600 heat units (HU, 86/55°F thresholds) are required to mature a bloom to a full-sized, hard boll, the stage at which fiber length development is complete. An accumulation of about 200 HU/week is common in central and western Arizona during August and early September. Under those conditions, one would need to maintain adequate soil-water conditions to provide for the development of bolls intended for harvest over a period of about three to four weeks.

Water stress promotes crop senescence (aging). However, a certain amount of plant-water is necessary to keep the leaves physiologically active enough to form an abscission layer, and to maintain enough weight to the leaf so that the leaf and petiole can break off and drop. On the other hand, excessive water stress can lead to leaf burn and desiccation.

The crop will dry down after the final irrigation depending upon weather conditions, water holding capacity of the soil (soil texture), the amount of water applied in the last irrigation, and the overall condition of the crop fruit load and canopy. As a very general approach toward timing the defoliation, it has been found that for many cases the time interval between the last irrigation and the application of the chemical defoliant should be about 2X (twice) the normal time span used between the late-season irrigations. This should first provide for the basic water needs of the late fruit intended for harvest, and then allow some degree of crop dry-down, which in turn promotes crop senescence.

The use of a 2X (of the late season irrigation interval) “rule of thumb” approach may be helpful in a very general way. A more complete approach would be to consider the depletion of the plant-available water (PAW) in the soil after the final irrigation. To go through this type of estimate a person needs to know how much water was applied in the last irrigation, the soil texture to a four foot depth (effective rooting zone), and the depth of the soil profile that was filled from the last irrigation. Then by subtracting the evapotranspiration (ET) estimates on a weekly basis, which can be obtained from the weekly cotton advisories from the county offices of the UA Cooperative Extension, a person can easily develop an estimate of the depletion of the available soil-water. Any rainfall should also be added into the soil-water levels. A depletion of about 70% of the PAW often leads to a generally sufficient state of water stress on the crop to encourage defoliation (refer to example on back). Actually, neither approach is what you would call “bullet proof”, but paying attention to crop water conditions is important in timing defoliant applications.

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Table 1. General values for plant-available soil water holding capacities:

Soil Type	Plant-Available Water (PAW)
	inches/foot of soil
Sandy loam	1.0
Silt loam	1.5
Clay loam	2.0

Example

Defoliation Timing Based Upon Soil-Water Depletion

Assume:

1. An Arizona cotton field that has a uniform sandy loam soil texture (generally coarse), to a depth of 4 ft., which would allow us to assume a plant-available water holding capacity of 1.0 inch/foot of soil.
2. The last irrigation fills the soil profile to a depth of 4 feet.
4 ft. X 1.0 in. H₂O/ft. = 4.0 inches PAW total.
3. Target soil profile depletion of 70% (or 1.2 to 1.0 inches available H₂O remaining);
4 inches H₂O X 0.70 = 2.8 inches PAW (approx. 3.0 in.) Therefore, target depletion point =
4.0 - 2.8 = 1.2 inches PAW

Subtract weekly crop evapotranspiration (ET) rates (refer to local AZMET weather station data or weekly cotton advisories from University of Arizona Cooperative Extension).

Last Irrigation on: 28 August

Week #1 ET = 1.6 inches crop water use

Week #2 ET = 1.4 inches crop water use

Total water use (2 week period) = 3.0 inches

Depletion rate = 4.0 inches - 3.0 inches = 1.0 inches PAW (75% depletion level)

CAUTION: Rainfall events should be added to the PAW levels in the soil, which will delay the depletion rate.

Defoliation Application:

Third week after last irrigation (week of 6 September)

Note:

This type of an approach should not be used without the benefit of careful field evaluations for crop condition. A heavy boll load, extremely hot, dry, and/or windy conditions, and a heavy boll load can accelerate crop dry-down and defoliation timing.

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