THE UNIVERSITY OF ARIZONA
Whiteflies in Arizona: No.13

Whitefly Control in Cotton: Getting the Fundamentals!

A guide for PCAs and other Pest Managers interested in whitefly control in cotton

August 1, 2004

Peter C. Ellsworth, IPM Specialist, *University of Arizona*

Some have been managing whiteflies for so many years and perhaps in such a routine manner now that it is easy to forget the fundamentals. Properly managing whiteflies depends on a thorough understanding and practice of sampling methods, timing, and selection of control agents that have been instrumental in Arizona cotton regaining its reputation for producing clean, high quality fiber. For a full set of details, please visit ACIS on the internet at *http://cals.arizona.edu/crops*.

In brief, one must systematically sample whiteflies to obtain numbers on which to base sound, economic decisions on control tactics.

- After becoming familiar with the growth stage and variety present in the field, proceed by locating the 5th mainstem leaf below the terminal (the terminal leaf, leaf no. 1, should be an unfurled leaf at least the size of a quarter) (Fig. 1).
- Turn the leaf over and tally the leaf as infested if it has 3 or more adults on it (including those that fly up when disturbed).
- Then, detach the leaf, and examine a quarter-sized area between the central and left lateral vein, preferably with a hand lens, and tally the leaf disk as infested if it has 1 or more large (3rd or 4th instars), living nymphs.
- Do not include dead nymphs, which often appear flattened, desiccated or evacuated of contents due to predation.
- Repeat this process 30 times, preferably from 15 leaves from each of two locations in an average-sized field.
- Calculate the percentage of leaves that were infested (with 3 or more adults) and the percentage of leaf disks that were infested (with 1 or more large nymphs).

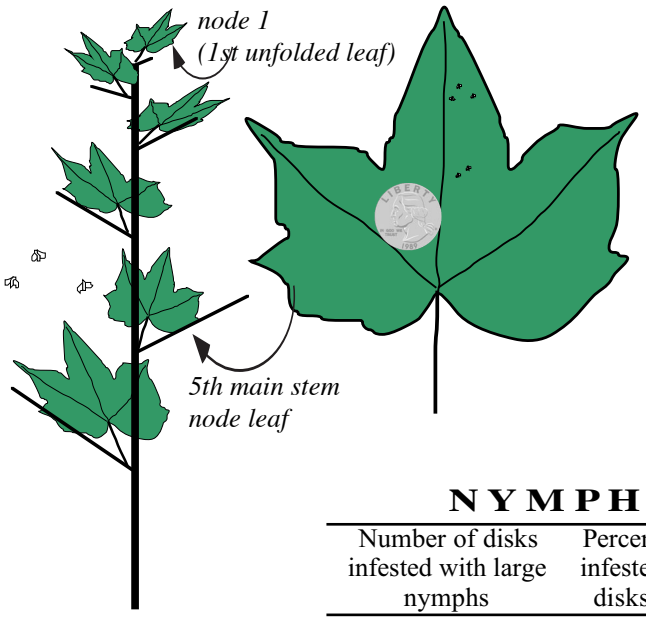
When to do something is as important as what to do. In whitefly management, we have research-proven, time-tested guidelines on the optimal timing for deploying whitefly IGRs (Knack® or Courier®) and other chemistry. In the majority of cases, IGRs should be used first against whiteflies. They really are most effective and most economical when used this way. They capitalize on the natural mortality factors already operating on whitefly populations. In essence, you get chemical residual and bioresidual from an IGR, and not just chemical residual as with other chemistry, because of their selectivity and safety for beneficials.

IGRs are best deployed first and when 40-57% of the leaves are infested with adults ***and*** *40% of the leaf disks are infested with large nymphs*. Bear in mind that both criteria need be satisfied to properly trigger an IGR application. Other chemistry, which has adulticidal activity, should be deployed no sooner than 57% of the leaves infested with adults. As a general rule in whitefly control, IGRs should not be mixed with other chemistries in an attempt to suppress adults as well. These mixtures tend to be broad spectrum and defeat the bioresidual of the IGR approach, in essence wasting control and money.

The tools for controlling whiteflies are exceptionally well understood. The list of best options is limited to the two IGRs, Courier and/or Knack, and the foliar neonicotinoid, Intruder®. Other chemical approaches, no matter how "cheap" ostensibly, should be reserved for short-term control scenarios, usually quite late in the season (e.g., pyrethroid mixtures with an organophosphate). Once again, IGRs should be deployed first, and if necessary followed with the alternate IGR, as part of Stage I of our resistance management program. Intruder or other non-pyrethroids should be used in follow up to Stage I as part of Stage II. In addition, neonicotinoids should be used not more than twice in neighborhoods or communities (i.e., within a 2-mile radius) where cotton is grown exclusively, not more than once where melons are also grown, and not at all where melons and vegetables are grown. Finally, late season, even as late as defoliation, a pyrethroid mixture (Stage III) may be used. Pyrethroids should not be used more than twice season-long for all pests.

ADULTS

Number of leaves infested with 3 or more adults	Percent infested leaves	Average per leaf
1	3.4	0.3
2	6.7	0.6
3	10	0.8
4	13	1.0
5	17	1.3
6	20	1.5
7	23	1.8
8	27	2.1
9	30	2.3
10	33	2.6
11	37	2.9
12	***40***	***3.2***
13	***43***	***3.6***
14	***47***	***3.9***
15	***50***	***4.3***
16	***53***	***4.7***
17	***57***	***5.1***
18	60	5.5
19	63	6.0
20	67	6.5
21	70	7.1
22	73	7.7
23	77	8.4
24	80	9.2
25	83	10.2
26	87	11.3
27	90	12.8
28	93	14.9
29	97	18.4
30	100	34.9



IGR Threshold

NYMPHS

Number of disks infested with large nymphs	Percent infested disks	Average per disk
8	26	0.5
12	***40***	***1.0***
16	52	1.5

IGR Threshold Decision Matrix		*Whitefly Adult Levels*	
		< 40% infested leaves	**40–57% infested leaves**
Whitefly Large Nymph Levels	**less than 40% infested disks**	Wait and re-sample in 3–7 days	Wait; Re-sample in 3 days; **or** Use a Stage II adulticide; **or** apply Knack®
	at least 40% infested disks	Wait; Re-sample in 3 days; **or** apply Courier®	Spray with either IGR

Fig. 1. The sample units, locations, and binomial conversion tables for whitefly adults and large nymphs (3rd or 4th instars) in cotton, as well as a threshold decision matrix for IGR use in cotton based on a 30-leaf sample (adapted from Ellsworth & Martinez-Carrillo, 2000; Ellsworth et al., 1995, 1996c; Diehl et al., 1996; Naranjo et al., 1996b).

***Summary Guidelines**: Maximum number of uses per crop season for neonicotinoids in three different cropping communities.*

Community	*Cotton*	*Melons*	*Vegetables*
Multi-Crop	**0**	**1***	**1****
Cotton / Melon	**1**	**1***	**—**
Cotton-Intensive	**2**	**—**	**—**

**Soil only; **Soil or Foliar*

Important Links

1. *http://ag.arizona.edu/crops/cotton/insects/wf/wfly8.pdf*
2. *http://ag.arizona.edu/crops/cotton/insects/wf/wfly11.pdf*
3. *http://ag.arizona.edu/crops/cotton/insects/wf/wfsampl.html*
4. *http://ag.arizona.edu/crops/cotton/insects/wf/ipm6.html*
5. *http://ag.arizona.edu/crops/cropxcrop/ccrecommend/wfly12.pdf*
6. *http://cals.arizona.edu/pubs/insects/az1319.pdf*

Funding for the printing of this bulletin was provided by the Arizona Pest Management Center funded in part by grants from USDA-CSREES Western IPM Center and the University of Arizona IPM Program.

This and other documents of interest relating to crop production / protection are available on the Arizona Crop Information Site at *http://cals.arizona.edu/crops*