

Sweetpotato Whitefly, Bemisia tabaci, a new pest of cotton in Arizona

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The sweetpotato whitefly, Bemisia tabaci (Genn.), appeared during 1981 as a very serious pest of cotton in Arizona and California. It had been collected from cotton a number of times previously but the numbers had never increased to such damaging populations over such a large area of the Southwest.

Why did this insect seem to suddenly appear? There are a number of opinions. One is that the several warm winters the Southwest has experienced recently has allowed the insect to invade more northerly areas than it usually occupies. This species seems to be distributed worldwide between the 30° parallels but it may extend its distribution northward when weather conditions permit. It has been an injurious pest of cotton in Israel for a number of years. Another idea is that the extensive use of pyrethroid insecticides may have permitted the insect to increase. Dan Gerling, UC Riverside, made detailed studies of this and two other species of whiteflies on cotton at Indio and Westmorland, CA from 1962 to 1965 and concluded that damage often follows after insecticide application (Ann. Entomol. Soc. Amer. 60:1306-1321). Natural control factors played an important role in keeping the whitefly populations at low levels. The buildup in 1981 was so widespread that it is difficult to associate it with a particular insecticide group. Also, whiteflies were very severe in some of the fields treated with pink bollworm pheromones and thus had not been treated with the normal doses of pyrethroids or other insecticides. Others believe that stub cotton may have provided overwintering sites and a good host for the spring development. While this is true, areas in California such as the Coachella Valley, far from any stub cotton fields, had very severe whitefly infestations by early August 1981 (as they did in 1963). As for overwintering, adult whiteflies are present on many of the weeds in the Phoenix area in early January 1982. It now remains to be seen whether they will persist the whole winter and whether the eggs they have laid will develop.

DAMAGE: The primary damage of whiteflies to cotton is caused by honeydew which falls on the lint. Honeydew is a sugary material which the adult whiteflies excrete while feeding on the undersides of the leaves. The honeydew falls on the leaves and lint below. Homeowners are familiar with sticky honeydew caused by aphids feeding on arborvitae, pecans, roses and other plants. In the case of cotton, lint that becomes sticky with honeydew may gum up the gins during the ginning process, or more often, cause clogging of high-speed looms during spinning. Buyers generally avoid cotton from areas known to have sticky cotton. Sudan has had serious problems with the cotton whitefly for many years and also has had problems with selling cotton on the world markets. This past summer heavy rains during September in western Maricopa County washed much of the honeydew from the cotton so at harvest the lint was not as sticky as it might have been. Another type of damage to cotton associated with honeydew is caused by a black fungus that grows on the honeydew on the leaves and on the lint. In this case, rains in September may wash the black fungus onto the cotton fibers, causing them to become darkened with a loss of quality.

Where whiteflies have been abundant, cotton leaf crumple virus may develop and cause a reduction in yield. Disease transmission by adult whiteflies may be an extremely serious problem in other crops such as squash, melons, beans and lettuce. On a worldwide basis, this insect has been implicated in the transmission of 25 to 35 virus-like diseases on a wide variety of host plants. There may also be a loss of vigor in cotton, melon, okra, eggplant, and bean plants if young leaves become heavily infested with whitefly larvae sucking the plant juices.

LIFE HISTORY: Although whitefly adults appear to be very tiny and fragile, they are able to fly and can be carried by winds for long distances. Last summer clouds of whiteflies were visible flying on many days in the Imperial Valley. Single eggs are laid on the undersides of the leaves of host plants. Their bases are firmly embedded into the leaf tissue and cannot be dislodged like many insect eggs. The duration of the egg stage depends upon the temperature. At 68°F it lasts 11.5 days, while at 86°F it lasts only 5.4 days (Table 1). The tiny larva crawls out of the top of the egg and around on the leaf surface before settling down to feed, usually within a day. It feeds by sucking juices from the leaf. As the larva develops, it goes through two additional larval stages, then develops into a pupa and finally an adult. The time from when the egg is laid until the adult appears may vary from 34.7 days at 68°F to 16.6 days at 86°F (Table 1).

From these developmental times, the number of heat units (HU) for development can be calculated using Huber heat units with a low threshold of 55°F. The egg stage requires 163 ± 9 HU and the egg to adult period 487 ± 31 HU. Approximately another 33 HU may be needed for the preoviposition period, making a total of 520 HU needed for a whitefly generation. The pink bollworm requires 750 HU for a generation, therefore the whitefly develops much more rapidly.

At Buckeye there were from 25 to 30 HU per day during June 1981. At these temperatures the egg stage lasts from 5 to 6 days and the egg to adult development required from 16 to 19 days. Under the 10 to 15 HU per day at Buckeye last April, development required 11 to 16 days and 32 to 49 days for the egg stage and the egg to adult stage, respectively. Thus at cool temperatures, development is relatively slow. This fall we wondered if the eggs laid on sugar beets were going to hatch because

they seemed to be taking so long. At high summer temperatures a generation of whiteflies can develop in only 2 to 3 weeks, more rapid than any other cotton insect pest, and thus may give us a blizzard of whitefly adults that in 1981 blanketed our crops and home gardens.

OVERWINTERING: Overwintering of the adult sweetpotato whitefly is very important as it may be the major factor that determines how far north the insect can survive. This past fall was relatively warm and development of whitefly larvae took place in cotton on the few leaves that were not defoliated and on the new leaves that appeared after defoliation. The first frost at Phoenix occurred November 26 freezing the tender new leaves of cotton but the adult whiteflies were still active. During December adult whiteflies were observed on the leaves of weeds in downtown Phoenix and were found in nurseries and home gardens in January.

There is a wide range of winter weeds that appear to be favorable overwintering hosts for adult whiteflies. Dan Gerling observed all developmental stages of the sweetpotato whitefly on Malva parviflora L. in his overwintering studies in California. This appears to be a major adult overwintering host in Phoenix. Eggs are present in January but no larvae so it is unclear as to whether these plants mainly serve to allow the adults to survive to fly to young cotton plants or other hosts next spring, or whether eggs on these winter hosts will develop into new adults next spring. In any case, the abundance of whitefly adults on weeds in the southwestern desert agricultural areas in early January 1982 poses a very serious threat to cotton this coming year.

CONTROL: One of the most discouraging aspects of the sweetpotato whitefly problem is our apparent inability to successfully control it with the insecticides registered for cotton insects. This may be due in part to the long egg stage and to the inability to kill the immobile larval and pupal stages which inhabit the undersides of the leaves. Some pest control advisors are considering the use of systemic insecticides at the time the cotton is planted in an effort to combat the overwintering and first generations. Some also have found that certain combinations of insecticides are more effective than others during the season.

A tiny wasp parasite, Encarsia, is an effective parasite of the sweetpotato whitefly. It didn't seem to become very numerous during the summer, perhaps due to high temperatures or to the heavy use of insecticides. However, in October at Phoenix a month after insecticides applications stopped, parasitism of the whitefly larvae became almost complete. Preliminary examinations of the extensive cotton leaf samples collected during September and October 1981 indicate that this parasite is widely distributed in both Arizona and California.

TABLE 1. Duration in days of the egg stage and the egg to adult stage of the sweetpotato whitefly at various constant temperatures.

<u>Temperature °F</u>	<u>Egg Stage</u>	<u>Egg to Adult</u>
68	11.5	34.7
72.5	9.9	27.8
77	7.6	23.6
81	6.1	17.8
86	5.4	16.6

STUB COTTON SURVEY: YUMA AND MOHAVE COUNTY, ARIZONA

P. W. Borth

Summary

A questionnaire was sent to every individual on the Yuma and Mohave County farm mailing list that actually has a mailing address within those counties. The total number mailed was 344 of which 44.5% were returned. The total number of unspoiled surveys that were returned and thus reported was 138. As a group, 97.8% did not favor the growing of stub cotton. Using their experience as a guide, 98.6% of the group felt there was a correlation between the number of acres of stub cotton grown and agricultural insect problems, in general. Every individual who felt a correlation existed, thought it was a positive correlation, i.e., as stub cotton acreage increases, so do agricultural insect problems, in general.
