

# Sorghum Midge

found in San Joaquin Valley

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The sorghum midge—*Contarinia sorghicola* (Coquillet)—the most important pest of grain sorghums in the Southern states—was found in Tulare county on October 6, 1960. This apparently is the first record of this midge west of New Mexico. Surveys at the time of the initial discovery indicate that it is firmly established in Tulare County and is also present in Madera, Fresno, Kings, and Kern counties.

Damage results from a condition called blast or blight of the spikelets caused by feeding of the larvae of the midge upon the developing ovaries. The grain heads become blasted and produce little or no grain, resembling sterile heads. The insect readily attacks the seed heads of all varieties of sorghum including grain sorghums, sorgos—sweet or silage sorghums—broomcorn, Johnsongrass, and sudangrass.

The first record of the sorghum midge in this country was reported from Alabama in 1895. Since this initial record it has spread and is well established throughout the Southeastern quarter of the United States. Its western distribution up to the time of the present discovery was limited to an area along the Rio Grande from Presidio, Texas, to Las Cruces, New Mexico. Its northern distribution extends to Charlottesville, Virginia, and Hastings, Nebraska. The most severe infestations occur in the more humid sections of the southern and eastern states.

The sorghum midge is believed to be a native of southern Asia. In addition to the United States it is also recorded from Mexico, South America, the West Indies, Italy, Africa, Indonesia, Australia, and the Hawaiian Islands.

To date no commercial resistant varieties appear to occur. The midge does not breed extensively in any native grasses although it has been reared from foxtail grass—*Setaria lutescens*—and purple-top—*Triodia flava*. In California Johnsongrass appears to be an excellent source of midges. It is widespread in

many areas, develops early, and should act as a reservoir of midges to infest sorghum fields.

The adult sorghum midge is a minute two-winged fly, reddish-orange in color, about  $\frac{1}{8}$ " long. The female is more robust than the male, has antennae less than half the length of the body, and has an extensible ovipositor more than  $\frac{1}{16}$ " long. The antennae of the male are as long as the body.

Sorghum midge showing characteristic body coloring. Male at left, female at right.



Blasted seed opened to show dorsal view of pupa inside.

Oviposition takes place during bloom, but can occur anytime during a 2–4 day period while the glumes remain flexible. Individual females deposit from 28 to 124 eggs, laying single, elongated, pale pink to yellowish eggs in the spikelets on the inner walls of the glumes. Eggs are laid singly in different spikelets, but many females often oviposit in the same spikelet. During warm weather midge activity—particularly in the case of the males—is greatest in the early morning.

The duration of the egg stage is usually from 2–4 days.

Upon hatching the larva crawls towards the base of the spikelet and feeds on the developing ovary. The larva extracts juices from the developing seed causing it to discolor and dry up. During a larval period of from 9–11 days the larva turns from a pink to a deep reddish-orange. From 1–13 larvae can complete development in a single seed, but usually one or two occur.

Pupation occurs in the depression formed in the seed by the larval feeding. Pupae are red with the head and appendages dark brown or black. The pupal stage lasts 3–5 days. The pupa works its way to the tip of the spikelet when ready for emergence and upon emergence the pupal case projects from the tip of the seed—often a diagnostic feature in survey work of the presence of the midge. Some larvae in most generations produce brown cocoons and overwinter as larvae in the cocoons, pupating and emerging the following spring or even the second or third spring. In the cocoon stage the midge can be moved from one area to another with sorghum seed.

Investigations in other areas indicate that during the summer only 13–16 days are required for a complete cycle. Continuous overlapping generations occur. As many as 13 generations annually are recorded in Texas.

A survey on October 20, 1960 in Tulare county in which heads were collected about the edges of seven fields and the spikelets examined microscopically indicated a range in midge damage from 0.4% to 96% for an average of 30%. If off-type heads were eliminated—which are usually more heavily damaged—the average loss was 25%. Losses were greater in three silage varieties than in the grain varieties examined. Seed heads of second growth silage varieties approached complete destruction. Inasmuch as damage is usually more severe around the edges of fields, the 25% loss

Continued on next page

## SORGHUM MIDGE

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figure is considered high. A later survey of about seven fields in which heads were picked at random throughout grain fields indicated a range of from 1.5% to 24% loss from the midge with an average of 10%. Losses in Tulare County are estimated at from 10%–25% for the 1960 season. However, the extent of midge damage—if any—to the nutritive value of silage sorghum has not been determined.

In many fields losses due to sterility, blasting due to unknown causes, bird damage, and damage caused by the corn earworm or other insects accounted in

many cases for greater damage than that attributed to the midge. In the survey, losses from these causes were eliminated from the figures.

Birds, spiders, and insects are reported in other areas to play some part in checking the abundance of the sorghum midge. A wasp parasite—*Eupelmus popa* Girault—is reported to be very abundant, consuming both larvae and pupae of the midge, and resorting to feeding on developing seeds when the midges are destroyed.

Control of the midge in other areas where it occurs is based primarily upon cultural practices which seem to offer the greatest hope for minimizing damage likely to occur during 1961. The use of

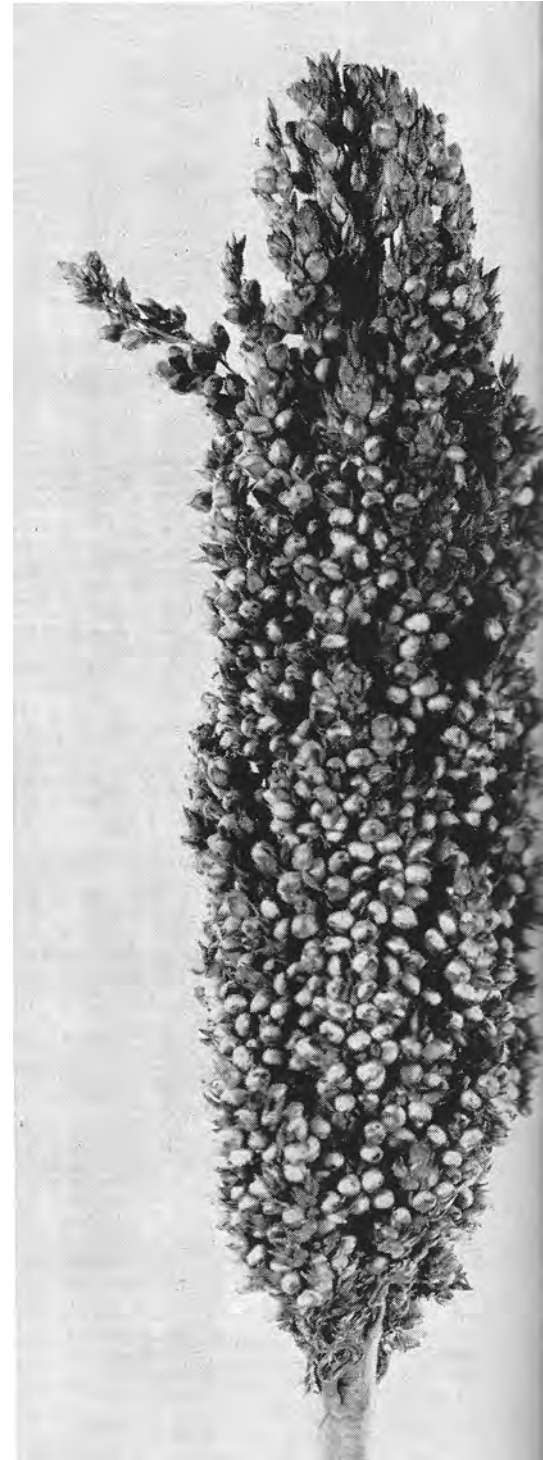
insecticides and resistant varieties remains to be investigated under California conditions.

The 10-point cultural program for the 1961 season might be:

1. Planting of enough seed to minimize tillering—10 to 14 pounds of seed per acre on 12" to 30" rows are necessary to insure uniform flowering. Late tillers occur when plants are spaced more than 2" apart in-the-row.



Normal sorghum seeds in upper row. Infested seeds in lower row show failure to develop.



Damage of midge to grain sorghum headse

2. Early planting is necessary as plantings made in April, May, and early June are most likely to escape severe damage. Late maturing varieties must be planted early.

3. Planting should be up-wind from any early planted sorghum.

4. Planting should be done when neighboring growers are planting.

5. Pure seed of a uniform blooming variety should be used.

6. Pre-irrigation and a uniform seed bed should assure all plants in a field equal maturity.

7. Irrigation is necessary before signs of moisture stress occur. Moisture stress encourages late branching and the formation of late heads that prolong the flowering period.

8. Johnsongrass in the area should be controlled as it not only allows for a source of overwintering midges but is a reservoir of midges for later sorghum plantings.

9. Headed sudangrass or forage sorghum should not be clipped while grain sorghum is blooming as adult midges will emerge and lay eggs in the sorghum.

10. All refuse from grain and forage

sorghum fields, sudangrass and Johnsongrass should be destroyed before the midges emerge in the spring.

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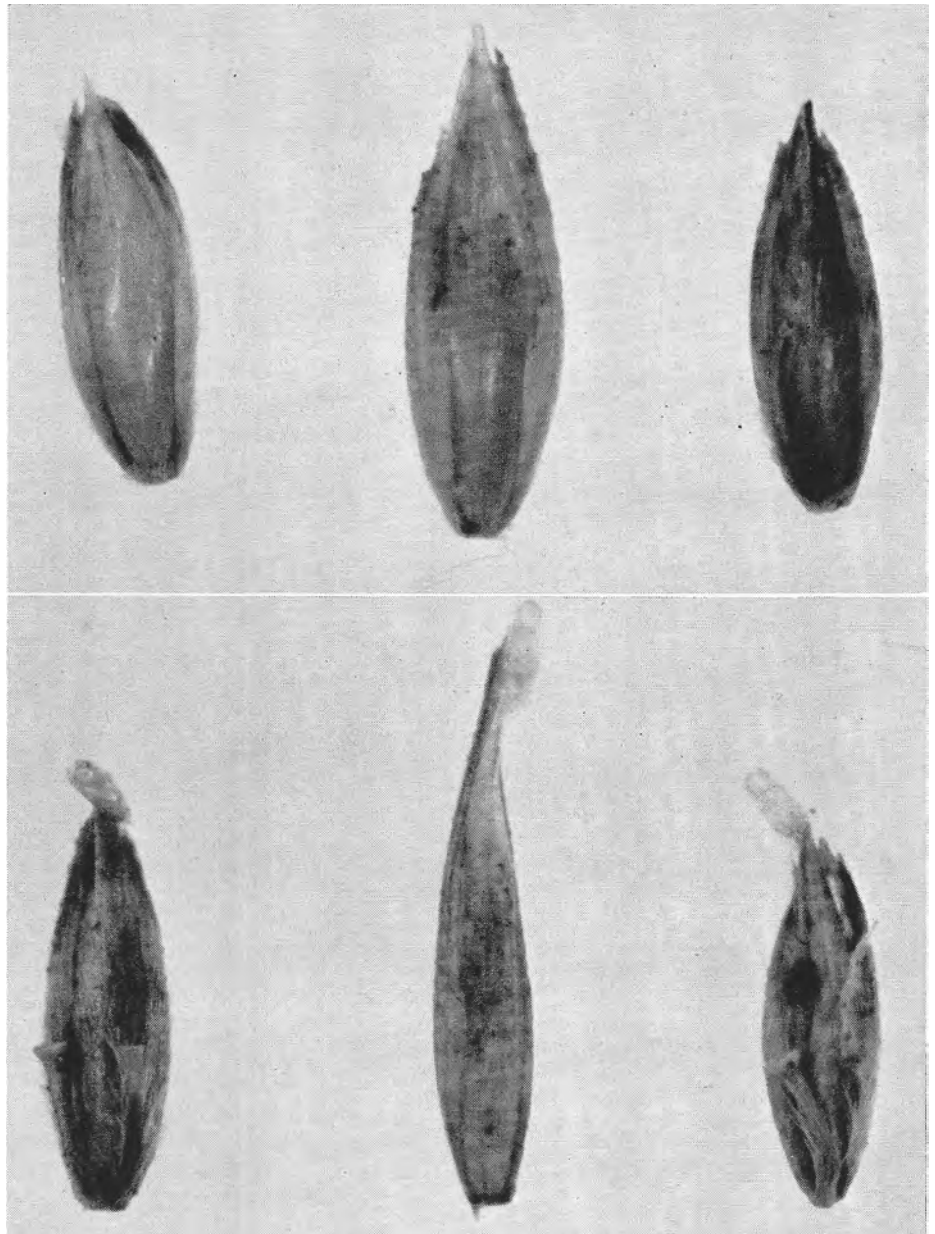
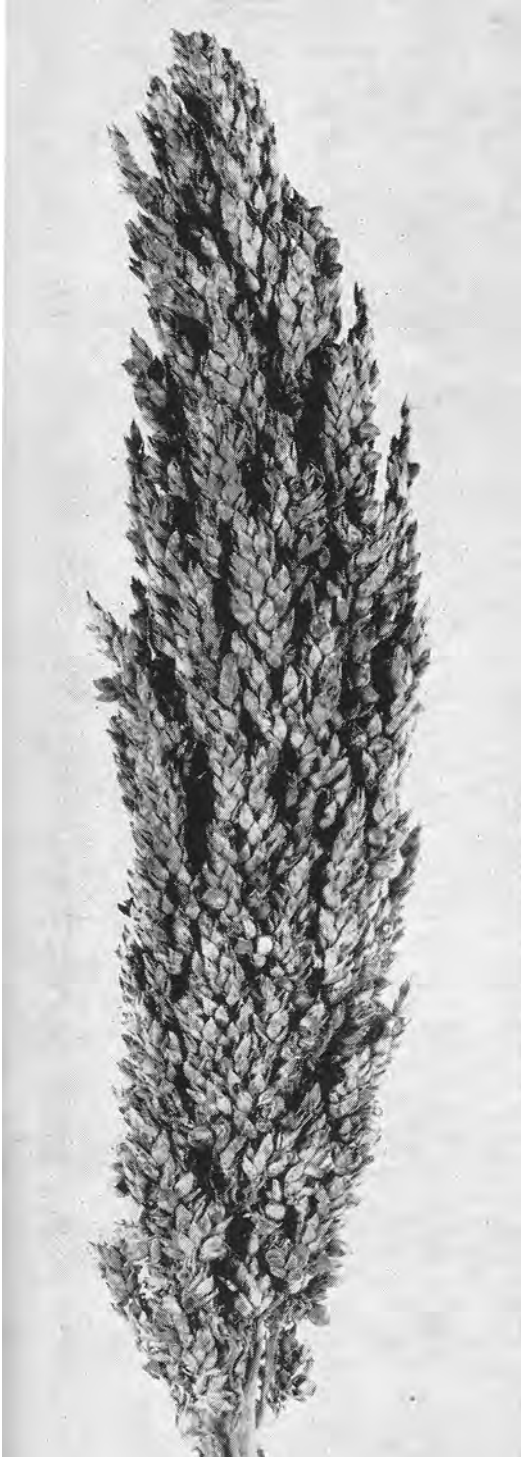
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*Earl Pritchard, Associate Professor of Entomology, University of California, Berkeley confirmed the determination of the midge.*

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*California State Department of Agriculture, Sacramento, supplied distributional records.*



*left, slight damage; right, severe damage.*

**Johnsongrass seeds: above, normal; below, infested with midge showing projecting pupal cases.**