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FACT SHEET

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THE SORGHUM MIDGE AND ITS CONTROL

John G. Thomas • Extension Entomologist • Texas Agricultural Extension Service

One of the most damaging insect pests of grain sorghum in Texas is the sorghum midge *(Contarina sorghicola)*. Loss estimates have exceeded $10 million annually in Texas several years since 1950. Midge damage has caused economic losses in all sorghum-producing Texas counties except in the northern Panhandle. Surveys in the counties north of Swisher indicate midge populations of little economic importance.

Midge control is generally a preventive program. Early, uniform planting of sorghums within a community or area is recommended to avoid losses. Delayed planting, due to adverse weather and other factors, often results in the need for insecticide applications to prevent or reduce losses. Extending the planting period in any community creates an ideal situation for sorghum midge population development.

Keys for Control

To effectively and economically prevent sorghum midge losses in grain sorghum, a producer must understand the habits of the midge and realize how and when sorghum is damaged. For a producer to avoid economic losses there are two important factors to consider:

1) Midge damage occurs at the time of floret pollination, and

2) The midge population level which constitutes an economic infestation.

To better explain why these two points are important, it is necessary to consider the midge itself—description, biology and habits—as well as characteristics of the grain sorghum plant which influence midge damage.

Description, Life History and Habits

The sorghum midge, a tropical pest, is now distributed over most of Texas. Midge attack grain sorghum, sweet sorghum (sorgo), johnsongrass, sudangrass, broomcorn, *Sorghum almum* and certain wild or uncultivated grasses.

The florets or "seed husks" of host plants serve as hibernating quarters for overwintering larvae or maggots. Pupation and adult emergence occurs in the spring about the time johnsongrass begins to bloom. The adult midge, an orange-colored, fralgie-looking gnat or fly is about 1/12 inch long. The adults mate and females begin laying eggs soon after emergence. Each female may deposit from 50 to 250 tiny white eggs during her 24 to 48 hour life. Eight to 10 eggs may be placed in each floret or grain. However, a single larva is capable of destroying that developing seed.

The male lives only a few hours to 1 day. Eleven to 21 days (with an average of 16) are required for the midge to develop from egg to adult. Eggs are deposited by the female in the sorghum florets and the pink to orange maggot feeds on and consumes the internal content of the developing seed.

Adults usually are most active during the morning and evening hours when they crawl over or fly about the blooming grain heads. Eggs are deposited in the individual florets as pollination occurs. Pollination begins at the tip and progresses downward to the base of each head. Egg laying occurs most frequently, if not entirely, in the pollinating portion of the head. This may vary slightly with variety.

Spring and early-summer populations are maintained on johnsongrass and other wild hosts, where one to three generations may occur. This is significant, since it is recognized that early sorghum is apparently required for midge to develop large, damaging populations. Volunteer and early-planted sorghum serve this purpose. As early sorghum begins heading, midge migrate from wild hosts to nearby grain sorghum, the preferred host. Early grain sorghum infestations are not sufficiently damaging to warrant control. These early populations contribute directly to later heavy populations, which cause economic damage. Thus, *early, uniform* planting is the best means of avoiding midge damage. The most damaging popula-

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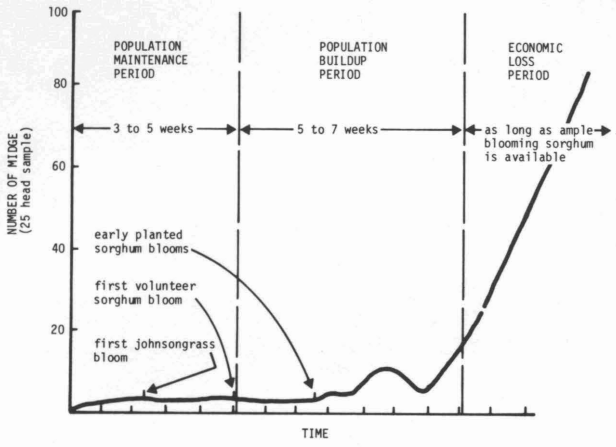

Figure 1. An example of seasonal sorghum midge buildup based on laboratory and field investigations.

tions commonly occur with the emergence of the third generation in grain sorghum, figure 1.

Figure 1 presents the normal pattern of sorghum midge population development. Midge emergence from a 25-head sample is indicated on the vertical axis. Increasing field populations correlate closely with increasing emergence from head samples. Time is represented on the horizontal axis.

The significant points illustrated in figure 1 are:

1) Midge populations do not increase significantly until volunteer or early planted sorghum is available for egg laying.

2) When sorghum (the preferred host) begins blooming, midge populations start to increase.

3) Approximately 2 weeks (about 16 days) are required for each generation. Though generations overlap as the season progresses, population peaks can be detected early in the season.

4) The "population buildup" period may require 6 to 7 weeks or may be shortened where weather, ample early blooming sorghum and other factors favor midge development.

5) Shortly (about 2 weeks) after a considerable acreage of sorghum in a given area has begun to bloom, midge populations increase rapidly and noticeably. Sorghum blooming after the heavy emergence has begun is generally damaged extensively without adequate insecticide control.

Once a producer recognizes that his sorghum is "susceptible" to damage only when it is in bloom (yellow anthers exposed on individual florets), then he should determine if midge populations are at a damaging level. This is easily determined by close field inspection. Referring to Figure 1, it is difficult to find more than one or two midge per 100 heads checked when inspecting blooming sorghum heads during the "population buildup" period. Almost overnight the situation changes drastically. Once the midge population has reached the "economic loss" stage, head inspections suddenly reveal numerous (5 to 100+) midge per head.

Midge activity may vary during the daylight hours. More than one check per day is suggested. If only one check is possible, it should be made in the morning before 10 a.m. Once economic populations have developed in an area, sorghum blooming after that date has little chance of escaping extensive damage unless insecticides are used.

When Is Sorghum Damaged?

Since damage (or egg laying) occurs at the time of pollination, it is of interest to look briefly at the blooming characteristics of sorghum. Many producers apply insecticides too late—after pollination is completed and the damage is done. This commonly occurs when a producer notices adult midge emerging (about 16 days after egg laying or pollination) from the heads which already have grain exposed and entering the hard dough stage. Mating frequently occurs on the old head before the female leaves in search of sorghum in bloom.

Table 1 presents the average daily percent of floret bloom on a grain sorghum head. Most heads require about 9 days for all florets to pollinate. However, the second through the sixth day of blooming is the most important period for any given head.

Single head pollination (period of susceptibility) is not in itself of utmost importance. The "susceptible period" of the *entire* field must be considered. Figure 2 reflects the percent of the field susceptible to damage on a daily basis. Bloom periods vary somewhat from field to field. Many factors influence plant growth and heading uniformity. Some fields may complete blooming in

TABLE 1. AVERAGE DAILY RATE OF GRAIN SORGHUM POLLINATION ON SINGLE HEAD

Day	Percent of florets pollinating
1	3.7
2	18.0
3	28.0
4	29.0
5	15.0
6	5.0
7	1.3
8	0.2
9	0.2

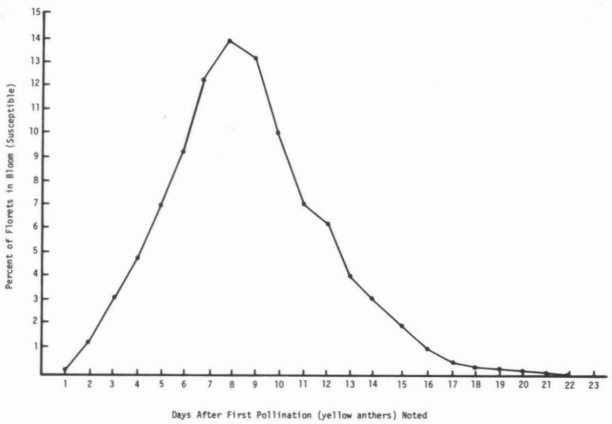

Figure 2. Percent of grain sorghum florets pollinating (susceptible to midge damage) by days.

16 to 18 days; others may require as long as 8 weeks in unusual situations.

Figure 2 is field data averaging blooming rates for a number of varieties, at different locations. The significance of the table is in the pattern of blooming. By using this information, fairly accurate loss estimates can be developed.

Damage

Midge damage resembles "blasted or blighted" sorghum heads resulting from high temperatures at or before booting, disease, infertility, drouth, etc. The major difference is the presence of midge pupal skins on midge-damaged heads. Current information does not indicate any real difference in the resistance or tolerance of commercial grain sorghum varieties to sorghum midge attack. After damaging midge populations are observed in an area, most later-blooming sorghum will be heavily damaged.

Table 2 represents the percent floret bloom by days, column 2. Most of the sorghum in the field is susceptible to midge damage (blooming) from the 3rd through the 14th day after the first anthers are observed.

The *potential* daily loss is presented for a 5,000 pound per acre field (3rd column) and an 8,000 pound per acre field (4th column). This can be misleading, because the dollar values (shown in parentheses) represent the daily loss *only* if 100 percent of the florets were infested each day. This level of damage may be closely approached, but doesn't occur often.

The value of grain from daily blooming was based on $1.62 per hundred pounds. This was derived from a $1.82 market value, less 20 cents a hundred for harvesting and hauling. The significance of the information in figure 2 and table 2 is that heavy losses can occur daily, when damaging midge populations are present, if chemicals are not promptly and properly applied.

Control

Early planting, although not always possible, is the most practical means of avoiding midge damage. Sorghum blooming prior to the following general dates is seldom damaged by midge. The critical period of potential midge damage begins around June 5 in the counties south of Travis (Austin), June 10 to 20 in the counties south of and surrounding Brazos, June 25 in the counties south of Hill and August 1 on the High Plains. Reduction in grain sorghum yields in late-blooming fields has ranged from 20 to 100 percent. Following the research findings in the late 1950's overall losses have been reduced by planting early and properly applying insecticides, where needed, to control the midge on fields of grain sorghum blooming after the above dates. Thus, satisfactory and economical control is directly related to the biology and habits of the midge.

Thorough observation in fields is necessary to determine the adult midge population in any given area. Once damaging populations are observed in an area, it is almost certain that grain sorghum

TABLE 2. GRAIN SORGHUM POLLINATION—FLORET "BLOOM" IN FIELD ON DAILY BASIS

Day	Percent of Florets Blooming	Amount of Grain (Value[1]) 5,000 lb./A.	8,000 lb./A.
1	0.1	5 ($0.08)	8 ($0.13)
2	1.1	55 (0.89)	88 (1.43)
3	3.2	160 (2.59)	256 (4.15)
4	5.0	275 (4.46)	400 (8.48)
5	7.2	360 (5.83)	576 (9.33)
6	9.2	460 (7.45)	736 (11.92)
7	12.2	610 (9.88)	976 (15.81)
8	14.0	700 (11.34)	1,120 (18.14)
9	13.3	665 (10.77)	1,064 (17.44)
10	10.1	505 (8.18)	808 (13.09)
11	7.2	360 (5.83)	576 (9.33)
12	6.3	315 (5.10)	504 (8.16)
13	4.0	200 (3.24)	320 (5.18)
14	3.0	150 (2.43)	240 (3.89)
15	1.8	90 (1.46)	144 (2.33)
16	1.0	50 (0.81)	80 (1.30)
17	0.5	25 (0.41)	40 (0.65)
18	0.3	15 (0.24)	24 (0.39)
19	0.5	25 (0.41)	40 (0.65)
20	0.1	5 (0.08)	8 (0.13)
21	0.02	1 (0.02)	1.6 (0.03)
22	0.01	.5 (0.01)	.8 (0.01)
23	0.002	.1 (0.01)	.16 (0.01)
24	0.002	.1 (0.01)	.16 (0.01)

[1]Based on $1.62/cwt.

which has not completed pollination will be damaged. It is possible for some areas of a county to completely escape midge damage, even though heavy losses occur in other areas of the county.

Insecticides recommended for control of the sorghum midge and additional comments are given in MP-339, *Texas Guide for Controlling Insects and Mites on Corn, Sorghums, Small Grains and Grasses.* PROPER TIMING OF APPLICATIONS TO CONTROL THE SORGHUM MIDGE IS MOST IMPORTANT. As a general guide, the first application should be applied when 50 percent of the heads are out of the boot, when damaging midge populations are present. This will correspond to the second or third day of blooming in figure 2 and table 2. A second application should be made in 3 to 5 days. The interval between the first and second applications should not exceed 5 days. Where adverse weather follows an application or short residual materials are used, reduce application intervals to 3 days. In fields where the yields are high, a third application may be justified.

Summary

One of the most frequent comments made about midge control is "I sprayed yesterday (or 2 days ago) and I have more midge in my field today than before I sprayed. That insecticide is not killing them!" This is a normal reaction; and there is a great deal of truth in the observation. The female midge lives about 1 day and there is constant movement of midge into the field. The only difference in a treated and untreated field is that the females in the treated field may deposit only a few eggs before being killed instead of 50 to 250. It is very difficult to visually determine how effective an application is. Use a recommended insecticide, apply at the right time and at the rate suggested. Effectiveness of the application will be apparent in 10 to 14 days.

Refer to B-975, *Insects Attacking Forage Crops,* for additional information on the sorghum midge and other pests of forage and grain crops.

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