

Research Note

THE SORGHUM MIDGE, *CONTARINIA SORGHICOLA*, A SORGHUM PEST NEWLY INTRODUCED TO PUERTO RICO^{1,2}

Contarinia sorghicola (Coq.) is probably the most widely distributed and damaging of all sorghum pests.³ Losses usually amount to millions of dollars in countries where it has become established. This midge is probably native to Africa and at present is distributed throughout all continents. It is only known to attack members of the genus *Sorghum*, both wild and cultured, whose contaminated seed is responsible for this pest's introduction to other parts of the world.⁴

Sorghum [*Sorghum bicolor* (L.) Moench] has been an experimental grain and forage crop in Puerto Rico for most of this century. Only recently has grain sorghum been commercially grown on the island and its future as a high protein, drought resistant crop looks quite promising. Although reports of insect pests of this crop appear in past literature in Puerto Rico, no new insect reports have been published since 1976.⁵ As a result, we intend to report our finding of the sorghum midge, *Contarinia sorghicola* (Coq.), as a new insect pest for Puerto Rico, partially assess its abundance in several localities on the island, present new records on natural enemies of this pest, and a brief

life history, with control measures recommended in recent literature.

Adult midge specimens were collected by aspiration from each of ten flowering panicles of sorghum or Johnson grass (*Sorghum halepense* (L.)). Samples were from a commercial farm in Dorado (cv. 'R1090'), USDA-TARS Isabela station (cv. 'PR5BR') and an experimental planting at Sabana Grande (mixture of cv. 'R1090', 'AT378/R x T430', 'T-EY60', 'X447' and 'DeKab 64') during June-July 1984. Parasitoids were collected by aspiration or by rearing under laboratory conditions with whole grain spikes inside petri dishes. Adult parasitoids were counted and identified upon emergence. Insects were identified by R. J. Gagne and M. E. Schauff of the Systematic Insect Laboratory, USDA, Beltsville, Maryland.

Adult midges are small (<2 mm), orange, and short lived, usually dying within 24 hours after emergence. Females oviposit between the outer and inner glumes of the sorghum floret, midway between the glume's apex and base, ovipositing only during anthesis.⁶ Larval and pupal stages are completed within the glume. Development time from egg to adult ranges

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²Research supported in part National Research Council Fellowship in cooperation with USDA-ARS, Tropical Agriculture Research Station, Mayagüez, Puerto Rico.

³Young, W. R. and G. L. Teetes, 1977. Sorghum entomology. *Annu. Rev. Entomol.* 22: 193-218.

⁴Harris, K. M., 1979. Descriptions and host ranges of the sorghum midge, *Contarinia sorghicola* (Coq.) (Diptera: Cecidomyiidae), and eleven new species of *Contarinia* reared from Gramineae and Cyperaceae in Australia. *Bull. Entomol. Res.* 69: 161-82.

⁵Martorell, L. F., 1976. Annotated food plant catalog of the insects of Puerto Rico. *Agric. Exp. Stn. Univ. P. R.* pp. 1-303.

⁶Wiseman, B. R., W. W. McMillian, 1973. Diapause of the sorghum midge and location within the sorghum spikelet. *J. Econ. Entomol.* 66: 647-49.

between 14-21 days.^{7,8,9} Evidence suggests that larvae of *C. sorghicola* feed on plant juices produced by enzymatic predigestion of the sorghum ovary.¹⁰ Females have been reported to produce unisexual progeny by sexual means (rather than by parthenogenesis) with a 1:1 ratio of male-producing to female-producing females in each generation.⁷ Diapause is known in this species, with varying proportions of individual larvae entering this stage each generation. Larvae can remain 3 to 4 years in this physiological state.¹¹ This condition appears to be broken by synergistic interactions between increasing temperatures and precipitation.^{12,13} Diapausing larvae require exposure to 12 to 13 days of continuous moisture at 30° C to induce diapause termination. Diapausing larvae have been reported to occur in larger numbers in the lower portions of the sorghum florets.⁶

The following tabulation shows mean values of observed adult midges per panicle during our survey. Although the average number of adults per panicle was as low as 2.3 per panicle, higher densities (53.4 and 63.7 adults per panicle) were observed at Sabana Grande and Dorado, respectively. Although the average number of adults appears low at Isabela, it surpasses the economic injury level established in Texas⁹ (i.e., 2 adults/panicle) thus underscoring the damage potential of this pest in Puerto Rico. Johnson grass was a reservoir host for the midge in all areas surveyed.

Location	Sorghum	Johnson Grass
Dorado	63.7 ± 9.5 ¹³	25.3 ± 10.1
Sabana Grande	53.4 ± 7.7	4.6 ± 2.1
Isabela	2.3 ± 0.7	0.6 ± 0.2

Two hymenopterous parasitoids were found attacking the sorghum midge in Puerto Rico in separate surveys conducted in 1985. The more common of the two, *Aproctocetus diplosidis* Crawford (Hymenoptera: Eulophidae) was found parasitizing 43% of the midge larvae at Dorado. *A. diplosidis* was found abundantly in all sorghum growing areas of Puerto Rico. The less common *Tetrastichus* sp. (Hym.:Eulophidae) parasitized less than 2% of the midge larvae. Very little work has been conducted on the biological control of the sorghum midge. In other sorghum growing areas parasitism has been noted to fluctuate between 11-26% and up to 20% in Johnson grass.¹² The higher parasitism rates observed in Puerto Rico underscore their importance in regulating sorghum midge populations.

In most sorghum growing areas, cultural control has proved the most effective in regulating sorghum midge populations. Simple guidelines have been used successfully in many parts of the world. Some of these are a) reduction of diapausing populations with good hygiene (discarding refuse) and thorough cultivation, b) reduction of flowering period variability by sowing to bring the bulk of the crop to flower roughly at the same time, c) avoidance of the segregating

⁷Baxendale, F. P. and G. L. Teetes, 1981. Production of unisexual progenies by the sorghum midge, *Contarinia sorghicola*. *Ann. Entomol. Soc. Am.* 74: 412-13.

⁸Bowden, J., 1965. Sorghum midge, *Contarinia sorghicola* (Coq.) and other causes of grain sorghum loss in Ghana. *Bull. Entomol. Res.* 56: 169-89.

⁹Viana, P. A., J. M. Waquil and A. I. T. de Lucena, 1979. Principal aspects of the biology of the sorghum midge, *Contarinia sorghicola* (Diptera: Cecidomyiidae). *Ann. Soc. Entomol. Brasil.* 8: 19-28.

¹⁰Petralia, R. S., A. L. Wuensche, G. L. Teetes and A. A. Sorensen, 1979. External morphology of the mouthparts of the larvae of the sorghum midge, *Contarinia sorghicola*. *Ann. Entomol. Soc. Am.* 72: 850-55.

¹¹Baxendale, F. P. and G. L. Teetes, 1983. Thermal requirements for emergence of overwintered sorghum midge (Diptera:Cecidomyiidae). *Environ. Entomol.* 12: 1078-082.

¹²Wiseman, B. R., H. R. Gross and W. W. McMillian, 1978. Seasonal distribution of the sorghum midge and its hymenopterous parasites, 1975-77. *Environ. Entomol.* 7: 820-822.

¹³Mean ± S.E.

TABLE I.—*Mean number of adult sorghum midges sampled in ten flowering panicles of sorghum and Johnson grass from three plantations in Puerto Rico.*

Location	Sorghum	Johnson grass
Dorado	63.7 ± 9.5	25.3 ± 10.1
Sabana Grande	53.4 ± 7.7	4.6 ± 2.1
Isabela	2.3 ± 0.7	0.6 ± 0.2

cultivars and ratoon cropping, and d) elimination of alternate hosts such as Johnson grass (*Sorghum halepense* L.) and Sudan grass (*S. sudanense* (Piper) from the vicinity of sorghum fields.

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