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The Sorghum midge, (Stenodiplosis sorghicola Coq), (Diptera: Cecidomyiidae), Parasitoids and Predators and Their Abundance in Rain Fed Areas, Sudan

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ABSTRACT

Sorghum midge, (Stenodiplosis sorghicola Coq.), parasitoids and predators and their abundance were studied during October – December 2010 and 2011 at Damazine Research Station Farm (Longitude N 11 46^{o} and Latitude E 034 21^{o}). Parasitoids showed low population level during October and December and peaked in mid November (33-38 and 27-30 parasitoid adults/panicle/bottle in the years 2010 and 2011 respectively). On the other hand, the midge incidence was remained high during the period from October, 30 to November, 20 (198 – 217 and 126-189 midge adults/ panicle/ bottle in 2010 and 2011 respectively) then starts to decrease during December and onwards. The results of identification revealed that, eulophids Aprostocetus sp, Tetrastichus sp and unidentified hymenopterous sp were recorded as parasitoids of sorghum midge and Aprostocetus sp was found in large numbers followed by Tetrastichus sp and the unidentified hymenopterous sp. The Orius (Minute pirate bug**)** and spiders are the most abundant predators and their incidence was peaked during the 4th week of October to the 2nd week of November.

Keywords: *Sorghum midge, abundance, parasitoids, predators.*

1. INTRODUCTION

Sorghum midge (Stenodiplosis sorghicola Coq.) is one of the most destructive insect pests of sorghum grain worldwide. It occurs globally and has a wide distribution in Asia, Africa, Australia, Europe, Latin America and United States ([3]; [10]; [13]). In the Sudan, it was reported since 1932 and then in Southern Kassala, Blue and White Nile States, Gezira research station, Western regions mainly Kordofan and in eastern region mainly Red Sea, Kassala, Gedarif and in River Nile and in Rahad areas ([3]; [5]; [2]; [9]; [7]). Natural enemies of sorghum midge include most general predators found in a sorghum field. In addition, several parasitoids of sorghum midge have been recorded. These include the eupelmids Eupelmus popa Girault, E. australiensis Girault, E. varieolor Girault, and E. urozonus Dalman, and the eulophids Aprostocetus diplosidis Crawford, Ceratoneura petiolata Ashmead, Pediobius pyrogo Walker, Tetrastichus venstus Gahan, ([12]; [1]; [11]; [14]). The objectives of this work were to study the abundance of the sorghum midge and its parasitoids and predators under rain fed conditions at Damazine areas, Sudan.

2. MATERIALS AND METHODS

2.1 Abundance of the Sorghum Midge and Its Parasitoids and Predators

Abundance of sorghum midge and its parasitoids and predators was studied during the period from October to December of the seasons 2010 and 2011 at Damazine Research Station Farm (Longitude N 11 46^{o} and Latitude E 034 21^{o}). The abundance of the parasitoids was monitored in field samples of naturally infested sorghum panicles. Samples of 15 infested panicles at late soft dough stage were collected randomly every 10 days from the field and put into bottles (15cm height and 20cm diameter), one panicle per bottle and then placed in the laboratory for the parasitoids and midge adults to emerge. Midge adults and parasitoids were counted daily, and then removed from the bottle. Average number of the emerged parasitoids and midge adults were calculated per bottle for each collecting date. Emerged parasitoids were kept in small vials filled with 75% ethanol and was sent to the insects taxonomy unit at Agricultural Research Corporation(ARC), Wad Medani, Sudan for identification, and the same specimens was sent to International Center for Insects Physiology and Ecology (ICIPE). As for the predators, a sample of 50 sorghum panicles was randomly collected per week. The polythene bags were used to collect the predators (adults and or larvae) in the sorghum panicles.

3. RESULTS AND DISCUSSION

Figures (1 and 2) showed the parasitoids and midge incidence during the period from October to December 2010 and 2011. The parasitoids were not observed during the period from early to mid October. The incidence was remained very low during October (0 - 7 parasitoid adults/ panicle/ bottle) after which the density starts to increase. The peak of the parasitoids incidence was observed during mid November (33-38 and 27-30 parasitoid adults/panicle/bottle in the years 2010 and 2011 respectively), then starts to decrease very sharp during December and onwards (Figures 1 and 2). On the other hand, the midge incidence was remained high during the period from October, 30 to November, 20 (198 – 217 and 126-189 midge adults/ panicle/ bottle in 2010 and 2011 respectively) then starts to decrease during December and onwards (Figure 1 and 2), which agreed with the findings reported by [9]. The results of identification revealed that, eulophids Aprostocetus sp, Tetrastichus sp and unidentified hymenopterous sp were recorded as parasitoids of sorghum midge. According to parasitoids

incidence, Aprostocetus sp was found in large numbers followed by Tetrastichus sp and the unidentified hymenopterous sp (Fig. 3). Despite presence of a large number of the parasitoids during the peaks of midge, they did not seem to provide significant suppression of sorghum midge and this may be attributed to midge biology or to parasitoids inability to attain sufficient population densities or to the cropping period which is short and there is no crop continuity to sustain the natural enemies and their hosts. ([12]; [1]). Further research studies on biology and ecology of the parasitoids are needed.

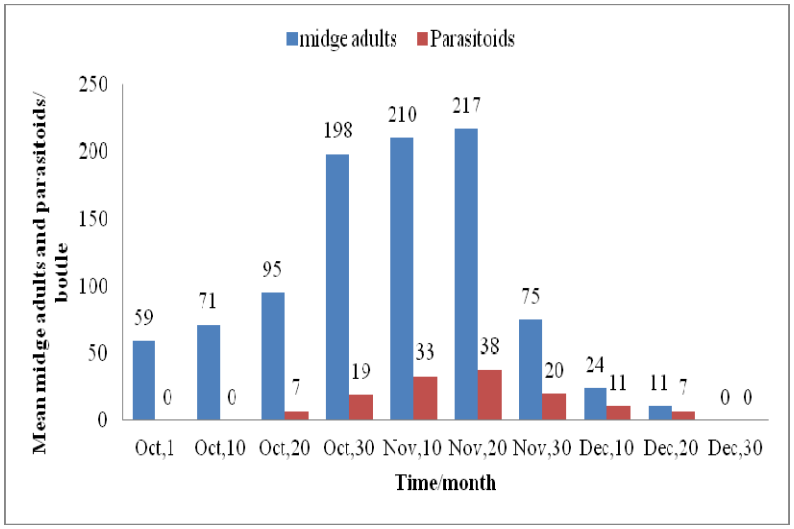

Fig 1: Mean numbers of midge adults and the parasitoids during the period from October – December 2010. Damazine Research Farm

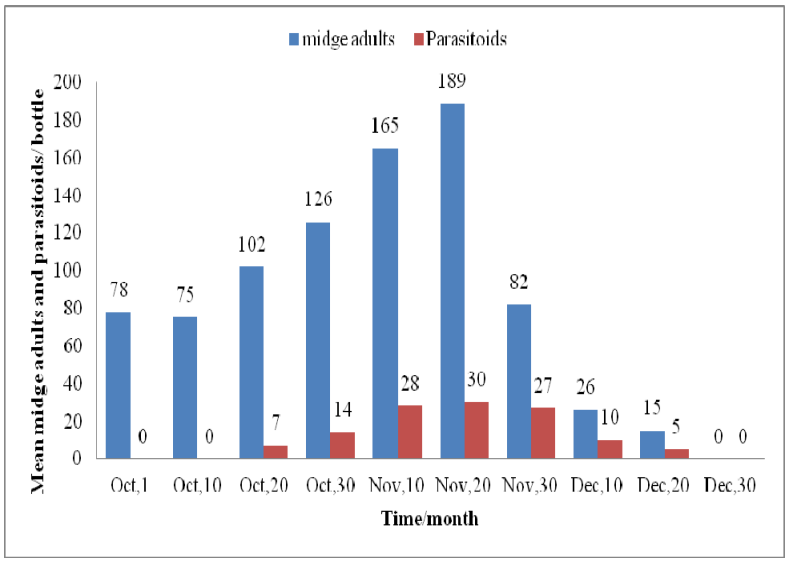

Fig 2: Mean numbers of midge adults and the parasitoids during the period from October – December 2011. Damazine Research Farm

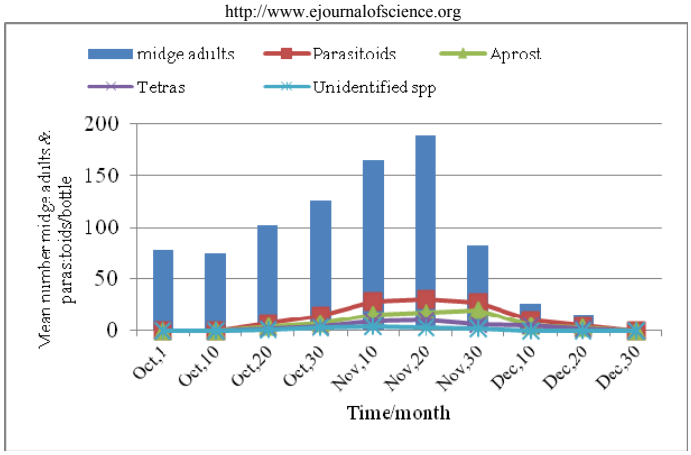

Fig 3: Mean numbers of midge adults and the parasitoids (Aprostocetus sp, Tetrastichus sp and unidentified hymenopterous sp during October – December 2011. Damazine Research Farm

The incidence of the predators; Orius, Spiders, Coccinellids, Syrphids, Malakids and Chrysoperla during the period from October to December of the seasons 2010 and 2011 was presented in Tables (1) and (2). In season 2010/11, the incidence of the predator species, Orius, Spiders, Coccinellids and Malakids were ranged between 2.7 - 147.5, 1.5 – 23.7, 0.6 – 6.7 and 2.4 – 18.6 individuals/50 panicles respectively. In the season 2011/12, the mean numbers of the Orius, Spiders, Coccinellids, Syrphids, Malakids and Chrysoperla were 38, 5.8, 0.2, 0.02, 4.6 and 0.15 individuals. Orius and spiders are the most abundant predators; their incidence was peaked during the period from the 4th week of October to the 2nd week of November (Tables 1 2 and 2). The Orius was observed preying on the sorghum midge adults when they are emerging from spikelet or laying eggs and the spiders was observed preying and trapping many adults of midge ([4]).

Table 1: Mean number of midge predators; Orius, Spiders, Coccinellids (Adults and Larvae) and Malakids per 50 panicles, during October – December 2010 (Damazine Research Farm).

Date	Orius	Spiders	Coccinellids	Malakids`
Oct.07.2010	34.7	14.2	0.0	0.0
Oct.14.2010	63.4	9.8	0.0	3.6
Oct.21.2010	60.3	19.6	0.0	4.7
Oct.28.2010	68.7	22.5	1.4	3.9
Nov.07.2010	132.6	18.6	0.9	2.4
Nov.14.2010	147.5	23.7	1.2	2.8
Nov.21.2010	77.1	17.2	0.7	6.6
Nov.28.2010	27.3	9.4	1.9	7.4
Dec.07.2010	13.2	7.9	0.0	11.2
Dec.14.2010	8.9	5.2	0.6	18.6
Dec.21.2010	4.7	2.8	0.0	15.7
Dec.28.2010	2.7	1.5	0.0	4.1
Total	641.1	152.4	6.7	81.0
Mean	53.4	12.7	0.6	6.8

Table 2: Mean number of midge predators; Orius (adults and nymphs), Spiders, Coccinellids (Adults and Larvae), Syrphids (Larvae), Malakids and Chrysoperla (Larvae) per 50 sorghum panicles, during October – December 2011. (Damazine Research Farm).

Date	Orius	Spiders	Coccinellids	Syrphid	Malakids`	Chrysoperla
Oct.07.11	20.7	2.0	0.0	0.0	0.0	0.0
Oct.14.11	47.1	4.6	0.0	0.1	0.7	0.3
Oct.21.11	43.1	12.4	0.2	0.1	1.0	0.9
Oct.28.11	52.7	6.4	0.3	0.1	1.8	0.6
Nov.07.11	129.0	13.0	0.0	0.0	0.6	0.0
Nov.14.11	123.0	8.3	0.0	0.0	0.3	0.0
Nov.21.11	18.3	6.3	0.0	0.0	5.6	0.0
Nov.28.11	8.3	5.7	0.0	0.0	1.3	0.0
Dec.07.11	2.3	1.6	0.0	0.0	6.1	0.0
Dec.14.11	3.9	4.6	0.9	0.0	23.9	0.0
Dec.21.11	5.7	3.7	1.1	0.0	12.9	0.0
Dec.28.11	1.6	0.6	0.0	0.0	1.4	0.0
Total	455.7	69.2	2.5	0.3	55.6	1.8
Mean	38.0	5.8	0.2	0.02	4.63	0.15

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