APHELINUS PERPALLIDUS PARASITISM OF *MONELLIA CARYELLA* POPULATIONS IN FAR WEST TEXAS[1]

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ABSTRACT

In 1981 and 1982, a survey was conducted to determine the impact of the parasite, *Aphelinus perpallidus* (Gahan), on populations of the blackmargined aphid, *Monellia caryella* (Fitch), in far west Texas. Parasitism did have a moderate impact on aphid populations in most of the orchards sampled in El Paso County. In 1981, peak percentage parasitism ranged from 6% in the Fabens orchard to 17% in the El Paso orchard. In 1982 peak percentage parasitism generally increased and ranged from 25% in the El Paso orchard to 30% in the Ysleta and Tornillo orchards. Further information on the phenology of *A. perpallidus* from each site is presented.

Key Words: Primary parasite, hyperparasite, *Monellia caryella, Aphelinus perpallidus.*

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INTRODUCTION

The blackmargined aphid, *Monellia caryella* (Fitch), which is the most common pest of pecan orchards in far west Texas, can damage pecan trees under some circumstances. Foliar applications of insecticides have been the primary aphid control method used in western orchards. These sprays can be timed to treat peak aphid populations, but are relatively expensive, and can be harmful to beneficial insects. Soil-applied (systemic) materials are an alternative with less direct impact on parasites, but systemics must be applied prior to the opportunity for evaluation of the severity of the infestation. Thus, systemic applications anticipate large aphid numbers which may not materialize, and may result in economic waste. Limitations in both types of chemical control require that information pertaining to a biological control program be assembled. Primarily, information is needed on the species and population levels of beneficials present in the orchards.

Research on the pecan aphid parasite, *Aphelinus perpallidus* Gahan, is limited. Tedders (1978) reported that *A. perpallidus* parasitized the yellow pecan aphids, *M. caryella* and *Monelliopsis (nigropunctata) pecanis* Bissell and the black pecan aphid *Melanocallis (Tinocallis) caryaefoliae* (Davis), in Georgia. He also reported that the greatest numbers of parasites were usually found in October and that parasitism appeared to be directly proportional to host abundance. Edelson and Estes (1981) reported that parasite populations in Alabama pecan orchards in 1979 and 1980 cycled at ca. 2 - 3 week intervals and showed some correlation with peak aphid abundance.

Surveys of parasites of the blackmargined aphid in southwestern irrigated orchards revealed the presence of *A. perpallidus* (Gahan) (Watterson and Stone 1982). *Aphelinus perpallidus* populations peaked in mid-September, possibly in response

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to peak *M. caryella* populations. No other primary parasite was found. Those surveys are continuing. We also have begun trials to examine the aphid/parasite relationship, to determine the impact of the parasite on aphid populations, and the impact of control practices on the parasite population. This paper summarizes the results of our preliminary observation of the relationship between the blackmargined aphid, *M. caryella* and its most commonly-occurring parasite, *A. perpallidus* in 1981 and 1982.

MATERIALS AND METHODS

Three pecan orchards planted to the "Western Schley" variety in the lower El Paso valley were chosen for study. Sample trees were randomly selected in Fabens (8), El Paso (4), and Ysleta (4), TX in 1981, and in El Paso (4), Ysleta (4), and Tornillo (4), TX in 1982. Tree height varied from 7.6 - 9.1 m.

Aphid counts were taken weekly on 10 randomly-selected compound leaves from each sample tree. Aphid samples were collected from 1.5 - 2 m above ground concurrently with counts to identify the species of aphids and parasites and percentage parasitism. In 1981, population counts and aphid collections began on 12 June, and aphid sample sizes ranged from 100 (12 June) to 3500 (11 September). In 1982, population counts and aphid collections began on 28 May, and aphid sample sizes ranged from 60 (28 May) to 1,000 (27 August). Aphids were taken to the laboratory, placed on excised pecan leaflets, stored in petri dishes, and observed daily. Upon appearance, each mummy (black parasitized aphid body) was placed in a gelatin capsule for adult parasite emergence. Mummies from the same location and date were placed in a single petri dish and maintained at laboratory conditions (24°C and 10% RH). Percentage parasitism, (number of mummies/number of aphids collected)100, was calculated for each sample. Parasite emergence was determined by examining mummies daily for several weeks. Emergence dates and number of each parasitic species were recorded.

RESULTS AND DISCUSSION

Aphid numbers never exceeded 8 aphids/leaf in the Ysleta orchard during 1981 and 1982. Percentage parasitism reached 15% during the summer of both years (Fig. 1). The orchard was sprayed with phosalone for a black aphid infestation in 1981. For a few weeks post-treatment no aphids were found, and samples were not taken. The yellow aphid population recovered and peaked at 11 aphids/leaf in the fall. The parasite, *A. perpallidus* recovered from any harmful insecticide effects when aphids were again available. The aphid population peaked at 10/leaf in early September 1982, and the parasitism rate peaked at 30% in late September in response to this increase.

Aphid numbers in the El Paso orchard during the summer of 1981 did not exceed 9/leaf but reached 20/leaf in the fall (Fig. 2). Parasitism peaked at 17% in mid-September. We cannot explain the lack of response by the parasite after the aphid population peaked in early October. Aphid numbers during the summer of 1982 did not exceed 4/leaf. Parasitism gradually increased to 16% during the summer. Aphid numbers peaked at 10 aphid/leaf in mid-September. Parasitism increased gradually into the fall reaching a peak of 25% in mid-October in response to increased aphid numbers.

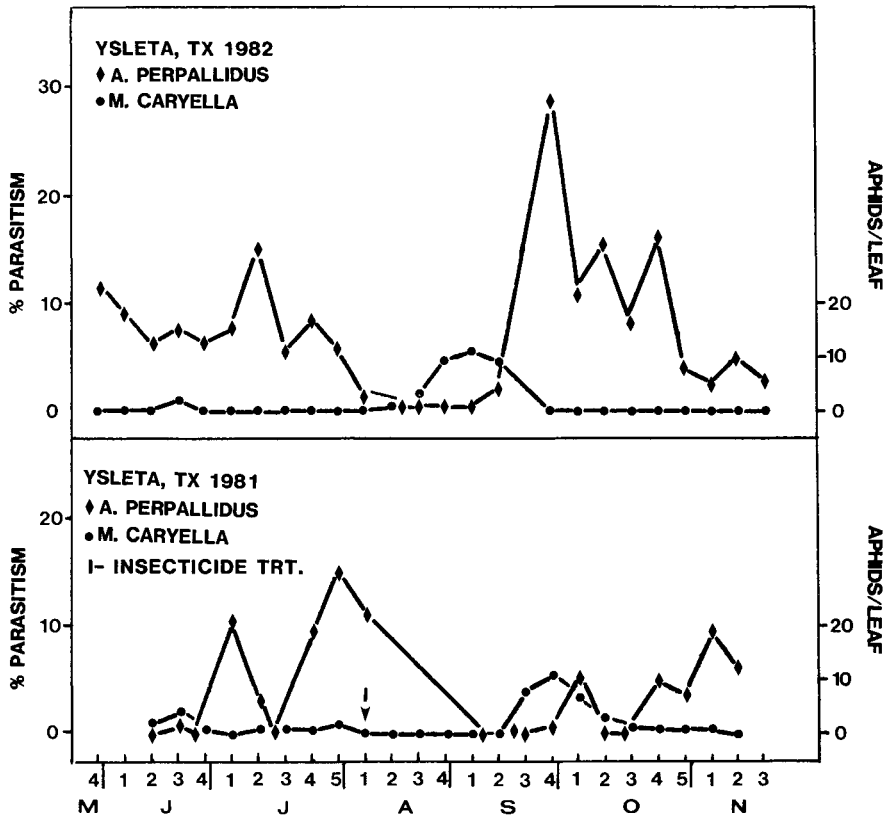

Fig. 1. Population of aphids and % parasitism of *Monellia caryella* by *Aphelinus perpallidus* in the Ysleta orchard in 1981 and 1982.

Aphid numbers peaked at about 90/leaf in the Fabens orchard in the fall of 1981 (Fig. 3). Shortly afterwards, the orchard was sprayed with dimethoate. The insecticide reduced the aphid population significantly, but ample aphids remained for several weeks. The percentage parasitism never exceeded 6% during the summer and decreased to 2% in the fall.

The aphid population in the Tornillo orchard reached 15/leaf in mid-June 1982 after which the orchard was sprayed with dimethoate (Fig. 4). Sampling continued even though the aphid population was low for several weeks. The percentage parasitism reached 20% in mid-July and declined for several weeks therafter. Although the aphid population was reduced significantly after spraying, percentage parasitism actually increased for a few weeks. This was due because there was a favorable level of aphids available. The aphid population peaked at 43/leaf in mid-September and parasitism peaked at 30% in late October. Parasitism declined steadily after October.

The parasitism of blackmargined aphid populations by *A. perpallidus* during 1981 and 1982 is summarized in Table 1. Percentage parasitism was highest in the El Paso orchard in both years and increased 2% in the El Paso and Ysleta

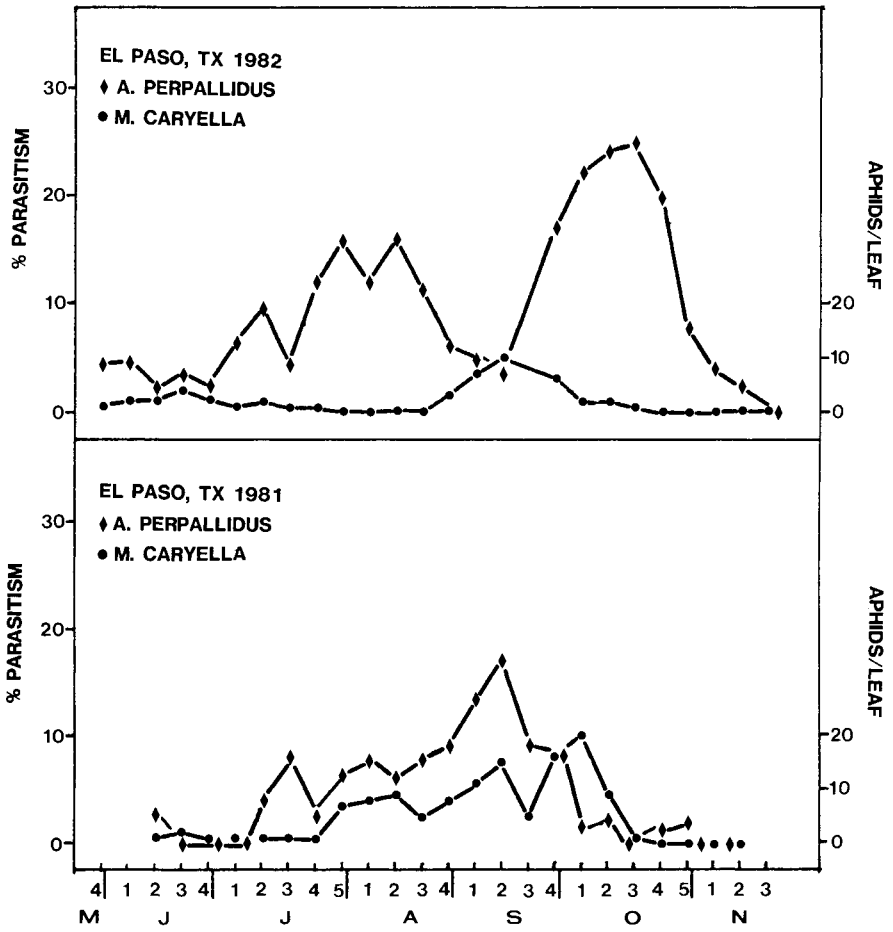

Fig. 2. Population of aphids and % parasitism of *Monellia caryella* by *Aphelinus perpallidus* in the El Paso orchard in 1981 and 1982.

orchards from 1981 to 1982. The Ysleta and Fabens orchards had lower percentage parasitism in 1981. The Tornillo and Ysleta orchards had a lower percentage parasitism than the El Paso orchard in 1982. Parasitism increased slightly in Ysleta in 1982, but was lower than El Paso in both years.

Total adult parasite emergence from mummies is indicated in Table 1. Total adult parasite emergence decreased slightly from 53.5% in 1981 to 41.9% in 1982 (Table 1). There was a substantial decrease in emergence in the Ysleta orchard from 60.3% in 1981 to 42.7% in 1982. We are not aware of any factor operating in the Ysleta orchard that can account for the dramatic drop in emergence from the mummy. Causes of parasite mortality after reaching the pupal (mummy) stage are unknown, but substantial death occurs even in this protected environment.

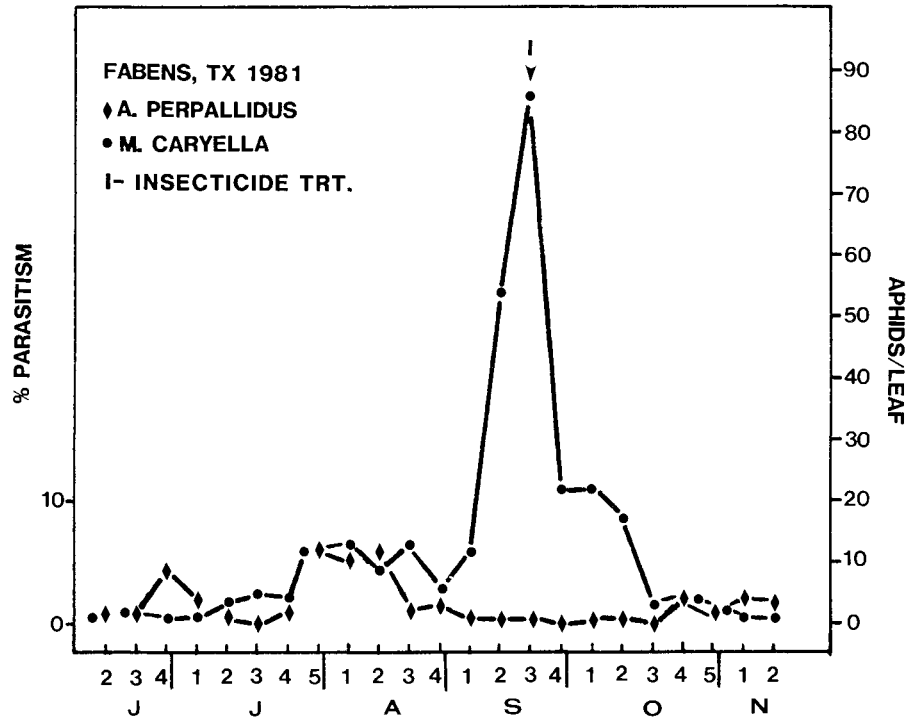

Fig. 3. Population of aphids and % parasitism of *Monellia caryella* by *Aphelinus perpallidus* in the Fabens orchard in 1981.

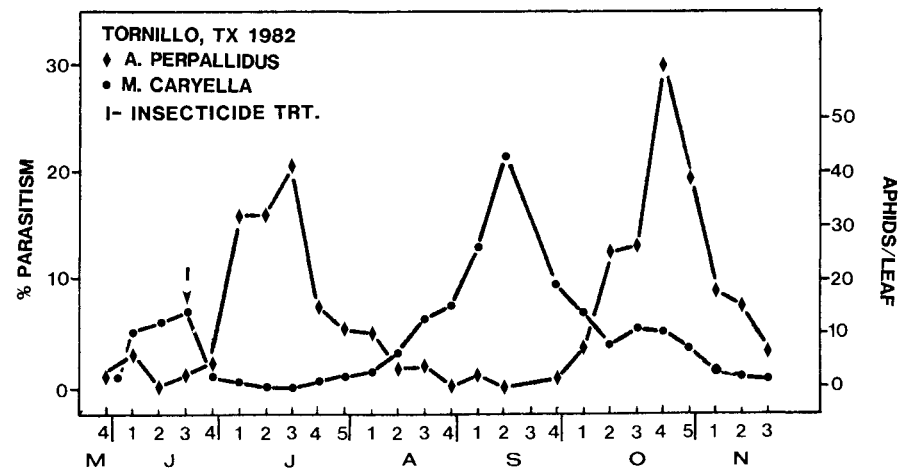

Fig. 4. Population of aphids and % parasitism of *Monellia caryella* by *Aphelinus perpallidus* in the Tornillo orchard in 1982.

Table 1. Parasitism and emergence of *A. perpallidus* from *M. caryella* mummies and hyperparasitism of *A. perpallidus* in far west Texas in 1981 and 1982.

Location	Aphids Collected	Aphids Parasitized	*A. perpallidus* Emerged	Hyperparasites Emerged*
		1981		
Ysleta	6,630	272	164	9
El Paso	10,225	754	364	9
Fabens	18,860	302	182	5
Total	35,715	1,328	710	23
		1982		
Ysleta	8,640	531	227	1
El Paso	11,010	1,038	501	13
Tornillo	10,745	704	225	0
Total	30,395	2,273	953	15

* Hyperparasitic species include *Alloxysta schlingeri* (Andrews), *Signiphora* spp., and *Aphidencyrtus* spp.

The hyperparasites identified were *Alloxysta schlingeri* (Andrews), *Signophora* spp., and *Aphidencyrtus* spp. Hyperparasitism did not appear to have a significant impact on *A. perpallidus* in either year (Table 1). The Ysleta orchard had the highest hyperparasitism rate in 1981, 3.3%, but the El Paso orchard had the highest rate in 1982 at 1.3%. Total percentage hyperparasitism decreased from 1.7% in 1981 to 0.6% in 1982.

The parasite, *A. perpallidus,* had a definite impact on *M. caryella* populations in some orchards. Generally, parasitism increased in 1982 compared to 1981. Hyperparasitism had little impact on *A. perpallidus* and actually decreased in 1982 compared to 1981. It is not known at this time to what extent insecticide applications affected the biology and behavior of the parasite.

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