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PHYTOSYEIID AND OTHER PREDATORS ASSOCIATED WITH BANKS GRASS MITES IN CORN AND SURROUNDING NATIVE VEGETATION

by

Larry Buschman, Matthew Messenger,[1] and James Nechols[2]

SUMMARY

Commercially available predatory mites were released into the border vegetation around corn fields to determine if they could become established and enhance biological control of Banks grass mites in the corn. Sampling was done from May through July at about 2-week intervals. Corn and alternate host material were placed in large Berlese funnels to extract spider mites and predators into alcohol. None of the released phytosyeiid mites were recovered, and no significant differences occurred in the spider mite populations or predator mite populations in release and nonrelease fields. Five species of native predatory mites were identified.

INTRODUCTION

Biological control of spider mites in corn currently occurs through conservation of predators such as the phytosyeiids. This is done by delaying insecticide applications or using insecticides with less impact on the benificial species. Supplemental releases of phyosyeiids could provide a more predictable level of predator activity and allow them to build up and control spider mite populations. The objectives of this study were to release commercially available phytosyeiids early in the season and try to document enhanced numbers of phytosyeiids in the corn of release fields compared to nonrelease fields. We also report the presence of several native phytosyeiids and describe their seasonal occurrence.

PROCEDURES

Winter wheat and native grasses surrounding commercial corn fields in southwestern Kansas were surveyed in the spring and early summer 1996 and 1997. Corn fields with Banks grass mite (BGM) populations present in adjacent hosts then were paired up so that each pair of fields had similar hosts, mite populations, location, and irrigation. One field for each pair was randomly designated the release field. In 1996, eight corn fields (four pairs) were chosen (two sites in Finney Co., two sites in Haskell Co., and four sites in Kearny Co.). In 1997, 12 fields (six pairs) were chosen (six sites in Haskell Co., six sites in Kearny Co.). Winter wheat was the adjacent host surrounding all fields in Finney Co. and Haskell Co. Downy brome, volunteer wheat, and other native grasses were the adjacent hosts for all sites in Kearny Co. The corn hybrid was Pioneer 3162 in all fields. All fields were subject to standard pesticide applications, including miticide and insecticide treatments. Alternate hosts also were sampled during the winter of 1996-97 around selected fields.

In 1996, a mixture of three phytosyeiids, *Neoseiulus fallacis* (Garman), *N. californicus* (McGregor), and *Galandromus occidentalis* Nesbitt, was released around the perimeter of the release fields on the alternate hosts. In 1997, only *N. californicus* was released. Release dates were May 30 and June 12, 1996 and June 18, 1997.

Alternate hosts and corn was sampled every 2 weeks. In winter wheat, three to four samples of 3 row-feet of vegetation were taken. Two to three samples of 1 square foot of native vegetation were taken. In corn, samples consisted of two plants selected at random in each of five sample sites set up along a transect into the field. The samples were placed in 20-gallon Berlese funnels for 3 days with a light bulb for heat. Arthropods were collected in 70% methanol and suctioned onto 9-cm #10 black-ruled filter paper using a Buchner funnel. The filter paper was examined under a binocular microscope to record spider mites, phytosyeiids, thrips, minute pirate bugs, and other

[1]Former Graduate Research Assistant, Department of Entomology, Kansas State University, Manhattan.
[2]Department of Entomology, Kansas State University, Manhattan.

predacious arthropods. These numbers were converted to numbers per square meter for analysis and presentation.

The total numbers of spider mites, phytosyeiids, and other arthropods calculated across fields by sample block were analyzed for differences between release versus nonrelease fields. Simple linear correlation analysis was performed on the number of phytosyeiids, thrips, and *Orius* spp. versus several potential prey species, such as spider mites or thrips, in corn or alternate hosts.

RESULTS AND DISCUSSION

The nonnative phytosyeiids, *G. occidentalis* and *N. californicus*, released in 1996 and 1997 were not recovered, either in corn or in alternate host samples. *N. fallacis* was recovered in both years, but it was not possible to distinguish the released commercial strain from the naturally occurring population. No significant differences ($P > 0.05$) occurred between release and nonrelease fields, either in the number of spider mites or phytosyeiids recovered. Failure to recover any *N. californicus* in these studies was surprising, because previous studies in west Texas corn had been successful.

The BGM was the predominant spider mite recovered in corn in both years. The twospotted spider mite was recovered only once in 1997. In spring 1996, BGM populations exceeded 1000 per sq m around four fields and exceeded 100 per sq m around all eight fields. Large numbers of BGM dispersed into the corn, and populations seemed to peak during mid-July, for example Kearny Co #3 (Fig. 1). BGM populations exceeded 1000 per sq m in four fields and exceeded 100 per sq m in seven fields. A general decline in BGM populations occurred during the first week of August, and only one miticide was applied on the eight fields.

In spring 1997, BGM populations did not exceed 100 per sq m in any of the 12 fields. In corn, BGM populations were very low throughout spring and early summer, for example Kearny Co. #4 (Fig. 3). BGM populations exceeded 100 per sq m in only four of the 12 fields. However, the weather turned hot and dry in late July, and BGM populations were beginning to increase in some fields, so seven of the 12 fields were treated with a miticide. Surprisingly, adverse effects of the miticide applications on BGM populations were not obvious in the biweekly samples (Fig. 3). A natural BGM population decline was associated with a rainy period in early August, but the

Fig. 1. Population trends of BGM and N. fallacis in corn and alternate hosts for Kearny #3 - 1996. This was a phytoseiid release field. Arrows indicate application of encapsulated methyl parathion at 0.28 kg (AI)/ha (19 July) and dimethoate at 0.56 kg (AI)/ha (3 August).

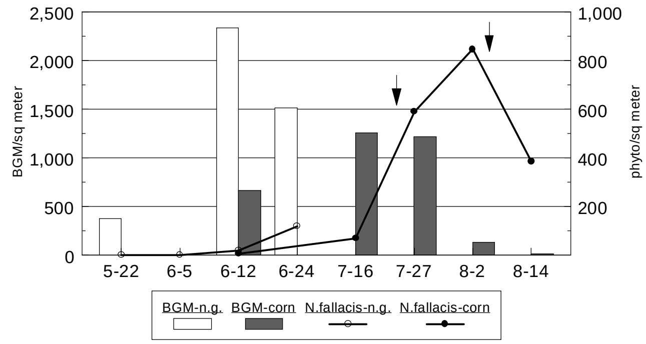
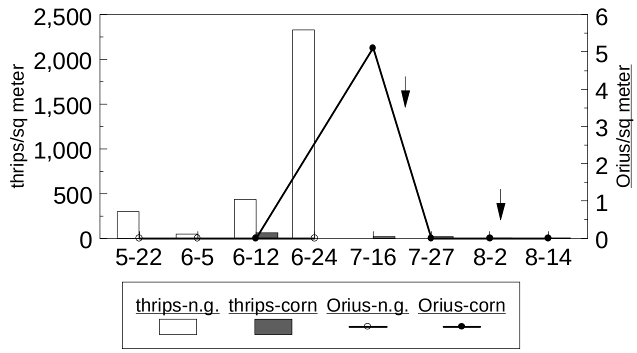


Fig. 2. Population trends of thrips and Orius sp. in corn and alternate hosts for Kearny #3 - 1996.



second half of August was dry, and mite populations began to increase again in some fields (Fig. 3).

The phytosyeiids were the most abundant spider mite predators in both years. Five species were recovered in corn, wheat, and native grasses. In order of abundance they were: *Neoseiulus fallacis*, *N. comitatus* (DeLeon), *N. setulus* (Fox), *Proprioseiopsis ovatus* (Garman), and *Amblyseiella setosa* Muma. Of the recovered phytosyeiids, 66% were *N. fallacis* and 29% were *N. comitatus*. All five phytosyiid species were recovered in alternate host vegetation sampled during the overwintering period.

N. fallacis was the most abundant of all the predators. In corn, it accounted for 90 to 99% of the phytosyeiids recovered (Fig. 5). In the alternate hosts, it was not so predominant, but it still accounted for 7 to 26% of the phytosyeiids recovered (Fig. 6). In addition, *N. fallacis* populations correlated significantly ($P = 0.05$) with spider mite populations (a potential prey) in corn in both years and also in the alternate hosts in 1996. *N. fallacis* populations were much higher in 1996 than in 1997. At most sites, the

Fig. 3. Population trends of BGM and N. fallacis in corn and alternate hosts for Kearny #4 - 1996. This was a control field (no phytosyeiid release). Arrows indicate application of chlorpyrifos at 1.12 kg (AI)/ha (27 June) and bifenthrin at 0.053 kg (AI)/ha (4 August).

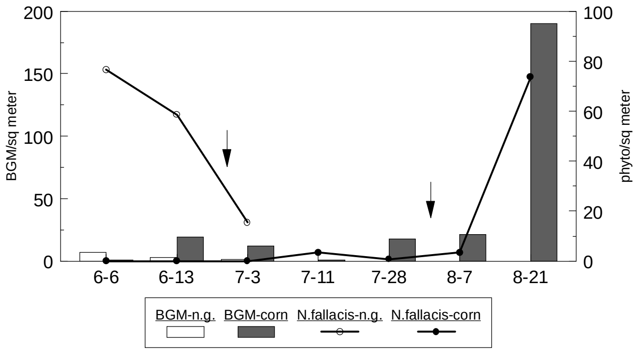


Fig. 4. Population trends of thrips and Orius sp. in corn and alternate hosts for Kearny #4 - 1996.

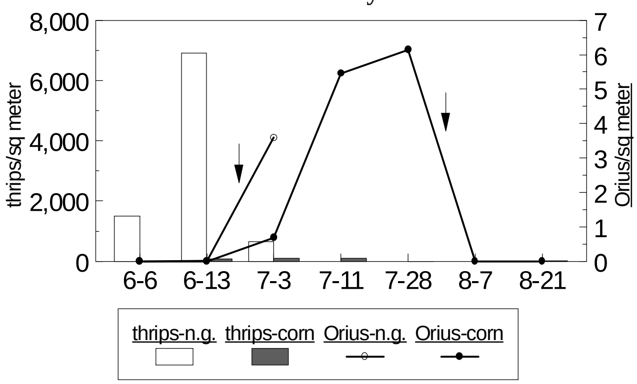
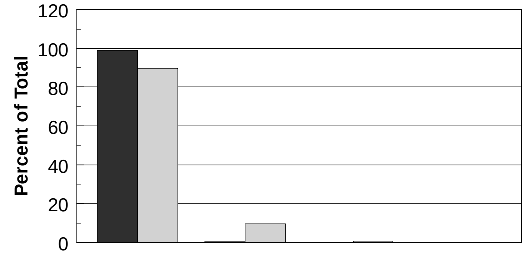
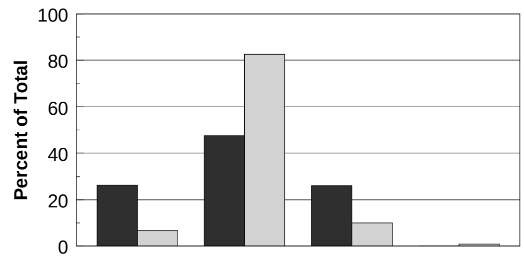


Fig. 5. Percentage of each species of phytosyeiid recovered from corn, southwestern Kansas.



Phytosyeiid Species	N. fallacis	N. comitatus	N. setulus	P. ovatus
1996 ■	99.1	0.5	0.2	0.2
1997 □	89.7	9.6	0.6	0.1

Fig. 6. Percentage of each species of phytosyeiid recovered from alternate hosts such as wheat, downy brome and native grasses, southwestern Kansas.



Phytosyeiid Species	N. fallacis	N. comitatus	N. setulus	P. ovatus
1996 ■	26.2	47.5	26.1	0.2
1997 □	6.6	82.5	9.9	1.0

populations in the alternate hosts peaked in mid-June and in corn during the first part of August (Figs. 1 & 3). Up to 1055 *N. fallacis* were recovered in a single sample of two corn plants. Surprisingly, the populations did not seem to be affected adversely by the pesticide applications (Fig. 3), except for Kearny Co #3 (Fig. 1).

N. comitatus was the most abundant phytosyeiid recovered in wheat and native grass samples, accounting for 48 to 83% of the total (Fig. 6). It was also the most common phytosyeiid recovered in small corn (8- to 11-leaf stage) from May until mid-June, but it did not seem to survive well on corn and soon disappeared. This was the second most abundant phytosyeiid in corn, but it accounted for only 0.5 to 10% of the total (Fig. 5). Populations seemed to peak in the alternate hosts by late June and were much higher in 1997 than in 1996. *N. comitatus* populations did not correlate with populations of any potential prey tested. Up to 514 *N. comitatus* were recovered in a 3-row foot sample of winter wheat.

Orius insidiosus (Say) (Hemiptera: Anthocoridae) was the second most abundant predator in corn and in alternate host plants. *Orius* populations were present in each corn field and on most alternate hosts. They seemed to peak in the last week of June on the alternate hosts and in July on corn (Figs. 2 & 4). They seemed to decline as corn reached the tassel stage. *Orius* populations were significantly correlated (P = 0.05) with thrips populations (the potential prey) on corn (1997) and in alternate hosts (1996). Up to 23 adults and 62 nymphs were recovered from a 3 row-foot sample of winter wheat. *Orius* populations appeared to be affected adversely by the pesticide applications (Figs. 1 & 2). They declined following 17 of 26 pesticide applications; however, most of these applications were made after tassel stage when populations were declining naturally.

The fungal pathogen, Neozygites adjarica (Tsintsadze & Vartapetov) (Entomophthorales: Neozygitaceae), was recorded from infected spider mites in August 1996 when epizootics occurred in two fields.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan 66506

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