d. Oklahoma Demonstration Sites

Phase II, Year 1 (2002-2003)
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During the 2002-2003 winter wheat growing season in Oklahoma, a total of six demonstration sites were evaluated by OSU and USDA-ARS scientists for aphid, natural enemy, and weed abundance. A pair of diverse (wheat in rotation with another crop) and simple (continuous wheat) sites were identified in Jackson, Alfalfa, and Kay/Noble county (Fig. 1). Demonstration sites in these counties were chosen to represent the variability in environmental conditions that can occur within Zone-2 (continuous cropping) of the overall areawide program.

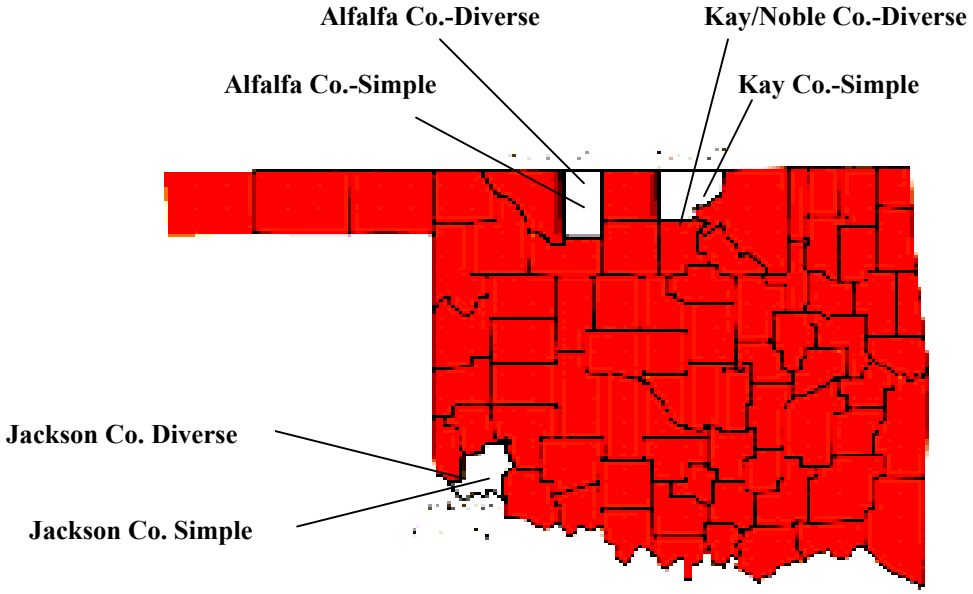

Figure 1. Location of demonstration sites in Oklahoma

Site Description

Jackson County. The diverse site was chosen primarily because the grower rotates winter wheat with a variety of different crops including alfalfa, sorghum, corn, peanuts, and cotton. Following the 2002-2003 winter wheat crop, cotton was rotated into production (Fig. 2 A). This field was embedded within a diverse landscape that included a significant area of lowland water. The simple (continuous wheat) site (Fig. 2 B) was embedded primarily within a grass habitat (Wheat and other grasses).

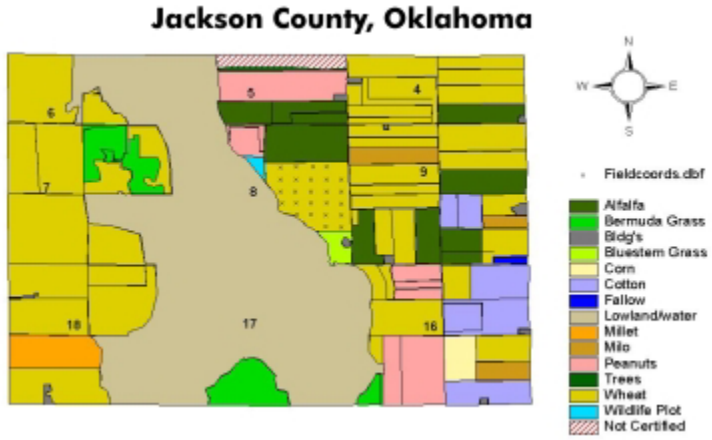

Fig. 2 A. Jackson Co. Diverse

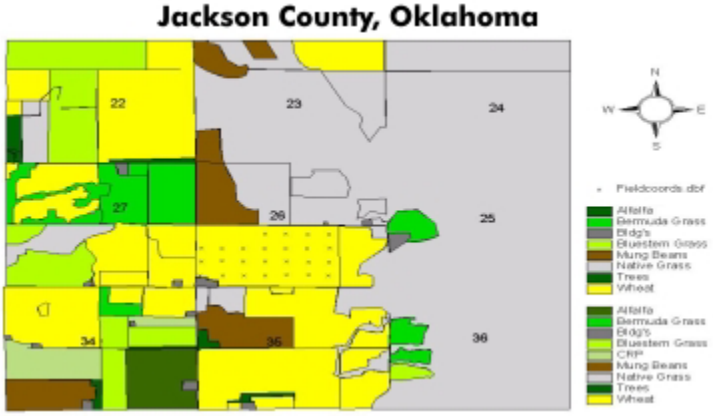

Fig. 2 B. Jackson Co. Simple

Alfalfa County. The diverse site was chosen primarily because the grower rotates winter wheat with sorghum. Following the 2002-2003 winter wheat crop, sorghum was rotated into production (Fig. 2 C). This field was embedded within a landscape mostly of wheat, but with a small amount of alfalfa and sorghum. The simple (continuous wheat) site (Fig. 2 D) was embedded primarily within a grass habitat (Wheat and other grasses) with a small amount of alfalfa production.

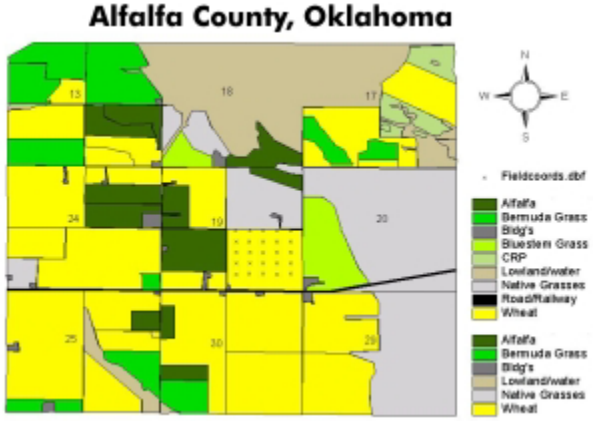

Fig. 2 C. Alfalfa Co. Diverse

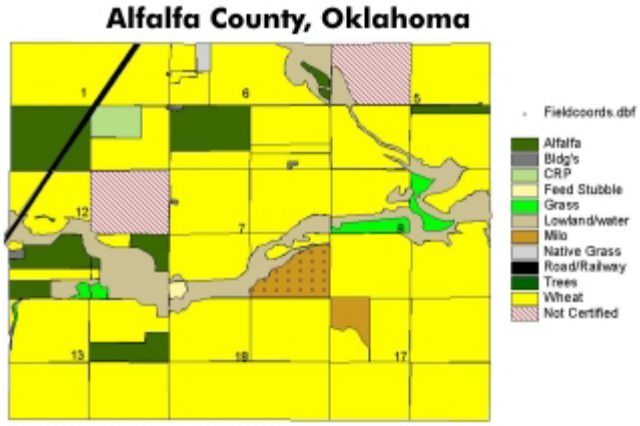

Fig. 2 D. Alfalfa Co. Simple

Kay/Noble Counties. The diverse site was chosen primarily because the grower rotates winter wheat with sorghum. Following the 2002-2003 winter wheat crop, sorghum was rotated into production (Fig. 2 E). This field was embedded within a landscape mostly of wheat, but with a significant area devoted to soybean production and small amount of alfalfa. The simple (continuous wheat) site (Fig. 2 F) was embedded primarily within a grass habitat (Wheat and other grasses) with a small amount of alfalfa production.

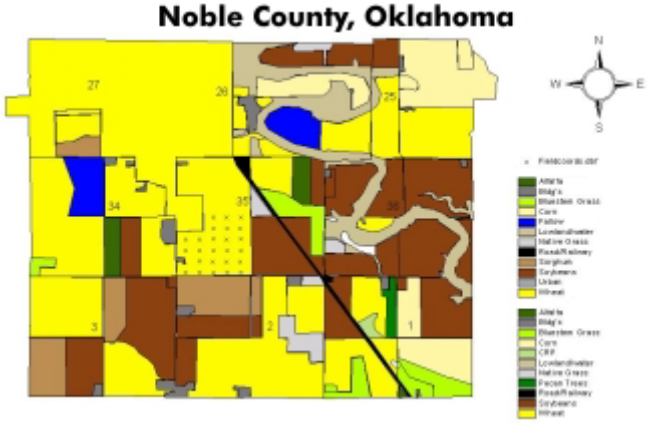

Fig. 2 E. Kay Co. Diverse

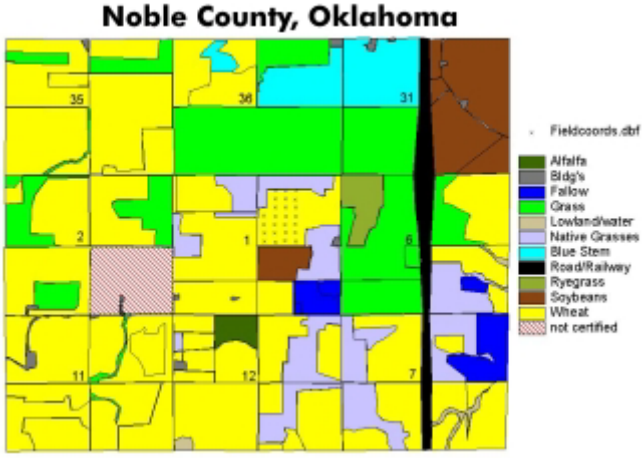

Fig. 2 F. Kay/Noble Co. Simple

Sampling

Developed protocols for sampling arthropods and weeds in wheat and alternative crops were followed (See appendix for details). Briefly for arthropods in wheat, we sampled for aphids (Tiller and Burlese), predators (Visual and Sweep), and parasitoids (Tiller / emergence tubes) at 25 grided locations throughout each field multiple times during the growing season.

Results

Arthropod abundance in wheat

Aphids and parasitoids from tiller samples. In general, greenbugs were found at extremely low levels in all of the fields evaluated (Fig. 3). Parasitism (*Lysiphlebus testaceipes*) of greenbugs at each site was consistently present throughout the growing season, which clearly limited numbers. Significant numbers of other aphids (primarily Bird-cherry-oat aphids - BCOA) were present at a few of the locations, but showed no noticeable trends between diverse and simple demonstration sites. BCOA did however supply significant hosts for parasitoids and predators.

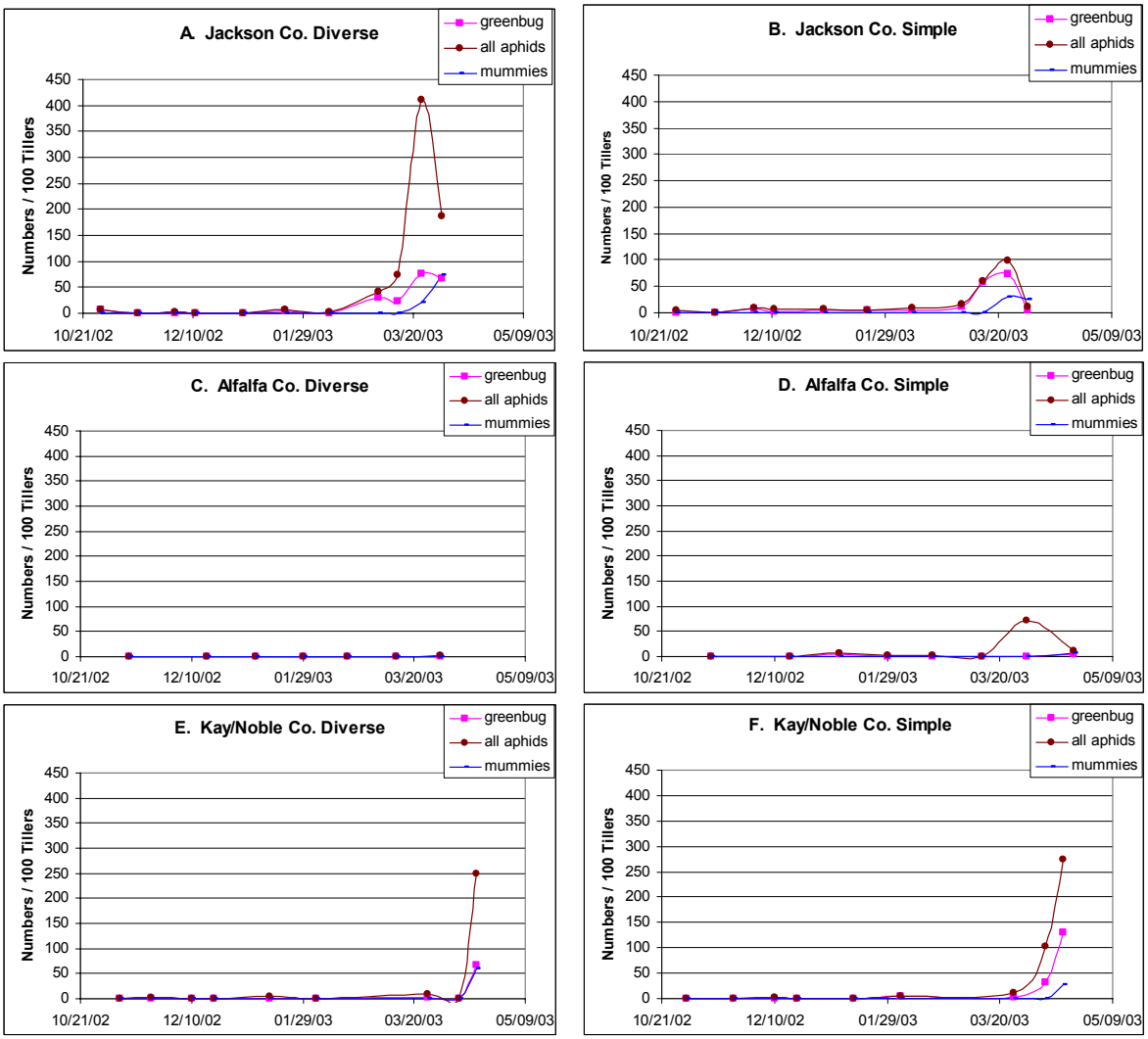

Figure 3. Greenbugs, all aphids combined, and mummies (parasitized aphids) in Winter Wheat at Oklahoma Demonstration Sites.

Aphids from burlese samples. Greenbugs were found at extremely low levels in all of the fields evaluated (Fig. 4). No noticeable trends in aphid abundance between diverse and simple demonstration sites were observed other than the consistently higher numbers at the beginning of the field season at diverse sites. When aphids were abundant, BCOA and Cornleaf-aphids were the primary aphids found. These aphids likely supplied significant hosts for parasitoids (Fig. 3) and predators (Figs. 5 and 6).

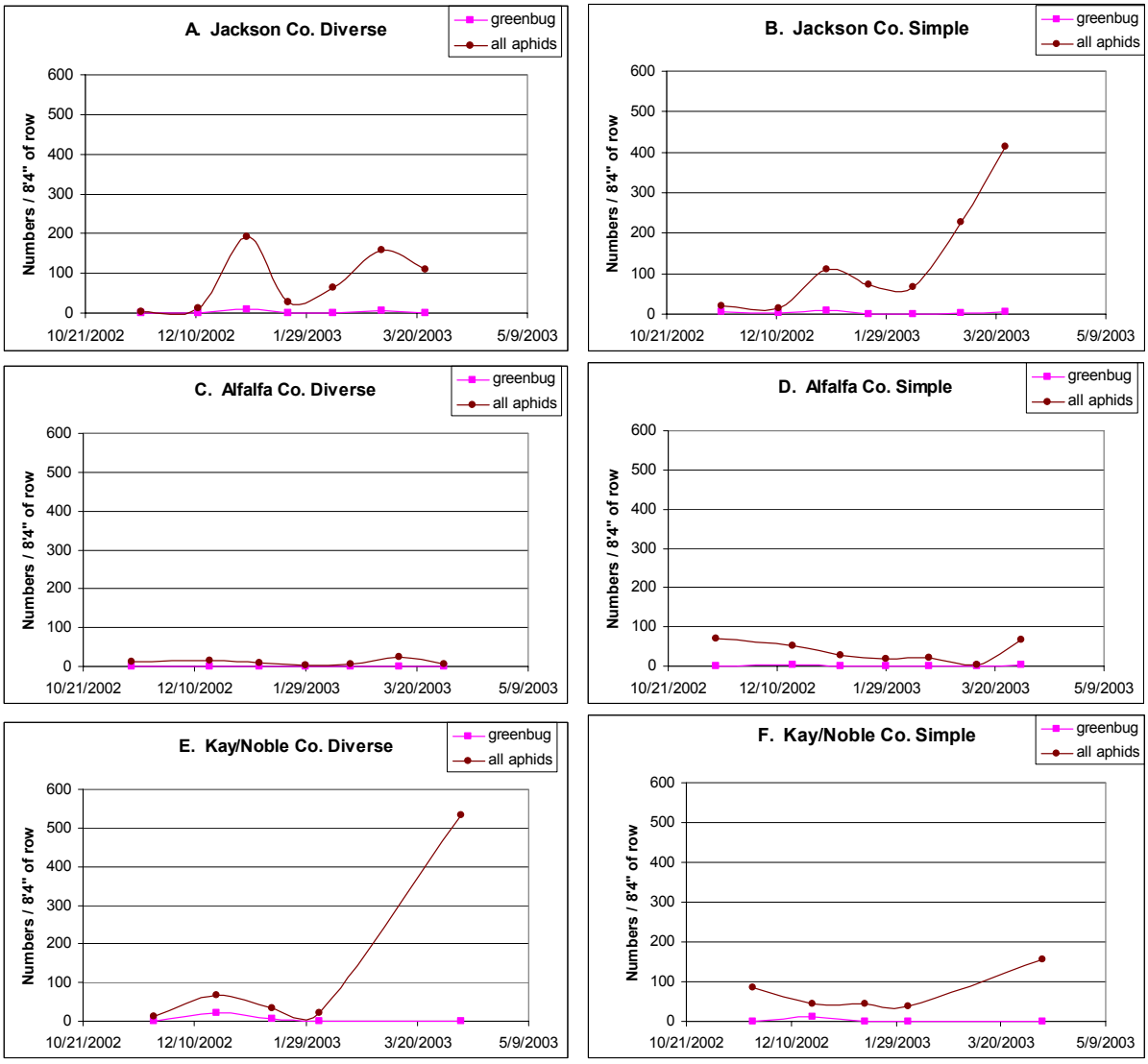

Figure 4. Greenbugs and all aphids in Burlese samples from Winter Wheat at Oklahoma Demonstration Sites. Numbers were summed over twenty five 4"- burlese samples.

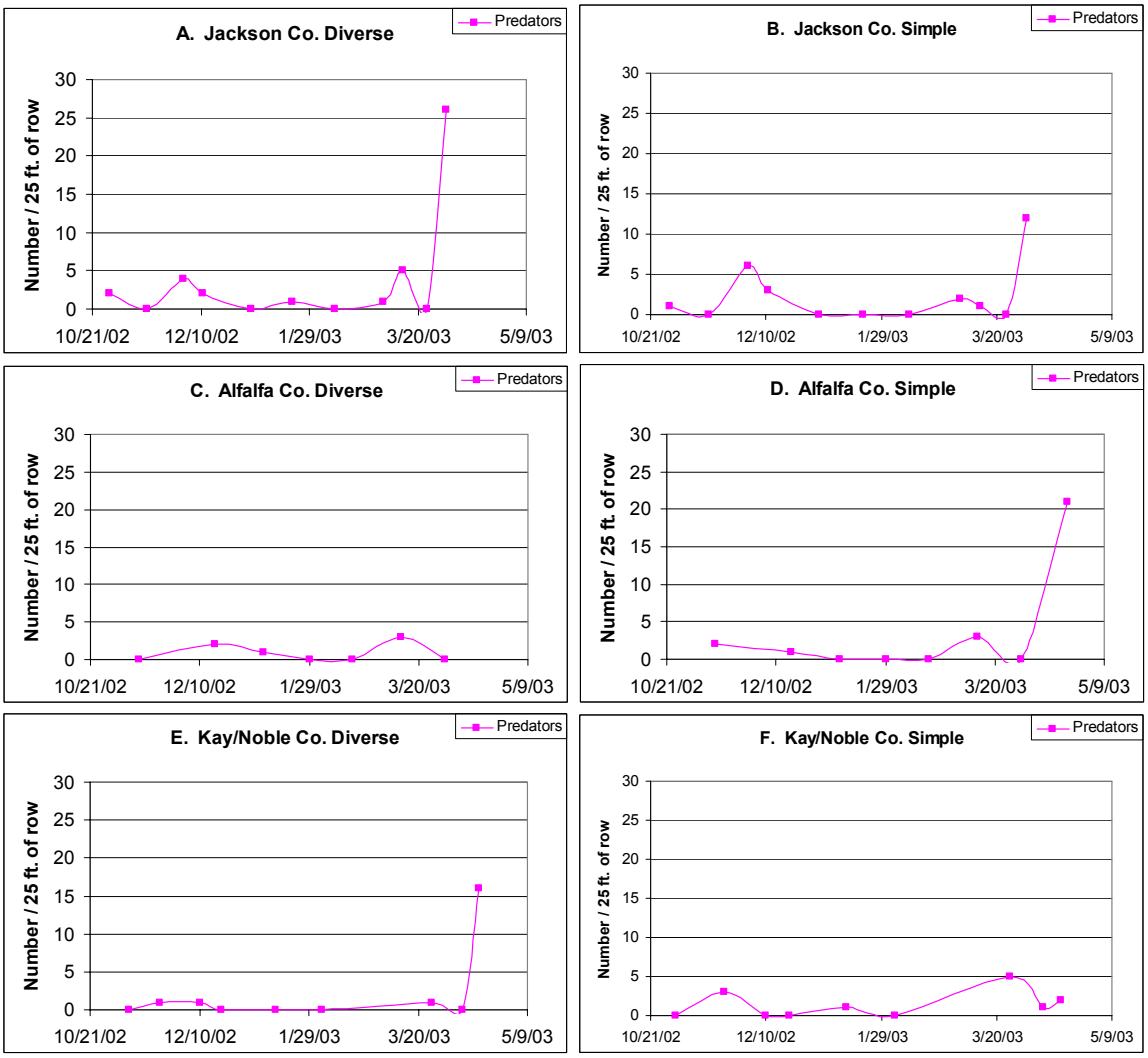

Figure 5. All arthropod predators in Winter Wheat at Oklahoma Demonstration Sites. Numbers were summed over twenty five 12"-visual samples.

Predators from visual and sweep samples. Predators in general were found at low levels in all of the fields evaluated (Figs. 5 and 6). Higher peak numbers of predators were found at diverse sites (vs. simple) at Jackson and Kay/Noble demonstration sites. At Alfalfa County, predator numbers were higher at the simple site; it is important to notice however that the landscape differences in Alfalfa County were minimal. Predator numbers appeared to be related to aphid numbers; when aphids were abundant, they likely supplied significant prey for predators.

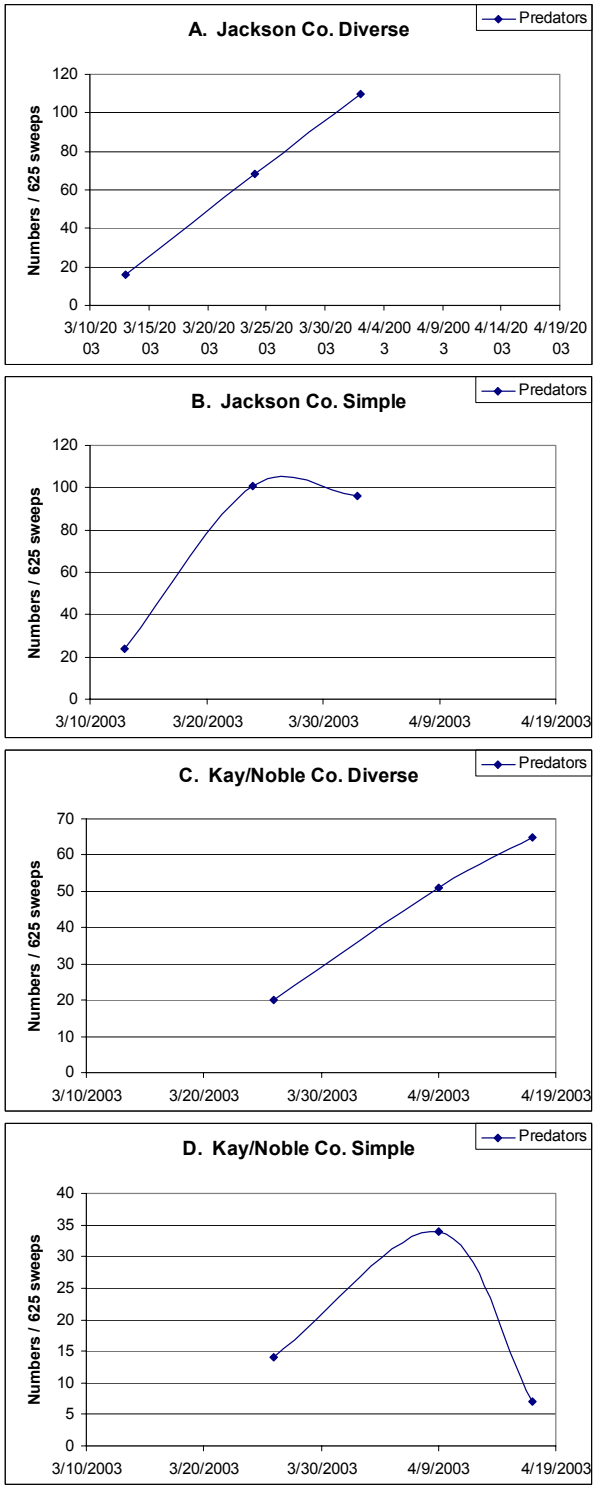

Figure 6. All arthropod predators in Sweep Samples in Winter Wheat at Oklahoma Demonstration Sites. Numbers were summed over twenty five 25-sweep samples.

Other Measures

Weeds. In general weeds were found at low-to-moderate levels in all of the fields evaluated, and no significant differences were observed between diverse and simple sites. Data is continuing to be summarized.

Arthropods in alternative crops. In sorghum, aphids were present at all sites, but were severely reduced by parasitism (*L. testaceipes*). This primary parasitoid is the same that attacks aphids in wheat. The high levels of parasitism throughout the sorghum growing season suggests that *L. testaceipes* is conserved in diverse systems.

In cotton (at the Jackson Co. diverse site), cotton aphids built up quickly after planting, but were dramatically suppressed by an abundance of predators. Ladybeetles were observed to be the primary predators. Parasitism of cotton aphids by *L. testaceipes* was not observed. Data from sorghum and cotton fields is continuing to be summarized.