Implementation of a Pest Monitoring Network For Vegetable Growers In Yuma County

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Abstract

A n insect pest monitoring network spanning the major growing areas in Yuma was implemented in 1998-1999. This project was designed to measure the relative activity and movement of adult populations during the growing season and provide important information to growers and PCA's. A series of pheromone-baited and yellow sticky traps were placed in 11 locations among the growing areas in the Yuma, Gila and Dome Valleys in Yuma county. Numbers of adults / trap /night were recorded weekly from September-April. Seasonal differences in insect species activity and abundance among locations were observed, but difficult to precisely explain because of the lack of historical trap data. Information gathered from the trapping network will provide historical baseline data for pest activity on an area wide basis from which relationships between insect trap captures and seasonal factors that influence their activity and abundance may be explained. The results of the monitoring network during the 1998-1999 growing season for is provided in this report.

Introduction

The perception of Integrated Pest Management (IPM) is becoming increasingly critical to agricultural production every year. First, the Government Performance and Results Act of 1993 called for a 50% reduction in pesticide use by the year 2000. This was quickly followed by the IPM Initiative set forth by the Clinton Administration addressing a 75% adoption of IPM by 2000. Most recently, the passage of the Food Quality Protection Act (FQPA) of 1996 threatens to remove many important broad spectrum insecticides from vegetable cropping systems, and places more dependance on alternative IPM tactics. Since effective insecticides are the primary management tool in Lettuce IPM programs, the University of Arizona must increase it's efforts in developing new IPM approaches. Monitoring and detecting relative pest abundance on an area wide basis is one such way to begin achieving this goal.

A monitoring network spanning the major growing areas in Yuma was implemented in 1998-1999. This project was designed to measure the relative activity and movement of adult populations during the growing season and provide important information to growers and PCA's. The Vegetable Information Advisory was developed that served as a mechanism for delivering weekly monitoring information as well as timely IPM updates to the PCAs and growers that provides information describing new biological, ecological and management information on key pests. The Vegetable Information Advisory Website can be found at http://Ag.Arizona.Edu/ aes/yac/veginfo/ . Furthermore, the information gathered from the trapping network will provide historical baseline data for pest activity and occurrence on an area wide basis to measure future changes. The results of the monitoring network during the 1998-1999 growing season is provided in this report.

Materials and Methods

Information describing adult insect activity was generated from a network of traps that were monitored weekly from

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August through March. Traps were located at several sites throughout Yuma County's vegetable growing areas (Table 1). Three-four trapping stations were situated in the Yuma Valley, Gila Valley and Dome Valley/Roll areas for a total of 11 trap locations. At least one location in each growing area was situated near an AZMET weather station. The approximate location of traps in each valley was selected with the assistance of local PCAs. The crops being grown adjacent to each monitoring site was documented in September, December and March (Table 3).

At each site, either pheromone-baited or yellow sticky traps were used to monitor beet armyworm, cabbage looper, corn earworm, tobacco budworm, aphids, thrips and leafminers (Table 3). Traps were checked 1-2 times per week. Pheromone lures were changed on a 3-week schedule to ensure consistent performance and sticky traps were replaced every sample. Moths captured in pheromone-baited traps were counted and recorded at each trapping site. Sticky traps were taken to the laboratory where all leafminers, thrips and aphids were counted and recorded. Leafminers were identified to species (*Liriomyza trifolii* and *L. sativae*). Aphids and thrips species were not identified to species, but traps were examined for the the presence of green peach aphid and potato aphids during spring captures. Data from trap captures was converted to the mean number of adults / trap/ night and presented in a graphic format. Weather data was summarized for each sample date. Ambient temperatures for each AZMET site was prepared and provided graphically showing relative weekly trends across the season.

Results and Discussion

The desert vegetable growing areas of Arizona are characterized as multi-cropping systems where crops are grown throughout the year. Most insect pests encountered in these areas are polyphagous (feed and reproduce on multiple hosts) and highly mobile. Thus, they are able to readily disperse among numerous crops and build extremely high population densities. Understanding these relationships may provide insight towards the development of improved IPM management tactics. In addition, monitoring pest activity during the growing season, can indicate when and where pests are moving, and can serve as an early warning mechanism to aid pest control advisors in determining which pest to watch for most closely.

The results of the 1998-1999 monitoring network can be found in Fig 1-7 and Appendix. Based on seasonal trap counts, peak adult activity for each insect species generally varied among the three growing locations (Fig 1-7). Differences in the time and duration of activity observed among the growing areas probably reflects regional differences in cropping patterns, cropping diversity, and to a lesser extent, temperatures. Other factors such as wind, rain, dust, pesticide spraying and cultural management in surrounding fields, and experimental error undoubtedly influenced trap counts as well. Consequently, lacking historical trap data, it is difficult to precisely explain the seasonal differences we observed. However, we plan to continue the trapping next year and build a database so that in the future we may be able to determine relationships between insect trap captures and seasonal factors that influence their activity and abundance. General comments on the trap catches for each species is described below.

Tobacco budworm/Corn Earworm. Trap catches of moths peaked at all locations during September (Fig 1), but tobacco budworm catches were greater and significant activity extended into October. Trap captures were negligible for the duration of the growing season. This is consistent with our observations that Heliothis larvae appear to be most abundant in lettuce fields during the fall. Figure 2 shows the relative proportion of the two species captured during the fall. The relative occurrence of each species differed among the growing areas, but corn earworm appeared to be most prominent in the Dome Valley area. Tobacco budworm/Corn earworm was greatest in the Yuma Valley, possibly a reflection of periodic movement out of Mexico.

Beet armyworm/Cabbage Looper. These two lepidopterous species are the primary worm pests in fall lettuce and is reflected in moth catches (Fig 3). Beet armyworm adult activity appeared to extend considerably throughout September and October. Cabbage looper activity peaked a little later and extended into December. Moth activity measured during the winter and spring months was comparatively minimal. Again, this trend is consistent with the occurrence of larval populations and the need for worm management in lettuce fields during the fall.

Diamondback Moth. Although not considered a primary pest of cole crops in our area, their presence can be found each season. Trap captures remained low throughout the growing season (Fig 4), becoming active with the cooler fall

temperatures. Because diamondback moth is host specific to *brassica* crops, we are sure weather this pest is capable of over-summering in Yuma. More than likely, moths are reintroduced each fall via transplants. This factor, coupled with warm fall temperatures, may suggest why diamondback moth populations remain low in the desert.

Silverleaf Whitefly. The data from sticky traps reflects the reduced whitefly numbers we have experienced the past few years (Fig 4). Adult movement in the three areas was greatest in early September and may have bee related to warmer fall temperatures. Activity was greatly reduced by mid-October. These peaks in activity are consistent with termination of cotton crops and alfalfa harvesting near trapping locations.

***Liriomyza* Leafminers**. Leafminer activity was clearly greatest in the Yuma Valley (Fig 5). Trap catches peaked in late August and again in mid-October, coinciding with cotton termination and melon harvests. Leafminer activity was negligible during the cooler winter months, increasing again in April. As observed in previous studies, Liriomyza sativae appears to be the dominant leafminer species in all Yuma growing areas (Fig 6). In general, populations were almost non-existent in the Dome and Gila Valleys during the fall.

Thrips. Thrips adults, as indicated by trap catches, were most active during the early fall and again in the late spring (Fig 6). Fall population movement was probably related to cotton/alfalfa harvest and cooler temperatures. Movement in the spring is probably closely related to the gradual increase in daytime temperatures. Previous studies have shown that adult thrips will begin to fly when temperatures exceed 65 F during the day when light intensity is high. Furthermore, harvest of vegetables, and drying of desert habitat and weed hosts undoubtedly contribute to this activity.

Aphids complex. In general, alate aphids reached were most active during November and December, and again in late February and March. The late fall activity, which accounted for the peak activity, probably reflected movement of many aphid species dispersing from desert habitat, weeds and other alternate host plants to alfalfa, small grains and vegetable crops. Total aphid activity was greatest in the Gila Valley at that time. The second peak can be associated with the normal spring movement seen in lettuce and cole crops as temperatures begin to increase again. Aphid activity was lower in Dome Valley than in the other growing areas.

Acknowledgment

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Table 1. Monitoring network locations in the Yuma growing area.

Site	Location	GPS Position
Yuma Valley	1. Co. 22nd and Ave I	N 32 30, W 114 46
	2. Co. 16th and Ave G	N 32 35, W 114 44
	3. Co. 12th and Ave C	N 32 39, W 114 39
	4. Co. 8th and Somerton Ave	N 32 39, W 114 39
Gila Valley	1. Co. 8th and Ave 5E	N 32 42, W 114 32
	2. Co. 7th and Ave 10E	N 32 42, W 114 27
	3. Laguna Dam Rd and Chavez Ln.	N 32 42, W 114 29
	4. Co. 8th and Ave 7E	N 32 46, W 114 31
Dome Valley	1. Co 7th and Ave 17E	N 32 45, W 114 20.
	2. Co 8th and Ave 20E	N 32 42, W 114 17.
	3. Ave 25E near the Gila River	N 32 40, W 114 12.

Table 2. Description of the cropping patterns associated with trap locations

		Fields Adjacent to Traps (within 0.5 mile)		
Site	**Loc**	**Sep-Oct**	**Dec-Jan**	**March-Apr**
Yuma Valley	1	Broccoli, Fallow	Broccoli, Wheat	Cotton, Melons, Lettuce
	2	Lettuce, Fallow, Melons	Lettuce, Fallow	Cotton, Fallow, Lettuce
	3	Cotton, Melons, Broccoli	Broccoli, Melons, Fallow	Lettuce, Melons, Fallow
	4	Sudan, Cotton, Fallow, Lettuce	Lettuce, Broccoli, Fallow	Lettuce, Melons, Wheat, Cotton
Gila Valley	1	Lettuce, Fallow, Sudan	Broccoli, Fallow	Cotton, Lettuce, Fallow
	2	Cotton, Lettuce	Lettuce, Fallow	Wheat, Cotton, Fallow
	3	Fallow	Lettuce	Wheat, Cotton, Lettuce, Fallow
	4	Alfalfa, Fallow	Alfalfa, Lettuce	Alfalfa, Wheat, Fallow
Dome Valley	1	Fallow, Cotton, Lettuce	Fallow, Lettuce	Wheat, Cotton
	2	Alfalfa, Cauliflower, Lettuce	Beans, Alfalfa, Fallow	Alfalfa, Wheat, Fallow
	3	Cotton, Lettuce, Fallow	Lettuce, Fallow	Wheat, Cotton

Table 3. Monitoring Techniques for trapping insect pests.

Pest Species	**Monitoring Technique**
Beet armyworm, *Spodoptera exigua*	Pheromone-baited bucket traps
Cabbage looper, *Trichoplusia ni*	Pheromone-baited bucket traps
Corn Earwom, *Helicoverpa zea*	Pheromone-baited cone traps
Tobacco budworm, *Heliothis virescens*	Pheromone-baited cone traps
Diamondback moth, *Plutella xylostella*	Pheromone-baited wing traps
Silverleaf whitefly, *Bemisia argentifolii*	Yellow sticky cards
Liriomyza Leafminers; *L. trifolii* and *L. sativae*	Yellow sticky cards
Western flower thrips, *Frankliniella occidentalis*	Yellow sticky cards
Onion thrips, *Thrips tabaci*	Yellow sticky cards
Aphid complex, multiple species	Yellow sticky cards

Figure 1. **Tobbaco Budworm & Corn Earworm**

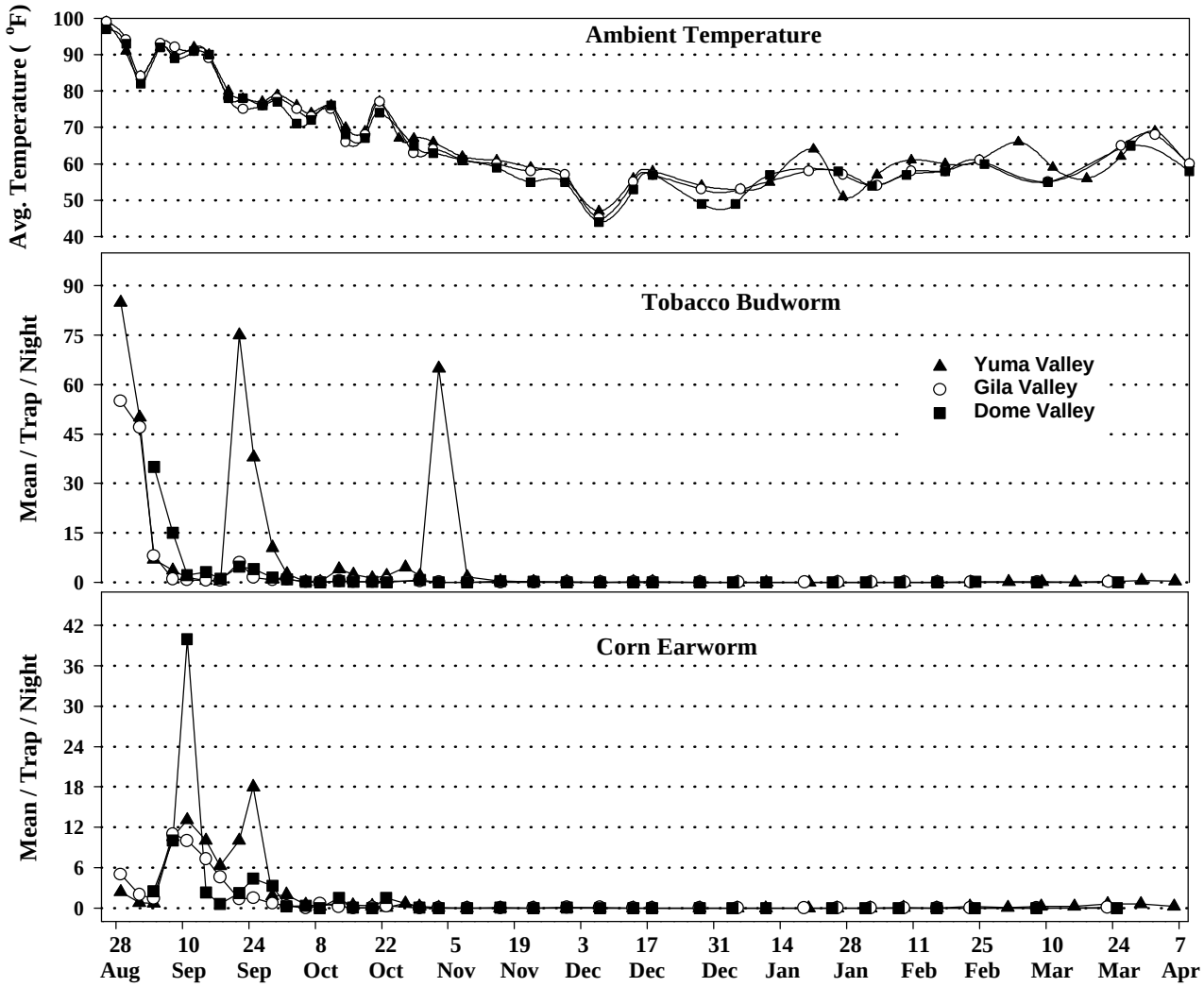

Figure 2. **Proportion of Tobacco Budworm to Corn Earworm**

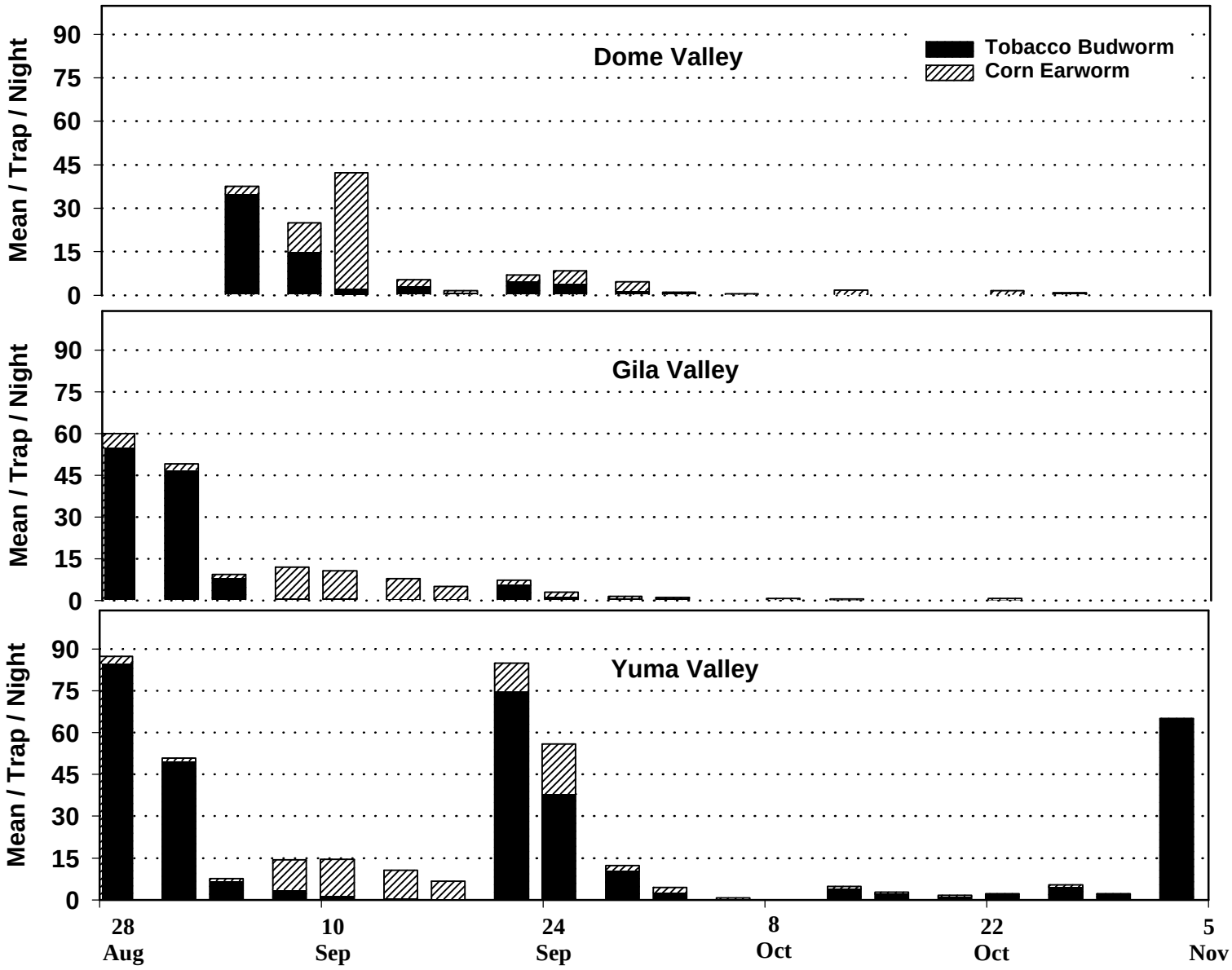

Figure 3. Beet armyworm & Cabbage Looper

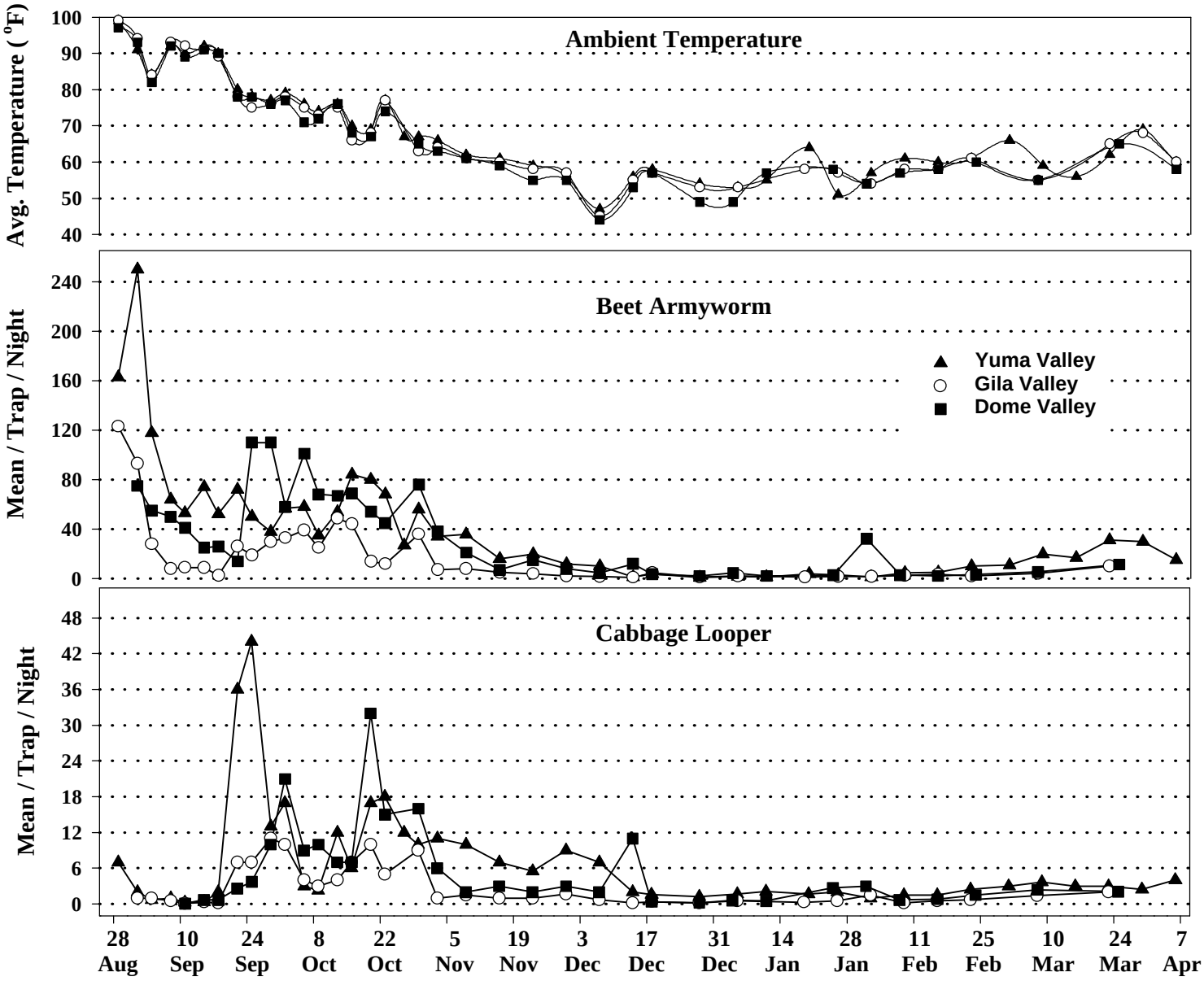

Figure 4. **Diamondback Moth & Silverleaf Whitefly**

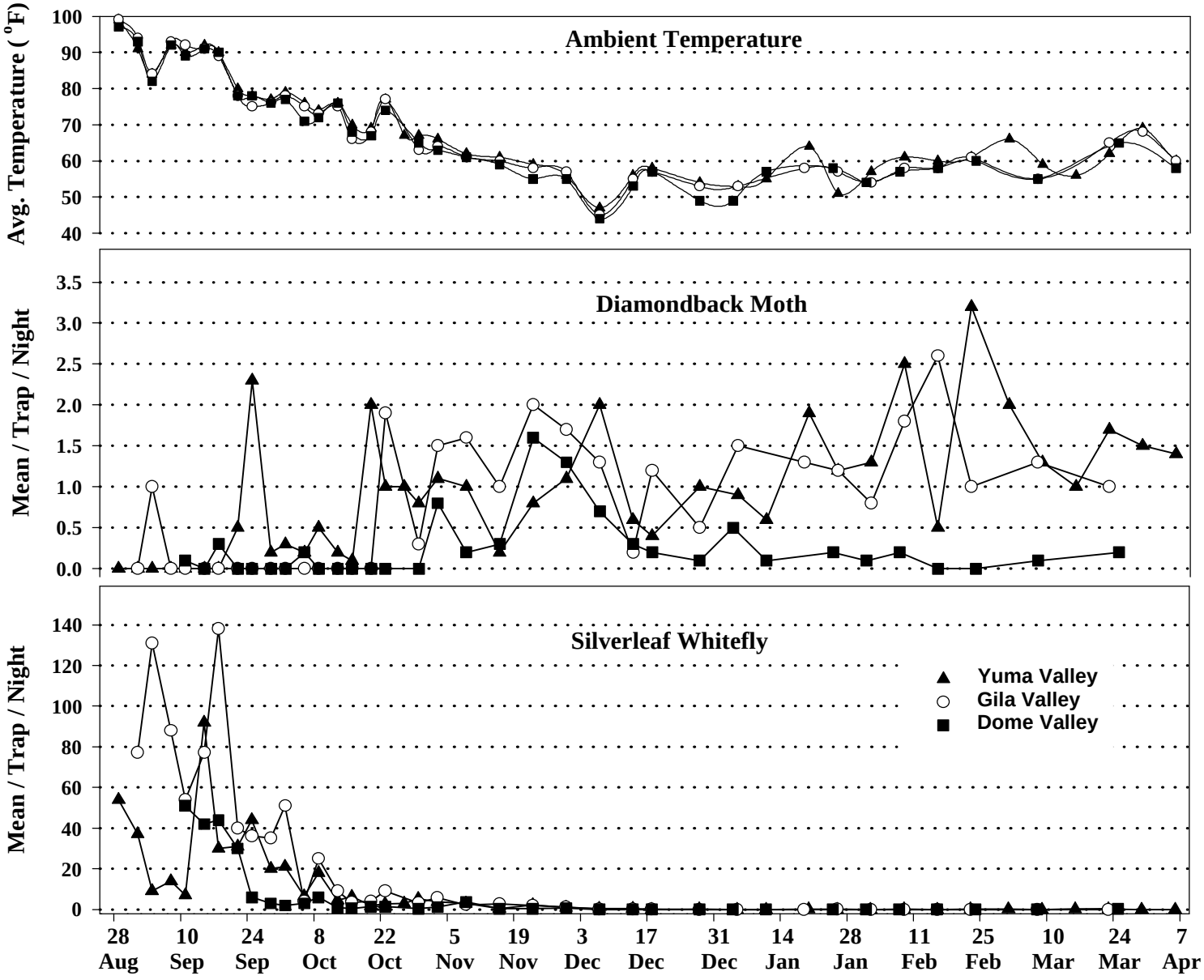

Figure 5. ***Liriomyza*** **Leafminers**

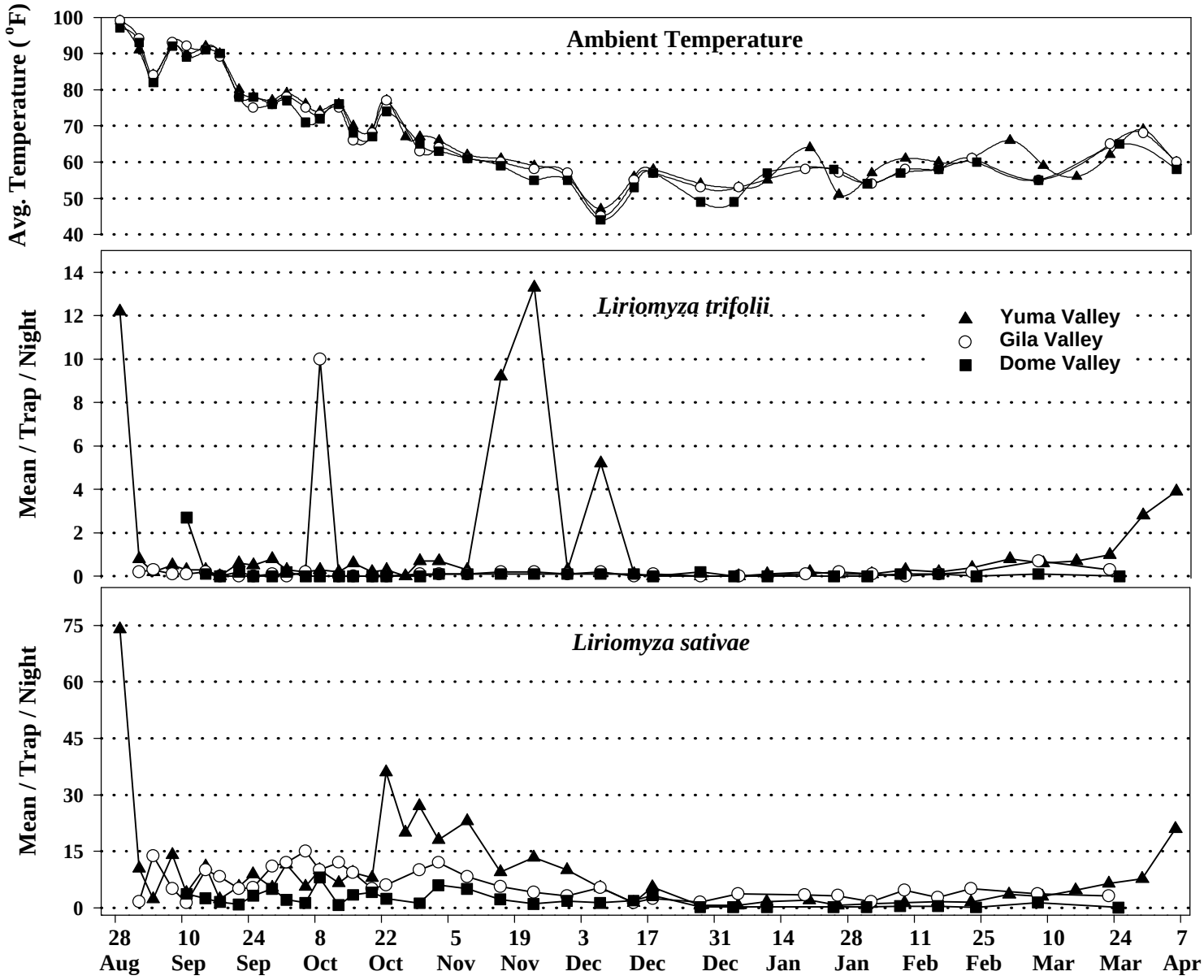

Figure 6. Proportion of *Liriomyza* Leafminers

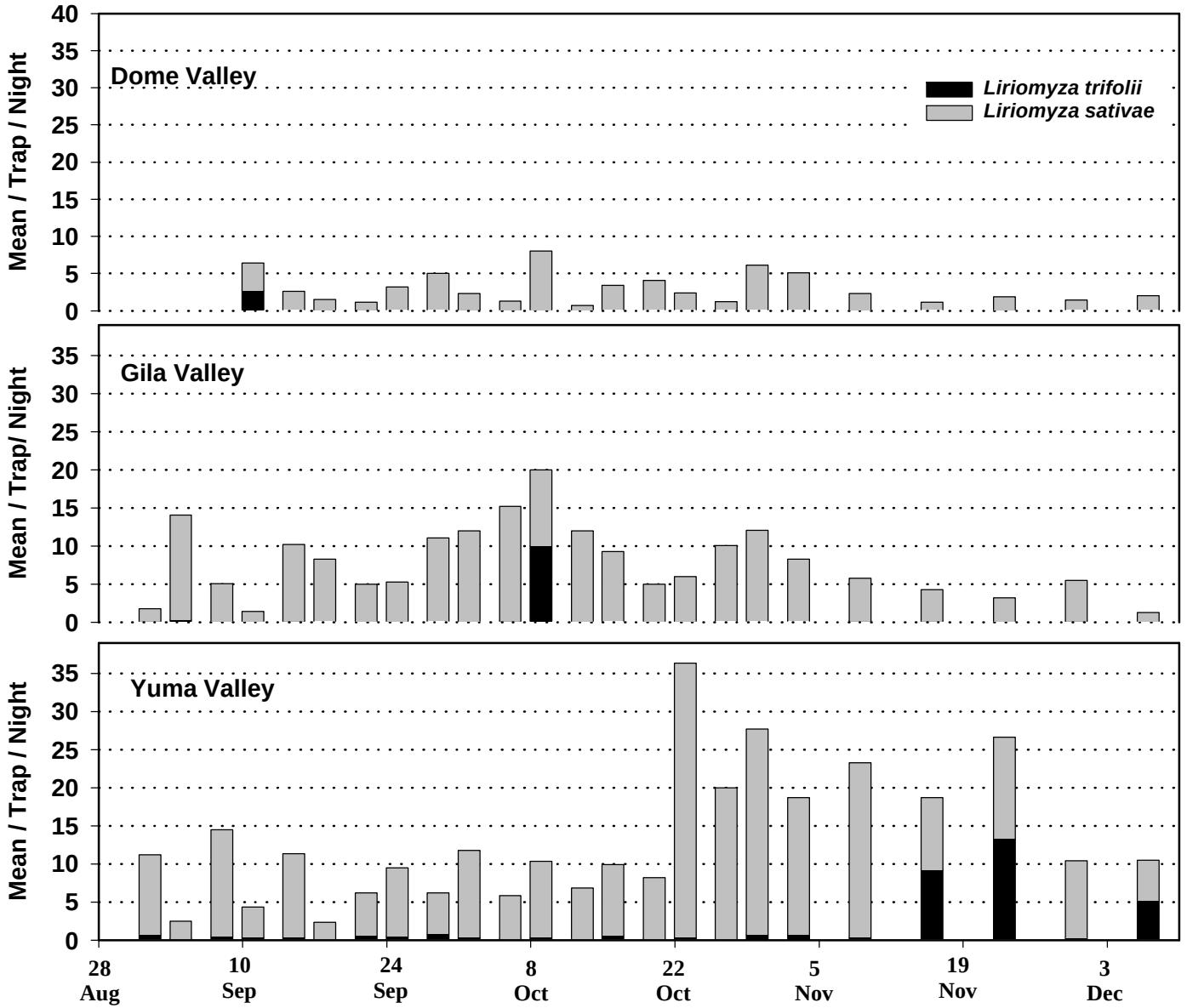

Figure 7. Aphids & Thrips