Kansas Insect Newsletter

For Agribusinesses, Applicators, Consultants and Extension Personnel

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Impact of Pesticides on Natural Enemies: Secondary Pest Outbreak and Target Pest Resurgence

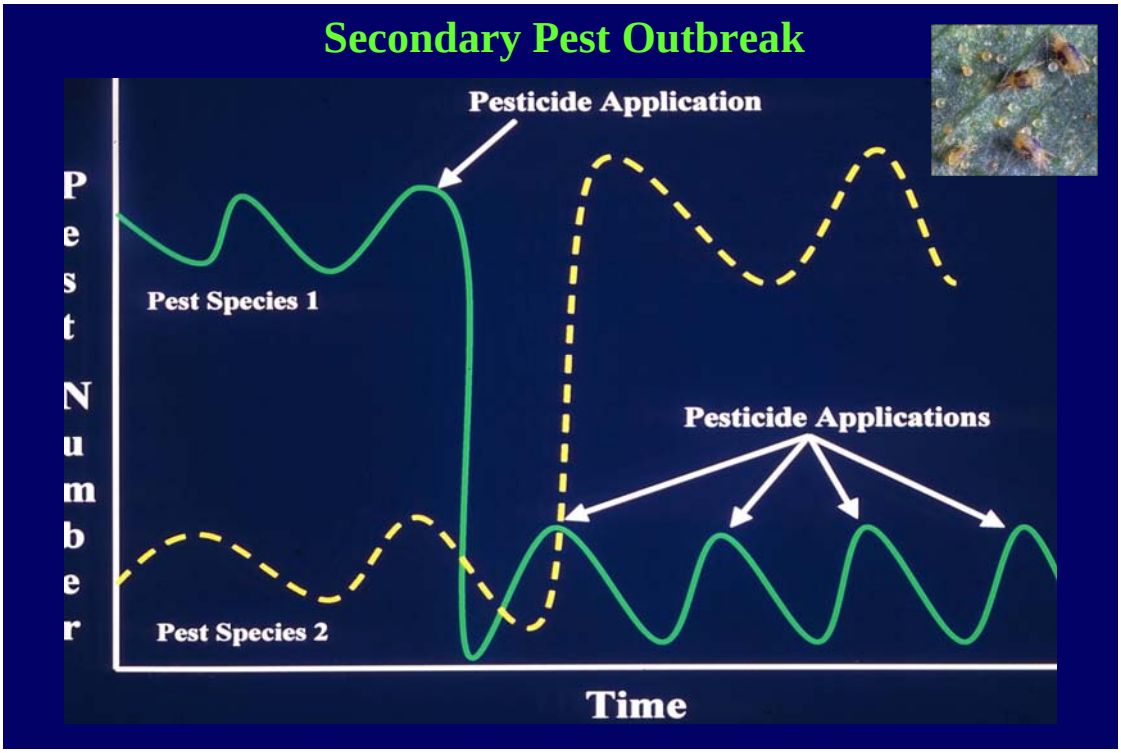
Have you ever wondered or considered what happens to the 'ecosystem' after applying pesticides (in this case, insecticides and miticides) to deal with insect and mite pests of ornamental plants in landscapes including herbaceous annuals and perennials, and trees and shrubs (ok…may be not, but as an entomologist I tend to do this sort of "stuff," which tends to enhance my limited social life). Well, two situations can occur as a result of relying on pesticides to regulate insect or mite pest populations that involve directly or indirectly killing natural enemies (e.g., parasitoids or predators). These are secondary pest outbreak and target pest resurgence. Secondary pest outbreak or pest replacement occurs when a major insect or mite pest is regulated downward and continues to be regulated downward by a particular pest management strategy, such as the use of pesticides, but is replaced in importance by another insect or mite pest that was previously of minor importance.

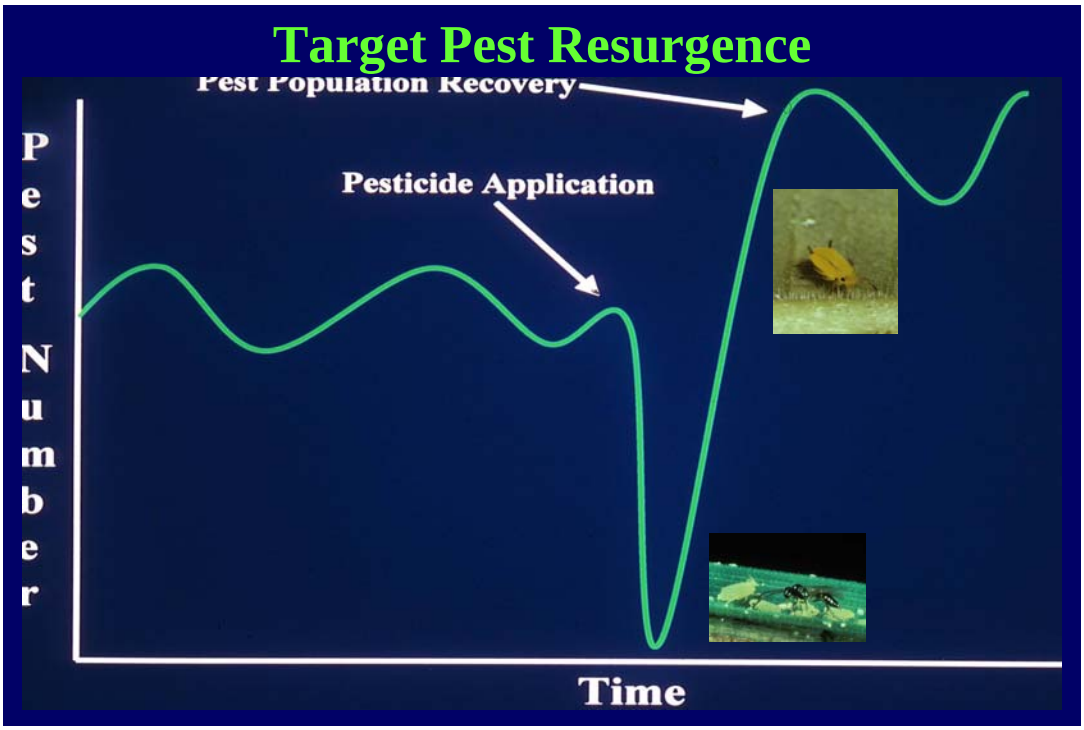
Let me provide an example of secondary pest outbreak. In general, the twospotted spider mite (*Tetranychus urticae*) is considered a secondary pest (although many people may not agree with this generalization), that is induced by the extensive use of pesticides. Both carbaryl (Sevin) and cyfluthrin (Tempo) are both effective in regulating the adult stage of many beetle pests such as the Japanese beetle (*Popilla japonica*); however, both pesticides have a broad-spectrum of activity and extensive use of either or both of these products will result in the direct killing many types of insect or mite pests. Furthermore, both pesticides are harmful to natural enemies, including predatory insects and mites that naturally regulate twospotted spider mite populations. In the absence of predatory insects or mites, twospotted spider mite populations may build-up to substantial numbers capable of causing significant damage to ornamental landscape plants. In addition, natural enemy populations take much longer to recover or build-up to numbers that may be sufficient to have an adverse effect on the twospotted spider mite population. As such, regular applications of pesticides will be required to sustain twospotted spider mite populations below damaging levels. This is referred to as the "pesticide treadmill."

Frequent applications of pesticides may disrupt the "natural balance" of the ecosystem by removing natural enemies. This then increases the time required for re-colonization by natural enemies leading to insect or mite outbreaks because insect or mite pests tend to be less susceptible to pesticides compared to natural enemies; possibly due to resistance. The continual use of pesticides, especially those with broad-spectrum activity, can reduce natural enemy populations beyond recovery and cause repeated insect or mite pest outbreaks.

Target pest resurgence occurs when an insect or mite pest population, after having been regulated downward by the application of a pesticide, rebounds to numbers even higher than before regulatory action had been implemented. Because natural enemies must wait for a sufficient quantity of a food source, their populations tend to "lag" behind in

growth. As such, without the regulatory effects of natural enemies, populations of certain insect or mite pests such as aphids and twospotted spider mite can increase at an accelerated rate and actually exceed previous levels. If pesticides are no longer applied for a period of time (e.g., 2 to 3 weeks), then any existing natural enemies will build-up and regulate the insect or mite pest population to their original levels. However, by this time, additional pesticide applications are usually conducted before this can occur. This leads to permanent displacement of natural enemy populations. Again, this results in the need to frequently apply pesticides in order to keep the insect or mite pest population from causing extensive damage ("pesticide treadmill"). It is important to understand that not only insecticides and miticides, but also foliar applications of certain fungicides may negatively impact natural enemies.





Raymond Cloyd

Ward Upham's "Hot Topics" ----- Bagworms and Pine Wilt

Ward sends out a weekly request to all County Extension Personnel to "send in" topics/questions which they have addressed during the current week. Ward then compiles these reports and makes them electronically available. Two items from his latest "Hot Topics" caught my eye: Is it too late to spray for bagworms? And, Pine Wilt.

What about spraying for bagworms? The window for spraying bagworms closed several weeks ago after bagworms finished their 2010 bagworm feeding activities. Evidence of "shutdown" was in the form of a heavy silken "tie" which secured the bag to the tree (Figure 1).

Figure 1

With the permanent closure of its "front door", the larva then flipped in its bag so that its head was at the bottom of the bag. Thusly positioned, the larvae entered its pupal stage. As determined by a blacklight trap catch, the first emergence of male bagworm moths (Figure 2) occurred Sunday evening (September 7). Additional moths have been taken nightly since.

Figure 2

The image of this male moth is puzzling. Its posture is that of a "calling moth". It suggests that the moth is producing/dispensing a pheromone. Pheromones are chemical substances used for communication within a species. The four "types" that come to mind are trail pheromones (think of ants following each other to and from their colonies), aggregation pheromones (where insects may gather en masse), alarm pheromones (where one is disturbed and thus gives off a "signal" warning all others to disperse/drop to the ground to avoid some "bad thing") and sex pheromones (produced by the female insect to attract a mate).

So why the puzzlement? Who/what would this male moth be calling? Certainly not a wingless female bagworm moth which remains in her bag and puts out her own pheromone as **she** calls for a mate. And I would not think that the male is producing an aggregation pheromone attracting other male competitors which would be to the detriment of its mating a female moth. So, ?????????????????????? as to what's happening.

Pine Wilt Cycle. The crux of the pine wilt calls may have to do with the fact that green healthy trees have suddenly taken on the scotched appearance associated with pine wilt disease. At this point in time, the recommendation is to identify a "suddenly dead" tree(s), cut them down and drag them to a "burn pile" (Figure 3).

Figure 3

Why burn? The purpose of burning trees is to destroy the larvae of the next generation of pine sawyer beetles (Figure 4).

(Figure 4)

The greatest surge/emergence of the next generation of beetles will begin in mid-May, 2011. Thus burning any time between now and April 1 is the recommended time frame for eliminating developing borer larvae. Especially during winter when there is a lull in field work, burnings can be easily accomplished.

A BIG SURPRISE! – A Juniper Pest

More than a month ago,, Andrea Burns (Ford County CEA-ANR) called to report a disturbing situation in an eastern red cedar windbreak: trees looked a bit sparse and branches and foliage were webbed into tight clumps. Over the phone, my immediate response was, "Sounds like juniper webworm". But, as I was scheduled to pass through Dodge City in a couple of days, we met up at the Dodge City site. Trees did appear sparse (Figures 5 & 6).

Figure 5

Figure 6

Upon closer examination, “clumped”/webbed masses were very evident (Figure 7).

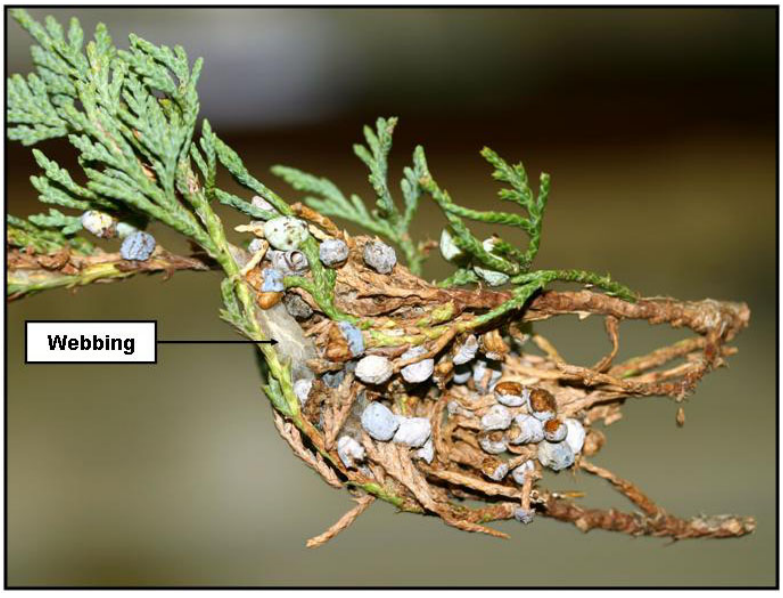


Figure 7

By parting the webbing, occasional yellowish-green larvae were found (Figure 8).

Figure 8

While this larvae did not resemble a Juniper webworm (Figure 9), might this just be a variation “in form” as often happens with lepidopteran larvae?

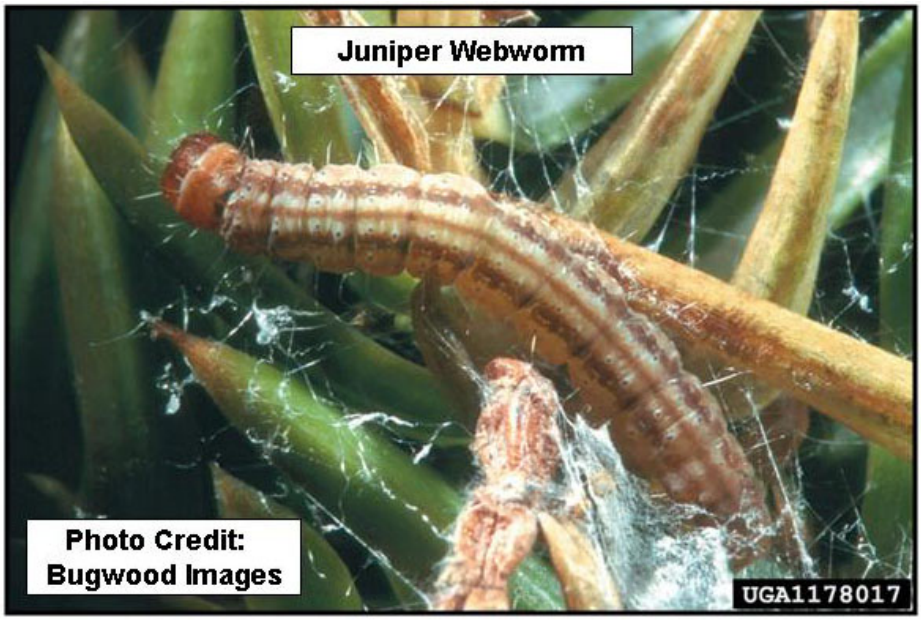


Figure 9

Also evident at the Dodge city site were empty pupal cases indicating recent emergences of moths (Figure 10).

Figure 10

We collected a good number of samples to examine more closely. It appeared that most of the moths had emerged as evidenced by the many freshly-emptied pupal cases (Figure 11).

Figure 11

Also found were several viable pupae (Figure 12).

Figure 12

Thus it was just a matter of time before Juniper webworm moths (Figure 13) would emerge.

Figure 13

However, what emerged did not resemble Juniper webworm moths! Jan Metlevski (KSU Department of Entomology Research Associate) identified the moths as **Juniper budworm** moths (Figure 14). These are small moths with a ½-inch wing spread.

Figure 14

So is this a new insect pest in Kansas? In a google search on the Juniper budworm (*Cudonigera houstonana*), the Texas Forest Service produced a Pest Management Article in which they reported a county-wide outbreak of this insect (in 2002) in Texas. They also mentioned that the life history study of this insect had been made **in Kansas**. It turns out that it was the Ph. D. Thesis for a former K-State Department of Entomology graduate student, and is THE definitive work of this insect species complete with graphs, charts tables, plates and drawings on all aspects of all live stages down to anal forks of

first through ninth instar larvae to setal patterns and setal lengths on various body segments of various instars, and more…….

For practical/applied use, it boiled down to the description of the Juniper budworm's Life History:

"The data collected indicated there is a single generation each year. About 11 months starting in mid-July are spent in the larval stages (Plate II). Pupae appear in June. Adults and eggs first appear in July. Larvae enter diapause in late August and September and overwinter within mined shoots. Feeding resumes in April. The egg, larva, pupae and adult are shown in Plate III."

The Juniper budworm's seasonal developmental cycle is identical to that of the Juniper webworm. Thus if a person were to attempt to control (reduce – eliminate) either of these species, insecticides would have to be applied to Junipers at the time moths are emerging and depositing eggs, and as larvae are hatching but before

they mine into needles. However, Texas Forest Service personnel did contact me to say that there has been no repeat of the 2002 experience. They speculated that populations of beneficial insects flourished and exerted control of the Juniper budworms. From our collected samples, 3 species of parasitic wasps were collected. It may be that the Dodge City Juniper budworm population may face the same fate as those in Texas. The current situation will be monitored in 2011.

Bob Bauernfiend

Report from the Kansas State University Insect Diagnostic Laboratory:

The following samples were submitted to the Insect Diagnostic Laboratory from September 3rd to September 9th.

September 3 2010 – Dallam Co., TX – Spider mites in corn (orange diapausing form)
September 3 2010 – Leavenworth County – San Jose scale on pear
September 3 2010 – Pratt County – Pine tip moth damage on pine
September 3 2010 – Morton County – Bird mites in building
September 3 2010 – Fairfax County, VA – Hickory horned devil caterpillar around home
September 7 2010 – Shawnee County – Noctuid caterpillars (just hatched) in home
September 7 2010 – Leavenworth County – Black soldier flies around feed store
September 8 2010 – Haskell County – Winged formicid ants in yard
September 8 2010 – Sherman County – Velvet ant in home
September 8 2010 – Cowley County – Fall Webworm on Pecan
September 8 2010 – Sedgwick County – Drone fly on vehicle
September 9 2010 – Riley County – Green scarab, *Euphoria sepulcralis*
September 9 2010 – Shawnee County – Whitelined sphinx caterpillar

If there are any questions regarding these samples or about the identification of any arthropod please contact the Insect Diagnostician at (785) 532-4739 or GotBugs@ksu.edu.

Holly Davis

Sincerely,

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