Kansas Insect Newsletter

For Agribusinesses, Applicators, Consultants and Extension Personnel

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Rotenone: A Botanical Insecticide

There is mis-conception among the public and others that botanical pesticides (insecticides and/or miticides) or those derived from plants are actually "safer" than synthetically-derived pesticides. However, this is not true, as many plants produce some of the most toxic compounds so as to protect themselves from herbivores (insect and mite pests). In fact, certain botanical insecticides may be highly toxic to humans. One botanically-based insecticide that may be used in home gardens is rotenone, which has been utilized as an insecticide since 1848. Rotenone has insect and "some" mite killing activity; however, it is primarily effective as an insecticide. One of the major concerns associated with rotenone is that it is highly toxic to fish. Consequently, rotenone should never be applied around ponds, lakes, and rivers. Rotenone is derived from the plants, *Lonchocarpus* spp., or *Derris* spp., which are primarily grown in Malaya, Venezuela, Peru, and East Africa. Rotenone is extracted from the roots of these plants, ground-up, and commonly formulated as a dust.

Rotenone has both contact and stomach poison activity. However, it is most active when consumed by insect pests. It is slow-acting but insect pests stop feeding immediately. Products containing rotenone as the active ingredient are labeled against a variety of insect pests including aphids, sawflies, certain caterpillars (e.g., bagworms), beetles (e.g., Japanese beetle and flea beetles), leafhoppers, thrips, stink bugs, whiteflies, and some mites. Rotenone works by inhibiting cellular respiration via disrupting electron transport system in the mitochondria, which results in a decrease in the production of ATP (adenosine tri-phosphate).

Rotenone has been registered in the USA since 1947 and is commercially-available for use in gardens to deal with insect pests of vegetables, fruits, and ornamentals. Rotenone is sold as a 1% or 5% active ingredient, formulated as either a dust or powder. Dust formulations should only be applied when the wind is still. In some formulations, rotenone is combined with pyrethrins (e.g., pyrethrum); however, the use of these products is not recommended because rotenone has to be consumed by insects to be effective and the contact activity of the pyrethrins may reduce ingestion. Although rotenone is relatively non-toxic to bees (e.g., honey and bumble bees) it will directly kill beneficial insects such as parasitoids (parasitic wasps) and predators (e.g., ladybird beetles and lacewings) by contact.

Rotenone is not effective when the spray solution pH is >7.0. A synergist called MGK 264, which prevents insect pests from metabolizing insecticides, may be added to certain products so as to enhance the activity of rotenone. Rotenone is quickly degraded in soil and water, with persistence dependent on exposure to environmental conditions. For example, rotenone is quickly broken down under ultra-violet light resulting in a half-life between 1 and 3 days. Toxicity is 5 to 6 days when exposed to spring sunlight whereas toxicity is less

(2 to 3 days) under summer sunlight. Because rotenone is rapidly broken down under sunlight it is best to make applications in the evening.

Rotenone is one of most acutely toxic botanicals available with LD_{50} (lethal dose that kills 50% of the test population of rats) ranges from 132 to 1,500 mg/kg (milligrams of toxicant/killigrams of body weight) with variability due to differences in plant extracts. However, the oral LD_{50} is between 300 to 500 mg/kg; most typically cited as 350 mg/kg. Although this may be considered “moderately toxic” this is still more harmful than both the synthetically-derived insecticides, carbaryl (Sevin) and malathion. Furthermore, direct contact with rotenone may lead to irritation of the skin and mucous membranes. Rotenone was considered “safe” to use in organic production systems; however, due to recent studies that have linked possible rotenone chronic exposure to some forms of Parkinson’s disease in animals, it is no longer registered for use in organic production systems.

It is important to understand that just because pesticides are derived from plants or claim to be “natural” doesn’t mean they are “safer” to humans and other organisms. As such, always read the product label and exercise caution when applying any botanical pesticides.

Raymond Cloyd

Wheat Update

The bird cherry-oat aphids, greenbugs, and English grain aphids that were increasing in numbers in many wheat fields have continued to be really well controlled by lady beetles and parasitic wasps and /or other environmental factors, i.e. thunderstorms. Hopefully, this situation will remain well managed until harvest. However, in some wheat fields in Central KS, there are relatively significant populations of chinch bugs. For the most part, these bugs won't stress healthy, well-growing wheat plants. All the bugs are adults but they are in the process of mating and laying eggs so the small reddish nymphs will soon start appearing (see photo). These will feed more voraciously than the adults, so if there are thin spots in your fields now due to adult chinch bug feeding, these spots will probably get larger, especially if growing conditions become less than favorable. Also, if there are significant populations of chinch bugs in your wheat (1 chinch bug per ft. 2) then planting corn or sorghum adjacent to that wheat field would be very problematic. Please see Sorghum Insect Management 2012 for management recommendations:
http://www.ksre.ksu.edu/library/ENTML2/Mf742.pdf

Chinch Bugs, adult and nymphs

Jeff Whitworth *Holly Davis*

They're everywhere! They're everywhere! ------- Read on

Although I can clearly hear (in my mind) the above utterance, the closest that I can come to identifying the source (but I know it is not the real/original source) is the 1983 TV commercial for Converse All Stars (a brand of wildly popular, highly colorful sports footwear). Well I'm not going to talk about footwear, but rather, Ash/Lilac borer.

Earlier (Kansas Insect Newsletter #5, April 6, 2012), Dr. Cloyd presented a thorough description of the life cycle, particular habits, type of damage and recommended procedures for controlling the Ash/Lilac Borer (ALB). Dr. Cloyd emphasized the importance of relieving "plant/tree stress" as a step in stymieing ALB activities. This is especially important when dealing with newly transplanted plant stock which may require several years of coddling before becoming firmly established and more capable of standing on-their-own as near-mature/fully-matured trees. This is not to say that the latter category trees should be "forgotten" ---- just that they are 'better equipped" to absorb/withstand minimal and/or occasional ALB damage.

If insecticide treatments are being considered, the timing of applications can be predicated upon the presence/activities of moths. When first moving into the horticultural arena (1992), I queried Extension personnel as to pests-of-concern. ALB was a frequent response. Thus in order to determine the onset of ALB moth activities, I located a line of lilac (near Keats) in which I hung a series of wing traps baited with the clearwing borer pheromone lures. In 1993, male moths first appeared May 17. In 1994 and 1995, first-of-year (FOY) catches were April 19 and April 15, respectively. Thus for whatever reason, the 1993 "early birds" represented an outlier statistic. Mid-April appeared to be the norm.

A number of years passed before I again began trapping ALB ---- this time in a line of privet at an apartment complex within the Manhattan city limits (2003 – 2009). My intent was to collect moth specimens for use in displays. Thus to avoid sticky moths ensnared in wing traps, I used the top of a Catch Can Trap to which was secured a water-filled plastic bag (Figure 1). Trapped moths (treading water) were therefore easy to retrieve and use for display purposes.

Figure 1

Both the lilac and privet sites were somewhat inconvenient as they required travel. In 2009, I set out my "water-based" trap on the back deck of my house (Figure 2). This is the basis of, "**They're everywhere! They're everywhere!**" While there are no lilac, privet or ash plantings (that I am aware of) in the immediate vicinity of my home, I collect many, many ALB moths. So the moths appear to be generally in-the-air just passing through the neighborhood.

Figure 2

The following information represents the FOY dates that I have accumulated over the years:

4-13	4-14	4-15	4-16	4-17	4-18	4-19	4-20	4-21	4-22	4-23	4-24
2006		1995 2010			2009	1994	2003	2011		2004	2007

Not represented were 1993 (previously mentioned outlier), 1996 – 2002 and 2008 (no trapping) or 2005 (no retrievable information). What the presented dates substantiate is the initiation of flights towards the 2nd and 3rd weeks of April.

So what about our current situation? We already have experienced earlier-than-usual initiations/completions of seasonal cycles for European pine sawfly and eastern tent caterpillars (by 3-4 weeks). As of Saturday evening, April 7, ALH had yet to be caught in the above-mentioned pheromone trap. I was out of town April 8 – 14. But the evening of April 14 (after having arrived back in Manhattan), there were 55 ALB moths in the trap. Four were “fresh” ----- floating and struggling. The rest were drowned but in various stages of decomposition. The freshest “dead specimens” were still fairly well in tact (maybe only dead a couple of days) whilst others were quite mushy/discolored (3-4 days dead). So pushing back the calendar, this year’s Manhattan ALB flight may have begun April 10 or 11. While this was 2-3 days earlier than that of 2006, it was not what I would rate as excessively early. One reason could be that the unseasonably warm early-season temperatures did not have a penetrating effect on overwintered ALB larvae (and the initiation and completion of pupation) within their protective confines (a supposition on my part).

While the oft recommended initiation of insecticide applications against ALB is based upon/contingent on the peak moth flight as determined by pheromone trap catches, few people deploy pheromone traps. Thus they have no way of determining that activity point. Lacking that point-of-reference, I recommend that once a sustained flight (as opposed to a flight peak) is determined, that serve as the basis upon which to initiate spray treatments. And we are at that point-in-time. Refer back to Dr. Cloyd’s article as to insecticide considerations and recommended spray procedures.

Bob Bauernfeind

Report from the Kansas State University Insect Diagnostic Laboratory:

The following samples were submitted to the Insect Diagnostic Laboratory from April 13th to April 19th.

April 13 – Shawnee County – Inchworm, Family Geometridae on marigolds
April 16 – Lyon County – Hackberry nipplegall psyllids on around home
April 16 – Leavenworth County – Bat bugs in multi-housing building
April 16 – Douglas County – Clover mites and springtails in basement
April 18 – Pawnee County – Elm leaf beetles around home
April 18 – Morris County – Conifer sawfly larvae in Scotch pine
April 19 – Johnson County – Armyworm larvae in home
April 19 – Wyandotte County – Lasius sp. ants and carpenter ant damage in home

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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