November/December 1999

Millennium Subscriptions

This is your final opportunity to bring subscriptions out of arrears and into the next millennium. Subscribers who fail to pay for their newsletter by the end of January, 2000, are going to disappear from the mailing list.

To check your status, simply look at your mailing label. If the two digit number after your name isn't 00, 01, etc., then your subscription will become a Y2K casualty. Theoretically, that doesn't matter if you have a computer connected to the Internet, because my newsletter is supposed to be there. I understand that it is behind, again. I'll work on that (I do not have access to the server).

I have enclosed an easy to use form for those of you intending to catch up with the clock. It is on page 7, back to back with your address label, so that I know who you are. Thank you for your timely response.

Private Applicator Certification

Nearly every beekeeper in California who intends to treat his or her colonies with CheckMite+® (coumaphos) hive strips must be a certified Private Applicator and have the certificate and "labeling" (supplemental use instructions) in his or her possession at the time that the strips are being placed in the hives. The only exceptions are beekeepers who happen to be licensed PCA's or other licensed applicators.

How does one become a Private Applicator? Go to your County Agricultural Commissioner's office and pass a short, multiple choice test. How do you know what is on the test? Purchase a copy of the $7.00 U.C. publication, number 3383, titled "Pesticide Safety: A Reference Manual for Private Applicators." It should be available at the Farm Advisors' offices. The manual explains how to interpret pesticide labels, how to mix and apply pesticides, the hazards of pesticide use, and how to handle pesticide emergencies.

Most of this information is superfluous for your use of the coumaphos strips. But, pay particular attention to the safe handling information. Coumaphos is an organophosphate material. It's mode of toxicity is to knock out the functioning of the chemicals involved in transmitting nerve impulses. It has a cumulative effect on your nervous system. Be sure to use rubber gloves when working with the strips and try not to inhale the powder in the bags – it is pure coumaphos. If you can smell it, you are getting too much!

In March, we have to submit a new set of paper work to obtain a new Section 18 for the use of CheckMite+® strips. The original Section 18 expires in July of 2000. In that paperwork we have to report how well the treatments worked, what new alternatives are available (they specifically asked about formic acid, already), whether we had any serious negative effects using the material, and if our clientele obeyed the laws when using it. Mann Lake Ltd. has to share its sales records with U.S. E.P.A. and Cal. Dept. Pesticide Regulation. The number of Private Applicators who are using the product in California is supposed to match the number of California customers. If that is not the case, we may have problems renewing the Section 18. Without coumaphos, we are likely to have a real problem controlling Varroa. In many areas, the mites not only are resistant to fluvalinate, but also to amitraz. Amitraz was highly toxic to Varroa ten years ago. The following article explains the resistance phenomenon and why treatments should be administered only as directed.

Acaracide Resistance

The following article is reprinted from Vol. 31(4):74-75 of the Honey Producer Magazine, the periodical published by the American Honey Producers Association.

Proper use of pesticides to control varroa and to manage resistance.

By Patti J. Elzen, James R. Baxter and William T. Wilson, USDA, ARS, Kika de la Garza Subtropical Agricultural Research Center, Weslaco, Texas

Nature of Problem

Fluvinate (specifically *tau*-fluvalinate) resistance in Varroa is present across the United States, as evidenced by reports of poor control seen from California to Florida. With the advent of an additional pesticide as a weapon to fight Varroa, many questions have arisen: How does resistance develop? How can coumaphos be used to manage fluvalinate-resistant mites? How should coumaphos and fluvalinate be used in a control program? Will proper use of authorized pesticides result in residues in honey and wax? In this article we will attempt to address these questions as they relate to beekeeping operations of all sizes.

How Resistance Develops

We will examine how two different classes of pesticides *should* work, then explain how resistance causes pesticides not to work. This involves discussing some pesticide chemistry.

Fluvalnate (Apistan®) belongs to a class of pesticides known as the pyrethroids. Pyrethroids act on the surface of the nerves in Varroa (and other mites, insects, and animals). A lock-and-key relationship can describe how pyrethroids work: the pyrethroid is absorbed into the mite and then into the blood stream, where it travels to the nerves inside the mite. On the surface of the nerves are certain specific sites ("locks") where the pyrethroid ("key") fits perfectly. When the pyrethroid fits in the specific site, it causes the nerve to become unstable, quickly killing the mite.

There are two ways a mite becomes resistant to a pyrethroid such as fluvalinate. When the pyrethroid enters the mite and travels to the surface of the nerves, the specific sites where it is supposed fit are structurally changed – the pyrethroid cannot fit onto the nerve and exert its toxic effects. So the mite is not killed at normal doses. Another way a mite becomes resistant to pyrethroids can happen before the pyrethroid ever gets to the nerve site: when the pyrethroid is in the "traveling" phase of movement within the mite. Before it gets to the nerves in sufficient quantities, enzymes break down the pyrethroid to a harmless form. The mite is not killed. These are the two known ways that Varroa could become resistant to a pyrethroid like fluvalinate. The mite can have the first kind of resistance, the second kind, or both at the same time.

Coumaphos (CheckMite+®) is a different class of compounds from the pyrethroids, with its own different way of killing Varroa. Coumaphos, an organophosphate (OP), does not primarily work on the surface of nerves, but rather in the tiny space between nerves. Nerves send electrical impulses between each other throughout the body of Varroa. A substance works between the nerves to make sure the transmissions move along at a proper rate. Organophosphates combine with this substance, rendering the substance inactive, and the nerves miscommunicate with each other and the mite rapidly dies.

Resistance to an OP by a mite can arise two ways. First, the substance that works between the nerves changes slightly in structure, such that the OP no longer fits but not so much that it cannot do its normal biological job. If the OP cannot fit, the substance is free to conduct its normal actions. The mite lives and is resistant. Second, enzymes in the blood or other tissues of the mite break down the OP, before the OP has a chance to work at the site between the nerves. The OP is broken down, the mite lives and it is resistant. A mite can have the first kind of resistance, the second, or both.

As can be seen pyrethroids and OP's have different ways of acting in the mite and different possible ways that resistance can develop to each class. But how does resistance - any kind of resistance - come about in the first place?

How Resistance Arises and Spreads in a Varroa Population

Even before a pyrethroid or OP is used, a very small number of mites have the mechanisms of resistance from the start. We do not know why these mites have these ways of detoxifying pesticides before the pesticides are used. The most generally accepted answer is that the mites encounter things in their diet that are similar to the pesticides, and they develop a tolerance for these. When the pesticides are then used, the mites are already "programmed" to deal with these new threats.

At first there are very few of these resistant mites. But as a pesticide is used more frequently, these resistant individuals survive the pesticide treatment and dominate the mite population. As pesticide use continues, the resistant mites continue to "out compete" the susceptible mites and the resistant mites become more numerous. The migratory nature of beekeeping further spreads these resistant mites around the country, and more people notice control problems.

How to 'Manage' Resistance

With only two EPA-authorized pesticides available for Varroa control as of 1999, devising ways to lengthen the time each compound will be effective is of paramount concern. To prolong the life of each product as long as possible, we should follow the lead of other agricultural commodity groups that have dealt with pesticide efficacy and resistance issues. (Pesticide resistance has been a fact of life for over 40 years in some commodities). The key strategies are *rotation* of chemical types and *treatment* only when damaging *thresholds* have been determined.

The idea behind rotation of chemical types, or classes, is that pressure for resistance to develop to one pesticide is lessened over time as it is rotated with a different type of compound. As discussed previously, fluvalinate has a different way of acting than coumaphos. By rotating we decrease the chances for mites to become resistant to either compound. This does not guarantee that resistance will not develop, but rotating different chemicals should slow the process. Avoid treating hives with both pesticides at the same time. *And each pesticide type should be left in the hive only as long as the label recommends*—leaving the strips in longer than 45 days continuously favors the resistant mites; taking the strips out favors the susceptible mites and they predominate. Spraying bottom boards with liquid fluvalinate will hasten resistance, because the pesticide is present for extended periods of time.

The ideal resistance management strategy to take is to use fluvalinate when damaging levels of Varroa have been determined (by either roll or sticky boards) and then use coumaphos the next time Varroa need to be controlled. Of course, if resistance to fluvalinate is already present, there is no choice but to switch to coumaphos when Varroa are present in damaging numbers. We are currently investigating how long a beekeeper can wait before Varroa become susceptible again to fluvalinate; preliminary evidence suggests this is longer than one year. We think that continuing to use one pesticide exclusively until it fails to control Varroa, and the mites have developed resistance, is not a wise management procedure.

Safety of EPA Authorized Pesticides

How toxic are these compounds to bees and beekeepers, and what are the chances of chemical residues ending up in wax and honey?

Both fluvalinate and coumaphos, when formulated into plastic strips for treatment of bee colonies, have been rigorously tested to certify that they do not harm bees and beekeepers ***when used as the label specifies.*** Misuse of either compound, either by treating too often or using liquid/powder formulations registered for other uses, can lead to serious problems. In plastic strip form, fluvalinate and coumaphos leave negligible residues in both honey and wax. A tolerance of 0.05 ppm has been established for a number of years for residues of fluvalinate in honey; there is no tolerance for fluvalinate in wax. With regard to coumaphos, the EPA has looked at all available data and proposed uses, and concluded that there is no reasonable expectation of residues of coumaphos in commercial honey and processed beeswax used for food or cosmetics from the Section 18 use of bee strips. The EPA has classified the Section 18 use of coumaphos as a non-food use and no tolerances were established in either honey or wax. This means that coumaphos may be used only when bees are not producing honey. It is important to note that this “no tolerance” for coumaphos does not mean “zero” tolerance. What this does mean is that if the coumaphos strips are used according to Section 18 labels, there should be little residues present; it does not mean absolutely no or zero resides can be present. In summary, unacceptable residues are likely if liquid fluvalinate or liquid/powder coumaphos are used in the hive.

Future Outlook

In other agricultural commodity groups there are long lists of pesticides available for use in controlling pests. However, the U.S. bee industry has only two legal compounds for Varroa control. We must continue to use these compounds in a responsible manner. Efforts must continue by researchers and industry to develop new classes of compounds, so that rotational strategies are most effective. The process of developing and registering a new compound for Varroa control can take up to ten years, so all efforts should be made by beekeepers and researchers to ensure that present and future compounds are used in the most responsible manner possible. Without proper use, the U.S. could face a situation such as in Europe, where, over the entire continent, there has been recorded resistance by Varroa to all pesticides Europe has at its disposal. Only with care and diligence can we prevent such a dire situation in the U.S.

(Mention of a product does not constitute an endorsement by the USDA).

Honey Bee Importations

After many years of petitioning, it appears as though live honey bees may be imported from New Zealand into the U.S. by beekeeping customers. Salient details of the December 9, 1999, Federal Register

(continued on page 7)

Latest Publication on Safe Uses of Pesticides Around Bees

"**How to Reduce Bee Poisoning from Pesticides**" was printed and became available to beekeepers and other interested persons in August of this year (1999).

Following some general information on bee poisoning and how to prevent it, the publication lists currently used pesticides, whether or not they should be applied to plants (crops or weeds) in bloom, at what time of the day they can be applied with minimum danger, and the approximate duration of bee-toxic residues in the field, after application, in hours or days. The text does not include LD_{50}'s or "slope" values, as did Larry Atkin's old publication L2883 (1981) from UC, but there is more than sufficient information for growers, applicators, agricultural commissioners, and beekeepers to determine the likely consequences of using these materials around bees.

To order one or more copies of this Pacific Northwest Extension Publication (Washington, Oregon, and Idaho cooperating), we must order from out of state at this time. UC may eventually get their own copies to disseminate.

"How to Reduce Bee Poisoning from Pesticides"
PNW518
Bulletin Office
WSU Cooperative Extension
P.O. Box 645912
Pullman, WA 99164-5912
Toll-free Order No.: (**800**) **723-1763**
Inquiry Phone: (509) 335-2857
FAX: (509) 335-3006
Email: bulletin@coopext.cahe.wsu.edu

Single copies of the publication cost $ 1.50 plus mailing (refer to table below). Quantity discounts of 15% are given on orders of 100-249 copies of a single title and 25% on orders of 250 copies or more of a single title. Orders must be accompanied either by check or money order (payable to: **Cooperative Extension Publications**), purchase order, or credit card information.

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(continued from page 5)
document, “Risk Assessment: Importation of Adult Queens, Package Bees and Germplams of Honey Bees (Apis mellifera L.) from New Zealand,” are extracted from Tom Sanford’s apiary newsletter “Apis.”

This document catalogs diseases and pests found on the United States mainland and Hawaii, as contrasted to New Zealand. It states: “Based on the history of honey bee importations into New Zealand, the absence of any reports of species other than Apis mellifera or of other adverse subspecies or strains, New Zealand honey bees are considered equivalent to honey bees in the United States.” The only real concern appears to be with American foulbrood. However, the document states: “Combining the risk ratings for consequences and likelihood of introduction, we conclude that the overall pest risk potential for P. larvae larvae is low. Although this pest already occurs in the United States, its listing as a pest of international importance relative to the movement of honey bees requires caution. Apiary inspection programs in the United States also monitor this pest to prevent its movement in interstate commerce. However, the statutory measures for AFB prevention and control in New Zealand are at least equivalent to those imposed within the United States. Consequently, the inspection and certification program currently used by New Zealand for honey bee exports to other countries where AFB is endemic and under statutory control are adequate for shipments to the United States.”

With reference to other possible problems, the risk assessment

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For **new subscriptions** or **address corrections**, please use the form below.

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____

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Please submit the completed form and a check covering the cost of your requested subscription period, made payable to **The Regents of UC**, to Dr. Eric Mussen, Entomology, University of California, One Shields Avenue, Davis, CA 95616-

concludes: "We found no evidence of adverse species, subspecies or strains of honey bees that would be of concern relative to the importation of honey bee germplasm from New Zealand. Likewise, we found no viruses or other disease organisms that posed significant risk to the import of germplasm.

We recommend that all queens and package bees exported from New Zealand to the United States be from apiaries inspected and certified by New Zealand regulatory officials as:

1. The bees are a product of New Zealand
2. The bees are derived from an apiary or apiaries registered and inspected under, and otherwise complying with, the Biosecurity Act of 1993 and any regulations made under that Act.
3. The brood combs in the hives from which the bees are derived showed no clinical signs of American foulbrood on the day of collection."

Comments on this document are solicited until February 7, 2000. Send four copies to: Docket No. 99-091-1, Regulatory Analysis and Development, PPD, APHIS, Suite 3C03, 4700 River Rd., Unit 118, Riverdale, MD 20737-1238.

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