The following are a series of articles prepared by Mryl Stone for the Chester County Beekeepers Association newsletter column on the subject of varroa research and management. Mryl has generously allowed distribution to SBA members.

Nov 2015

Welcome to a new CHESCO monthly newsletter column. This column is a kickoff for a new task group that is being launched by your club. The focus of this endeavor will be aiding members in the continuous battle with the varroa mite scourge. Two objectives are paramount. The first requirement – this project must yield workable, in the bee yard, useful guidance and advice. Generating charts, data sets, and graphs will not be a goal. The second requirement – the project must be useful to all club members. The beekeeping community includes many subsets, a number of which are represented in our club. The hobbyist, the sideliner, the beginner, the skilled, the traditional, the natural, and more are sitting at our club's table.

The mite has been with us for roughly thirty years. Where do we now stand? Answer – treading water would be the most optimistic assessment. Earlier this summer at the Western Apiculture Society conference held in Boulder CO, Dr. Marla Spivak commented on the varroa problem. The reports are she stated that varroa has gained the upper hand. I'm sure the listeners expected to hear a declaration on pesticides or loss of forage base, but varroa? Haven't we been working and moving forward against varroa for almost 20 years? Working, yes – advancing, no – winning the battle, a resounding no! The hum in the bee world could be likened to the reaction of a hive struck with a hammer. Dr. Spivak's work places her in the absolute top echelon in the bee research field. When Dr. Spivak speaks, the bee world listens.

Recently, Bee Culture magazine hosted a symposium "The Four Pillars of Management". I attended this meeting, and I have been home just two days as I sit writing this article. The group consisted of approximately 150 attendees holding in aggregate roughly thirty thousand colonies. Keynote speakers included Dr. Dennis VanEngelsdorp and Randy Oliver, and family names holding thousands of colonies, Miller, Card, and others. Included in the group were small commercial operations and sideliners like myself. Rounding out the crowd were folks holding only a few colonies. This symposium will be the subject of a club meeting report that we will fit into a future meeting schedule. Until that time, I am presenting some key points from the event.

The data keeps flowing in, year after year. One can analyze the collection criteria; parse the numbers but the news remains bad - very bad.

An unmanaged or untreated colony has a life expectancy of one to five years. If one ignores mites, the colony will die.

Queen genetics may aid in control of the mites within a colony, but it being a solution to the overall problem is not clear. One speaker who runs thousands of colonies is participating in the sponsored Russian bee project. He was reluctant to

offer an opinion of success. Dr. VanEngelsdorp did make a comment, which caught my ear. The mite will reproduce six to nine generations for each queen's effective laying life. My conclusion is that the mite's reproduction rate has aided in its ability to adapt. The resistance to certain chemicals developed quickly. As we breed queens for resistant traits, will the mite not adapt with a corresponding evasive behavior or characteristic? Another factor working in the mite's favor is rooted in the method of reproduction. For readers with much spare time on hand, I suggest researching arrhenotokous reproduction.

The mite transmission mode is now reasonably well understood. The mite moves from colony to colony attached to wandering drones and worker bees. Any mite infested colony in a fellow beekeepers yard or feral habitat within three miles of another colony (your colony) has a very high chance of infecting that colony (again, your colony). During the summer months this may be only a trickle of mites. However fall brings on a new behavior – oh, how our bees love to rob! If a heavily mite infected colony is dwindling or dead, vicious robbing will often ensue. Bees, being bees, will discover, rob and scour the sick colony clean of honey within hours. The mite population will take advantage of the opportunity and hitch a ride to their next host's home. The assumed clean colony quickly becomes grossly overloaded with mites and will most likely die during the upcoming winter. Dennis dwelled on this subject making it one of the key points in his address. The term "mite bomb" has been entered into beekeeping lexicon. Are mite bombs falling on your colonies? I do know that I will be keeping a very close eye on my colonies as the fall progresses. I must add, the three-mile number noted above is a soft figure – closer increases the odds of transmission, further lessens the odds.

Parasitic Mite Syndrome (PMS) was another topic discussed. We can expect more attention given and research devoted to the virus transmission aspect of mite infestation in the future. Comments indicated that many commercial operators are already working on mite diagnostic and response models based on PMS observations.

We, as a club, can expect a call to action in the upcoming months. Bee journalists will not let this symposium go unnoticed. A cry for better education, better colony oversight and better colony management will go out.

I began keeping bees in 1965 - some would say in the good old days. The good old days, you may ask – the pre varroa mite era. Nostalgia is a powerful emotion, however often misleading. I helped dig the burn pits into which hives were placed and witnessed bee inspectors overseeing the burning of complete colonies infected with American Foulbrood. If one peruses early bee literature, one will discover that disease, pests, and other calamites have been endured by generations of beekeepers. We have not escaped this repeating pattern; our challenge is the varroa mite.

Dec 2015

Thank you for attending our last meeting and for participating in the Q & A forum following my talk. The Q & A is very important to me as it provides a much needed feedback mechanism. I am beginning this month's article with two true stories.

Once upon a time, I attended an evening beekeeping presentation. Yes a cliché opening, but the following story is true and I do wish to protect the speaker's identity. I paid my entrance fee, drove many miles to attend and drove many hours into the night to return home. A well-known speaker was on the agenda. He delivered his address and then moved into a question and answer segment. Each answer was delivered with skill and clarity, however each began with, had embedded in it, or ended with the clause, "*it all depends*." My immediate reaction was if "*it all depends*" then my notes taken during the presentation were really of little value. During the long return drive, I was thinking about the perceived waste of my time and money, however – let's call it a beekeeping epiphany - it dawned on me that my skill level advancement would require the learning of hive or colony nuances. One answer to fit all situations was not possible – the key to advancement rested in the "it *all depends"* realm. That realm is where I needed to concentrate my learning efforts. The speaker needed an out, an escape route. One's answer will always be correct if "*it all depends"*.

Our second story begins in my childhood. I grew up on a large dairy farm and agricultural operation. My father and his brother owned and operated the farm, and the farm's management presented a steady stream of important and potentially profitable or costly decisions. My uncle's term for this decision making process was an "*educated guess"*. I always liked that term - honest, to the point. Something a grandfather would utter; a grandfather with his feet planted firmly in agriculture. The term is like a balance scale – less education and the guess factor increases – more education and the guess factor decreases. In context of our *"educated guess"* term, all possible relevant information, observations, and experience fall into the educated category. The remaining uncertainties such as weather and the fact that we are dealing with a living creature fall into the guess column. It is often said with a chuckle, "Bees forgot to read the instruction manual. " Yes a joke, but a bit of wisdom to remember.

Pulling these two stories together, I'm sure you already know into which category I fall. I'm an educated guess type of fellow. If one makes a colony management decision based on observations and knowledge and then follows through on the chosen course, one will become a smarter beekeeper. The decision may not be the best, but one will build a baseline, a building block to knowledge. Muddle along and one's knowledge acquisition will be just that, a muddle of experiences, which never quite fit together. Ignoring varroa, muddling along, will have one outcome – a dead colony.

In the upcoming articles, we will begin delving into the varroa's life style, its strengths and weaknesses. Yes, its weaknesses. We will begin the process of learning to make meaningful timely observations, moving past the snapshot view of a mite drop or mite

roll count. We will look at the mite's life cycle, the honeybee's life cycle and how they interact – interesting relationships which we can manipulate and exploit in the control of varroa.

In closing, have a Merry Christmas, Happy Holidays, and enjoy a bit of cooking with your summer's tasty honey reward.

Jan 2016

In the past two newsletter issues, we have discussed the importance of monitoring varroa mite populations. Now we will look at some examples in mite control strategy. I'm going to follow a simple one-year control cycle. We will begin in the spring just coming out of a successful overwinter phase. Successful here will mean the colony is alive, often no mean feat if varroa mites have been ignored.

Before beginning, I would like to explain an important term which some may be familiar with, but others not. The term is *Integrated Pest Management,* often written as *IPM*. *IPM* is a cornerstone of modern day agriculture and can be defined as a coordinated collection of pest management techniques combined so as to place maximum negative pressure on the targeted pest. Early in the history of our varroa mite problem a chemical treatment was developed and applied to the colony. Simple but in the long term ineffective, the mite developed a resistance to the chemical after repetitive treatments. Enter IPM - however let's not fault these early chemical attempts, as the use of IPM requires a detailed knowledge of our targeted pest, a knowledge base that initially did not exist.

Screened bottom boards with sticky boards came about because someone noted that the mites would sometimes fall to the bottom of the hive but were able to crawl back up into the colony. Screened bottom boards with a sticky base in themselves are not adequate to control varroa but the board will put pressure on the mite populations. Likewise with the drone larvae removal plan – at times in the year, it can place severe pressure on the mite population growth. Splits place pressure in creating an artificial brood break; varroa can reproduce only if brood is present. These are all tools which can be used and when combined, place a very heavy negative pressure on the varroa mite. The combining or application of practices will be determined by hive dynamics – screens are quite benign and can be left on year round – drone cells must be present to utilize the drone removal technique, a colony must be very populous to use the split method. Splits are interesting because they get to the heart of IPM. One could see swarm control, hive count increase, requeening, and varroa control rolled into one hive manipulation event. Here we have a yard labor expenditure yielding a three to one gain towards a management goal.

Let's take a simple example and apply it to our hive. The solid bottom board is removed and a screened bottom board with sticky paper is put in its place. Now we can begin capturing falling mites, but more importantly we will get an idea of the overall hive mite population. I'm going to simplify the mite population evaluation process – if one inspects the board and sees a mite here, a mite there, oh- there's one, oh – here are three, and so forth; this equals *BAD*. If one must diligently search to find even a very few mites – this is equal to *not so bad*. If one finds no mites whatsoever, one is either extremely lucky or unskilled in identifying mites. I'm going to use this nomenclature for the remainder of this article – *BAD* and *not so bad.* Yes, there are more scientific methods in identifying mite loads, but we will set them aside for the moment. I will

make the analogy – one is sitting at the table at an outdoor picnic, a fly lands on ones plate – shoo, go away; later another fly lands – scowl; suddenly fifty flies alight – yikes, disgusting: push the plate away. Wasn't that an easy decision? – *Not so bad and BAD.* Of course those who misinterpret flies as being simply pepper, _ _ _ _!! : The same situation as not being able to recognize mites. There is no need to count the number of flies in any one quadrant on the plate – mite counts are coming to this.

Addressing the *not so bad*, the screen and sticky paper remains in place and we will begin pulling drone larvae. This can be done passively when we do our hive inspections. Burr comb containing drone larvae is removed. An uncapping fork is used on patches of drone larvae. Since the mites much prefer drone cells doing this larvae removal will place pressure on the varroa reproductive process. I might add this is also an excellent technique in evaluating mite load. The BAD will require a more aggressive handling. The aforementioned techniques will remain in place. Consulting a treatment selection work sheet which can be found in most bee equipment supplier's catalogs, (Betterbee, Mann-Lake, Brushy), we can select an appropriate treatment. Available are many products fitting the non-harsh chemical category. I'm not going to recommend as the technology is constantly evolving, each hive is different, weather conditions vary, and in addition each beekeeper's sensibilities must be taken into account.

As the season progresses into late spring or early summer a split and requeen of the original colony will be executed. This applies to both mite level categories. A sugar dust could be worked into the summer strategy. This will provoke a higher phoretic mite drop rate as the bees groom themselves of the sugar dusting.

We have now reached late summer/ early fall season and we are now entering what could be termed the colony killing season. As drone production slows, the mites are robbed of their favorite reproduction sites. From the mites point of view, "No problem, here are worker larvae, we will simply move next door into these waiting cells." If there are a significant number of mites making this move, the colony is doomed. We may see a fall dwindling and death, or later find a winter dead out, but in any case the colony will die. Because of the critical nature of this moving to worker brood phenomenon, all colonies must be handled with a mite control agent. Again consulting the treatment charts an appropriate agent will be chosen. A *BAD* or *not so bad* colony will influence the treatment selection. Remember the term introduced and defined in a previous article an *" educated guess "*. Take your hive observations, apply them to the table criteria, and make an *educated guess*. Your decision may not be the best, but it will be much better than doing nothing. Each season your decision making process will improve.

The fall and early winter plans are a continuation of your late summer/ early fall strategy applied to all colonies. The oxalic acid vapor process can fit handily into your strategy. The process does have some potential pitfalls and can present some confusing conundrums both of which can be avoided and be explained – a subject for a

subsequent article. If one is not comfortable with the oxalic vapor application, the chart can be consulted for alternate handling. Our final winter strategy – I would suggest the Oxalic acid dribble treatment. This procedure has gained traction as a standard, “put the bees to bed for the winter”, final mite control step. The dribble formulation is very inexpensive, very effective, and as everyone attending our club’s recent application demonstration observed, very quick and easy. A couple of notes I should make. If a chemical treatment was or is used – do not repeat/follow with same chemical; this is how resistance is built. An exception is oxalic acid. I was a part of an informal conversation with a noted bee research scientist and someone asked if mites could develop resistance to oxalic acid. With a chuckle he answered, “about as much chance as a human developing resistance to mustard gas.”
This was off the record of course.

In conclusion, here we have a simplified varroa mite management plan. Many of the steps involved can be incorporated into routine good practice hive inspections and hive manipulations. Synthetic mite control chemicals can be avoided and the cost can be minimal. Moving on to more advanced mite control programs and the harsh chemicals will save more hives, however a basic simple program can be the salvation of thousands of colonies.