MAY 2006

Bee Culture

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It's apple blossom time. Benjamin Sage is a professional horticultural photographer and also operates a farm market and orchard in Chardon, Ohio. You can see more of his work at www.basage.com

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Bee Culture

THE MAGAZINE OF AMERICAN BEEKEEPING

MAY 2006 VOLUME 134 NUMBER 5

FEATURES

DEPARTMENTS & COLUMNS

Comments
Suggestions
Criticisms
Kudos, and
anything else

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Testing Protocol

TO THE SCIENTISTS OF THE WORLD

I just read a few articles and I am starting to be really concerned with what I am reading. Everyone is using a different testing method, times and numbers. Can you bring the following issues to the floor and confirm that what I collected is either the truth or incorrect in testing and threshold practices.

Supposedly, a few years ago, an unwritten convention was generally agreed upon by most scientists. It may be time to write it down. Below are, at the present, rumors without written proof, which I generally use.

1. Data and the number of mites collected by samples, either by sugar roll, alcohol wash, soap wash, are considered inaccurate. As samples from the same hive from different places can have 0 to 20 or 200 difference. Rumor is that this originated at the Swiss Bee Research Institute.

2. Drops induced by pesticides are inaccurate as the resistance is unknown.

3. The only correct measure is "natural drop". This collected over a minimum of three days and a maximum of five days and prorated into 24 hours. I was reprimanded when I used to recommend the alcohol wash as most reliable by Canadian scientists.

4. The "pesticide drop" must be collected for the first 24 hours of the application but no more than 48 hours and prorated to 24 hours.

5. If the "man made pesticide drop" is 20 times more than the natural drop then no serious resistance should be expected. Below 10 times the treatment may not work.

6. For natural substances like acids, and essential oils, this multiple can relate to the efficacy of the treatment. However, the relation between the multiple and the level of infestation needs more testing.

7. *Varroa* tests are most effective in:

• The Spring – just before Spring buildup

• The Fall – late Summer when the queen reduces laying to produce Winter bees

8. Test and treatments in October are too late and inaccurate as both Summer bees and Summer mites are dying off. I have more mite droppings in October after a treatment than before and in the Spring the same hives were clean with two to three mites 24 hour prorated natural drop.

It is also possible that natural substances like formic acid using the low dose continuous prolonged method actually make mites sick and they continue dying in large numbers long after the treatments theoretically end.

This was much more evident from the Canary Island test in 2005 available on our website at www.mitegone.com in the scientific evidence section.

Is it possible to instigate a discussion paper so all scientists talk the same way about the same subjects and use the same methods.

Bill Ruzicka
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Pure & Natural

In reference to *Inner* Cover, March, 2006, I think the (National Honey Board honey purity) poll results were rather sad. It only reflects what people believe these days about nutrition and health. I agree that "pure and natural" needs to be shouted from the housetops, but I think its an issue that goes much deeper. People need to be educated. The term "pure and natural" is no longer understood in what it means in regards to their health.

For years now doctors and the media have been telling people that a low-fat diet is the healthiest way to eat. So what does that mean? It means eliminating from your diet some of the purest and most natural food you can find, such as nuts and butter. I know the argument continues that some fats are better for you than others or that they are O.K. in moderation. But what about this question? Why would an all-loving, omnipotent God create a cow to produce milk and cream for the nourishment of humans (His most magnificent creation) and at the same time have that nourishment be something that will kill them? So doctors have persuaded the public that the alternative is much better for them. A butter substitute made with man-made chemicals, and joy of joys, *it's fat free*! What a deception!

So now a new craze is sweeping the nation – low carb diets. And what is honey? A high carbohydrate food source. Once again people are being persuaded that that alternative is better for them. Their bodies need a low carb item filled with sucralose, malitol, and whatever else adds sweetness but, joy of joys, not carbohydrates!

Foods in their most natural state are what our bodies need. "Pure and natural" needs to be preached and along with that the message of what it really means. Its swimming upstream against the cry of the media and trusting our Creator that He knows best. Butter and honey taste better because they are supposed to!

Have you tried a generous amount of that combination on a thick slice of whole wheat toast lately? YUM.

Cindy Byler
Garrettsville, OH

Summer/Winter Death

In the Northeast there has been large winterkills of bee colonies for various reasons, but I propose that there is more to it than just bad luck.

How many of you have bees not make it through the Winter or die in the early Spring? Have these bees died with honey just inches away? Did the dead bees die in a cluster with their abdomen sticking out of the cells? (By the way this called starving to death.) How big was the cluster, was it the size of your fist covering the inside of two frames or was it the size of melon covering three or four frames?

The signs point to starvation but I propose they died of clusterization problems. Let us take a look at what goes on inside the hive before they die. Going into the Winter the bees should be in the bottom box with food reserves above them. As temperatures drop the bee cluster together generating heat by shivering (contracting their wing muscles). As the bees eat their food they move from now emptied frames to frames that have food. The bees move as a cluster and by doing so they keep each other warm. This is how it's supposed to work. Unfortunately if the cluster is too small to adequately keep each other warm the bees can die of starvation even with food inches away. This is a cluster problem – the bees being unable to move to frames with more food. What caused this, how did a populous colony in the Fall dwindle down to nothing only to die of starvation with food inches away?

I believe the answer lies in what happens in the dearth time. In the month of July we have started into a drought-like condition, which usually lasts to September. The queen also stops her egg laying during this dearth. No rain during this time doesn't allow the flowers of late Summer/early Fall to provide the bees with sufficient nectar or bloom time to adequately repopulate and put away stores for the Winter. Remember, the queen starts to increase egg laying with the incoming nectar flow. This nectar flow is too short to provide the time for the queen to lay enough eggs to build up the colony with Winter bees. So the colony goes into the Winter with old bees that probably hatched out in July or August and the probability is high it will die before next Spring.

I got a clue from my observation hive the fourth week of July. My observation hive is set up in my garage with the bees traveling outside through a window. The observation hive went from lots of brood in various stages and plenty of food to no eggs, no food and an inch layer of dead bees in the bottom of the observation hive. It was going down hill fast. I made up some sugar water, 1:1 and added an Apistan strip. Within one day they cleaned up the dead bees and by the third day there were eggs to be seen. This stimulant feeding brought this colony back from the grave. I then checked my other colonies only to find they also had little or no brood, some with no signs of eggs and what had been a large hive body with plenty of honey to nothing. The only difference was these had Apistan strips since the honey supers were removed the first week of July. These colonies are not pleasant to work since all the bees are home and, the temperature is hotter. But these also were fed 1:1 sugar water. I checked on these colonies one week later to find the stimulant feeding to produce similar results. There was one colony in particular that had no eggs the prior week making me think it was queenless, it now had three frames with eggs in it.

I concluded that with no eggs in the Summer no bees for the Winter. I rarely go into the colonies in the HOT Summer months, since the bees are more aggressive and they stay that way for days after you're in them. By watching the observation hive I was able to see what was taking place inside my other colonies. Remember when the queen lays an egg it takes 21 days for the worker to hatch out. By feeding 1:1 in the Summer the queen can lay enough eggs to provide a work force to collect the Fall nectar flow and build up enough of a population to carry the colony through the Winter. Eggs laid in late August through October will be the Winter bees that will get the colony through the Winter, provided you have a young egg laying queen.

Perhaps you should feed your bees in Summer to help get them through the Winter! Of course other Fall management techniques are needed also which you could read from any number of books. But don't neglect the basic management of helping colonies have young bees to successfully over Winter.

David Kelly

Mite Treatment Lineup

I would just like to comment on an article written by David VanderDussen - *Staying In The Bee Business (2006).* David wrote about a variety of management issues facing beekeepers in this new century. But I found especially helpful the lineup of mite controls available in the U.S. He gave the pros and cons of each. This good information helped me decide which kind I was going to use. He also gave information on treatments that are available in other countires, like Oxalic Acid and hopefully, in the U.S. when the ag politicians get it all sorted out. Well done David.

Brent Bean
Sawyer, MI

INNER COVER

There is a well known and often repeated legend that says that the USDA will do anything and everything in its power to keep food prices in this county cheap. Anything and everything. And when you look at what percent of your weekly income you spend on food, compared to anywhere else in the world you instantly know that the legend is in full force. We eat cheap.

Perhaps it's not just the USDA's mission statement, but congress' philosophy, and the USDA has been charged with carrying out the mandate. Or maybe it's the big agribusiness conglomerates – the mega processors and ag chemical companies – who without question pull some of USDA's strings - that want costs low and profits high.

In any event it seems that somebody somewhere looses sleep every night trying to figure out how to keep ag producers of every kind from making a living, while every middle man and end consumer in this country benefits from their efforts.

No? The public picture is pretty clear. There is reluctance on somebody's part – to support the Country of Origin Label law (COOL); reluctance to enforce all manner of food safety regulations; resistance to support and enforce pesticide label laws (read Tom Theobold's commentary in this issue); and all manner of other and more restrictions, user fees and blatant refusals to uphold and protect producers – so that prices are kept low for the middleman and end users.

Oh, by the way, you are one of those end users. You, too, benefit from this conspiracy of producer persecution. Your eggs, meat, vegetables, fruit, bread, rice, cotton, milk and poultry all are relatively inexpensive because some producer somewhere is pushed to the edge every day, in every way. Don't forget that.

Yes, I know it's not The USDA that's responsible for this. It's some individual, or group of individuals that make these decisions – or don't make them. Nevertheless, the legend persists, doesn't it? From generation to generation. From administration to administration. From Cabinet Secretary to Cabinet Secretary. Like it has a life of its own, that legend.

Perhaps it is the ghosts of Grover Cleveland (who created the USDA), and Norman Coleman, (the first Secretary) who pursue and persist in perpetuating the legend.

Or, maybe Wendel Berry had it exactly right when he commented "Cheap at any price."

The question, then, is how cheap can it get?

•

Meanwhile, in other sectors of the USDA family, good things and new things are happening. At the Beltsville Bee Lab, Dr. Mark Feldlaufer has moved on to become the Research Leader at the Chemicals Affecting Insect Behavior Lab (CAIBL). Mark had been at the Bee Lab since 1998. Dr. Jeff Pettis has taken his place. Jeff tells me that because of extreme budget restraints Dr. Feldlaufer's position will not be filled, but the lab will be able to keep and use his salary funding to put toward research. Another case of eating your seed corn I guess, but it's the best they can do Jeff says.

In case you don't know Jeff, he received his B. S. and M. S. from the University of Georgia and his PhD from Texas A & M. He did post doc work at Simon Fraser University in Canada and has been with ARS in Beltsville since 1996. There he has worked on mite problems, queen issues and other honey bee health problems.

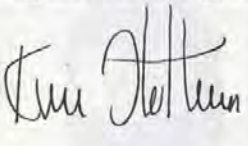
His most recent concern deals with the persistence of Tylosin and its breakdown products in honey. "Tylosin", he says, "is a very stable and persistent compound and recent sampling in Canada, shows an increase of from 5% of samples with residues in 2004, to 23% in 2005, supports that concern".

The Beltsville lab worked hard, along with the FDA, to get Tylosin registered he added, and he doesn't want to see it misused. He has thoughts on what can be done to reduce this problem and will be sharing them as soon as he gets settled in his new position.

"In the meantime, he cautions, if you export honey ... most countries do not allow <u>any</u> detectable levels of Tylosin, summer and fall treatments are best, and <u>only</u> where there is an AFB problem."

Jeff is, I might add, 1996 recipient of the EAS Student Award, and the 2004 Recipient of the EAS Hambleton Award. Few in the academic community have achieved this distinction. I am confident the beekeeping community, and beekeeping research in general will be well served.

So, May's here, Spring's here and you need to be really sure your hive tool's sharp and your smoker's lit. It's beekeeping time again. Have a good season...



CHEAP FOOD; and, JEFF PETTIS

Commentary

Education can not only improve the mind, but also prepare people for financial and business success. But degrees, per se, may not do either.

A. Gary Shilling

A recent Pew Charitable Trusts study examined the literacy of American college graduates in three areas: analyzing news stories, understanding documents and possessing the math proficiency to handle things like checkbooks and restaurant tips. The results were deplorable. Half the graduates of four-year colleges and three-quarters from two-year institutions lacked the skills to understand credit card offers. They also couldn't interpret tables relating exercise to blood pressure or understand newspaper editorial arguments.

It just isn't many college graduates that are unequipped to handle everyday tasks. Gov. Jeb Bush is justly proud of the advances in test scores for Florida's public school students, but the levels are still disquieting. Students reading at or above grade level have risen from 46% in 2001, but still are barely over half, 53%. High school graduation rates are up from 60% to 72%, so 28% still leave without high school diplomas. And what's expected of students at all levels has been dumbed down tremendously in recent decades. When I took the SATs in 1955, perfect scores were unheard of. Now they're routine after standards were lowered in response to pressure from minority groups.

When I graduated from Amherst College a few years later, one in the class made *summa cum laude* and about a dozen of us were awarded *magna*, less than half those elected to Phi Beta Kappa. But then college faculties hyped grade inflation during the Vietnam War to help new grads escape the draft. So when our daughter graduated from Amherst in 1993, there were more than half as many *summas* as Phi Bets. Furthermore, the best graduate students in America's top universities are often foreigners. And they come from much cheaper education systems. In 2000, the U.S. spent $10,240 per pupil in elementary school through college compared with $6,361 on average for 25 nations. Yet American 15-year-olds ranked in the middle of the pack in math, reading and science scores, and their high school graduation rate was below international averages.

None of this is surprising. Americans always have seen education as the route to business and financial success, a long way from Plato's Athenian Academy where intellectuals concentrated on developing their minds while avoiding the crass everyday world. That concept moved to Northern Europe with the Renaissance. In Shakespeare's *Love's Labour's Lost*, King Ferdinand of Navarre and his gentlemen agree to make his court "a little Academe" of learning for three years. They swear off women but, of course, romantic relationships wrecked the whole plan. Well, at least they didn't shift to dispensing condoms, as is often true in schools today.

The good news of the American education-financial success association is that businesses can rely on colleges to screen their job candidates. Employers generally are assured that top school graduates have the best prospects for success – whether it's because those institutions do a great job at education or because they attract the cream of the crop. The bad news is that higher education is available for any intellectual level as long as the tuition is paid by someone – often the government.

In the post-World War II years, all manner of colleges have been established. In 1955, President Eisenhower met with the top winners of the Westinghouse Science Talent Search and told us that he hoped for a community college in every American city. Today, 38% of people age 18-24 are in college compared to 10% in 1950.

But as higher education quantity has soared, quality has dropped. Many institutions are mere diploma mills, graduating students of limited intellectual capability. Wall Street firms and management consultants fawn over MBAs from Stanford and Harvard, but won't even interview the legions of night school MBAs from second-rate institutions, taught by poorly-paid adjunct professors of questionable quality.

Reforming this system is tough, but employers can help by making it clear that a college or graduate degree by itself doesn't cut much ice. Those who don't come from first-rate institutions or can't pass rigorous tests need not apply. This would discourage many from spending their time and money on worthless degrees and encourage their pursuit of fruitful education and training.

It also would reinforce those who want to reform elementary and high schools. The Administration's No Child Left Behind program encourages rigorous testing and merit pay for teachers. Others like Govs. Bush and Schwarzenegger advocate vouchers to create competition to force public schools to improve. Magnet schools and private schools for minorities are other options. So too are the special public high schools for promising minority women promoted by Ann Tisch in the Northeast and Lee Posey in Texas.

Education can not only improve the mind, but also prepare people for financial and business success. But degrees, per se, may not do either. BC

A. Gary Shilling is an Economist, a sideline beekeeper, and regular contributor to Forbes *magazine.*

Commentary

How big does the crisis have to be before someone starts to do something?

Tom Theobald

On March 3rd I spoke on the second day of a three-day agricultural conference in Greeley, organized by Colorado State University and The University of Wyoming Cooperative Extension. It was the Colorado Agriculture "Big and Small" Conference and Trade Show. I had 30 minutes and the topic I was given was "Bee Populations and Implications to Fruiting Crops". It wasn't a happy message that I brought.

After spending some time reviewing the history of bees and beekeeping I asked the audience, "If I were to tell you that there was an asteroid speeding toward the earth that held the potential to obliterate a third of American agriculture in the next five years would you be interested, or if I told you fourth generation irrigation farmers that you were about to lose your water, would it get your attention?"

Of course they were interested and of course it got their attention, and when I went on to explain that this may be exactly the situation we are about to face with bees and pollination, both locally and nationally, you could hear a few chins hit the table.

The sad reality is that we may not be able to cover all of the pollination needs here along the Front Range, and some growers are going to be hurt by that. Quite simply we may not be able to keep enough bees alive or beekeepers in business and it looks like it is only going to get worse.

This isn't a new problem, and many of you readers know that I have touched upon this subject off and on for a number of years. There are a number factors that have contributed to the crisis now looming, and without exception, each has been irresponsibly neglected. As time goes by, it becomes clear that the Katrina Model of Management was being applied to beekeeping long before New Orleans went under.

The appearance of the mites in the late 80's has certainly played a major role in the decline, but mites have also been used as a convenient excuse to divert attention from other important problems and sweep them under the rug, other loss factors that could have been managed but weren't.

Knowledgeable beekeepers warned 20 years ago of what was to come, but for the most part it fell on deaf ears. Research money was limited, and while researchers did the best they could, many avenues of research went unexplored and we find ourselves today with few answers. The current administration wanted to close the bee labs or cut the budgets as a cost saving measure at a time when they were needed most. So much for foresight and vision, anticipation, good judgement and good management.

Mites are notorious vectors for other diseases and there is little doubt that they have introduced other pathogens which are contributing to the die-offs. We know what some of these are, but don't have any methods to control them short of controlling the mites, and we aren't doing a very good job of that.

The wholesale honey market has fallen into the basement as a consequence of the dumping of foreign honey that should have been stopped. A recent example? A sham corporation is created, which puts up a small bond for a single entry import, then dumps millions of pounds of honey on the U.S. market. When the Feds discover the fraud and come knocking, if they ever do, the company has folded and is gone. It's happened not just with honey, but garlic, apple juice, shrimp and several other commodities. I'm also told that since 2003, roughly $700 million in tariffs that could have been assessed on these commodities have not.

The EPA comes in for considerable criticism for failing to regulate pesticide use in accordance with the law, resulting in the loss of millions of dollars and hundreds of thousands of colonies. And this hasn't just been benign neglect or indifference. The EPA has undermined bee protection through policy decisions, administrative manuevers and proposals to suspend the Bee Law under vague and ill-defined circumstances, all of which serve to limit or eliminate protection for honey bees and other pollinators despite what the law may say. The EPA answers to Congress. Congress has done nothing to change this drift away from the EPA's original charge. For beekeepers this has been costly, sometimes crippling.

The EPA has delegated responsibility for enforcement of Federal pesticide laws to the states and then has held the states to very low standards, at least with respect to pollinator protection. Our own Colorado Department of Agriculture has one of the worst records in the nation. In the decade of the 90s they oversaw the loss of 60% of the state's managed colonies in just 10 years, and when beekeepers were protesting most vocally about pesticide problems, the state lost 1/3 of its colonies in a single year, a figure close to what beekeepers were saying had been killed or damaged by pesticides. Along with trying to pin the blame on mites, one of the Department of Agriculture's brilliant explanations – bees were being killed by poison pollen from native plants. We actually pay these people for these kinds of answers.

In the days leading up to the Big and Small Conference I debated whether or not I wanted to be the skunk at the garden party. Looking back, I now think that I might well have made an even stronger statement. Two things happened right after the conference to make me think that way.

First, a warm day let me take a look at the last of my beeyards. I'd previously looked at the rest, which had come through the Winter fairly well. Historically this has been one of my largest and most productive yards. Half of the colonies were lost last October and it looks like the rest will be lost this spring. I'll be lucky if I can save a single colony. The cause? Who knows? I do know that I can't keep crawling out of a deep hole every spring and survive indefinitely, and

I'm typical of beekeepers large and small all across the country.

The second thing that happened was equally disturbing, an Associated Press news story that started circulating on March 4th. It appeared in the Pueblo Chieftain on Saturday, March 11 and you may have seen it in your own local paper. The headline read "Bee die-off causes buzz". The article stated that **"the number of honey bees and managed beehives is down so much that production of pollinated plants has fallen by about a third in the last two years from the usual $15 billion per year."** It goes on to cite one Kevin Hackett, **"head of the U.S. Department of Agriculture's research program for bees and pollination"**. I've been fairly involved in these problems and Hackett has stayed below my radar. It sounds like he has a pretty important job, but until now I haven't heard of him and I have to wonder where he's been. Hackett is quoted as saying **"I've heard people complaining about bee shortages all over the country, 15 years ago there were twice as many hives as there are now,"** Mr. Hackett is probably a very nice guy. Maybe he isn't responsible for managing the approaching storm, but it looks like he gets the rap, and if he is it hasn't turned out very well.

If not Mr. Hackett, then who is minding the store? Anyone? How big does the crisis have to be before someone starts to do something? If the facts reported are accurate – half the managed colonies in America lost in the last 15 years, one third of pollinated crops in the past two, to the tune of $5 billion dollars, – or even if you assume those figures are wildly inflated and cut them in half, it's still a huge problem. Where is the sense of urgency. I see none.

So you Colorado growers who will start to share the pain as the chickens come home to roost have a lot of people to thank for that, and you'd better get started so they know you're out here because it is likely to get worse. You might start with your Senators and Congressmen and see how many bees they have for you.

Great job Kevin. Good work Tom and Don, Linda and Anne, John and all the rest of you politicians and bureaucrats who kept your heads low, your mouths shut, did what you were told, didn't make any waves and cashed your checks shamelessly while the wheels were coming off the wagon. Brownie would be proud of you. You've done a heck of a job. All of you. BC

Tom Theobald is a sideliner beekeeper, author, and commentator living in Niwot, Colorado.

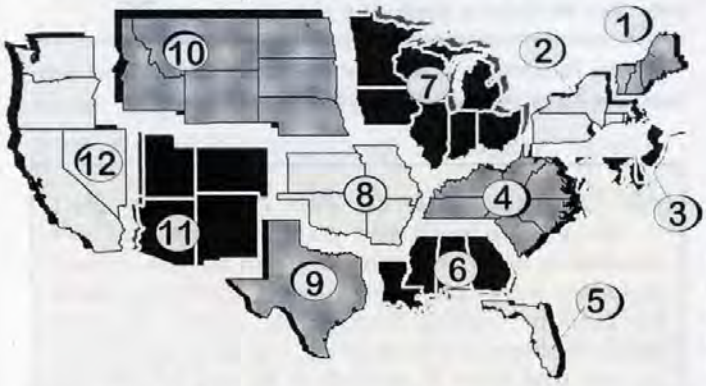
All Stirred Up & No Place To Go?

So you've read the commentary and are wondering what you can do. Some of you, myself included, have spent years trying to resolve these problems by working through the system. It's been largely fruitless and frustrating, but we at least know by now that there is unlikely to be any satisfaction by dealing with the low level functionaries. Their tactic is to nail one of your feet to the floor and keep you going around in circles, endlessly, while nothing gets done. Don't waste your time.

One step that should be pushed to address the pesticide issue is a resurrection of the Beekeeper Indemnification Program, but in a form that puts the burden where it belongs, on the users of pesticides that are toxic to bees, not on the backs of American taxpayers. There should be an assessment on all pesticides toxic to bees at the manufaturing level. It could be a graduated fee based upon the level of toxicity and a pesticide's record of bee kills, and the fund should be sufficient to make damaged beekeepers whole again, not just some token amount to throw them a bone. I think we would see a lot more care exercised in using pesticides safely if millions of dollars in damages can't just be pushed off on the beekeepers.

I'm not going to give you a cook book to follow, and it isn't really necessary at this point. These are largely Federal problems and they require Federal solutions. The Feds hold the purse strings on research and the EPA answers to Congress, or at least is supposed to. Right now it seems to be answering to the chemical companies. I believe that the situation calls for Congressional Hearings to examine this whole mess in an orderly fashion and decide what steps need to be taken. Call or write your Senators and Representatives, and don't be content with a form letter answer or a patronizing pat on the head. Demand some action, because if you don't and you are a commercial beekeeper you might want to consider what your next career is going to be. And while you're at it, light a fire under your local and national beekeeping organizations. At the risk of offending some of my friends, I think both the American Beekeeping Federation and the American Honey Producers could be doing a lot more. For example, a year ago the AHPA passed a resolution to create a committee to start bird dogging the EPA, but to my knowledge nothing has come of it, and I haven't seen any fire from the ABF either. You get the form of government you are willing to put up with and it's time for more of you beekeepers to stand up on your hind legs and start to howl or you are going to be ex-beekeepers.

MAY – REGIONAL HONEY PRICE REPORT



Winter's over and it's time to review, regroup and repair for the season that's right here, right now.

Across all regions and all reporters, there was an average colony loss of 27% this past winter, with a range of only 10% loss, on average in Region 8, to a high of 38%, lossa, on average, in Region 5. Region 7 was close at 37% loss.

Growth is the goal for a quarter of our reporters (24%) this year, while 62% want to remain at the status quo – that is to just get back to where they were last year. 13% will remain downsized.

75% or our reporters sell more than 1000 pounds of honey every year, while just under 20% sell only 100 – 500 pounds each season.

How well do our reporters fit the mold of the report they contribute to each month? We asked. 16% have their prices, on average, lower than those on the report, 48% are right on, leaving 36% with their average prices higher than on the report. Where are yours?

That appears to be a comfort zone, since only 3% are considering lowering their prices this year, while 84% will keep prices steady, but 13% intend to increase prices over the last year's.

Ranking colony conditions on a 1 – 5 scale (1 = terrible; 2 = below average; 3 = average; 4 = better than average; and 5 = Wow!) all reporter's colonies, across all regions averaged out at 2.8, or just below average for this time of year. The ranking ranged from a low of 1.7 (below, below average) for Region 6 (with a 30% loss) to a high of 3.3 (above, above average) for region 2 and 8. Not surprisingly, these two regions reported the fewest losses overwinter at 14 and 10% respectively. Makes sense, doesn't it.

6% of our reporters ranked their colonies as terrible; 36% at below average, 37% as average, 19% at stronger than average and only 1% were at Wow! Take this another step. 27% of last fall's colonies were lost, leaving only 73% of last year's colonies alive this spring. Of those remaining, 42% are below average, meaning that only 40% of last years colonies made it to March in better than average condition. Which, all things considered, isn't too bad.

Region	Percent Loss	Colony Condition (1 = Terrible 2 = Average 3 = WOW!)
1	32	2.6
2	14	3.3
3	15	3.0
4	28	2.9
5	38	2.3
6	30	1.7
7	37	2.4
8	10	3.3
9	21	2.3
10	12	3.0
11	32	3.0
12	31	3.2

	Reporting Regions												Summary		History	
	1	2	3	4	5	6	7	8	9	10	11	12			Last	Last
Extracted honey sold bulk to Packers or Processors													**Range**	**Avg.**	**Month**	**Yr.**
Wholesale Bulk																
55 gal. Light	0.89	1.00	0.89	0.89	0.81	0.83	0.86	0.89	0.89	0.87	1.00	1.05	0.81-1.05	0.90	0.94	1.12
55 gal. Amber	0.94	0.95	0.94	1.15	0.65	0.63	0.70	0.94	0.65	0.94	1.00	0.90	0.63-1.15	0.87	0.89	0.96
60# Light (retail)	95.00	108.70	103.33	98.25	98.50	125.00	95.50	103.33	100.00	103.33	141.00	98.15	95.00-141.00	105.84	102.08	110.73
60# Amber (retail)	95.00	103.40	100.94	98.50	92.00	100.00	90.57	100.00	100.00	115.00	135.00	90.00	90.00-135.00	101.70	95.16	108.30
Wholesale - Case Lots																
1/2# 24's	39.28	46.39	43.44	38.70	59.04	32.50	39.03	43.44	43.44	35.76	36.45	48.84	32.50-59.04	42.19	36.76	38.68
1# 24's	55.71	61.82	65.73	57.00	68.24	56.00	60.87	62.40	51.75	72.80	72.50	71.40	51.75-72.80	63.02	63.06	61.02
2# 12's	55.58	58.29	57.23	52.45	60.32	52.00	56.90	58.80	45.20	57.84	42.50	59.85	42.50-60.32	54.75	54.67	54.71
12 oz. Plas. 24's	51.84	57.72	59.56	57.65	52.44	48.00	49.23	51.60	42.85	46.64	62.75	55.44	42.85-62.75	52.98	53.55	52.84
5# 6's	56.53	63.00	64.96	57.27	64.96	64.96	60.04	52.50	57.00	56.43	58.00	65.25	52.50-65.25	60.07	57.74	60.71
Quarts 12's	72.00	105.85	87.66	81.81	77.82	72.80	82.50	75.00	96.00	110.88	81.70	82.92	72.00-110.88	85.58	82.78	80.93
Pints 12's	41.00	54.98	53.43	55.00	43.60	42.67	49.70	44.00	59.00	49.50	50.00	51.96	41.00-59.00	49.57	50.05	50.02
Retail Honey Prices																
1/2#	2.37	2.55	2.72	2.83	2.72	2.35	2.48	1.83	1.99	2.55	2.83	2.75	1.83-2.83	2.50	2.46	2.37
12 oz. Plastic	3.13	3.04	3.29	3.35	3.50	3.49	2.87	3.57	3.10	3.23	3.28	3.26	2.87-3.57	3.26	3.16	3.20
1 lb. Glass	3.71	3.45	3.62	4.24	3.76	3.99	3.45	4.34	3.83	4.19	4.13	4.25	3.45-4.34	3.91	3.93	3.91
2 lb. Glass	6.70	6.31	6.22	6.14	6.50	6.99	5.93	7.15	6.05	6.62	6.43	7.21	5.93-7.21	6.52	6.51	6.43
Pint	4.25	7.00	5.10	5.47	5.20	4.42	4.91	5.17	5.33	5.15	5.06	5.92	4.25-7.00	5.25	5.60	5.90
Quart	8.00	10.25	9.58	8.30	8.23	7.75	8.10	8.63	8.67	10.02	9.25	9.97	7.75-10.25	8.90	8.89	8.48
5 lb. Glass	12.63	13.30	11.62	13.83	12.00	12.99	12.44	14.25	13.85	12.93	12.57	12.99	11.62-14.25	12.95	13.89	13.25
1# Cream	4.18	4.99	5.29	4.29	5.29	3.31	4.90	4.42	5.00	5.49	5.01	4.10	3.31-5.49	4.69	4.65	5.31
1# Comb	4.38	4.86	5.37	5.38	4.10	4.50	4.96	4.50	5.37	6.00	6.49	6.36	4.10-6.49	5.19	5.74	5.65
Ross Round	5.19	4.15	5.19	5.83	5.00	5.19	4.38	5.00	5.19	5.63	6.00	4.49	4.15-6.00	5.10	5.19	4.86
Wax (Light)	2.19	2.57	2.00	2.09	1.63	1.80	2.18	2.50	1.90	2.15	1.87	2.62	1.63-2.62	2.12	2.32	2.21
Wax (Dark)	1.44	2.30	1.60	2.13	1.20	1.30	1.68	2.25	1.80	1.59	1.50	2.03	1.20-2.30	1.73	2.17	2.01
Poll. Fee/Col.	45.00	63.50	45.00	39.50	42.50	40.00	45.57	50.00	71.56	71.56	107.50	56.33	39.50-107.50	56.50	67.91	51.98

RESEARCH REVIEWED

Explaining • Defining • Using

Steve Sheppard

"Breeding bees, mite resistance to pesticides and limitations of bee research."

This month, I diverge from the normal format of this column to bring up an issue that has a bearing on the relationship between beekeepers and bee researchers. Within the community of researchers, there are those who, as part of their assignment or avocation, conduct bee research that has a readily discernable "applied" aspect. Thus, a researcher who is working on a novel control measure for a honey bee pest or disease or on an improved field technique to evaluate colony health or honey production would fit this description.

Alternatively, scientists who conduct research on the distribution and degree of hybridization among natural populations of honey bees in a distant land or work to unravel biochemical pathways within the physiology of the honey bee also gather data that, ultimately, can be applied to solve challenges faced by beekeepers, although the connection may not be so obvious or immediate. Within the circle of possible projects that a researcher can choose to work on, there will be research topics that strike a chord with some and not other members of the beekeeping community. That is to say, there will be differing opinions on the relative importance of specific topics. In addition, the researcher will have to rank possible research projects in the light of other criteria such as their technical, financial or personal limitations. So far – all of this is straightforward. However, limitations exist even when a specific problem is so prevalent that beekeepers and researchers agree there is a major challenge?

Most beekeepers probably would agree that the negative impact of the parasitic mite *Varroa destructor* on the colony heath of managed honey bees in the U.S. is one of the greatest challenges facing beekeepers. In contrast, the tracheal mite, *Acarapis woodi,* while a contributor to colony mortality in some parts of the country, would be considered secondary in importance as a threat. There may be information to be gleaned from thinking about this contrast a bit further.

First, as beekeepers, we have allowed tracheal mites to place "pressure" on the honey bee population to a much greater extent than *Varroa* mites. What do I mean by this? Answer the following questions: Out of all the beekeepers you have known in the past decade, how many treated one or more times per year for *V. destructor* (or still do)? How many of them treated one or more times per year for tracheal mites (and still do)? A quick survey will likely show you that some beekeepers within your sphere of acquaintance no longer treat for tracheal mites, while that is likely not the case for *V. destructor.*

If the above scenario is true – then what has been a possible consequence of these actions by beekeepers? Clearly, populations of bees that are susceptible to *Varroa* are still with us and reproducing, thanks to chemical inputs that have kept generations of these bees alive in the face of *Varroa* infestation. On the other hand, the current *lassez faire* attitude of many beekeepers to tracheal mites suggests that after an initial decade or so of significant population losses, the U.S. honey bee population of today is more resistant to tracheal mites than when the mites appeared in the mid 1980s. The initial heavy losses across the U.S., coupled with the relatively narrow temperature range where menthol treatment is effective, means that selection probably played a role in changing the honey bee population to become more resistant to tracheal mites. Thus, honey bees that were most susceptible to mites were less successful in leaving offspring compared to the more mite-resistant stocks.

Indirect evidence for this scenario comes from the historical patterns of tracheal mite/honey bee interactions in Europe. After tracheal mites became established in continental Europe around 1920, there was an initial couple of decades of notable colony losses and published efforts to come up with effective control measures. Interestingly, menthol (in the form of peppermint oil) was also used for tracheal mite control during that time. However, as time passed, European beekeepers became less concerned with these mites until, eventually, they were no longer considered a significant problem. Today most European beekeepers give little notice to tracheal mites within their apiaries.

So what is it about the *Varroa* mite story that has been different? First, as mentioned above, most beekeepers still actively treat their colonies for *V. destructor.* The primary legal (and illegal) hard chemicals that are in use have become much less effective due to mite resistance. Unfortunately, the possibility to incorporate colony and mite population cycles (broodless periods, etc.) as part of an overall IPM program to reduce hard chemical use, has been perceived as somewhat remote for important sectors of the beekeeping industry.

For example, larger migratory beekeeping operations, such as those that provide pollination for most U.S. agriculture, usually strive to maintain strong populous colonies. Stimulatory feeding to promote brood production at "unusual" times of times of the year ("unusual" relative to the population growth curve of a stationary colony)

is a fundamental aspect of the management system. Encouraging high brood productivity throughout much of the year leads to tremendous potential for mite population growth and tremendous pressure on beekeepers to find effective mite control. The economics of managing large operations also provides incentive to minimize the time input for mite treatments. The majority of package and queen producers find themselves under some of the same pressures, as they strive to produce the maximum number of bees and queens for sale during a limited season.

So what does this mean? It means that most of the current honey bee populations in large scale migratory operations and most of the queens and bees being produced by queen producers have come from management systems where miticide use was required to maintain strong colonies. Thus, unlike the situation with tracheal mites, until now there has been little opportunity for selection to change the overall honey bee population in the U.S. to one that is more noticeably resistant to *Varroa* mites.

Does the continued presence of *Varroa*-susceptible honey bees in the U.S. mean there is little hope for the development of mite-tolerant strains? Not entirely...there are several reasons to be optimistic.

First, we have good evidence that there exists within *A. mellifera* the genetic capacity to co-exist with *V. destructor*. Researchers have shown that certain selectable traits, such as SMR (suppression of mite reproduction) can confer tolerance to *V. destructor*. Expression of the SMR trait can be increased in a honey bee population through selective breeding.

Prior to these findings, it was known that Africanized honey bees could survive *Varroa* mites without treatment. In fact, mite population levels within infested Brazilian AHB colonies declined in the decade following the initial *Varroa* introduction. Brazilian researchers attributed the change to natural selection favoring greater reproductive success for those colonies that were better able to keep mite populations low.

Secondly, reports and advertisements in current U.S. bee journals suggest that some honey bee stocks have already been selected by the bee breeding community to exhibit higher levels of tolerance to *Varroa* mites. Some of these reports cite the use of an initial "survivor stock" selection program with subsequent selection of breeding stock being undertaken without the further use of miticides. Taken together, these could be seen as reasons for optimism that U.S. beekeeping will be able to move away from a reliance on unsustainable chemical programs for mite control.

Newer "soft chemical" control measures are becoming readily available and are highly compatible with the use of management tools and genetic resistance. However, there are potential barriers along the road. One of these is the possibility that the beekeeping industry as a whole will not support nor sustain the selection of genetic resistance and, instead, will continue to rely almost exclusively on chemical control of mites. This will be through no malicious intent, rather it will reflect the inability of some beekeepers to find a way to survive economically and keep their bees alive without continuing to apply low-time input chemical controls. The economies of scale for maintaining 10,000 colonies of bees, while perhaps positive for large scale honey production, can also be negative when it limits the "handling time" that can be devoted to monitoring mite populations, making control decisions and performing manipulations at the individual colony level.

So, getting back to the start of this column . . . what about limitations? Is time and money better spent working on a short term solution (short term because we know mites can rapidly develop resistance) to develop easily applied chemical controls that can kill mites or would it be better to focus on a long term solution such as breeding a honey bee that can survive without mite control chemicals in the post-*Varroa* world we live? Arguably, both of these research directions are "applied," although one might be seen to be a bandage for a serious wound and the other a means to prevent such wounds in the future. Ironically, continued use or overuse of hard chemicals to control mites works contrary to the development of mite-resistant stocks through breeding for the reasons mentioned earlier: primarily, miticide use continues to shore up a susceptible gene pool of honey bees. In fact, perhaps the biggest challenge of the breeding approach, whether in a grant supported university program, a USDA honey bee selection program or an innovative private or commercial effort is the need to make fundamental inroads into the overall managed honey bee population.

If a balance can be found among these issues, it will come through a wider realization among beekeepers that the genetic composition of their bees is of paramount importance. I reckon dairy farmers, turkey growers and thoroughbred horse owners have known the importance of selective breeding all along. Until now, bee breeders have concentrated on selecting bees for honey production and perhaps rapid colony buildup to suit the needs of their commercial honey producer and pollination consumers. However, it is no longer good enough to buy a queen that can produce a lot of brood and produce a honey crop only when being constantly medicated to survive. It is time to ask your queen supplier what she or he is doing to help the situation. If they are keeping their bees alive for breeding and package production only through the application of home remedies of miticide active ingredients, how well do you expect these bees to perform, unless you too are willing to administer a constant stream of chemical control? Do you want to continue to keep bees derived from stocks that have no measurable tolerance to *Varroa* mite infestations? A queen producer that strives to incorporate mite resistance into his/her stocks should be supported and those that succeed should be promoted. I guess the final word on this is that consumer demand in this area can have a significant role in changing the habits of and the genetic stocks distributed by the commercial industry. BC

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Malcolm T. Sanford

Mite Tolerance In Honey Bees: Breeding Bees For The Small Beekeeper

"It is possible for the small beekeeper to take on a program of breeding mite-tolerant bees."

In the March 2006 *Bee Culture*, Willard Phipps of South Bend, IN asks whether it's possible for the small beekeeper to breed a strain of bees tolerant or immune to mites. The short answer is yes. The technology to do it, however, may vary, and can be time-consuming, expensive and difficult. Two sources of mite tolerance come to mind: Survivor feral bees that have existed in the wild for several seasons and imported honey bees selected for survival (see the October 2004 *Bee Culture*).

The Russian bees fall into the latter category and appear to have the most published evidence reflective of success. The history of the stock is well documented:

According to Glenn Apiaries Web Site[1], which offers pure Russian stocks: "In 1905 the trans-Siberian railroad was completed, opening eastern Russia to the rest of Europe. The European honey bee was imported into this area which had only been inhabited by the Asian honey bee *Apis cerana*, the natural host of *Varroa* mites.

"The Asian honey bee and *Varroa* mites have co-evolved into a balanced host/parasite relationship without much harm being done. *Varroa* only reproduces on drone pupae in these bees, and drones are only available part of the year, so high populations of mites never build up.

"When the European bees encountered *Varroa*, things were different. *Varroa* is able to reproduce on worker pupae which allows extremely high numbers of mites to build up. This high infestation eventually kills the colony.

"Feral bees or bees managed without miticides have intense natural selection pressure, allowing only the most mite resistant colonies to survive. There are at least four resistance mechanisms that scientists have identified. They include, bees grooming mites off themselves and each other, hygienic behavior of removing infested pupae, acceleration of brood development, and suppression of mite reproduction. The ultimate goal of bee breeders is to produce bees with all these traits in a single stock of bees.

"It's hoped that the Russian bees will provide resistant genes that will let us take a giant step forward in the breeding effort. An earlier USDA introduction of bees from Yugoslavia did much in enhancing resistance to another serious pest, the tracheal mite.

"Every beekeeper can help in the effort by using some of these Russian bees in their hives. Drones are produced from the queen's unfertilized eggs, so all drones from the Russian queens will be 100% Russian. This fact will greatly help in the spreading of the resistant genes, as drones fly for miles in search of queens to mate. If all goes well we may see the emergence of *Varroa* resistant bees across the country.

"The USDA scientists, led by Dr. Thomas Rinderer, have done their part, now it's up to breeders and beekeepers to do their part in distributing these resistant bees. It may be our best option for getting off the chemical treadmill."

Clearly, the above statement exhorts the small beekeeper to get involved at least on a rudimentary level. In a recent review of the Russian introduction program it was concluded: "One of the key points is that it's public stock. So it's something that anyone can easily work into their own program."[2]

A comprehensive program to look at for guidance is the one in Canada using Russian survivor stock. François Petit, Pilgrim Community Ventures, reports that results are promising after six seasons using these bees, which are continually being imported.[3]

Mr. Petit lists the objectives of his project to be:

1. Utilize genetic material acquired through natural selection for resistance to *Varroa* found in Eastern Russia.

2. Continue the selection needed to bring this stock to acceptable level of productivity.

3. Distribute the stock to beekeepers and breeders across Canada.

4. Provide a long-term solution to the invasion of *Varroa* mites in honey bee populations across Canada.

The work started in 2000, when stock was first imported by the University of Guelph in Ontario. The yearly details so far include:

2001 – Drone colonies established. Eggs from isolated breeder colonies used to produce open-mated queens and pure Russian drones.

2002 – Third importation. Most production colonies requeened with pure Russians.

2003 – Four-frame nuclei (headed by queens that are both open and closed mated) sold to beekeeping public. Another importation; eleven lines established. Testing begins on stock raised in 2002 with hygienic and quick test.

2004 – Only in this year could data from 2002 and 2003 be analyzed. Distributed open mated queens and nuclei across Canada. For the first time honey production measured.

Another importation occurred and the 24-hour mite drop test was initiated.

2005 – Encouraging signs seen in wintering, vigor and strength. Best honey crop since year 2003.

Casual observation heard on the street from beekeepers using Russian bees in the United States is that they might be tolerant to mites, but are lacking in honey production. Mr. Petit's results so far show an evenly distributed range of 0 to 176 pounds in 2004 with an average of 83.5 pounds. In 2005, the range was 0 to 238 pounds with an average of 152 pounds. Unfortunately, this increase cannot be attributed specifically to the season or genetics. Canadian colonies of other bees routinely produce more honey, leaving Mr. Petit to conclude: "This shows a need for more selection, to select the genes responsible for higher honey production." Many would agree that determining colony productivity on colonies with only two years of data is premature.

This is a chicken or egg sydrome; to show more honey production, while at the same time ensuring bees are tolerant to diseases and pests is a continuing challenge. Clearly most programs have opted for Mr. Petit's strategy: tolerance first; production later. This is where the small beekeeper has more "wiggle room" because his or her income is not solely tied to bee colonies.

The tests employed by Mr. Petit deserve attention:

1. Hygienic test: Measuring how well colonies detect, open and uncap larvae affected by brood diseases (American foulbrood) or *Varroa*. A full description of this technique is available through the USDA's Sustainable Agriculture Research and Education (SARE) program.[4]
2. Quick test for tracheal mites (*Acarapis woodi*): Introducing newly emerged worker bees (not infected with honey bee tracheal mite) into infested colonies and a week later examining how infested these bees become. This is used in the Ontario (Canada) Bee Breeding program.[5]
3. 24-Hour mite drop: Counting the number of *Varroa* falling off a cluster of bees over a two- to three-day period. A description of this test has been published by United Kingdom's Central Science Library.[6]

There's little question the Russian stock is hygienic according to Mr. Petit. The quick test did not show as strong a result for the Russians when compared to other Ontario stock, but it was still better than average, and Russians began with lower tracheal mite levels than local stock. Mite drop was also not as clear cut as that for hygienic behavior, partly because colonies were treated for *Varroa* in 2004 but not 2005. Both years reveal, however, that in general there were fewer "problem" (heavily infested) colonies; identifying and removing these few, therefore, could make a difference when looking at the entire apiary. Mr. Petit concludes that he is encouraged by these results and wants beekeepers across the nation to be aware of the potential of this stock. The program is on track to end in 2008.

Meanwhile in the United States Russian bees continue to be available from a number of sources. Those interested in this project have a good deal of documentation available to them on the World Wide Web. Besides the California site

mentioned above, a blow-by-blow description of the chronology of the project can be found at the USDA ARS Web Site.[7]

1995 – First trip to Russia. These would end in 2005.

1997 – First importation of queens from Russia's Primorski area to quarantine on a Louisiana barrier island.

1999 – Six selected Russian lines from the long term resistance test are propagated.

2002 – Test yards set up with cooperators in Iowa (M. Bigalk) and Mississippi (H.Tubbs).

2005 – Beginning of Phase III of project; Lines selected for release in 2006 are 05A-618: **White/Orange** 05A-663: **White/DkBlue.**

2006 – Breeders will be selected in the Fall for release in the Spring of 2007 for Block "B". Block "C" cooperators will be selected next year.

According to the USDA, "The scope of the Russian honey bee trials is large, involving several cooperators. There are two reasons for needing these cooperators. First, the trials require more honey bee colonies than the laboratory can possibly maintain on its own. Each year the tests require more than 500 colonies of honey bees. Second, in order to produce a stock of commercially valuable honey bees, tests need to be conducted in several different beekeeping environments so that lines selected for inclusion in the program are known to have value in more than one location."

Cooperators include Manley Bigalk, Golden Ridge Honey Farm, Cresco, Iowa; Charlie Harper, Carencro, Louisiana; and Hubert Tubbs, Tubbs Apiaries, Mize, Mississippi.[8] Charlie Harper's operation has a Web site that says in part: "In cooperation with the USDA Bee Lab in Baton Rouge, LA, we are pleased to offer the 2006 release of Russian breeder queens. There are (2) lines available, White Blue and White Orange. They are available now until July 2006."[9] Scanning the two major bee journals reveals a host of advertisers for this stock, suggesting the vision of those to distribute this stock across the country is becoming a reality.

Russian bees are not the only game in town that the smaller beekeeper can take advantage of to begin a breeding effort. An almost bewildering variety of stock is also touted in the bee press, such as New World Carniolan® (see the January 2003 *Bee Culture*), SMR, Minnesota Hygienics, and other selected survivor stock, advertised as not treated for Varroa. Those contemplating using stock should ask for documentation (data) that corroborates the claims. Survivor stock from untreated apiaries in localized areas may also provide good possibilities for breeding efforts.

To repeat what was earlier stated, it is possible for the small beekeeper to take on a program of breeding mite-tolerant bees. This situation reminds me of educational programs that seek to make the average investor a trader in his own securities, including mutual funds, bonds, stocks and most risky, stock options, currency and futures. The successful stock and options trader must have a trading program consisting of entry and exit strategies, and be able to employ a number of tools from charting to using computational skills to ensure that trades have the most potential for success.

It is hoped that this article will provide the fledgling small bee breeder with some of the options that are currently available in terms of obtaining stock for a breeding program.. In addition, tests have been described, which are currently in use to determine if a breeding program is achieving some manner of success. BC

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PROTECTING BEEKEEPERS FROM PRODUCT LIABILITY

Sylvia A. Ezenwa, J.D.

In today's litigious society, the risk of product liability lawsuits is great and, therefore, should be factored into the cost of doing business. Under product liability law, a person who has been injured by a defective product (i.e., a plaintiff) may attempt to recover monetary compensation or *"damages"* for the injury by suing any company or individual (i.e., the defendant) involved in the product's manufacture, distribution, or sale.[1] Product liability lawsuits are usually decided in two stages: first, a court will determine whether the defendant was responsible or *"liable"* for the injury to the plaintiff; and second, if liability is found, the court will assess the kind and amount of damages to award to the plaintiff.[2] Notably, there is no uniform, Federal law used to decide product liability cases throughout the United States. Rather, in such cases, the laws of individual States govern both the determination of liability and the assessment of damages.[3]

Product Liability within the Beekeeping Industry

From the hive, beekeepers extract honey, beeswax, pollen, propolis, and royal jelly. Honey is processed, bottled, and sold as food. Pollen, propolis, and royal jelly may also be sold as food, medicine, or nutritional supplements. Beeswax, in combination with other ingredients such as essential oils, fragrances, chemical preservatives, and coloring agents, is used to manufacture candles, soaps, lip balms, and other cosmetic products.

Candles and honey are the most popular hive products, and so trigger most product liability lawsuits within the beekeeping industry. The plaintiffs in such lawsuits are typically individuals who have either been injured from burning defective candles, or have become ill from eating contaminated honey. And to the extent that beekeepers are the ones that manufacture, produce, process, distribute, and sell hive products, they are the defendants.[4] Defendants may also include honey packers, candle manufacturers, natural food stores, and other individuals and companies that manufacture, distribute, or sell hive products.

How liability is determined

A product liability lawsuit begins when a plaintiff files a complaint in court. The complaint must state one or more legally recognized causes of actions.[5] A *"cause of action"* is like a template, which shows a plaintiff what he must prove in court in order to recover damages or monetary compensation from the defendant. There are three causes of action commonly raised by plaintiffs in product liability lawsuits: (1) strict product liability; (2) negligence; and (3) breach of warranty.[6]

(1) Strict Product Liability

To establish strict product liability, a plaintiff must prove that: (1) a product was defective and unreasonably dangerous when it left the manufacturer's control; and (2) the defect caused the plaintiff's injury.[7] "A product may be unreasonably dangerous because of a defect in manufacturing, design, or marketing. A defendant's failure to warn of a product's potential dangers when warnings are required is a type of marketing defect. Liability will attach if the lack of adequate warnings or instructions renders an otherwise adequate product unreasonably dangerous."[8]

In 1997, the National Candle Association began leading the development of candle fire-safety standards. And as a result of its efforts, national industry standards for candles have been developed and published through ASTM International (formerly the American Society for Testing and Materials). To date, there are five ASTM candle standards, including: Cautionary Labeling Standard, Heat Strength of Glass Containers Standard, and Fire-Safety Design Standard.[9] The Cautionary Labeling Standard "sets forth specifications for the warning label that cautions consumers to always keep a burning candle within sight; never place a candle on or near anything that can catch fire; and to keep candles out of the reach of children and pets."[10] Failure to place a warning label on a candle may be considered a *marketing defect* because it makes the candle unreasonably dangerous.

By contrast, microbial contamination of food is usually a *manufacturing defect*, because it makes the food unreasonably dangerous (e.g., honey that is contaminated with the food poisoning bacterium *Clostridium botulinum*). Spores of *Clostridium botulinum* can cause infant botulism when ingested by children less than one year old. Most infants who develop infant botulism have been fed honey, which is the only identified food source of *Clostridium botulinum*. Infant botulism, though rarely fatal, usually requires hospitalization.[11]

Finally, in strict liability cases, the defendant's care in manufacturing or handling a defective product is irrelevant and cannot be considered a defense to a plaintiff's allegations. However, a defendant can only be held liable for injuries to *"foreseeable plaintiffs,"* which means those plaintiffs that an ordinary person

might expect to be injured by the product.[12] In the case of defective hive products, foreseeable plaintiffs might include buyers of candles or honey, and their family members, particularly children, who might be burnt by a candle flame, cut by an exploding glass candle container, or sickened by infant botulism.

Candles and honey are the most popular hive products, and so trigger most product lawsuits within the beekeeping industry.

(2) Negligence

To establish negligence, a plaintiff must prove that: "(1) the defendant had a legal duty to exercise 'reasonable care' in manufacturing the product and to warn all foreseeable users of all foreseeable dangers, (2) the defendant failed to perform this duty, and (3) the defendant's failure to perform this duty caused the plaintiff's injury."[13]

Product manufacturers are the most susceptible to negligence claims, although, in certain situations, distributors and retailers may be found negligent as well. For instance, if honey is neither packaged nor in a sealed container (such as bulk honey sold in a natural foods store), a retailer (in this case, the natural foods store) might be expected to use reasonable care to inspect the honey for *apparent or visible* defects (e.g., contamination by foreign objects like dust, soil, sticks, or stones), and may be found negligent if there was a feasible procedure for inspecting the honey that was not used. By contrast, the retailer (again, the natural foods store) would not be expected to discover *latent or hidden* defects (e.g., microbial contamination) in bottled honey, *unless* the retailer was also the manufacturer of the honey, packaged it prior to sale, or could have tested the honey for safety, but chose not to.[14]

Finally, product manufacturers, distributors, and retailers may be found negligent for failing to warn consumers of the hazards of a product, or of the existence of a potentially dangerous condition in the product, especially when there are state or federally-mandated warnings or labels that were supposed to be used, but were not.[15] As discussed earlier, an ASTM standard currently exists for the fire-safety labeling of candles, so the failure to place a warning label on a candle may be considered negligence.

To establish *"negligence per se,"* which is a form of negligence, a plaintiff must prove that: (1) the defendant violated a statute or regulation; and (2) the statute or regulation was specifically intended to prevent the kind of injury the plaintiff suffered.[16]

Many negligence per se claims against companies in the food (including the honey production) industry result from violations of Hazard Analysis and Critical Control Points (HACCP) regulations and/or guidance documents.[17] HACCP is "a preventative food safety system in which every step in the manufacture, storage and distribution of a food product is scientifically analyzed for microbiological, physical and chemical hazards. Potential hazards are, therefore, identified and appropriate control measures are taken before the problem can occur."[18] The key to avoiding negligence per se claims is to assure honey quality and safety by developing and implementing a company HACCP plan. Even then, compliance with such a plan does not guarantee honey that is free of contamination.[19] [For a list of HACCP Resources, visit the National Honey Board Web site at http://www.nhb.org/howto/haccp.html].

(3) Breach of Warranty

A *"warranty"* is a promise or statement of fact about the quality or character of a product sold, made by the seller to induce the sale, and relied upon by the buyer.[20] According to the Uniform Commercial Code, which is the law that governs commercial transactions in individual States, sellers are required to conform to warranties.[21] Therefore, in order to establish a breach of warranty, a plaintiff must prove that: (1) a product did not conform to a warranty; and (2) the non-conforming feature of the product caused the plaintiff's injury.[22]

A warranty may be express or implied. An *"express warranty"* is a promise included in the written or oral terms of a sales agreement in which the seller assures the quality, description, or performance of a product.[23] Express warranties can be created by a salesperson's statements; pictures or writing on a product's packag-

ing; advertisements; or product samples or models.[24] An example of an express warranty is a honey label which reads: 100% Pure Honey. A breach of warranty occurs if the honey has actually been diluted with corn syrup, and a consumer who is allergic to corn has a severe reaction to it.

Meanwhile, an *"implied warranty"* is "[a] promise arising by operation of law, that something which is sold shall be merchantable and fit for the purpose for which the seller has reason to know that it is required."[25] "Arising by operation of law" means that the warranty is triggered not by any statement or conduct of the seller, but by the mere fact of the product being sold.[26] In other words, any product that is sold comes with an implied warranty of merchantability and fitness for a particular purpose; and, just by selling a product, a seller is implicitly promising that: (1) the product is merchantable, i.e., fit for the ordinary purposes for which such products are to be used, *provided that the seller is in the business of selling products of that kind*; and (2) the product is fit for a particular purpose, *provided that the seller, at the time of sale, knew the particular purpose for which the product was required, and the buyer relied upon the seller's skill or judgment in selecting a suitable product for that purpose.*[27] For example, any candle that is sold by a beekeeper must be merchantable or fit for the ordinary purpose for which candles are normally used, i.e., it must be fit to be burned. A breach of implied warranty of merchantability occurs if the glass candle container is not heat resistant, and so, when the wick is lit, the container explodes and injures the user or a bystander.

Conclusion

Once a court determines that a beekeeper is liable for a consumer's injuries, it must then assess the appropriate damages to award to the consumer; that damage assessment will be the topic of Part Two of this article, along with certain procedures beekeepers should implement to minimize the risk of product liability. BC

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The African Honey Bee II

The Displacement Of European Honey Bees by African Bees In The New World

Stan Schneider, Gloria DeGrandi-Hoffman, Deborah Smith, David Tarpy

In our first article on the African honey bee (AHB), we explained how differences in the behavior and nesting biology of *A. m. scutellata* allowed it to thrive and spread at a phenomenal rate throughout Latin America, largely displacing European honey bees in all colonized regions. In addition, despite repeated interbreeding between African and European bees, in most areas the AHB has not blended with the EHB. Rather, it has largely retained its African genetic make up. This means that European traits brought into the African population through matings with European bees are being lost from the population. The failure to incorporate European characteristics is at the heart of the success of the AHB in the Americas and the biological and economic impacts it creates. Thus, to fully understand the African bee invasion and the effects it may have in the U. S., it is essential to understand how it interacts with *and replaces* European bees.

There is no *single* factor responsible for the displacement of European colonies and the loss of European characteristics in areas where African bees immigrate. Rather, at least six different mechanisms contribute to varying extents to the loss of European patrilines (lineages of the drones) and matrilines (lineages of the queens). Some of these factors may be of greater importance in managed apiaries, whereas others play a stronger role in feral honey bee populations.

Stan Schneider received his PhD in Animal Behavior from the University of California at Davis and is now at the University of North Carolina at Charlotte. His main areas of research are honey bee communication and the biology and behavior of the African honey bee.

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David Tarpy received his PhD in Entomology from the University of California at Davis and is now the Extension Apiculturist in the Department of Entomology at North Carolina State University. His research interests address the biology and behavior of honey bee queens – using techniques including field manipulations, behavioral observation, instrumental insemination, and molecular genetics.

Figure 1. *A swarm of African bees. African colonies swarm more often than European colonies and quickly establish large wild populations, which helps them out compete European colonies. African colonies are also much more likely to abscond (abandon a nest site) and migrate during dearth periods. This increased colony mobility further helps to spread the AHB quickly throughout a colonized region.*

Swarming Behavior

One of the major differences between European and African honey bees is the rate of colony population growth. While European bees have been selected primarily for honey production and storage to survive longer, colder winters, African colonies have a greater emphasis on pollen collection and a more rapid conversion of pollen into brood. African bees devote two to four times as much comb area to brood rearing compared with European bees. The resulting higher growth rates allow for increased African swarm production (Fig. 1). In the Neotropics, African colonies can increase 16-fold per year, while maximum increases in wild European colonies in temperate areas are only three- to six-fold. Consequently, the density of African colonies can increase quickly in the wild, especially in regions with small populations of European honey bees. This in turn gives the AHB a numerical advantage that helps it out compete and displace EHB colonies.

Negative Heterosis in Hybrid Bees

A factor that has been proposed repeatedly to explain the loss of European traits from African populations is reduced fitness and survival of hybrid bees (Fig. 2). Several researchers have proposed that there may be incompatibilities between European and African genes that make it difficult for hybrid colonies to persist unless they are managed by humans. In particular, it is thought that European maternal and African paternal genes may be especially incompatible. This would help to explain the drastic loss of European matrilines in feral

Figure 2. *Worker, drone and queen honey bee. AHB/EHB hybrid workers and queens have lower metabolic rates than African bees. Also, the left and right fore wings of EHB/AHB hybrid workers are less symmetrical when compared to one another than are the wings of African workers. This may further reflect incompatibilities between African and European genes that negatively affect larval development. In combination, the physiological and developmental differences might make hybrid bees less competitive and less efficient at foraging, swarming and mating. As a result, hybrid colonies may not survive well in the wild, which would contribute to the loss of European traits.*

honey bee populations, despite repeated opportunities for "Africanized" European swarms to move from commercial apiaries into the wild. The reduced fitness in hybrids (referred to as **negative heterosis**) is a controversial topic among honey bee researchers, but there are two main lines of evidence to suggest that it occurs.

First, European/African hybrids have lower metabolic rates than "pure" African or European bees. This was first demonstrated for hybrid workers in 1993 by Dr. Jon Harrison of Arizona State University and Dr. H. Glenn Hall of the University of Florida. More recently, Dr. Harrison's lab has shown that hybrid queens also have lower metabolic capacities. The lower metabolic rates could reduce flying ability, which in turn could negatively affect foraging, swarming, and mating flights.

A second line of evidence for reduced fitness in hybrid bees comes from studies of the shape of the honey bee wing. Dr. Stan Schneider of the University of North Carolina at Charlotte and Dr. Gloria Degrandi-Hoffman of the USDA Carl Hayden Bee Research Center in Tuscon, AZ used instrumental insemination to create crosses between European queens and African drones (i.e. EHB/AHB hybrid workers), "pure" African workers (African queens mated with African drones), and "pure" European workers (European queens mated with European drones) and then raised them in the same colony. On the day that the workers emerged as adults, they were collected and the shape of the left and right forewing of each bee was compared using a mathematical process. The wings of hybrid workers were slightly less symmetrical that those of the pure African workers. The ability to build left- and right-side structures during an animal's embryonic development is genetically controlled. If the genetic programs for development are stable, then the two sides of an animal's body are more symmetrical. Conversely, if the genetic programs have less stability, then the animal often has more asymmetrical structures. Thus, the greater asymmetry in the wings of hybrid workers suggests that they have lower developmental stability than "pure" African bees, which may further indicate incompatibilities between European and African genes. In combination, the lower metabolic rates, possible developmental problems, and greater asymmetry of hybrid workers would contribute to the loss of European characteristics and might help to explain why hybrid colonies do not persist over time in the wild.

Mating Advantages for African Drones

When African bees colonize areas with resident European populations, queens will mate with both European and African drones (Fig. 3). However, matings with European drones decline over time resulting in a reduction of European patrilines in managed and wild colonies. There are several factors that may contribute to an African drone mating advantage in invaded areas. First, AHB colonies produce more drones than EHB colonies of the same size. Second, the more numerous AHB drones will drift into European colonies, which suppresses the production of EHB drones. Third, AHB colonies experience high rates of queen loss and the resulting queenless colonies rear large numbers of worker-produced drones. Fourth, there may be differences in mating-flight times that increase the chance of EHB

Figure 3. *AHB drones may have a mating advantage over EHB drones. African drones are more abundant, take mating flights at times that may increase their chances of mating with European queens, and will drift into EHB colonies and suppress the rearing of European drones. Also, even if queens mate with an equal number of AHB and EHB drones, they may preferentially use African sperm to fertilize their eggs. AHB drone mating advantages result in the rapid spread of African genes and the loss of European genes.*

queens mating with African drones, but decrease the chance of AHB queens mating with European drones. Finally, in a recent study, Dr. Gloria DeGrandi-Hoffman, Dr. Stan Schneider and Dr. David Tarpy of the North Carolina State University instrumentally inseminated queens with semen from an equal number of African and European drones and then monitored the number of AHB and EHB workers produced for six months. They found that significantly more AHB workers than expected were produced, which suggests that African sperm may have an advantage over European sperm, even if queens mate with the same numbers of drones of both types. An African drone mating advantage would result in the rapid loss of European paternal genes and may be an important factor in the AHB's ability to displace European bees.

African-patriline Advantages During Queen Replacement

European genes are also lost when colonies in invaded regions raise new queens. When a colony swarms or supersedes its queen, workers rear up to a dozen or more virgin queens (VQs) in specially constructed cells. Virgin queens are highly aggressive toward one another and battle to the death until there is a sole survivor, who then becomes the new laying queen of the colony. A virgin queen can eliminate her "rival" sister queens in two

ways. First, she will attack queen cells and sting her rivals to death before they emerge. Second, emerged VQs seek out each other and attempt to sting one another. Workers often attempt to influence the interactions of virgin queens and may play a major role in determining which VQ will "win" the elimination process.

In colonies where queens mate with a combination of African and European drones, the colony population is made up of African- and European-patriline bees. During queen replacement, these "mixed" colonies will rear VQs from both patrilines. Recent research conducted by Dr. Gloria DeGrandi-Hoffman and Dr. Stan Schneider has shown that African-patriline VQs have a strong advantage during queen elimination.

Workers in mixed colonies raise similar numbers of African- and European-paternity queen larvae and devote equal care to both queen types. However, African-patriline VQs develop faster and emerge sooner, which may give them more opportunities to eliminate rivals confined in queen cells. In 70% of the mixed colonies studied, an African-patriline VQ was the first queen to emerge, and the first-emerging queen usually became the new laying queen of the colony.

African-patriline VQs also appear to be better fighters than their European-paternity sister queens (Fig. 4). African VQs kill significantly more of their emerged rivals then do the European VQs. African-paternity VQs also produce more bouts of "piping" (a high-pitched, pulsed sound) than European-paternity queens. The function of piping is unclear, but it is somehow related to fighting ability. VQs that pipe more survive longer, kill a greater number of rivals and are more likely to become the new laying queen. Workers in mixed colonies also interact with African-patriline VQs more often than they do with European-patriline VQs. In particular, workers perform more "vibration signals" on African VQs (Fig. 4). The vibration signal may promote queen fighting success, because queens that receive more signals kill more rivals and are more likely to survive the queen elimination process. In combination, because of their earlier emergence, greater fighting ability, piping activity and vibration signals received, African-patriline VQs are five times more likely to survive the queen-elimination process than are their European-paternity sister queens. When the African-paternity queens take mating flights in invaded areas, they will mate largely or entirely with AHB drones, resulting in increasing Africanization with each successive queen replacement event. A survival advantage for African-patriline virgin queens may therefore play a major role in the rapid loss of EHB characteristics in invaded regions.

> "To fully understand the African bee invasion and the effects it may have in the U.S., it is essential to understand how it interacts with *and replaces* European bees."

Figure 4. *Two virgin queens fighting to the death (photo courtesy of Ken Lorenzen). When African and European-paternity VQs are present in the same colony, the African queens kill more of their rivals and produce more bouts of "piping" (a sound signal that may promote fighting success). African VQs also receive more "vibration signals," which consist of workers grabbing a VQ and rapidly vibrating their bodies up and down for one to two seconds (see drawing). Queens can be vibrated hundreds of times an hour and VQs that receive more signals survive longer and kill more rivals. In combination, the greater fighting ability, piping activity and vibration signals received results in African-patriline queens winning the rival elimination process and becoming the new laying queens of their colonies. This in turn results in the rapid loss of EHB characteristics.*

Dominance of African Genes

In invaded areas, European colonies headed by open-mated queens often exhibit African behavioral traits, even if they mate with a relatively high proportion of European drones. African genes may therefore be dominant for some characteristics. Dominance of African genes has been most thoroughly studied for defensive behavior. African honey bees exhibit a more intense nest defense behavior than European bees. Colonies composed of workers that are crosses between European queens and African drones show levels of defensiveness that do not differ from those of 'pure' African bees (i.e., workers having an African matriline and patriline). These findings suggest that African defensive behavior may be genetically dominant. Because a honey bee queen mates with an average of 12 drones, the level of defensiveness exhibited by a colony will depend upon the number of workers sired by African drones. As explained above, queens in invaded areas mate disproportionately with African drones and may preferentially use African sperm to fertilize their eggs, which can increase the level of defensiveness in a relatively short period of time. In addition to genetic dominance, colony defense behavior also is affected by alarm pheromone. When African-patriline workers defend their colony, they release more alarm pheromone and this could stimulate European-paternity workers that otherwise would not respond to the initial disturbance to exhibit defensive behavior. Thus, the presence of African-patrilines in

Figure 5. *An African swarm usurping a European colony. Usurpation swarms are small reproductive or absconding swarms that invade an EHB nest, replace the European queen, and take over the colony. Queenless EHB colonies and those with a caged queen are particularly susceptible to usurpation. In southern Arizona, annual usurpation rates can reach 20-30%, suggesting that usurpation is an important factor in the displacement of European in parts of the southwestern U.S. In southern Arizona, peak usurpation activity occurs from October - December, which corresponds to the absconding season for African bees in the Tucson basin.*

a colony could increase its defensive response even if many of the workers have European paternity.

Nest Usurpation

One of the most unique behaviors of African honey bees is their ability to usurp European colonies. Nest usurpation is a form of social parasitism where small African swarms invade European colonies and replace the resident queens (Fig. 5). Nest usurpation results in the complete and instantaneous loss of European matrilines and may partially explain the rapid loss of European characteristics in regions where African bees are established. Dr. Stan Schneider, Dr. Gloria DeGrandi-Hoffman and Dr. David Gilley of the Carl Hayden Bee Research Center in Tucson studied nest usurpation in southern Arizona and found that annual usurpation rates can reach 20-30%. Furthermore, there are strong seasonal patterns for nest usurpation. A minor peak of usurpation activity occurs during the spring-summer months, which corresponds with the reproductive swarming season for honey bees in southern Arizona. However, the greatest usurpation activity occurs during the fall-winter months, which corresponds to the period of seasonal absconding when African colonies in southern Arizona abandon their nests to search for better foraging conditions. Usurpation swarms may be reproductive or absconding swarms that are too small to successfully establish a nest, and instead adopt a strategy of invasion and parasitism. Nest usurpation may be an important part of the annual colony cycle in southern Arizona, and play an important, although seasonally and regionally variable role in the spread of African bees.

How African swarms find and invade host colonies is unclear. Pheromone cues associated with the presence and condition of a queen may be involved in the location of susceptible hosts. We have found that queenless colonies and those with a caged queen are particularly susceptible to invasion. This raises important concerns about the manner in which European colonies are maintained in Africanized areas. The most commonly used method to maintain European characteristics is to annually requeen colonies with new European queens. The old European queen is removed and the new queen is confined in small cage for several days and then released. We have found that if requeening is conducted during the swarming or absconding season, it may actually increase the chance of colonies becoming African, rather than help to retain European characteristics.

Queenless and caged-queen conditions are not the only factors that make colonies susceptible to usurpation. Queenright colonies can also be invaded, suggesting that cues other than those emanating from the state of a colony's queen are involved in host location. While some overt aggression occurs during the invasion process, pheromone signals may also help usurpation swarms gain entry into EHB colonies. Invading African swarms may produce pheromone signals that circumvent the defensive responses of EHB colonies and alter worker-queen interactions in a manner that contributes to the loss of EHB queens. However, the mechanisms that regulate nest usurpation represent one of the least understood aspects of the African bee invasion process.

Conclusions

In summary, there is an array of behavioral, physiological and genetic factors that contribute to the AHB's ability to displace European honey bee colonies in invaded areas. Throughout much of Latin America, these factors have helped to preserve the genetic structure of the African honey bee population despite repeated interbreeding with European bees. The available evidence also suggests that these same factors are contributing to the spread and success of the AHB in the southwestern U.S. However, what the African bee will do in the U. S. in the future is far from clear. In the final article of this series, we explore the past and possible future spread of the AHB throughout the U.S., the factors that may contribute to its distribution and the impacts it is likely to have on beekeeping and agriculture. BC

The Road To Parthenocarpy

"Simply put, growers are addicted to honey bees."

Nick Calderone

In most parts of the country, fruit bloom is in progress; and the annual migration of honey bee colonies is well underway. Without any doubt, the honey bee has become the indispensable pollinator for over 90 commercially grown crops in North America. Indeed, the honey bee possesses a number of traits that have helped earn it this well-deserved and lofty title:

- Honey bee colonies are perennial: that means there is always a relatively large population of worker bees present, even in the Spring when large numbers of foragers are needed to pollinate crops.
- Honey bees are generalists: they forage on almost any flowering plant that produces pollen or nectar, and that makes them a highly versatile pollinator.
- Honey bee foragers fly long distances: that makes them well-suited to large monocultures

A highly-developed management system – apiculture – takes full advantage of these traits. Beekeepers rear queens and make splits to increase colony numbers and replace colonies lost over the Winter, thereby ensuring a continuous and ample supply of bees. Migratory beekeepers transport colonies long-distances, concentrating them wherever and whenever they are needed to satisfy the needs of commercial agriculture.

In fact, the honey bee's position as the indispensable pollinator seems almost ordained – but why? All bees collect pollen and nectar – that's part of what makes them bees. In fact, there are 43 species of bumble bees and nearly 4,000 species of solitary bees in the U.S. and Canada, and they all collect pollen and nectar. In addition, these non-*Apis* bees are usually much more efficient pollinators than their *Apis* cousin (see Box). So, why haven't they emerged as competitors with the honey bee?

The answer is found in the annual life-cycle of the non-*Apis* bees. A mated bumble bee queen winters alone in a small underground burrow in a state of arrested development known as diapause. In the Spring, she emerges and attempts to establish a new nest. If successful, she forages intensely and rears worker brood for a few weeks. Once this first round of brood emerges, she limits herself to egg-laying, and the workers assume the foraging duties. By the time the new colony has attained a sizeable population of worker bees, early blooms have long since withered. So, while the honey bee lacks efficiency, it compensates with numbers. A good honey bee colony on location during Maine's May blueberry bloom will have 10,000 – 20,000 foragers while a nascent bumble bee colony will have only a single mated queen.

Solitary bees have similar problems. They have annual life-cycles which are adapted to the phenology of specific crops. Adults emerge in the Spring or Summer right around the time a particular plant species is coming into bloom. They mate, establish new nests, forage, lay eggs and die, all within a few weeks. As a result, solitary bees are often not present in sufficient numbers for commercial use, they are only active for a brief time during the growing season, and they do not forage on as wide a range of crops as honey bees and bumble bees.

There are some notable exceptions to this story. The management of some solitary bees is very well-developed, and considerable research shows that others hold great promise:

- The alkali bee, *Nomia melanderi*, and the alfalfa leafcutter bee, *Megachile rotundata,* are both superior pollinators of alfalfa (Tepedino and Richards 1997). *M.*

A cucumber field.

Blueberry field in Maine.

rotundata can also be an effective pollinator for lowbush blueberries (MacKenzie et al. 1997a; Stubbs and Drumond 1997), and oilseed rape (Soroka et al. 2001), but not for cranberries (MacKenzie et al. (1997b).

- The horned faced bee, *Osmia cornifrons,* is used extensively for apple pollination in Japan (Maeta 1990; Batra et al. 1982; Sekita et al. 2001) and has good potential for pear pollination (Maetea et al. 1993). Considerable information on the effective use of *O. cornifrons* for pollination is also available (Maeta and Kitamura 1981). *O. cornifrons* was introduced to the US in 1977 (Batra 1979), but it has not yet established itself as a commercial player.
- *O. lignaria,* the blue mason bee, pollinates cherries (Bosch and Kemp 1999), and research has shown it has potential as an almond pollinator (Torchio 1981ab; Torchio 1982; Bosch et al. 2000). *O. aglaia* can be an effective pollinator for cultivated backberries and raspberries (Cane 2005). *O. excavata* and *O. jacoti* have potential as commercial apple pollinators (Wei-ShuGe et al. 2002).

Bombiculture has also come a long way in the past 20 years, and key developments have resulted in the year-round availability of certain species of bumble bee colonies with 150-300+ workers. In fact, bumble bees have emerged as a major commercial pollinator, but so far, they have not competed with honey bees. Instead, they have become the premier pollinator for high-value greenhouse crops like tomatoes and peppers. Their dominance in that market is due to the fact that their natural foraging range is considerably less than that of the honey bee, and that makes them ideally suited for the confines of a greenhouse. Of course, they also do well in the field; but their high cost, about a dollar a bee, has limited their use in that environment. (By comparison, at the $150/colony pollination fee some beekeepers received for almonds this season, a honey bee's value comes out to be just about a penny each. This is double, and more likely triple normal fees, however. Ed.)

There are a few obstacles to overcome before bumble bees become as commonplace as the honey bee. For one, a management system developed for one species of *Bombus* does not necessarily work with other species. That means research must be done to develop species-specific management systems. Another problem arises from the geographical distribution of the bumble bees. Although there are 43 species of *Bombus* in the U.S., each species is limited to a particular region of the country. There are concerns over the transportation of bumble bee species outside their home ranges. For example, in New York, *B. impatiens* is common; but it is not found in the west. Transporting *B. impatiens* outside its home range could turn it into an invasive species that displaces local species of bumble bees in other regions. Transporting bumble bees also raises the risk of introducing parasites and pathogens to regions and species previously free of such problems.

The message should be clear. The development of good management systems will impart to bumble bees and solitary bees many of the desirable traits that have made the honey bee so successful. Large populations that can be brought out of diapause at any time of the year, for shipment anywhere in the country, will make them strong competitors for crops currently serviced by honey bees. Of course, one could see this as more of an opportunity than as competition and start to provide pollination services with bumble bees and solitary bees. You would still be a beekeeper.

Whether its honey bees, bumble bees or solitary bees, they all have, or will have, their problems. From the grower's perspective, the best way to solve the pollination problem is to eliminate the need for pollination altogether. Many common fruits, including bananas and pineapples, and some cultivars of citrus, cucumber, summer squash and zucchini, already produce fruit without pollination. The technical name for this phenomenon is **parthenocarpy** (from the Greek *parthenos*, virgin + Greek *karpos*, fruit). Such fruits are often advertised as seedless, and consumer preferences for these products give growers considerable incentive to move in this direction.

Parthenocarpy can be induced several ways. Mainland and Eck (1968) induced fruit production in blueberries by applying various levels of the plant hormones auxin, gibberellin and kinin. Hayata et al. (1995) and Maroto et al. (2005) used plant hormones to induce parthenocarpic fruit production in watermelons. Parthenocarpy can also be induced through traditional breeding methods and modern molecular techniques (Pagnotta 1999; Rotino et al. 1997). Parthenocarpy occurs in some apple cultivars (Pauwels et al. 1999) and can be increased by selection.

Not surprisingly, genetic engi-

Bumblebee field nest.

Bumblebee nest in greenhouse.

neering is playing a greater role. Acciari et al. (2002) reported improved fruit production in eggplants by manipulating genes that control the production of plant hormones. One of these genes is called the DefH9-iaaM auxin-synthesizing gene. Don't get mired in the techno-speak. The iaaM gene simply confers the ability to synthesize auxin (a plant hormone promoting fruit growth), while the DefH9 controlling regions focus the expression of the gene in the ovules and placenta (parts of the plant that normally develop into seeds). Mezzetti et al. (2004) used the same gene to induce parthenocarpic fruit production in strawberry and raspberry cultivars.

Certainly, all of these alternatives will not become commercially viable tomorrow. For now, and for most crops, the honey bee retains the mantle of 'Indispensable Pollinator', but competitors are nipping at its pollen baskets. Ironically, this competition is a direct result of the honey bee's enormous success. The honey bee has been an economical and effective pollinator for agriculture for decades, and growers have come to depend on it for the vast majority of their pollination needs. Simply put, growers are addicted to honey bees. Their pollinator portfolio consists of a single stock – the honey bee – and this puts them at risk in the event of stock failure. This all played out this past Winter in the California almond market. Growers, desperate to lock up colonies for pollination after a hard year on bees, drove rental fees to record levels. Of course, this attracted a lot of bees, and prices have settled back down, but the situation left a wake of broken contracts, hard feelings and uncertainty. Growers do not like uncertainty. If beekeepers wish to maintain the honey bee's preeminent position in the marketplace, they will have to give the growers what they want: a stable supply of affordable and healthy honey bee colonies.

Fortunately, the development of mechanisms for maintaining stability is underway. A great deal of successful research on mite and pathogen resistant stocks of bees has been conducted at USDA-ARS Labs (SMR and Russian stock) and at University research facilities, notably at the University of Minnesota (hygienic stock). These stocks are making inroads among commercial queen producers and beekeepers. However, they are a long way from being a reliable and effective alternative to pesticides, which, of course, have their own set of problems. The long-term sustainability of the bee industry will require the creation of stabilizing mechanisms that reduce volatility in colony numbers and rental fees. These could take the form of third-party programs for Certified Stock and Certified Natural Honey that offer rewards to beekeepers who make investments in mite and pathogen resistant stock and the production of pesticide-free honey. BC

Non-*Apis* bees are usually more efficient pollinators on a bee-for-bee basis than honey bees.

Maeta and Kitamura (1981) determined that each *Osmia cornifrons* pollinates about 2,450 apple flowers per day compared to only 30 for a honey bee.

Cane (2002) determined that females of the alkali bee, *Nomia melanderi*, and the alfalfa leafcutting bee, *Megachile rotundata*, tripped 81 and 78% of visited flowers, respectively. Males of these species are significantly less effective (61 and 51%, respectively), but still significantly superior to the honey bee, *Apis mellifera* (22% of visited flowers tripped).

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Farm Market Tips & Tricks

Kim Flottum

I went to a Farm Market last Summer in Grants Pass, Oregon. It's a Saturday only affair run during the growing season, set up in a parking lot rented from the city. Vendors must be a member of The Southern Oregon Growers Association, a 501C6 non-profit group. You can't be a vendor if you're not.

It's typical of many Farm Market set ups in that every stand is temporary, and the merchants are all local (depending on how close you define local).

What I want to visit here are the techniques these sellers used to make the shopping experience easy for their customers, and profitable for themselves. And also to note some of the problems I found. These, too, are too common, and you can save yourself some problems by avoiding these errors.

You may not have control of these necessities, but EVERY Farm Market should have more than ample parking, waste containers in lots of places, and somewhat isolated restroom facilities.

Vendors should have easy access directly to their booths. Backing right up to the stand makes unloading, refilling and loading fast, easy and unobtrusive.

Wide, wide walk ways to accommodate families, carts, strollers, wheelchairs, wheeled baskets and lots of people, plus, room for people to stand in front of your stand is mandatory.

This stand accomplishes two purposes. The business sign is above head height so it's easy to find, no matter how crowded the area. And the display tables are set back as far as possible, allowing customers to get in out of the sun for a short respite. They will linger awhile longer if it's comfortable. This display missed opportunity to use some vertical shelving, to bring the product closer to eye level. Customers look at jar tops instead of product and labels.

This very attractive display uses a variety of containers and products, and some vertical displays, but all the shade is hogged by the seller, rather than sharing.

Excellent eye level display, with lots of hands-on at hand level. Business sign up high, too. Prices?

Lots of containers add variety, and good signs tell what it is and how much it costs. A missing should-have here is how to use it – recipe cards sell!

Veggies and soap and tie-dyed t-shirts were prominent, but hand crafted items like these offer variety, selection and probably the only chance most buyers get to find this type of product.

Only two beekeepers were there. A quick couple of questions determined, in my mind anyway, that this honey was produced organically, but wasn't organic (by a set of standards that's nearly unworkable). Prices are certainly reasonable, but the small display with only one variety is bound to hinder sales. However, I was at this same Farm Market a couple years ago and another local beekeeper was there with no umbrella, one card table and prices on the jar tops. He sold out in an hour and a half , and did every week. Honey sells. Well displayed sells for top dollar, and sells fast. Be careful with your claims though.

Color and variety, no matter what you are selling help get attention, and make sales – as long as the containers are more than full (heaping sells more than just full, but charge for all of what you're selling). And the cardinal rule – keep all displays full, full, full.

Queen Banks

IF YOU ARE BUYING QUEENS, ALWAYS ASK IF YOU ARE BEING SHIPPED PREVIOUSLY BANKED QUEENS.

Larry Connor

After a month of beekeeping meetings, I feel a very strong need to write about queen banks again, since, when I asked audiences, less than ten percent of the beekeepers confessed to ever having used one. So I've combined material from previous articles with some new thoughts – regular readers may find I have changed my views on a few things. So many of you like to keep me on my toes – I don't mind returning the favor. Thanks – you keep me writing.

QUEEN STORAGE IN NUCLEUS COLONIES

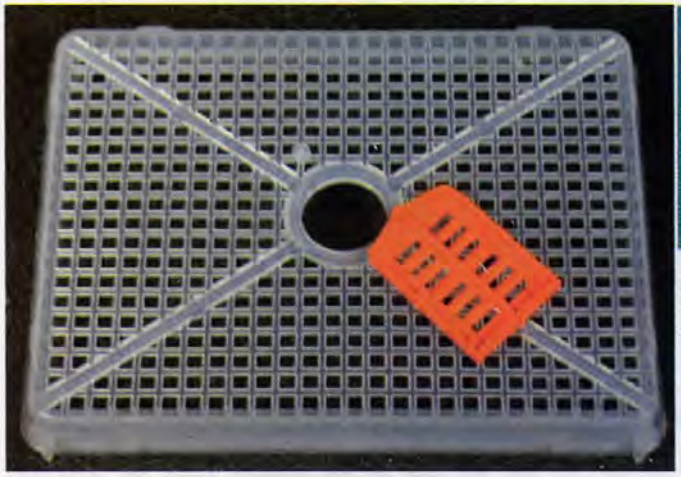
Individual Queens

A four- or five-frame nucleus is one of the best places to store queens – a single queen in a small colony where she is allowed to lay eggs and run on the comb. Introduce the queen onto a frame of brood using a push-in cage where the queen is confined and cannot get out. Wait until the queen has eggs and larvae under the cage before you remove the cage and allow her free run of the nucleus. Hold the queen in the nucleus hive for as long as necessary. Feed the colony before and during the introduction process with 1:1 sugar syrup – and anytime there is not a nectar flow.

Or place the queen into a *plastic "hair curler"* cage and position her between two frames of brood. Cylindrical screen/hardware *wire cages* may be made and used, but probably damage the queen's tarsal pads and this undoubtedly leads to queen problems. Inside the plastic cage, there should be a cavity filled with queen candy to allow her to feed herself. Feed the colony *before and during* the introduction process with 1:1 sugar syrup. After seven to 10 days allow the queen to walk out of the plastic cage onto the frame of brood. The queen should walk about as if nothing has happened, and the workers should react as if she has *always* been out of the cage. If there is any aggressive behavior toward the queen (balling), re-cage her and attempt introduction into another nucleus hive. The more unrelated the queen is, the more difficult it is to introduce her to a group of bees.

Use of nucleus colonies is ideal for breeder queen maintenance. Establish a routine inspection schedule, and clip the wings of all queens to insure queen identity. This is not an intensive labor effort, since you can inspect a nucleus colony quickly to determine if brood should be added to boost the bee population. If you space four frames in a five-frame nucleus box you will reduce damage to the queen during inspection. Nucleus colonies should always have their entrances reduced to one to two inches, with a piece of queen ex-

Typical queen delivery cages. Not the best for introduction, but acceptable.



Plastic push-in cages are easy to use, effective, safe for the queen, and inexpensive insurance.

cluder placed at the entrance if the queen is really important, or if there are invading African swarms in your neighborhood. A robbing screen may be needed in some areas, since strong colonies find nucleus colonies easy prey and set up robbing behavior – remember to consider this colony queenless if the queen is special (expensive) or at all inbred.

NUCLEUS COLONY USED TO STORE A SMALL GROUP OF QUEENS

The five-frame nucleus may be used to store and even transport moderate numbers of queens (mated or virgin). To make up a small nucleus sized queen bank, do it much the same as if you were making a strong increase nucleus. Select two or three nice frames of worker brood where bees are emerging – your goal is to have plenty of young nurse bees in this hive to care for the queens. Use two full frames (85% or more brood), or three partial frames (50-60% brood), plus a frame each of pollen and honey.

Place an empty five-frame nuc shell over the hive and use it to house a jar of sugar syrup. Continuously feed 1:1 sugar syrup with medication (Fumagillin) to prevent *Nosema apis* from growing in the midguts of the bees, including the queens. We know that *Nosema*-infected queens lay fewer eggs and are superceded earlier than uninfected queens. The feeding also keeps the queens well fed and sometimes will continue to lay eggs in the cages – a sign of good queen storage conditions.

The five-frame queen bank is a suitable place to store up to 30 queens and transport them to remote sites for introduction. The queens are less likely to be stressed in such a bank, and if you do not use them all they are well protected. To move the bank, screen the entrance and remove the feed shell. If you plan ahead, you may open vent ports on the side of the box for ventilation. Several cardboard nucleus boxes on the market have these ventilation features built in for your use.

Carefully maintain the queen holder. At least once a week inspect all frames for queen cells (the last thing you want is a mated queen to start laying in this box, for all the confined queens will die). Remove frames of brood that have emerged and replace them with fresh brood frames. After a month, you may want to relocate the holder a few feet away so the older field bees will return to a dummy hive you set up for them. This keeps only young nurse bees in the queen holder.

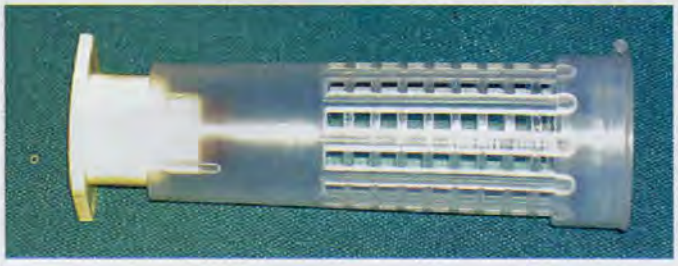
QUEEN STORAGE IN STANDARD SIZED COLONIES

A full sized queen bank is run much like a cell builder used to finish cell construction in a queen rearing operation. A young, vigorous queen is kept in an eight- or 10-frame hive body. Every week the open brood she has produced is moved to a second box above a queen excluder. If the queen is not seen, the brood should be gently shaken or brushed to remove enough bees to eliminate the chance of transferring the queen into the queen bank. Move empty brood frames to the bottom hive body – extracted if filled with nectar or syrup

Queen-holding frames should alternate between frames of open brood. As in the nuclei, these cages may be made of plastic or another material, keeping in mind the problem of possible damaged footpads in metal screen cages.

There may be 30 to 60 queens stored in one queen holding frame,

The modified hair curler cell protectors on a frame holder. Without them, you could lose a whole bunch of queens.



with up to two frames per queen bank. That is a lot of queens (and dollars) in a single hive, so make sure you are confident of your queen bank skills before storing a large number of queens. Banked queens should be of the same age and genetic makeup. Given a choice, worker bees select queens of similar genetics and care for them better than 'foreign' queens of unrelated stock. Do not mix young virgin queens with old mated queens in the bank, for this may put one group at risk.

Queen banks MUST be constantly fed, preferably with a division board feeder or a top feeder to reduce robbing. *Your goal is to duplicate conditions found during swarming season, the peak of the season, where colonies have lots of incoming food and young bees.* Inside a queen holding colony where the bees are well fed, you may find that the queens are laying eggs in their cages! See that as a very good sign. Equipment must be bee tight so the host queen cannot get in to the area where queens are being banked. Once she starts egg-laying in the queen holding area, the other queens die quickly.

The mesh wire cages. Too-large openings allow colony workers access to the queen's foot – and tarsel gland damage can occur. Avoid these.

Using Banked Queens

Dr. Diana Sammataro and her coworkers at ARS-USDA, Tucson, have been looking at what happens to a queen pheromone signature when multiple queens are stored in a queen bank. Their preliminary information shows that banked queens shut down their individual pheromone production when stored in queen banks. They find that laying queens have a stronger pheromonal signature than those not engaged in egg laying. Therefore, the stored queen, one that cannot lay eggs because she is caged and not normally fed, cannot compete with a recently removed queen laying hundreds of eggs/day.

The significance of this should sound an alarm in all beekeepers regularly using commercially produced queens. A non-laying queen ➢

must be allowed the opportunity for her ovaries to develop and lay eggs before being introduced into a hive and expected to perform like a racecar at the Indy 500. Even removal for a few hours, and certainly overnight, undoubtedly affects a queen's egg laying, total body weight, and pheromone production. There is much more research to do in this area, but the evidence is that the queen is, in part, perceived by the bees as a function of her pheromone production and that is based on her egg laying. A queen that is not laying eggs normally is not detected as a normal queen.

Bottom line: the biggest questions every queen buyer *must* ask his or her supplier – have these queens been in a queen bank? And if so, for how long? How long have these bees been in transit?

This may provides valuable answers to problems some beekeepers have with introducing queens taken from queen banks: they are often not accepted or may be quickly superseded if they make it through the introduction process. For that reason banked queens should always be introduced into smaller units, like splits or nucleus colonies, held in their cage or introduction cage for a week or so before they are released. And feed before, during and after the holding and release process. This should allow the queen to return to normal egg-laying and pheromone production levels with her ovaries again swollen with developing eggs. For those not wanting to wait the week or so to introduce the queen, ask yourself which takes more time – the week for delayed introduction or introducing another after the first one has failed to take?

After a banked queen is out and laying, inspect the colony every 14 days to check for supersedure cells. If found, see if the previously banked queen continues to build the colony normally and cut these cells out. The egg laying can be fine, but the pheromonal response may be lagging. If you are buying queens, always ask if you are being shipped previously banked queens.

So we have ended where we started – queens should be introduced into smaller, nucleus sized colonies, and they should be delayed in their release until their egg laying is on par with colony expectations. Banking queens can be done, but it comes at a cost of increased management effort. BC

Having returned from another month-long lecture/book-selling road trip, Larry Connor interrupted work on the final pages of Increase Essentials to write this article. Or re-write it, depending on you viewpoint. He sometimes answers emails sent to ebeebooks@aol.com.

A Tale Of Two Hives

The Developmental Legacy Of A Parent Colony And Its Offspring

James E. Tew

The situation

In recent *Bee Culture* articles, I reviewed some of the characteristics and behaviors of both the parent colony and its swarm. The possible scenarios are endless. Everything is a potential factor. The weather, the nectar flow, your management abilities, pollen sources, and pesticide exposure, are common challenges both established and establishing colonies must survive.

In these previous articles, I discussed two hypothetical colonies – one the parent and the other the split (or the swarm). It's simple bee colony reproduction – where there was one, there are now two. In this case, the colony reproduction, to this point, has been successful. But the saga continues. Winter is only a few months away. Life is not easy for the bees and sometimes the beekeeper is not as helpful as he could be.

Brood – the common shortage

What both the parent and the swarm colony seriously need is brood. The parent colony has room for it (abundant comb space), but no mated queen, while the swarm colony has a mated queen, but no comb in which to lay eggs. What should each colony do? Address the brood issue – immediately!

The parent colony's queen predicament

I alluded to the challenges facing the parent colony in earlier articles, but since a colony without a queen is a serious state, it bears some more discussion.

If all was normal when the swarm left, the parent colony was left with "queen potential" in the form of one to more than 20 maturing queen cells. The general working numbers are: 16 days for a queen to be developed from an egg, four to seven days within the hive in the imago (or soft) phase, four to seven days for mating flights or longer depending on drone population and weather, another seven days after that for physiological development enough to begin to produce eggs – low egg production at first. Finally, 21 days are required for the development of worker brood produced by the new queen. In total, an estimated 52 – 58 broodless days (nearly two months) pass while the development of a queen and subsequently her brood to develop. This harsh reality is true in all aspects of beekeeping – swarms, parent colonies, packages, splits – anytime queens must be reared or installed, this broodless gap becomes important. Frequently, I hear beekeepers say, *"I let the bees raise their own queens. They're better at it than I am."* Well, maybe so and maybe not. Anytime a beekeeper decides to let the bees raise their own queens, be sure to include nearly two broodless months into the colony development picture.

The swarm colony's queen predicament

The swarm colony has the better deal of the two in the area of queen replacement. It has a queen, but no place to lay so comb building is of paramount importance (Is that the reason that old comb is so attractive to a roving swarm?) And since there is no hungry brood to feed, most available resources can be directed to comb construction (or comb refurbishment). During the time that comb is made ready – usually three to five days – the queen is copiously fed and rebuilds her egg laying potential. The egg population is small at first, but time is important. Remember, every day, in both of the colonies being discussed, adult bees are dying, and are not yet being replaced. So the ratio of bees being reared to nurse bees is changing.

But there is a subtle difference that must be considered at this point. As the brood population grows ... and grows.... the pressures put on the swarm queen increases to the point that few swarm queens, already being a year or two old, can maintain the production pace. I suppose that all depends on how long the swarm queen can hold out, but most swarms quickly supersede the original queen. But the change in power is softened a bit in that the old queen can continue to produce some brood during the interval that new queens are developed.

Queens, the common shortage

Each colony, both the parent and the swarm, will have to deal with queen replacement procedures – only at different times. The parent colony may have a residual population of capped brood and the swarm colony may be able to depend on the failing queen for some brood production during the replacement interval, but both colonies will go through the event. Though absolutely necessary from a biological stance, the procedure will cost both colonies in brood population.

The elementary biological sequence

Roughly, in this order, a colony must have (1) workers, (2) comb, (3) nectar and pollen and (4) brood.

These two small swarms will soon need more space.

Obviously, they won't build all the comb they will ever need at the outset and obviously, the swarm needs enough food to meet daily requirements, but to survive the upcoming Winter, the colony must immediately address the comb/food/brood issue. Why no mention of the queen? True, she is critical to the survival of the colony, but queens can be produced from worker eggs. If a colony has eggs and very young larvae, they have queen potential. Colony defense is necessary when invaders challenge but in general, for the bees there are no other issues. No retirement homes, no second careers, no grand kids visiting. The primary issues are: comb/food/brood[1]. Without it there is no future and both colonies are working to meet the big three challenges.

From the beekeeper's perspective

The beekeeper can be helpful during this difficult time that each colony is experiencing. First, review why the colony swarmed in the first place. Colonies swarm sometimes when even the best beekeeper is in charge, but all of these events in my past two articles could have been avoided if the swarming event had never occurred. Remember, keep young queens as heads of the colony and provide brood space before the bees need it. Otherwise, get ready to capture swarms.

Requeen – judiciously

If a colony has just cast a swarm or if you are hiving a swarm, both of these colony types have just been through a behavioral trauma. The competent beekeeper could jump into the middle of this situation and requeen, but I suspect that most of us should let things calm before we add to the confusion.

In the real world, in the parent hive, it will be difficult to tell when the natural requeening process has been successful. There is a dark period when queens are fighting and mating before ever beginning egg production. During this period, there is no evidence of a queen's presence. Even patient beekeepers can become impatient waiting for signs of a successful queen replacement procedure. With virgin queens all about the hive, some in mating flights, some in capped cells, some already dead, just dropping in a new caged queen will not be the best approach. Let some of the biological confusion settle, and then install your new queen. You may ask, "If I wait until there is a new queen, why would I replace her with another new queen?" The honest answer is that many (most?) beekeepers probably do not replace the newly developed parent colony queen, but (1) you have no guarantee that the bees did a good job producing the queen and (2) you could readily assume that the swarming tendency was passed along in the new queen. Just be sure within two-three weeks of the swarm issuing that the parent colony has a functional queen in place.

The swarm queen will be much easier to find and her egg producing program will be much easier to evaluate. I suggest requeening the swarm colony as soon as the swarm has calmed and is clearly functioning as an independent colony. This procedure is always distasteful to beekeepers – to destroy a queen that has just been through such a challenging process as swarming. Well, either you can do it or the bees will do it and the bees will take a much longer time getting the job done. Just requeen the swarm and kill the old queen. There is nothing else to do with an aged queen. (I'm primarily talking to myself here. I always have trouble doing this.)

Supplemental food

Most of the time, nature is providing a larder for the bees. During the spring season, both pollen and nectar are usually abundant. But what if the Spring is not a great one? What if the swarm issues late and crashes into the Summer dearth? Beekeepers serve a valuable service to colonies making such errors by providing either sugar syrups or comb honey from other colonies. But for a beekeeper to undertake full-

This swarm is thriving, but needs space.

[1] For beekeepers, a rather distasteful discussion is the fact that starving bees will readily eat their brood – larvae first, then pupae. Abundant comb and brood are useless if there is no food. Under extreme colony conditions, brood is just a form of stored food.

time feeding during particularly bad seasons is probably doomed to fail. While the bees might be kept alive during warm months, the Winter months will penalize those colonies having light food stores. So feed, when helpful, but combine colonies when long-term feeding is futile.

Hive space

The parent colony is probably going to be okay on hive space. It is as though the kids just moved out leaving empty bedrooms upstairs. The swarm colony, on the other hand, will be growing like a juvenile and will need a second deep surprisingly fast. All Winter seasons are not the same (and more on this later), but absolutely no good is done to a nice, big swarm that quickly grows to fill its hive space while the beekeeper is off doing other things. Winter months will punish the bees for the beekeeper's shortage.

Disease and pest protection

If a colony was healthy enough to build up population to swarm, it was *probably* healthy before hand. Probably, but watch it anyway. Varroa will be a problem sooner or later. The beekeeper should try to make it later. Plus, during swarm season, surplus honey supers are normally on the hives so most common disease/pest control procedures should not be implemented.

Controlling problems like *Varroa* and American foulbrood are obvious, but colonies can really be distracted by nightly marauding skunks and raccoons. Refer to your books and beekeeping friends to get recommendations on controlling these distractions.

This year, forget the honey crop – from either colony

We hear it all time – about the big swarm that went on to yield several supers of honey and wintered fine. But most of the time, such a story is a fairy tale. Swarming is costly and dangerous for both colonies. Just getting new queens in place and enough food to meet Winter storage needs are certainly goals enough to expect from the two colonies. Refer to my first paragraph – everything is a variable. Just because swarm colonies did great this year is no harbinger for what will happen to next season's swarms.

The Summer dearth/the Fall flow

By the time all the requeening events have passed and normality returns, the Summer dearth is upon both us and the bees – it's hot and nectarless. Both colonies were frantic to get worker populations built up and now these populations sit or hang on the front of a hot hive – waiting for the Fall flow. Colonies that are successful will have about six to nine frames of brood and evidence of pollen stores will be near the brood. If both colonies got a good start in the Spring, the parent colony is probably heavier in stores than the swarm – but not necessarily. A good swarm will have filled two deeps in the Spring, but a single deep and part of a second is more common, and only a single deep isn't uncommon. That reserve may get them through a mild Winter, but the following Spring flow becomes of paramount importance.

In general, in cold areas a colony needs two deeps to confidently go into Winter (a gross colony weight of around 165-185 pounds for a two-deep hive plus bottom and top). In warmer areas, much lighter colonies can survive, but in many instances feeding will still be required, something that can be done in areas having warm Winters.

The first frosts

As it were, these two colonies have undergone major surgery. If these bees could talk, what tales they could tell. The swarm could tell of being sprayed with water from hoses or with insecticides while the parent colony flirted with laying workers and depleted resources – all the while trying to get a new queen in place. Yet, here the two colonies are; both queenright, healthy, and housed in two deeps. Maybe the parent colony even has a super on it. If you, the beekeeper, are at this point, it was a good season for these two colonies and you.

The final phases are to give a final check for *Varroa* populations, flip the inner covers and reduce the entrances to restrict mice. Next year, these two colonies, healthy and headed by new queens, should be two of your best producers – assuming the Spring flow is there and you are able to get supers on. As a beekeeper, you didn't eliminate swarming, but you and the bees survived it. BC

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THE FUTURE IS NOW . . .

Northern Nuc Production

A critical component in selling nucs each year is having good, drawn comb. Here's how.

Roy Hendrickson

Beekeeping is undergoing change, major change. Current *Varroa* control practices are living on borrowed time, mite resistance and comb contamination issues are mandating change, now. Africanized bees, once located in some far off south or Central American country, or maybe somewhere down in Texas, are here! They're on the move, and they're changing the way you keep bees, probably a lot sooner than you thought they would.

For serious beekeepers in the central and northern parts of the country this spells opportunity. Eventually the supply of southern queens and packages will be greatly reduced, or cut off entirely, creating a strong demand for locally produced replacement stock. If you're tired of producing honey and selling it at or below the cost of production; if pollination isn't part of your game plan, then opportunity is at hand. Consider producing replacement bees, queens and nucs for your local beekeeping community.

Queen rearing basics along with nuc makeup and management have been covered in the previous two issues of *Bee Culture*. If you plan to produce nucs for resale you need to develop a reliable comb replacement system. And the most important aspect of nuc production and colony increase is the production of these new or replacement combs. This sounds easy, but at times it can be a daunting task. Here are some practical methods of comb production that I've made work for me, and equally important, the direct and indirect costs of producing that comb.

Recent changes have also completely altered the internal makeup of the typical, and traditional beehive. Where there were only wooden frames and wax foundation, there are now a myriad of choices. Costs vary almost as much as the equipment, any attempt to analyze and compare those costs would be a useless endeavor. In the end personal choice or convenience will dictate what type of frame and foundation is used, cost will most likely be a secondary consideration.

However, unlike new equipment expenses, comb production costs are worthy of some analysis. From an expense standpoint do you use the honey flow to get the foundation drawn, or do you accomplish this task with supplemental feeding, or both? In my opinion the cost of sugar or corn syrup, transportation charges for the same, and the time spent in mixing and distribution, far exceed the cost incurred by using the natural honeyflow. Without question the fluctuating price of honey can influence this expense, but the convenience factor of using the honeyflow is difficult to overlook or to put a price on. From an operational standpoint, using the honeyflow has one other significant advantage. If circumstances change for any reason, you can always extract the honey.

In order to determine the cost of producing a drawn comb there has to be a starting point. For that purpose I will use $2.00 as the average price of a frame and foundation, plastic or wood. An old time beekeeping friend, now working that great honeyflow in the sky, once told me that no matter how hard he tried he was never able to render more than about three pounds of wax out of a standard 10 frame hive body. I'll use that figure as the basis for the amount of wax produced. There is an old beekeeping adage that says a colony will consume seven pounds of honey for every pound of wax it produces. That will serve as the basis to de-

Extra wax application on plastic foundation – pizza pan, queen excluder, support assembly, brush and foam paint roller.

Frame of comb honey – drawn above five frame broodnest (nuc).

termine the production cost. The last figure required is the dollar value of a pound of honey. I'll be conservative, somewhere between wholesale and low-end retail, and use $1.50/ lb. for that basis. If a standard 10 frame hive body contains three pounds of wax, the weight of the foundation has to be deducted in order to determine how much wax the colony contributed. At seven sheets per pound each sheet would weigh approximately 2.28 ounces. Ten sheets come in at 22.85 ounces, or about 1.4 pounds. Subtracted from three pounds, this leaves 25.15 ounces, almost 1.6 pounds of wax to be produced by the colony. Using the seven to one ratio of honey consumed to wax produced, it takes about 11 pounds of honey at $1.50/lb to reach a total wax value of $15.50 per box. Divide this by 10 for a cost of $1.65 per frame. Add in the set purchase price of $2.00 apiece for the frame and foundation and you have a total cost of $3.65 per frame, or $36.50 for a standard 10-frame hive body. Of course these figures are completely arbitrary, you can recalculate them any way you choose, but your formula will remain the same.

Comb production colonies should be strong and disease free with an abundance of stores. They also need expanding populations of young bees 12 to 18 days old, bees the prime age for maximum wax production. Honey bees will not arbitrarily work foundation. They draw wax only when need dictates, either to expand the broodnest or create additional nectar storage space. Don't install foundation until nectar becomes available, or an artificial carbohydrate source is supplied. As a general rule of thumb better comb will result if the foundation is drawn above the broodnest rather than in it. Bees naturally store nectar above the brood, heat from the broodnest rises and helps provide the warmth necessary for wax secretion and comb production and construction. However, in cases of colony increase where drawn comb is in short supply, the use of foundation in the broodnest becomes unavoidable. In this event heat retention becomes very important. Otherwise, the wax immediately behind the lower front corner of the forward end bar, and that just above the bottom bar will be removed, resulting in poor quality comb. Even during warm weather night time temperatures can fall to the point where damage to the foundation can occur. Install a tight fitting entrance reducer with an opening commensurate with current temperatures. In extreme cases such as early Spring package installation, consider the use of top insulation to improve the quality of the drawn comb.

Swarming is another consideration that must be taken into account when foundation is in place, particularly during the main Spring swarming season. Not all colonies work foundation well, and some won't work it at all. Those that don't will eventually start swarm preparations. There are a couple solutions to this problem. First of all, be selective. Look for colonies willing to draw foundation. Once located, take advantage of the trait and run them exclusively on foundation. If you rear your own queens, this is one characteristic you might want to select for.

Another management option would be the use of bait combs. Baiting is the practice of placing a partially drawn comb, or a comb of open brood, up into the box of foundation. This will draw the young bees up, either

Double and triple five frame colonies – end of main flow – wax drawn and filled.

to care for the brood or to initiate comb construction to accommodate incoming nectar.

There is a positive side to the use of foundation in the aforementioned swarming equation. Once a colony starts to draw comb in earnest, the chances of it swarming are diminished. With large numbers of young bees hard at work on the foundation, broodnest congestion is greatly reduced and colony morale improves. Swarming gets pushed to the back burner, superceded by the storing impulse.

My preferred methods of comb production center around strong single hive body colonies, and five frame nucs made up specifically to produce comb. The work starts as soon as the Spring weather will permit. Colonies with excess broodnest capacity are reduced to a single hive body and allowed to build. Depending on the season and overall colony condition, additional frames of brood are sometimes added to bring weaker colonies up to the desired strength. The main goal is get all the wax producing colonies in similar condition, that way they can be operated as a single entity. Full boxes of foundation are usually added around the beginning of the fruit bloom, weather permitting. Initially no bait combs are used. I like to wait and see whether the bees will start working on their own. I also use this technique to help gauge the flow conditions and the general attitude or inclination of the colony. Patience is the key. Often it will take a week or more before any serious work begins. Those colonies that are slow to start receive a bait comb. That will usually

Frame drawn above strong single – not from above box.

solve the problem and the work will proceed at a normal pace. However, occasionally you'll find a colony that will not work foundation under any circumstance. In this case don't waste time fighting city hall, remove the foundation and return the colony to its original configuration, or use it to make up splits.

I rarely feed syrup in the Spring, there just isn't enough time. I also don't want to take any chances that the syrup will be moved up into the supers once the main flow starts. I do however spray the foundation with thin 1:1 sugar syrup when the foundation is added. This helps to entice the bees up onto the foundation and hopefully gets them to start a little sooner. Occasionally a second or even a third spray application is required after a cold spell has caused the colony to cluster and temporarily suspend work on the new comb.

The five frame nucs are made up in late April or early May. They're started with two frames of brood, lots of extra bees and either a mated queen or queen cell. A frame of honey and two empty drawn combs complete the unit. About three and a half weeks after makeup, once the brood from the new queen starts to emerge they will need more space. A second five frame box with five frames of foundation is added at that time.

As with the full size equipment the foundation is sprayed with a thin sugar syrup solution at the time it's installed. Because the nucs were started from scratch and allowed to build, it takes much longer to get to the comb production stage than the overwintered colonies. As a result most of this foundation will be drawn out and filled on the main honey flow. This can result in some spectacular honeycombs. If you want to win the blue ribbon for frames of honey at your local fair, this is the way to produce those combs. When the center frames are starting to get capped, a second box of foundation is placed on top. Since comb production is well under way, there is no further need to spray the foundation. In my location two boxes is about all you're going to get drawn out and filled, because the honey flow will end before the third box can be added. I'm sure there are many areas that will out perform mine by a mile. If you have such a territory, go for it. Try adding a third or even a fourth box of foundation if conditions merit.

Summer honeyflows present another excellent opportunity to produce some top quality foundation. If you're lucky enough to live or operate in an area with a reliable Summer honeyflow, you're sitting on top of the beekeeping pyramid. You can get comb drawn with little concern about swarming, cold weather, or stimulative feeding. Best of all, your Spring crop isn't reduced because of the need to draw wax.

In my location there is a Summer flow two years out of five on average. When it occurs, the flow is of moderate strength and usually lasts four or five weeks. It finishes just as the goldenrod flow is starting. Goldenrod produces a strong, dark, heavy bodied honey which is very slow to granulate. It makes excellent bee feed or Winter stores, and is ideal for drawing foundation.

My normal procedure is to remove the Spring crop and watch for signs of a Summer flow. I'll pull a frame of open brood and give it a quick shake. If nectar spills out I'll put a hive body of foundation directly over the broodnest of the best colonies. I prefer plastic foundation in this instance. That way if the flow doesn't materialize, or if it fades out prematurely, the foundation will remain intact. If wax foundation were used under these circumstances, the wax would most likely get chewed up, especially around the support wires. If the flow remains steady, finished combs are periodically removed and either stored for future use, or given to colonies in need. The remaining partially drawn combs are slid together with more foundation added to fill out the box. All the foundation remains in the original box, additional boxes of foundation are not stacked up.

In addition to producing top quality finished combs, Summer flows are an excellent source of bait combs for use the following Spring. As the flow winds down remove the unfinished combs and store them somewhere out of the reach of robber bees. Don't worry about storing combs partially filled with honey. Even though these combs may start to ferment over the Winter months they will be readily accepted the following Spring. If any colonies appear light, feed thick two to one sugar syrup to make up the shortfall. Do not leave partially filled combs above the broodnest for Winter stores. The colony will eventually move up into these combs and die of starvation over the Winter.

My experience with plastic foundation has been mostly positive. My major complaint is that colonies are slow to start working the plastic. With wax foundation, work usually starts as soon as nectar becomes available. Young bees enter the super and begin to draw out the foundation to create the beginnings of a new comb. As the nectar flow increases wax glands in the young bee's abdomen begin secreting new wax and comb building goes into high gear. Plastic foundation has very little wax available to start this process and with unwaxed foundation there's none at all. It's no wonder colonies ignore it; or worse yet make a mess out of it.

The simple solution is to add some additional wax. Start with clean cappings wax. Melt it up using whatever device you have available and use a paint brush or foam paint roller to apply a coat of wax directly onto the plastic foundation. The end result doesn't have to look pretty; the bees don't care, they'll know exactly how to handle it. Wood frames with snap in foundation should be fully assembled prior to the wax application.

I've talked to many large beekeepers that routinely use this process to increase the attractiveness of plastic foundation and they all say the same thing – once an additional coat of wax was applied plastic was the equal of wax foundation as far as colony acceptance was concerned.

These are some of my ideas and methods for producing new comb. Adopt whatever seems appropriate and work it into your management program. Don't be afraid to experiment. It's a lot of fun, and a great way to learn the art of beekeeping. BC

Roy Hendrickson is a successful sideline beekeeper, and a frequent contributor to these pages.

The Honey Garden

Connie Krochmal

Combining the best of honey bee pollinated garden crops with honey recipes. The best of two worlds.

CHIVES

Chives are a very popular herb. Easy to grow, these are an excellent choice for novice gardeners. With a mild, onion-like flavor, this herb belongs to the Lily family.

Native to Europe, this plant has a small, shallow root system arising from short rhizomes. Chives produce small edible, onion-like bulbs, which continue to increase in size every year.

This mounding, tufted perennial forms dense clumps. Typically, it grows to about 1½ feet in height. With a grass-like appearance, chives are cultivated mostly for their edible, bright green to blue-green foliage. The leaves are rounded and hollow just like those of onions.

Very free flowering, chives bloom the second year when grown from seeds. The flowers appear during the late Spring and early Summer. Their color can vary somewhat. Normally, they will be lavender pink or pure pink. However, some varieties have white, cream, or yellow blossoms.

The stiff, erect, slender, flower scapes can sometimes reach a foot in height. Several dozen, tubular blossoms crowd together in a fluffy, globe-shaped umbel at the top of each flower stalk. Around 1½ inches wide, these flower heads are surrounded at the base by bracts. The individual blossoms are quite tiny. This makes it hard to see the flower petals, which are only ¼ inch in length.

The papery seed heads yield large numbers of shiny, black seeds.

Growing Conditions

Unlike Mediterranean herbs, chives reach their best growth in well drained soils that are high in organic matter. They are adapted to average, evenly moist conditions. So far as pH is concerned, a slightly acidic to neutral soil is best. Around 6.0 is considered ideal.

For best results, chives need at least six hours of full sun. Though the plants can tolerate some partial shade, they will not bloom as well in heavily shaded situations.

This herb is resistant to frost. But, it eventually dies back over the Winter months to return in early Spring.

Hardiness

Among the hardiest of the herbs, chives can be grown as far north as USDA zone three. On the whole, chives thrive with cooler temperatures. That explains why they aren't suitable perennials for Florida and other hot areas. In such locations, chives are best treated as annuals by growing them during the Autumn and Winter.

Planting

Chives will often be found in herb gardens and kitchen gardens. They are also good choices for peren-➢

RECIPES

Ann Harman

Chives are really interesting. Unfortunately snippets of them are thought of as a bit of green garnish, much like the sprig of parsley tossed on a plate and ignored. Indeed you can sprinkle chives on soups, potatoes, eggs, salads, and anything else you fancy. But chives have a flavor to offer – delicate but definitely oniony.

The leaves of chives are hollow, which has advantages and disadvantages. They are easily snipped with a scissors – much easier than cutting with a knife. But do not be alarmed if they collapse during cooking – the flavor is still there.

Let's explore some ways to use chives – for themselves, not as a garnish. I think you will be surprised.

This first recipe seems to use an amazing amount of garlic. However when garlic is cooked it loses much of its "punch" and adds a nice flavor without overpowering the other flavors. This is also a recipe that honors chives.

POTATO GARLIC SOUP WITH CHIVES

8 cloves garlic, peeled
8 cups chicken broth
2 pounds potatoes, cut in bite-size pieces
1/2 cup fresh chives, chopped (snipped, really)
1/2 teaspoon salt
1/4 teaspoon white pepper
1/4 cup fresh Italian parsley, chopped
2 cups milk
2 teaspoons lemon zest
1/4 cup additional chives, chopped (snipped)

In a kettle, combine first 7 ingredients (the garlic through parsley). Bring to a boil then lower heat and simmer partly covered for 30 minutes. With a slotted spoon transfer solid ingredients to a food processor and blend until smooth. Return processed mixture to pot, stir in milk and heat through but do not boil. Ladle into bowls and sprinkle with remaining chives and lemon zest.

Coosemans Worldwide

nial beds and borders. In addition, gardeners frequently use this plant for edging.

These can be planted during the Spring or Autumn. Space chives about 1½ feet apart in the garden. This allows enough room for the foliage to remain upright. If crowded together, their foliage can become floppy. When garden space is limited, grow them in containers.

Set each clump so that the crown is level with the soil surface or the top of the potting soil. Water the transplants on a regular basis if necessary until they become well established.

Because seedlings can take quite awhile to reach maturity, some folks prefer to buy plants or get divisions from another gardener.

Propagation

Chives are propagated by seed and division. If you plan on starting your own plants from seeds, use fairly fresh ones. Those stored longer than a year are less likely to germinate. The seeds should be planted in pots or plastic packs. Cover these to a depth of ¼ to ½ inch. Sow them thickly. What you want is a clump of seedlings rather than solitary plants. Place a black plastic bag over the pot or tray to exclude light. The seeds require darkness in order to germinate.

Seedlings should start to emerge in 10 to 14 days. Germination is best at 60 to 70°F. Once the seedlings appear, move the pots to full sun. Transplant into the garden when they are three to four inches in height.

Dividing Chives

Chives can be divided as soon as the soil can be worked in the Spring. During the Fall, do this at least a month before the first expected frost. When growing conditions are ideal, chives will need dividing about every three or four years.

Dig each plant with a shovel. Shake the excess soil from the roots. Next, divide each clump into sections by pulling them apart or cutting them with a shovel, trowel, or a pair of dividing forks. Each new division should be at least two inches across, and should contain three to five bulbs. Cut the tops back to several inches in height. Then, re-plant each new division.

Plant Care

The more you harvest, the more nutrients the chives will need. These are heavy feeders. Therefore, you will need to add compost, chemical fertilizer, or other nutrients during the Spring. An application of compost in the Autumn also helps.

To encourage re-blooming, snip the fading blossoms. Keep the weeds pulled from around chives. It becomes very hard to remove these if they grow into the clumps.

While most other herbs tolerate drought, chives benefit from watering during dry periods. This will keep the foliage tender and lush and promote flowering. In addition, the flavor can become sharper if the plants don't receive enough water.

If your chives bloom take advantage of those blossoms and make this omelet. You can use chive blossoms in salads, too.

BLUE FLOWER CHIVE OMELET

4 eggs
4 tablespoons milk
salt and pepper to taste
2 tablespoons minced chives
3 tablespoons butter
About a dozen or so chive blossoms, gently washed and dried

Melt the butter in a frying pan then combine the remaining ingredients, except the blossoms, in a blender and pour into the hot buttered pan. As the edges of the omelet begin to set, reduce the heat somewhat and with a spatula turn the uncooked eggs to the bottom of the skillet until they are all cooked. Sprinkle the blossoms across the top of the eggs and then fold the omelet over and let cook another few minutes. Yield 2 servings.

Cooking In The Shaker Spirit
Haller & Paige

These muffins go very well with a bowl of hot soup or as a quick bread with dinner.

DOUBLE ONION MUFFINS

Onions and chives, of course!
1 onion, finely chopped
1 teaspoon oil
1-1/2 cups flour
2 tablespoons sugar (you can try substituting honey)
1-1/2 teaspoons baking powder
1/2 teaspoon baking soda
1 cup buttermilk
1/4 cup fresh chives, chopped (snipped)
1/4 cup oil
1 egg

Line 12 muffin cups with paper liners. In a small skillet cook and stir onion in the teaspoon of oil over medium heat until tender. Set aside. Combine all dry ingredients in a large bowl. In a medium bowl combine cooked onions, buttermilk, chives, 1/4 cup oil, egg, and honey if you used it as a substitution. Beat well to combine. Add to dry ingredients and stir just until dry ingredients are moistened. Fill muffin cups about 3/4 full. Bake at 375° for 12-14 minutes until toothpick inserted in center comes out clean. Muffins will be very light in color. Immediately remove from pan. Serve hot.

Busy Cooks
Linda Larsen

In this next recipe the chives are not cooked very long so the hollow leaves will probably collapse only a little but the flavor is still there.

SPAGHETTI WITH ASPARAGUS, MUSHROOMS, LEMON AND CHIVES

12 ounces spaghetti
4 tablespoons butter, divided
2 tablespoons extra-virgin olive oil
1/2 cup thinly sliced shallots (about 4)
1 pound fresh shiitake mushrooms, stemmed, sliced or other flavorful mushrooms, sliced
6 tablespoons fresh lemon juice
1-3/4 cups vegetable broth
1 tablespoon grated lemon peel

Pests and Diseases

Normally, chives have few pest or disease problems. Overcrowding and wet conditions can bring on diseases, such as powdery mildew. If this occurs, cut the plants back to the ground and dispose of the clippings in your trash (not in the compost pile).

Varieties

In addition to ordinary chives, a number of varieties are available. Among these are the following.

Album is a white-flowering variety. This isn't quite as tall or wide as most other kinds of chives.

Forescate reaches about two feet in height. A vigorous plant, this has flower stalks that are about eight to 10 inches tall. Its blossoms are slightly larger than those of the species. These blooms will be brighter colored – a vivid rosy pink.

Grandiflorum grows to about 1½ feet tall. The leaves are somewhat thicker than those of the other chives.

Grolau is also called windowsill chives because it is often grown indoors during the Winter and in greenhouses. Smaller than the species, this has thick, dark green foliage. The flavor is stronger than that of most other chives with a slight hint of garlic. Its blossoms are lavender or pink.

Profusion is a sterile variety of chives that produces no seeds. Especially floriferous, it blooms for longer periods than the others. This was bred for its flowers. About a foot in height, Profusion is suitable for growing indoors.

Purly has an upright growth habit. Its leaves are thinner.

Roseum produces pink blossoms. Around a foot tall, this award winning variety received an Award of Garden Merit from the Royal Horticultural Society in England.

Status as a Bee Plant

Bees love the blossoms of all the onion relatives, and chives are no exception. They are rarely absent on these flowers. Freely producing nectar and pollen, chives bloom reliably.

There will rarely be enough of the plants to yield pure chives honey. When available, this tends to be amber colored. Initially, the honey has a slight onion-like flavor, which quickly disappears.

Harvesting

Cut and come again describes this herb. Begin with some of the outer leaves in each clump. Pinch or cut these back to about an inch or so above the ground. During the first year, the leaves of seedlings will be thinner than those of mature chives. But the flavor will be identical in both.

Begin harvesting when chives are about six inches or so in height. For plants grown from seed, this will be about four months from the time the seeds are sown. Rotate among the individual plants so that each one gets to rest several weeks between harvests. BC

Connie Krochmal is an award winning garden writer and a beekeeper in Black Mountain, South Carolina.

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1 pound asparagus, tough ends trimmed, cut crosswise into thirds
1/4 cup fresh chives, chopped (snipped)
4 ounces thinly shaved cheese, such as Swiss or Italian Asiago Medium

Cook spaghetti in large pot of boiling salted water until tender but still firm. Drain and transfer to large bowl. Melt two tablespoons butter with oil in large skillet over medium heat. Add shallots; sauté one minute. Add mushrooms, sprinkle with salt and pepper. Sauté mixture until mushrooms are soft, about six minutes. Add lemon juice and cook one minute. Add vegetable broth, lemon peel and bring to boil. Reduce heat to medium and simmer uncovered until liquid is reduced by half, about six minutes. Add asparagus to mixture and simmer until asparagus turns bright green, about two minutes. Add chives and remaining two tablespoons butter and stir until butter melts. Season to taste with salt, pepper. Pour sauce over spaghetti and toss to coat. Top with pieces of thinly shaved cheese. Serves four to six.

Tina Miller in *Bon Appétit*

Since chives are very happy growing in a flower pot on your windowsill, you can enjoy them year around. This next recipe was designed to be made as Christmas gifts, but crackers can be enjoyed any time during the year.

CHRISTMAS CHEESE CRACKERS

1 cup butter or margarine, softened
1 cup (4 ounces) grated sharp Cheddar cheese
2 cups flour
2 tablespoons chopped chives
1 teaspoon whole caraway seed
1 teaspoon steak sauce
1/4 teaspoon ground cayenne pepper
1 tablespoon salt

In a large bowl beat butter and cheese using lowest speed of an electric mixer until well blended. Add next five ingredients (flour through pepper). Mix until a soft dough forms. On a lightly floured surface use floured rolling pin to roll out dough to 1/4-inch thickness. Use a cookie cutter (your choice of simple or seasonal) to cut out crackers. Transfer to greased baking sheet. Sprinkle salt over crackers. Bake at 350° for 12 to 15 minutes or until crackers are light brown. Cool completely on a wire rack. Store in airtight container. Yield about 3-1/2 dozen crackers

Christmas Gifts Of Good Taste

I hope these recipes will show you that chives are much more fun than just a little garnish. With the delicate onion flavor and the beautiful blossoms, you can enhance many of your recipes. And, oh yes, thank a honey bee.

Ann Harman is looking for more chives in her garden near Flint Hill, Virginia.

NECTAR & SWARM MANAGEMENT

You need to think differently than some scientists and editors.

Walt Wright

I owe the subscribers to this magazine a description of benefits of the system of swarm prevention. A how-to appeared in February 2002. The background observations leading to the system were published in a series that appeared in 2003, with the last entry delayed to April 2004. Through those published articles, the advantages of CB/NM were not emphasized enough to get you interested in trying it. In spite of significant advantages, the management system has been very slow to gain acceptance.

Initially, it was called Checkerboarding. The name came from the diagonal placement of frames of honey and empty frames of comb similar to the red and black squares of a checkerboard. There is no magic in the diagonal placement. It's the result of combining nine frames of honey in one box with nine frames of empty comb in another box on an alternate frame basis. The odd number dictates that one box gets five frames of honey, and the other four. For the box with five frames of honey alternated with empty comb, the honey must be in the outside slots. The same is true for the nine frames of empty comb. Starting at the outside edge of one box with honey and the outside edge of the other box with an empty frame of comb produces the checkerboard pattern. It's the alternation of honey and empty frames that is important, and not the diagonal layout. Ten frame boxes with an even number of frames do the same job when honey frames are directly over honey frames in the lower box.

Editors did not like the use of a word that was not familiar bee jargon. The name of the technique was changed to Nectar Management. Although both those words are familiar to beekeepers, together they do not convey much sense. I regret the name change to appease editors of the bee magazines. In this article, the technique name is abbreviated to CB/NM.

The objective of the scheme is to break up the overhead honey band that the colony maintains through the swarm prep season. This band of honey (nectar, if reversed) is the limit of brood nest expansion in the build up. When that limit is reached, swarm preps start. If the band of honey is broken up with empty comb, it disrupts the colony swarm game plan and swarm preps do not start. Very effective swarm prevention. Details were provided in May 03.

The basic advantages can be summarized in a few words: CB/NM harnesses and redirects the reproductive energy of the colony to produce more population and increase honey production. Let's pursue that summation a bit further. All species must reproduce. Reproduction is a basic urge, and rates right up there with self-preservation. However, the honeybee is smarter than most mammals (including us). Self-preservation, or survival of the existing colony, has priority over reproduction. The colony will not jeopardize its survival to generate a reproductive swarm. The trick is to provide the illusion that colony survival is jeopardized. Perception of empty comb overhead does that. The operative word here is *perception* by the colony. Addition of empty comb above the reserve band is not necessarily perceived the same way. But when the brood nest expands to include the empty comb, it cannot be ignored. The colony postpones swarm preps until that comb is filled. By maintaining empty comb at the top, the colony continues to add nectar overhead until they run out of calendar time at reproductive cut off. Brood nest expansion continues to that time also.

The literature opinion that swarming is caused by congestion has jaded our judgment on swarm prevention. In my opinion, the reverse is true. Congestion is caused by swarming. Our ancestors got it backward. There is no denying that there is an association between swarming and congestion, but the congestion is necessary and deliberate in the swarm process. If you can make this small adjustment in your thinking, you will be more receptive to a new approach to swarm prevention. It should be obvious that swarm prevention, based on congestion theory, is not reliable. That should surprise no one if the basic premise is false.

A discussion of literature-recommended swarm prevention techniques is outside the scope of this article, but note that all except queen cell destruction have the potential for removing or opening gaps in the overhead honey barrier. When the reserve honey barrier to brood nest expansion is interrupted, those techniques become more effective. Even though done for the wrong reasons those techniques have been generally beneficial. But the question is, why continue to treat the symptoms, when attacking the real problem is easier?

The intent of this article is to present the pros and cons of CB/NM. The cons come first. In between the cons and the pros are some features of application of this management system that will be considered by some as advantages, and to others may be disadvantages. Those are a matter of personal preferences. The advantages of CB/NM will be treated last to end on a positive note.

The disadvantages of CB/NM fall into two major groups. The first deals with the mindset of the beekeeper and the second has to do with drawn comb inventory. They will be discussed in that order. Both groups stem from a basic concept of CB/NM of an "unrestricted" brood nest. *The colony that is expanding the*

brood nest does not start swarm preps. The CB/NM system encourages the colony to build large brood volumes by expanding the brood volume at their best rate through the swarm prep period in late Winter. Since the first action of swarm preps is brood nest reduction (nectar congestion), brood nest growth through the swarm prep period generates much greater colony populations.

The much larger brood nest takes some re-training on the part of the beekeeper. Several things that some consider important need to be unlearned. The following may not be a complete list, but is an introduction to some of them, with comments:

The queen excluder stays in storage. The device is intended to limit brood volume. When it is understood that the device *does* limit honey production, leaving it in storage becomes more acceptable. In a pending article, the reasons for reduced production will be described.

The upper reaches of brood nest expansion will be harvest supers after brood nest reduction on the main flow. Brood nest reduction may leave some feed pollen behind, sometimes encapsulated under honey. While an inconvenience during the extraction process, frames of pollen can be used to good advantage by the colony if put back on the hive. Even if added at the top, the pollen will generally be consumed by adult bees in the early Fall.

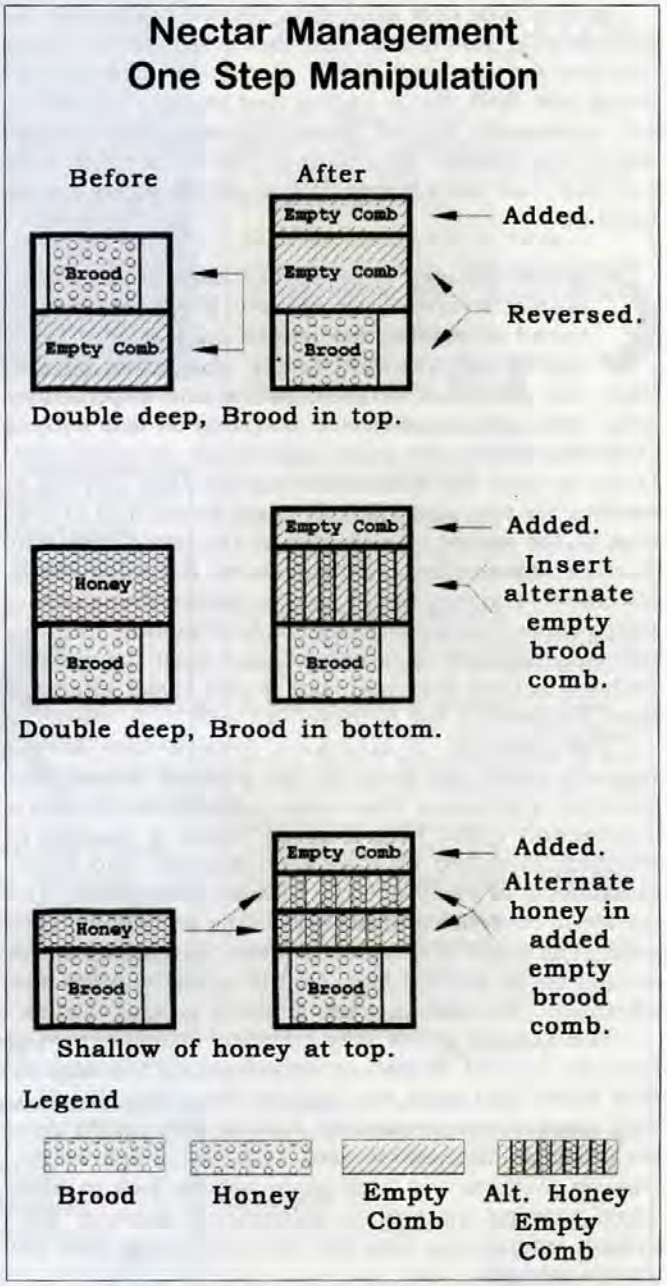
Extracting honey from brood frames is discouraged in the literature. The implication that dark comb discolors honey is a deterrent. If there is any darkening of the honey, I can't see it. Light honey in, light honey out. Keep in mind that when brood nest reduction is delayed by increased brood volume, the nectar stored comes from mid-season sources and is normally premium grade.

Any brood left behind overhead during brood nest reduction is typically drone brood. The brood nest reduction generally is fairly uniform across the hive, but the longer development period of drones creates another inconvenience. Given a little more time, those patches of drone brood will be capped honey also, but it is easier to prevent them. Two ways to do that are to provide enough drone cells in the basic brood area and avoid drone cells in the lower harvest supers.

Another subject that could use some persuasion is the concept that two deep brood chambers are enough. Two deeps with excluder do not normally achieve two deeps of brood. The colony that entertains swarm ambition starts brood nest reduction about six weeks prior to the main flow. With periodic reversal, the most brood volume at any time is about one and a half deeps. Compare that population with the CB/NM colony that increases brood volume continuously until three weeks before the main flow. The target brood volume is upscale of two and a half deeps of brood, and often exceeds the equivalent of three deeps. If you didn't follow that, it's OK. If you get too smart, too quick, it will be bad for the price of honey.

Having spent too much print space on the mindset considerations, it will be necessary to pinch down a more serious obstacle to application of CB/NM. A beginner will not be able to try the system because he will not have enough drawn comb. It takes about the equivalent of five shallows of drawn comb to accommodate the increased brood volume and nectar stored overhead during build up. Additionally, the seasoned beekeeper with enough drawn comb to support normal production with standard management for his area may be short on drawn comb to apply CB/NM across the board for all his hives. He could try it for a few hives while he builds drawn comb inventory.

One other consideration is cell depth in the uncapping process. Comb provided in the checkerboard manipulation is intended to be used for brood rearing. It must have brood rearing cell depth. The colony will not even use cells too short for brood rearing to store nectar in the build up. Short cells leave a blank space in the brood nest interior. This unique feature may require some adjustments in your uncapping procedure.



It is in your best interest to provide comb with the deepest cells possible, at least that is true for the comb provided for overhead nectar stored during build up. Brood nest heat rise is curing that nectar. The colony will continually top off those cells with fresh nectar within the cluster boundaries. The deeper the cells provided, the more honey that is accumulated during build up.

CB/NM induces supersedure beginning in your normal swarm issue season. If you are accustomed to looking for swarm cells at that time, that is very awkward timing. You would have to know the difference between swarm and supersedure cells. Although an article was prepared on that subject (July 05), looking for queen cells is not recommended. Learn to read top-of-the-hive signals that CB/NM is working for you, and stay out of the brood nest at that time in the season. Penetration of the brood nest may fracture supersedure cells and cause the colony to go queenless. You may find it hard to believe that a colony with a cluster three stories high is not thinking "swarm", but you can learn to "sit on it", and trust the system. Perhaps not the first year, but it gets easier after you have fractured a few supersedure cells.

The downside of automatic Supersedure is that upgrade queen you installed the previous season cost you time and bucks. Take some solace from the fact a supersedure queen from a strong colony is superior to anything produced by the queen sources, and queen characteristics carry over for several generations. The upside is that the need for systematic requeening goes away. The CB/NM colonies requeen themselves on an annual basis, and it's free. That is a time and expense advantage. You can upgrade genetics at your leisure.

The second either way consideration is the tall hives by CB/NM. Hives are sometimes six feet high by fruit bloom and eight feet high by main flow. I'm 6' 3" with arms like an orangutan, but the hive height gives me problems. In the first year of CB/NM, a lightweight, step-up platform was built to be able to look in hives when popping the top. In subsequent seasons, with system refinement, that two-foot advantage was not always enough.

The upside of tall hives is that the height translates into more honey in the tanks at harvest time. The downsides are the hive access and transportability. Moving hives for pollination is made much more difficult. Although we have moved hives to apple pollination by breaking them in half (transport in two stacks) there is some extra effort in ventilation and securing the parts for transport.

The basic advantages of this system are low-effort beekeeping with increased honey production. The CB/NM scheme was originally devised to reduce swarming, but the side effects are even better. We'll start with swarm prevention.

CB/NM is not the only approach to swarm prevention that is effective or reliable. Dee Lusby in Arizona uses a slightly different scheme that attacks the overhead honey reserve. She raises brood into the next higher box. While more invasive in that it includes brood nest disturbance, it supports her objective of acquiring natural comb with smaller cell size. She calls that system "pyramiding up." So, there are at least two management schemes that are available to the experts. If they weren't so busy duplicating each other's efforts in pest management, some could check out one or both.

The swarm prevention aspects of CB/NM are closed out with the statement that one hundred percent swarm prevention is attainable, but, it is important to follow the recommended regimen. Adding your own shortcuts or "improvements" will get you into trouble. (And damage my credibility.)

That brings us to the second major advantage- simplicity, or the low effort aspect. A child, who knows nothing about beekeeping, can alternate combs of honey and empty comb. It is done at the top of the over-wintered colony in late Winter, preferably before the colony has outgrown the brood chamber where they wintered. Since there is no brood nest disturbance it can be done in almost any weather short of a pouring rain. I've checker boarded in a light rain at 40°F. A tight cluster is actually of benefit. Some bees from inside the cluster will come up to investigate the intrusion, but they are warm already. They can make their way back down after your five-minute manipulation. After the first one-step manipulation, all that is required is maintaining empty comb at the top. That can also be done in non-flying weather. Once a week, add supers at the top, as required. When you get beyond the swarm prep season, established colonies (three years or more) will stop adding nectar at the top, second year colonies may continue to add nectar at the top. This is the three-week lull before the main flow. Prepare for the spurt in main flow storing by adding extra supers during the lull. Very simple!

If you are interested in honey production, CB/NM is your best bet. The third advantage is increased production. Look at it this way: If you get twenty percent swarming, stopping swarming would only increase production by 20 percent, other aspects being equal. The increased brood volume of CB/NM can increase honey production from 30 to over 100 percent *in my area.*

Production rate is increased on the main flow, by virtue of the increased population. In addition, you get more production on both ends of the main flow. Nectar is accumulated during build-up, and the increased brood volume is slower to decline on the trailing edge, generating more production. I shouldn't have to remind you that population is the key to honey production.

There you have it. It's no inconvenience to me if you continue to make partial honey crops for the rest of your beekeeping career. But don't be surprised if the novice you tutored this spring is soon putting your production to shame. BC

Walt Wright is a retired engineer and a hobby beekeeper in Tennessee. He is a frequent contributor to these pages.

TRY AN Observation Hive How-To

Dewey Caron

Have you looked in your beehive recently? To do so most of us need to leave the comfort of home, don some protective equipment such as old pants/coveralls, put on a veil, maybe gloves and boots and then we need to get a smoker going. One kind of hive doesn't need all these preparations – in fact you might not even need to leave your home or business to observe bees in a hive. I refer, of course, to an observation beehive.

Observation beehives are not for everyone. Some people, who might not object to honey bees in their flower and vegetable gardens, may not like being as close to bees as occurs with an observation hive. As a manageable unit, observation hives present some unique challenges that management of a standard colony does not. On the positive side, observation hives can be very instructional, entertaining, a great audience attention-getter and their care and management every bit as rewarding as keeping a standard colony.

I distinguish between two kinds of observation hives but you might have further distinctions. An *observation* hive is a bee colony maintained for observation purposes. Since it is being kept primarily for the purpose of watching the bees, it is different from other hives. Any colony can be observed or made temporarily observable, in whole or part; such units I term observational hives.

Observational hives vary from a colony that has only some portion visible to a temporary unit of observable bees. Observational hives are most appropriate for visits to schools, bee programs and for short-term outlets of bee products. They often are not a functioning hive, more a replica of what occurs in a colony or was occurring when you established the temporary unit.

A bit of history

The first observational hive is credited to Pliny, a Roman naturalist (23–79 AD) who used small transparent horn windows to look into his hives. A practical observation hive did not come into existence until high quality glass was available in the 1600s. This predates the movable frame hive so the hive interior might not have been very observable in these early models. Early English books on bee culture often featured comments on how to observe the bees.

Francois Huber might have been the first scientist to write about what was happening using an observation hive as a tool. He built a box with glass sides and then induced a swarm to build parallel combs in the box. Naturally, they built their combs perpendicular to the glass, which limited seeing what was really happening inside the hive itself. Huber then devised a leaf hive, where a single comb was positioned within a hinged frame. He could open his hive like book "pages" to see and observe bees in the hive interior.

L.L. Langstroth, a Philadelphia minister, is credited with the first patented movable frame hive. A careful look at his patent and reading of the book he wrote to extol its virtues (and sell the hive), reveals that the original Langstroth hive had glass walls. In his 1st edition of the *Hive and the Honey Bee* he wrote "As the price of glass is very low, I prefer to construct the inside of my double hives with this material." His hive, a doubled-walled hive, meant you had to remove a layer of wood to get to the glass.

Certainly the most famous use of observation hives was that of Professor Karl von Frisch, the Bavarian scientist who developed the concept of bee language by deciphering their intricate behaviors of "dancing." He was able to keep his research hive interiors completely observable thanks, in part, to the discovery 75+ years earlier of the concept of "bee space" by Langstroth.

Establishing an observation hive

When it comes to observation hives, as with most of beekeeping, there is no one correct or serve-all-purposes-hive for observation, just as there is no one "right" way to manage a beehive – or even one correct beehive either. You can purchase good observation

hives and stock them quickly. Some are expensive, others more portable. Some observation hives assemble and manage easily while others can cause more problems than the inexperienced beekeeping might care to handle, especially in stocking with bees. If purchasing or if you decide to make your own, first STOP to decide why you want it and what you want to do with an observation hive before you proceed.

An observation hive should be only a single comb wide to insure observability. It might be one to several combs high. If you desire a hive with parallel combs as bees construct their comb, you will be using an observational hive which still might serve your purposes. If you decide to build your hive, there are design plans that are available (see reference at end of article). The one feature in your construction you must not vary is bee space. The bees will "convert" interiors lacking bee space making it less observable and more difficult to properly manage.

As a functional hive, observation hives should have a queen, a brood rearing area during the appropriate season, area for storage of some reserves if flower resources are available and it should be carrying on normal hive activities. An observational hive, in contrast, might not have all of these. Purpose and management capabilities, along with best location, will dictate the best size and specific location for an observation beehive. Generally larger hives make more of an impact but small or large, observation hives take beekeeper skill in proper management.

Common observation hive uses are as a curiosity in home or office, for teaching/display purposes in schools, nature centers or other appropriate public sites, for promotion/sales display outlets where bee and/or natural products are featured, for student research/observation projects and even for a small bit of honey. Some observation hives, especially smaller units (i.e. fewer combs), might be established for a short time period; others can be left season-long. Since smaller units often do not survive Winter cold or Summer heat, they will need to be reestablished or dismantled during such periods and are best maintained only for part of the time.

Common problems with observation hives are site and size related. We sometimes need an observation hive at a public site which is not the most ideal bee site. Cold-side of buildings, out-of-the-way places, sitting over heat registers or with sun streaming on them for part of the day/season are all more problematic and require more beekeeper attention. Small hives are always more difficult to manage simply because they are small. They frequently lack enough resources for the season, overcrowd their interior, and have greater difficulty in thermoregulation of the brood area to rear brood.

Any permanent observation hive should have a standard hive as backup for management purposes. Ideally the observation hive itself can be quickly closed, both confined itself and the entry/exit area closed, to permit removal. It is usually best to plan to remove the observation hive from its permanent position for manipulations to correct problems. If the area in front of the entry/exit area is available for manipulations you can do them at the permanent site; otherwise plan to move the unit to your apiary where you can do your manipulations and then return the hive once you have corrected the problem and bees are resettled.

There are few "must do" with observation hives but one I think you MUST DO is to anticipate potential problems and plan for them in advance. For example, ALWAYS anchor a permanent observation hive securely, to floor, table and stand. Remember that it will not be watched 24/7 and so you should anticipate that kids will attempt to examine/open/disrupt it in ways you cannot imagine. Anticipate what might occur before you leave it for public viewing.

I recommend an emergency plan to handle accidents. This is especially important if inexperienced individuals might have to "clean-up" when bees are accidentally released. This would be the case in a nature center, school or other public place. At the very least you need to have at hand a portable vacuum, a trash bag large enough to enclose the entire unit and be securely tied and, of course, instructions on whom to call in an emergency. Remember, while we are complacent about bee stings, others are not and the stings will hurt, cause medical anxiety and possible bad PR/press.

Although the bees will be the main attraction, the area around an observation hive represents a 'teachable moment.' Establish some educational materials to inform and enlighten the public. But don't overdo it. Use top quality materials so easily produced and printed these days with a computer. Some cosmetic designs in the immediate area can make the observation hive look like a natural bee tree, with viewers entering the tree bole to view the bees or a beehive where you enter the "hive" itself. The bees are going to attract the audience by themselves so try not to overdo it.

The entry/exit area of the observation hive can be highly entertaining and should get special attention to make it attractive and educational as possible. Many visitors will find this hive/field interface fascinating and activity and interest will be focused here. Plan to change the exhibit material periodically, especially where the audience might be repeats, to reflect the bee seasons or events that occur at the site, such as fall festivals, apple days, spring fling, etc. Periodically visit "your" hive and update and freshen the exhibit. Take along someone unfamiliar with bees or ask others about the display. What you intend and they see might be very different so seek and listen to your intended audience.

For some beekeepers, installation and maintenance of an observation hive might be income generating. For others it might be a volunteer activity. Hives are used for personal reasons of just wanting to see bee activity, for education or to enhance bee product sales. Observation hives can be fun and rewarding and their establishment and management just as challenging as standard hives. For city/suburban beekeepers, an observation hive might represent their only viable option to be a beekeeper. The possibilities are limitless.

For more information consult *Observation Hives* by Webster and Caron and contributing authors, available from A.I Root Co. Medina, OH. This text also includes many suggestions for watching bees in an observation hive and season-long activities you might consider to increase your enjoyment of observation hives. BC

? DO YOU KNOW ?

Pollination Biology

Clarence **Collison**
Mississippi State University

Spring is an extremely busy time of the year for beekeepers especially if they rent colonies for pollination. Having colonies in excellent condition for pollination, as well as early nectar flows requires intense management early in the Spring. In addition to producing strong colonies, it is important that early Spring management manipulations serve as a means of swarm prevention as well as enhancing conditions for colony development. Pollination has long been recognized as the most important contribution that the beekeeping industry makes to agriculture. With the loss of most feral honey bee colonies in the United States due to parasitic mites, some feel that we are in a "pollination crisis"; because we do not have adequate supplies of bees to meet the pollination needs in some areas of the country.

Please take a few minutes and answer the following questions to determine how familiar you are with pollination biology and requirements of various crops.

Level 1 Beekeeping

1. ____ Squash plants produce separate male and female flowers with the female flowers being most numerous. (True or False)
2. ____ Male cucumber flowers produce more nectar than female flowers. (True or False)
3. ____ Cultivated American plum varieties are self-fruitful. (True or False)
4. ____ Foraging honey bees collecting pollen are more effective in achieving pollination than nectar collectors. (True or False)
5. ____ Packages and nucleus colonies are excellent pollination units for early Spring-time pollination. (True or False)
6. ____ A pollen grain will usually germinate only when it comes into contact with a stigma of its own species. (True or False)
7. ____ When pollen is transferred from an anther of one flower to the stigma of another flower on the same plant, it is self-pollination. (True or False)
8. ____ From a plant's standpoint, cross-pollination is preferred to self-pollination. (True or False)
9. ____ Both tart or sour and sweet cherries are self-fruitful. (True or False)
10. ____ Honey bee colonies are typically rented for apple, pear and peach pollination. (True or False)
11. ____ Honey bee colonies rented for pear pollination are normally moved into the orchard prior to the start of bloom. (True or False)
12. ____ Why are bumble bees considered to be better pollinators of red clover and blueberries than honey bees? (1 point)
13. ____ Honey bees are beneficial in the pollination of lima beans. (True or False)

Advanced Beekeeping

14. Name one type of citrus in which growers are attempting to keep bees two miles away from their groves. (1 point)
15. ____ When pollen is not well distributed over all the stigmatic lobes of the pistil, the fruit will frequently be asymmetrical. (True or False)
16. Not all fruits develop simply as a result of ovule fertilization. In a few plants, the ovary will enlarge into a "fruit" without the stimulation of pollen, resulting in seedless fruit. These fruit are referred to as _____ fruit. (1 point)
    A. polyembryonic
    B. parthenogenic
    C. parthenocarpic
    D. protandrous
    E. protogynous
17. A few plants have complete flowers, some of which never open. The pollen is released directly onto the stigma within the closed flower and self-fertilization results. Such flowers are referred to as being fertilized in the bud or _____ flowers. (1 point)
    A. cleistogamous
    B. heterogamous
    C. dichogamous
    D. hermaphrodite
    E. polygamous
18. Please distinguish between a monoecious and dioecious flowering pattern. (2 points)
19. If an orchard is not achieving adequate pollination even though there are plenty of bees present due to an improper planting arrangement or lack of compatible pollen, name one immediate approach that might be taken to achieve higher pollination levels within the orchard. (1 point)
20. In situations where the blooms of a particular target crop are relatively unattractive to potential pollinators, what approach has been taken to increase pollination activity within the crop? (1 point)
21. ____ Various varieties of crabapples planted within an orchard can be used to enhance apple pollination. (True or False)
22. Strawberry flowers consist of a center cone-like structure called the _____, which is covered with 300-500 pistils. This will eventually become the berry.
    A. pedicel B. receptacle
    C. calyx D. corolla E. peduncle
23. There are many named varieties of canola (rape) available. What two countries did the original varieties originate? (2 points)
24. ____ Honey bees prefer to work extra-floral rather than floral nectarines in cotton. (True or False)

Answers On Next Page

?Do You Know? Answers

1. **False** Squash plants produce separate male (staminate) and female (pistillate) flowers, with male flowers being more numerous.
2. **False** Female cucmber flowers produce more nectar than males, however, the male flowers produce nectar with a higher sugar concentration.
3. **False** American cultivated plum varieties are self-unfruitful. Interplanting is considered a safeguard for all plum varieties.
4. **True** Foragers collecting pollen from flowers are considered to be the most efficient pollinators since they actively work the anthers for pollen. In doing so, more pollen is deposited on their bodies and there is greater chance of making contact with the stigma. In a few crops, honey bees learn how to extract nectar from the flower without contacting the reproductive structures. This unpollinating behavior is quickly learned and once established, the forager is unlikely to deviate from it.
5. **False** Package bees and nucleus colonies have proven inferior to strong overwintered colonies for pollination of early season crops.
6. **True** A pollen grain will usually germinate only when it comes into contact with a stigma of its own species. The stigmatic surface of a flower is usually sticky, so it will catch and hold the pollen. Pollens from many different flower species are carried to the stigmas of different plant species, but the pollen will germinate and grow only when it contacts the right stigmatic fluid.
7. **True** Self-pollination occurs when the pollen is transferred from the anther to the stigma of the same flower or another flower on the same plant.
8. **True** Within the plant kingdom, cross-pollination is considered to be desirable to self-pollination, since the latter results in inbreeding.
9. **False** Tart or sour cherries are self-fruitful and most varieties of sweet cherries are self-unfruitful, thus require cross-varietal pollination.
10. **False** Honey bee colonies are typically rented for both apple and pear pollination but not for peaches. Most peach varieties are self-fertile whereas apples and pears are self-unfruitful and require the transfer of pollen between trees and varieties. Peaches can be pollinated with pollen from the same flower or flowers of the same tree. In addition peach flowers only have one ovule and thus require less pollen grains. A small number of bees can do a lot of self pollinating since almost every visit to a flower results in self-pollination. Many growers consider thinning of a heavy fruit set to be a greater problem than achieving adequate fruit set.
11. **False** Honey bees visit pear blossoms primarily for pollen since the nectar is low in sugar and unattractive relative to other fruits. Honey bees work pears best when colonies are first put into the orchard and later they tend to be attracted to competing flowers in the area. Because of this, it is not recommended to move colonies into pears until 25 to 50% of the flowers are open.
12. Bumble bees are considered to be more efficient pollinators of red clover and blueberries than honey bees since they have a longer proboscis which aids them in reaching the nectar supply. This increases the chances of them contacting the reproductive structures and achieving pollination in these tubular shaped florets and flowers. Even though bumble bees are more efficient, their population levels fluctuate from year to year and are usually not sufficient to pollinate large acreages.
13. **True** Bees are of benefit to lima beans but they are not necessary. The lima bean flower is capable of self-pollination but cross-pollination can and does occur. One researcher found a 30% yield increase when honey bees were present in lima bean fields, but not all research has indicated significant yield increases due to the presence of bees.
14. Clementine mandarins
15. **True** When an ovary (fruit) is divided into segments or locules, the styles and stigmas of the flowers are also made up of corresponding lobes, carpels or segments. When a compatible pollen grain falls on one stigmatic lobe, the pollen tube usually grows down through the style into its connecting locule of the ovary and fertilizes an ovule to form a seed. For example the watermelon may have 1,000 ovules in its three locules. This means that at least 1,000 pollen grains must land evenly distributed on the three stigmatic lobes, at the proper period of receptivity, if a perfectly shaped melon is to develop. When the pollen is not evenly distributed over the stigmatic lobes, the fruit will frequently be mis-shapened, especially at the blossom end of the fruit.
16. C) parthenocarpic
17. A) cleistogamous
18. If both pistillate (female) and staminate (male) flowers are on the same plant but distinct from each other, the plant is said to be monoecious. Examples would be corn, cucumber, pumpkin.

    If the two flower sexes are on separate plants within a species or variety, then the plant is said to be dioecious. Examples would be willow, American holly.
19. Placing a pollen insert in the hive entrance and supplying the insert with purchased compatible pollen. As foragers leave the hive, their bodies pick up the compatible pollen and they distribute it to the flowers, as they visit the various blooms.
20. Spraying the crop with sugar water or various commercial products (attractants) to enhance foraging on the crop. There have been a number of these so called attractants manufactured and promoted in-

Continued on Page 70

Baking Contest Upgrade Due!

Gwen Rosenberg

Let's encourage variety, texture, flavor and color!
Let's even change the rules!

Oh, the triumphs and tragedies of the beekeeper's annual baking contest. It is in this arena that the beekeeper's spouses come to lay waste their fiercest rivals; to claim victory before the scores of dejected bakers and playfully mock their failure with feigned modesty.

"Oh, this old recipe? I only use it when I'm out of bisquick."

It is the Springtime ritual that ushers in endless church bake sales and club meetings. Every potluck and field day provides unending opportunities to recount the *surprise* at having won, and offer words of encouragement for next year's competitors.

It is against this backdrop that I attended our region's recent annual beekeeping symposium, and as usual, the allure of the baking contest was too great for me to resist. Granted, this is a bit more modest affair than I would like. In my opinion, baking competitions should have million dollar cash prizes, mini-kitchens for recipe demonstrations, full corporate sponsorship and bleachers full of adoring foodies. This year like last year, and the year before it, offered little more than a couple of folding tables, smudged recipe cards, and a handful of Amish bakers arranging and rearranging zip-lock bags.

Even so, I was feeling confident, cocky even, when I strutted in with three tidy bundles. I was going for the triple crown. A win in each – the cookies, bar cookies and specialty bread categories. I had something to prove since Jeanne Schell bested me at the county fair last Summer with her Ukranian sweet bread, of all things. This year I planned a coup

in the world of honey baking. I was there with what I considered nouveau cuisine. Edgy new takes on typical honey baking recipes. Not your grandma's honey recipes.

The last 12 hours had been filled with beating, whisking and baking. The previous three months had been filled with painstaking research, cookbooks, internet archives and redos of family recipes. I was twitching and intensely sizing the competition as I handed over one plate of Lemon Anise Biscotti, one loaf of Chocolate Cherry Bread studded with dried fruit and bittersweet chocolate chunks, and finally my "safety," the caramel pecan cookie bars all whimsically renamed of course, in honor of the occasion.

Not wanting to leave anything in doubt, I cooly observed the judging until the county extension agent completely dismissed the "Three Banded Italian Biscotti!" I had to intervene. "What about the biscotti?" I asked. She had awarded first place to some pallid looking plate of chip and nut style drop cookies. "Oh, the biscotti was good, but it's just so different. How can you compare it all the others. Try one of these cookies. Isn't it just a perfect cookie?"

The prize winning cookie with its candy-flavor chips and soft texture was reminiscent of every cookie entered in every honey theme baking contest through this county and the next five. It was generic in flavor, texture and appearance. In a way, I guess she was right. It was perfect. Perfect in its homogenous and reliable version of "cookie." A shoe-in to win because it offers no resistance to the norm, the status-quo, the utterly bland. This contest ➢

was not the place for nouveau anything.

You can imagine how the Chocolate Cherry Bread went over – like a lead zeppelin. It's like the judge was some patron saint of finicky eaters, sparing the little darlings the trauma of a new eating experience and ushering away any food judged too unusual for the underutilized palates of her little charges. I placed first for Gwen's Killer Carniolan Caramel Cookie Bars, but I think the judge was influenced by my menacing glares and the fact that my scowl frightened off her bevy of Amish bakers.

There is no beekeeping gathering anywhere that does not involve some baking contest, but I have a real fear that the contests here and everywhere have been hijacked by a small group of very predictable, mainstream, don't-rock-the-boat judges who generally like to see what they generally like to see in the way of cooking. If you want to win at one of these things plan on preparing the recipe that won last year and the year before, and before, ad infinitum. In fact, I have a little pet theory that there is only one recipe for cookies made with honey and it just keeps reappearing in various outlets like a undying urban legend.

You know the cookie. You've probably made it 100 times. It's a soft rounded dome, scented with cinnamon, nutmeg possibly cloves. Sometimes this generic medium gets "jazzed" up with peanut butter or nuts sometimes mashed banana or carob chips but it's essentially the same cookie, back like a bland ex-boyfriend who can't take a hint. Mr. Reliable. Maybe I could learn to love his consistency and predictability but at my table I want a little more variety. I want a little *je nais se quois*, something unexpected, exotic and delicious. Are we still talking about cookies here? Anyway, isn't the point of the baking contest to compete with new ideas and flavors? The winners in the ingenuity category upping the ante for the year to follow? The Pillsbury bake-off does not encourage everyone to bake white bread. Neither should beekeepers encourage everyone to associate honey with whole grains year in and year out.

Enough with the oatmeal bread, spice cake and corn muffins! Who the heck eats carob chips anyway?! All I'm asking for is a little variety. Are we not the beekeepers-up to our eyes in honey year in and year out responsible for selling gallons of this liquid sugar to a populous whose most oft heard question is- what do I do with it? Is the response really "spend five hours making whole grain fiber rich bread!" No, No, No, I say. As research for this article I perused my cooking periodicals on the quest for honey recipes. I did not find bread of any sort. No texturally unappetizing and unappealing peanut butter cookies that pack a full day's fiber were present.

What I did find were unique applications for an ancient sweetener. It appears in appetizers, beverages, roasts, desserts – you name it. It has been pared with lavender, cardamom, mint, curry, bleu cheese and an array of combinations that would knock the stockings off most of these baking judges. Let's depart from the nineteenth century school of cookery and explore some uncharted territory, shall we?

I challenge the symposium organizers to ask the baking contestants to share the truly unique and flavorful recipes of their own making, or search the globe for flavors that middle white bread America has not seen repeated a million times already. Let's encourage variety and texture and flavor in our entries. In fact let's even re-write some of the rules. For example, can we *please* include the frosting on the cake in the entry. My mother and her mother and your mother, too, probably have frosting recipes that are more treasured than the cakes they are smeared over. Why not encourage some innovation *on* the cake as well as *in* the cake. In addition, let's add some new categories, maybe rotate out some of the less popular categories – bran muffins (again) anyone? Let's reward ambition in the most popular categories and embrace new categories that may get the creative juices flowing a bit.

And, has anyone tried the Honey Board's recipe for barbeque sauce? Did you think you could do better in your sleep? Me too! We can compete in barbeque sauces, honey mustard and other condiments, candies, preserves, salad dressings and alcoholic and non-alcoholic beverages just to name a few. We can even add a singular catch-all category that incorporates all delicious uses for honey. It seems only fair that as we try to modernize our hive management that we should also make honey a little more relevant to our customers.

I read once about a contest the sauerkraut making association, God bless them wherever they are, was having in an attempt to put sauerkraut in alcoholic mixed drinks. They were looking for new customers and new niches to fill, apparently with sauerkraut, and it worked. People submitted drink recipes and they got lots of publicity and maybe even a few new customers. We can generate a broader customer base and a heck of a lot more interest in cooking contests if we can make honey an ingredient in foods people enjoy making and eating. Consider this when you're sizing up your next baking competition and are tempted to recreate the recipe that brought success in years past. Do not short change the competition, because I'm out there and it's no more Mrs. Reliable Guy. BC

Gwen Rosenberg is busy making new recipes, and plotting revenge, in her kitchen in Kent, Ohio.

GLEANINGS

MAY, 2006 • ALL THE NEWS THAT FITS

ABF Louisville

KILLION RECEIVES PRESIDENT'S AWARD

Gene Killion (center) receives the President's Award from David Ellingson. Killion's wife Katy is also pictured.

Gene Killion of Paris, IL, was presented the 2006 ABF President's Award at the annual banquet in Louisville. In making the presentation, ABF Past President David Ellingson, right, cited Mr. Killion's years of support to beekeepers in Illinois and nationally. He retired in June 1994 from the University of IL after 12 years as Extension Specialist in Apiculture. Prior to that he was supervisor of apiary inspection in the IL Dept. of Ag. for 18½ years. A renowned expert in the production of comb honey, Mr. Killion conducted a workshop on that topic during the ABF convention. He also presented the convention's keynote address, in which he told the group: "The honey bee and the beekeeper will still be around for centuries to come, as man cannot live without this wonderful little insect."

DID YOU GET THAT WHIFF OF SPRING?

Nature provided the skunk with its trademark black and white-striped coat as a bold warning to other wildlife to leave it alone. Unfortunately for *Canis domesticus* – also known as Fido, Spot and Fluffy – such information is not ingrained in their little psyches, leaving them frequent targets of skunk spray.

When this happens, pet owners are usually left scrambling for a way to de-stink the dog. Experts advise leaving the tomato juice and vinegar in the cupboard. It's better to use the homemade solution listed here. Then hold your nose and convince the dog a bath is a good idea.

1 quart of 3 percent hydrogen peroxide solution

1/4 cup of baking soda

3 teaspoons of a liquid dish soap known for its degreasing qualities

COLLISON RECEIVES AIA AWARD

Clarence Collison and Harry Fulton.

The Apiary Inspectors of America at their annual meeting in Baton Rouge presented Clarence Collison with the annual award, January 11 at their joint meeting with the American Association of Professional Apiculturists.

FL STATE BEEKEEPERS AWARDS

Dr. Peter Teal, right with Dr. Baldwyn Torto, received the Florida State Beekeeper's Association Researcher of the Year Award. Both men are at the USDA's Center for Medical and Veterinary Entomology at the University of Florida and have been instrumental in developing a trap for small hive beetle control.

Florida Chief Apiarist, Jerry Hayes, presented a plaque to the Florida State Beekeeper's Association Woman of the Year, Carolee Howe of the Florida Farm Bureau Federation. She has been instrumental in helping the Association obtain research funding from the Florida legislature.

VIDEOS

BEGINNING BEEKEEPING VIDEO 2 hrs! All survival essentials: building hive; installing, feeding, medicating, inspecting, managing bees; harvesting, diseases & parasites; behavior. $35. Dr. Iacobucci, 172-BC Washington, Pembroke, MA 02359 www.roctronics.com/bee.htm. (TF)

PERIODICALS

RURAL HERITAGE – bi-monthly magazine in support of farming and logging with horses, mules, and oxen. Subscription includes THE EVENER Workhorse, Mule & Oxen Directory; $29 for 6 issues; sample $8.00. Rural Heritage, 281-B Dean Ridge Lane, Gainesboro, TN 38562. 931.268.0655, www.ruralheritage.com

THE SCOTTISH BEEKEEPER. Magazine of The Scottish Beekeepers' Assoc. Rates from Enid Brown, Milton House, Main Street, Scotlandwell, Kinross-Shire KY13 9JA, Scotland, U.K. Sample on request. $1.

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THE AMERICAN BEEKEEPING FEDERATION has many benefits to offer its members. Send for a membership packet of information today! Contact the American Beekeeping Federation, P.O. Box 1038, Jesup, GA 31598, ph. (912) 427-4233, fax (912) 427-8447 or email info@abfnet.org.

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THE AUSTRALASIAN BEEKEEPER. Published monthly by Pender Beegoods Pty. Ltd. Send request to: The Australasian Beekeeper, 34 Racecourse Road, RutherfordNSW 2320, Australia. Sub. $US 38 per annum, Surface Mail (in advance). Payment by Bank Draft. Sample free on request.

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THE NEW ZEALAND BEEKEEPER. National Beekeeper's Association of NZ. Write for rates & indicate whether airmail or surface. NZ BEEKEEPER, P.O. Box 447, Hamilton, NZ.

SOUTH AFRICAN BEE JOURNAL. The official organization of the S.A. Federation of Bee-Farmers' Associations. Sample copies only available on receipt of a donation. P.O. Box 41 Modderfontein, 1645, South Africa.

ANSWERS ... Cont. From Page 64

cluding Beeline, Beelure, Beescent, Pollenaid, Pollinus etc. In most instances research has shown them to be ineffective in enhancing pollination levels. If a foraging worker does not receive an adequate reward when visiting a flower, she quickly loses interest in the crop.

21. **True** Various varieties of crabapples are occasionally planted within an orchard to increase supplies of compatible pollen. A crabapple is basically a small apple. The flower is similar to that of the apple and bees freely visit the flowers for both nectar and pollen. Since apples requires cross-varietal pollination, crabapples can serve as a source of compatible pollen if they bloom at the same time as the main apple varieties.
22. B) receptacle
23. Argentina, Poland
24. **True** In contrast to bumble bees and some other species of wild bees, honey bees show a preference for the extra-floral nectaries of cotton and often seem reluctant to enter the cotton flower. When a honey bee enters a cotton flower, it may emerge coated with pollen, then alight on a leaf, and comb much of the pollen off without attempting to pack it in the pollen baskets.

There were a possible 13 points in each test level this month. Check the table below to determine how well you did. If you scored less than six points, do not be discouraged. Keep reading and studying- you will do better in the future.

Number Of	Points Correct
13-11	Excellent
10-8	Good
7-6	Fair

Clarence Collison is a Professor of Entomology and Head of the Department of Entomology and Plant Pathology at Mississippi State University, Mississippi State, MS.

Display Advertisers

Just Between You And Me

Ed Colby

"Pride goeth before a fall," goes the biblical proverb. Every time I brag, it comes back to bite me. But it's a fact that I haven't had any American Foulbrood (AFB) in a couple of years. Insofar as possible, I keep my bees isolated from other colonies. And I don't send them to California. I've seen bees just back from the almonds and riddled with AFB and *Varroa* mites.

Before, I promised myself that I'd burn any AFB colonies. However, when I did find an infected hive awhile back, I changed my mind and treated. That colony recovered nicely. But I think burning is a better long-term solution, and I promise to burn in the future. Really and truly.

It's *Varroa*, not AFB, that's killing my bees. I try to monitor. I try to use integrated pest management techniques and not drench my bees with cheap illegal chemicals that really do work. Last Summer I used the Sucrocide spray-down method. You spray Sucrocide – a sugar derivative – between the frames using a garden sprayer. You supposedly don't even have to remove the frames from the hive. Sucrocide desiccates the mites. I'd seen the test results: good control using a chemical that you could maybe drink if you ran out of Gatorade. (Just kidding about drinking this stuff!)

This sounded benign, and cutting edge. I followed the directions closely. Then last Fall I put in Apistan strips and did a sticky board test. I had mites up the ying-yang. Net result: As of mid-March, I've lost nearly half of my 80 colonies.

I'm always looking for the silver bullet, and I always have to learn the hard way. You need to find out for yourself what works. Never believe what people tell you.

Let's see if you believe this: I think I may be acquiring certain psychic abilities. I hope so. To wit: Even though I'm old and my knees are shot, in the winter I ski patrol on Aspen Mountain. The other day I thought, "Well, maybe I should review how to use the Epi-pen™." An Epi-pen is a device that looks something like a fat ball point pen, or a "Sharpie™" marker. You stab it into somebody's thigh, and a needle pops out and delivers epinephrine. Epinephrine can save a life if a person is having an allergic reaction to, say, peanuts, or a bee sting.

Anyhow, I got out the Epi-pen™, and I looked it over. I read the directions. "This is pretty simple," I thought. "I could do this, even though I'll never have to." In 30 years of patrolling, I'd never gone on an allergic reaction call. I put the Epi-pen™ away. Thirty minutes later, I picked up the phone. The caller said, "A woman is having an allergic reaction at the Sundeck Restaurant." I looked at my patrol buddies and said, "I've got the Epi-pen™."

The woman looked and acted like maybe a Polish countess. We have some of those in Aspen. Beneath her furs, her arms, chest, neck, and back were red and a little puffy. She was scratching like a hound, the little darling. But she wasn't having any trouble breathing. I held off on the Epi-pen™ and rode down the gondola with her. By the time I delivered her to the ambulance folks, she seemed much improved. Later, I learned that her throat swelled on the way to the hospital, and the ambulance crew gave her epinephrine en route. The doctors gave her another dose in the emergency room.

Every beekeeper ought to carry an Epi-pen™, because you never know. A couple of Summers ago, running Jack's bees up at Steamboat, I managed to get a yard all fired up. I was out in the boonies, but there was a phone company truck on the county road an eighth of a mile away. The phone guy was outside. I looked up and saw him swatting at something with his arms. Then he ran to the truck.

I pretended that I'd seen nothing and continued working. What was his problem, anyway? But if he had been allergic to bee stings, and had I had an Epi-pen™, I might have been able to save his life.

I wish somebody would save me from going broke. I'm just not a businessman. In the Spring, I rent a few bees to fruit farmers in Grand Junction. I like to deal with the small growers, because I can haul 12 hives in my pickup, and load them myself. I have no idea what the going rate is, but I try to make it worth my while. Last year I charged $50 a colony, with a $200 minimum. Look at it this way: I haul bees out of the mud hole where they Winter on Silt Mesa, drive them 70 miles, unload the little darlings, and leave them for maybe a month. I need to visit them a time or two to make sure they don't swarm.

This year I decided to raise my rate to $225 minimum, what with gas prices so high. But I forgot that I charged $50 per colony last year, so I quoted $40. One apricot grower, who seemed content with three hives last year, when I mistakenly charged him $150, instead of $200, said, "Well, if it's $225 minimum, I might as well take five hives." I can't fault his math. But just between you and me, this guy is a cheapskate. I'll get him next year.

Also just between you and me, I talked to Dr. Dave, and he slipped me an "expired" Epi-pen™ to take out to the bee yard. Because you never know.