AMERICAN BEEKEEPING FEDERATION

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CONTENTS

SPECIAL FEATURES

16 Biosecurity and American Beekeeping
by: Michael Hansen

18 Biosecurity in the Bee Yard
by: Meghan Milbrath

20 Commercial Beekeeper Spotlight
by: Jan Lohman and Vince Vazza, Vazza Farms, Inc.

22 Preventing the Spread of Disease in Your Apiary
by: Kelly Kulhanek

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REGULAR FEATURES

5 Advertisers Index
6 From the ABF President
9 From the ABF Vice President
11 Ask Hoopie
37 Federation Marketplace

ASSOCIATION NEWS

10 Member Milestones
12 Foundation Scholarship Winner Paper
14 4-H Beekeeping Essay First-Place Winner
38 Donations

EDUCATION

24 Western Region Apiary Inspection Programs
by: Joey Caputo, Alyssa Piccolomini, Jessica Rendon, Jack Peterson, Darcy Oishi and Laura Pottorff

26 Bee Nutritional Primer: Urban vs Rural
by: Dewey M. Caron

28 Bee-Engaged: An Average Joe's Guide to Queen Marking
by: Joseph " Joe" J. Komperda, Sr.

30 Testing for Pollen in Honey
by: Vaughn M. Bryant

QUEEN'S CORNER

32 Queen Committee Report
by: Anna Kettlewell

34 American Honey Queen Report
by: Mary Reisinger

36 American Honey Princess Report
by: Sydnie Paulsrud

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Barkman Honey 15
Bee Culture 7
Bee Smart Designs 8
Beekeeping Insurance Services ..... Back Cover
Buzz's Bees 8
C.F. Koehnen & Sons, Inc. 5
Cook & Beals 8
Dadant 39
Kelley Beekeeping 5
Kona Queen Hawaii 15
Mann Lake 2
Olivarez Honey Bees 13
Wooten's Queens & Bees 31

COMBATTING FALLING HONEY PRICES

JOAN GUNTER, ABF PRESIDENT

I recently read an online article about U.S. beekeepers and their fear of the future. Skyrocketing demand for honey should be an answer to a beekeeper's bottom line, but this doesn't seem to be the case. The average beekeeper needs a breakeven point of at least $2.00 per pound of honey for their crop. They are not getting it.

The *American Bee Journal* article titled "A Study of the Causes of Falling Honey Prices" refers to three major reasons why the U.S. is seeing falling prices. Various possible reasons have been suggested to explain the possibility of falling honey prices: 1) An increase in the number of beehives around the world, 2) a decline in the world's demand of the product and 3) massive dilution/adulteration of honey with cheap syrups from some exporting countries.

The seven major exporting countries of honey from the Americas are Argentina, Mexico, Brazil, Canada, Uruguay, Chile and Cuba. The seven main honey exporters of the Eastern Hemisphere are China, India, Viet Nam, Ukraine, Thailand, Taiwan and Turkey.

Major honey exports from the Americas have shown a slight increase in their beehives counts, while their honey exports fell due to increased population difficulties for the beekeeping region. Meanwhile, the total number of beehives of the East grew around 13%, but the region increased its honey exports by 196%. This goes against the world trends of lower productivity per hive. U.S. beekeepers have reported reductions in productivity per hive of 50-60% during the past decade.

Something fishy is going on in the East. The increase of exports from new non-producing countries is a red flag. Transshipping of Chinese honey may have been encouraged due to the anti-dumping duties implemented by the United States. China has also implemented a filtration policy that filters residues, dehumidifies and packs a product that cannot be traced to the country of origin. This activity is not allowed by international standards (CODEX, 1981). This production model could easily explain the amazing increase of Chinese honey exports.

The attractive low price for Chinese honey is not competitive for U.S. beekeepers. The U.S. authorities have taken action by beginning an investigation into circumvention and transshipping schemes of Chinese honey through Third World countries. These investigations unveiled the largest fraud of the food industry.

Adulteration has become another tool for flooding the market with cheap honey. Nuclear magnetic resonance (NMR) is the newest method for detection of adulteration of honey. NMR analyzes a spectrum of 36 different substances. This process makes it too expensive for adulterators to develop new syrups to beat the test. According to the German laboratory QSI, 60% of honey samples tested by NMR in 2016 were adulterated. This test shows hope for the future.

In summary, fraud mechanisms are responsible for a majority of the cheap honey being imported into our markets which are driving down the world market price of honey. The production of honey purity is a food security problem. Get to know your local beekeeper and buy from them or a supplier you trust.

ABF continues to be on the front lines in the fight for honey pricing. The team we have in place seems to have things well in hand. They continue to push for results by implementing new ideas through our social networking campaign. I am very happy to see other groups jumping on our bandwagon and pushing for the same thing. Working together has always been a mission of the ABF.

Educating the public with the truth in labeling has been our goal. People seem to be listening to our social media posts. The ABF office has been receiving positive comments from our membership and the public. They have lots of time to spend on social media during this COVID-19 reprieve.

Continue the good fight, ABF members!

Content for this article came from Norberto L. Garcia, USDA, and Pamela Parker, BBC News, California.

Joan Gunter

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DAN WINTER,
ABF VICE PRESIDENT

> KEEP YOUR MEMBERSHIP CURRENT AND PLEASE CONTINUE TO DONATE TO THE HONEY QUEEN FUND

ABF'S WORK CONTINUES DESPITE THE PANDEMIC

As most ABF members know, we have decided not to hold the 2021 ABF Conference & Tradeshow due to the ongoing pandemic. This was an awfully hard decision to make, especially considering how vital the conference is to raising money that supports the ABF's work on issues associated with beekeeping legislation and research.

I strongly urge everyone reading this message to keep your ABF membership current and please continue to donate to the Honey Queen Fund. These folks work extremely hard raising awareness for our industry, even in these uncommon times. Anyone wishing to donate can do so using the ABF website at *www.abfnet.org/donate*. We have also launched the ABF online store! It's a great place to buy ABF merchandise, and now is a perfect time for holiday gift shopping. For once, my shopping will not be rushed.

Since my last quarterly report, there have been three primary legislative updates.

1. The U.S. will continue the farm worker visa program extensions amid COVID-19. Law 360 reports, legislators have stated that foreign farmworkers can extend their H2As for their temporary work visas. This was considered vitally important to securing harvesting labor and, in turn, will help protect U.S. food suppliers. I know this is good news for beekeepers.
2. Congressman Kelly Armstrong (R-ND) is working on a bill to address a Standard of Identity for honey. Rep. Armstrong's office has reached out to the ABF with questions about some issues with its writing. We know it's important for a federal standard to come first before the states. Problems occurred in some states that did adopt a standard. We at the ABF look forward to helping with this effort.
3. And finally, a federal court overturned the Environmental Protection Agency's (EPA) approval of the use of Bayer's dicamba herbicide (commonly known as Roundup). This will make it illegal to use this herbicide. The ruling by the U.S. Court of Appeals for the Ninth Circuit found that the EPA "substantially understated the risks" of the dicamba herbicide and "failed entirely to acknowledge other risks."

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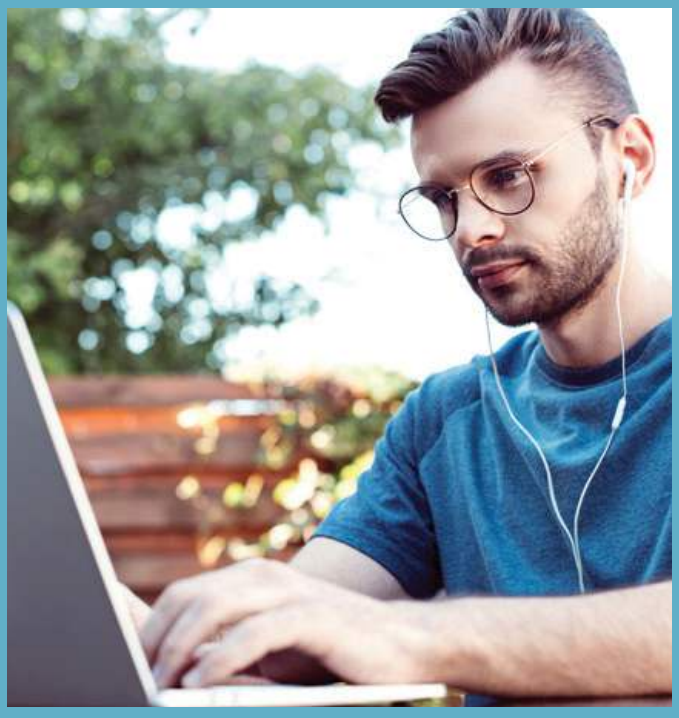

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ASK HOOPIE

Q. ***When should I take my comb honey section boxes off my colony?***

A. The minute (or second) the sections are fully capped over or the honey flow ends. The least amount of time that a super of section boxes stay on the colony, the better. Sections become what is called "travel stained." All award-winning section boxes have little or no stain. You want section boxes to be full edge-to-edge, but once that is accomplished, the boxes need to be off the colony. Otherwise, you will need to spend a lot of time cleaning the boxes, and that is difficult.

Many comb honey producers find that certain stocks of bees are better at filling section boxes and leave less superfluous wax. These beekeepers also select bees that have honeycomb that has an air space between the honey and the wax capping. This air space produces a "white" capping as opposed to what is called a "wet" capping. The white, or air space, capping just looks better.

Q. ***Is there a way to save a colony that has laying workers?***

A. The best way to use the workers is to unite it with another colony using the newspaper uniting method. This saves, or uses, these bees the best way possible.

It is very difficult to get a new queen accepted into a laying worker colony. As soon as there is no queen in a colony, there is a lack of queen mandibular pheromone (QMP), which suppresses ovary development in worker bees. Several workers then will develop their ovaries and start laying unfertilized (drone) eggs. These workers take on some queen-like behaviors, which make it very difficult to introduce a new queen.

If you do not have another colony you can use to unite with a laying worker colony, then here are a couple of queen-introduction solutions that sometimes work. Purchase, or obtain, a new queen as soon as possible. Then, put her under a push-in cage on some empty comb space. Leave her under the cage until she has filled the comb space with eggs. This will take a few days. Even consider moving the cage a few inches to more comb space for an additional couple of days before removing the cage. No guarantees, but this often works.

The second method that often works depends if you have a nuc with a laying queen. Find the queen in the nuc and put her in the center of two frames, with bees attached, from the nuc that have brood in them. Carefully put the two frames into the laying worker colony and close the colony. The frames from the nuc often have enough bees to ward off the laying workers and the colony will right itself. Spraying the laying-worker colony with sugar syrup prior to putting in the frames from the nuc will make the introduction of the new bees and queen even safer.

Q. ***In what case does a forager revert back to being a nurse bee? What are the possible repercussions?***

A. A worker bee normally goes through a series of age-related, division-of-labor tasks. While all of these tasks are usually age-related, there also is an as-needed basis. If all the nurse bees die or are removed from the colony, the older bees that have already passed through this stage due to age, will revert and take up the duty that is needed.

For example, years ago, there was a very toxic chemical (methyl parathion) that was encapsulated in a coating to make it safer to the person spraying the pesticide onto crops. Unfortunately, these little capsules ended up in pollen that foragers brought back to the colony. It was safe enough that the foragers were not killed, but the nurse bees that ate the pollen to produce brood food for the larvae were exposed to the chemical and died. Thus, no nurse bees! In many cases, older bees dropped back and filled the void. The repercussions were great, as the colonies lost a whole age group of bees and in most cases, the colonies were lost or produced no honey for the season.

In a normal colony, very few larvae or pupae die. When carefully documented, 92% of the larvae become pupae and 98% of the pupae survive to become adult bees. It is only when bees begin to forage that they start to die off. So, if you see that the colony's larvae are dying at a large rate, the colony has a problem (disease or pesticides), and attention should be given to the colony.

Q. ***What do you think happened to tracheal mites? Was it resistance by the bees, treatments or some other reason?***

A. I have to think the major decline was the latter—some other reason. Let me explain. In the early 1990s (I think it was 1992), when I was doing research at Michigan State University, our apiary had about 40 colonies. In the fall, the infestation rate of tracheal mites varied between 40 to 70% of the bees. The following spring, no colony had more than 4% infestation. No queen changes, so the colonies were the same stock as they were in the fall.

My guess is that a disease of the mites, hit all of the colonies at once. However, since my training was not in insect pathology, it is only a guess. I am not sure that bees haven't added a little resistance to the equation since then. But I think disease caught up to the tracheal mite problem—just in time for us to focus our attention on Varroa mites.

Please email your questions to ***info@abfnet.org*** with *"Ask Hoopie"* in the subject line.

Therapeutic Probiotic to Fight Against American Foulbrood

SCHOLARSHIP WINNER PAPER

by: Sofía Romero, The University of British Columbia

Introduction

Paenibacillus larvae (P. larvae) is the causative bacteria of the most virulent honey bee brood disease to date: American foulbrood (AFB). Historically, AFB has been responsible for the highest economic losses to farmers and beekeepers.[1, 2] Therefore, its prevention is crucial. In the United States, the only FDA approved antibiotic to prevent AFB is oxytetracycline, of which efficacy is hindered by antibiotic resistant *P. larvae* strains.[3] Also, there are recent studies that have shown the negative effects on bees' health and lifespan caused by oxytetracycline treatment.[4] Furthermore, the residues of antibiotics in human consumption products is an alarming problem that beekeepers and the apiculture industry face. Unfortunately, there is no alternative strategy to prevent AFB. Because of the lethality of this pathogen and the difficulty involved in the eradication of the spores, burning the contaminated hives is an enforced practice, but it brings economic losses with it.

Adult bees are immune to *P. larvae* infection, but they act as a disease vector by feeding larvae (premature bees). Larvae are vulnerable to AFB likely because of two main reasons: First, they lack the characteristic commensal gut bacteria which act as an efficient barrier against pathogens;[5] second, larvae have an underdeveloped immune system to fight against pathogens, including a lower production of antimicrobial peptides.[6, 7] Antimicrobial peptides are small peptides that severely damage or kill pathogens. Adult honey bees produce different antimicrobial peptides, some of them being released in the hemolymph, and few others as part of secretions, such as royal jelly. Hemolymph antimicrobial peptides produced by honey bees have been tested against *P. larvae* and have showed inhibition activity.[8, 9]

The treatment of larvae with naturally occurring antimicrobial peptides as prophylactics is very promising, since opposite to antibiotics, they are less likely to induce resistance because of a more direct mechanism of action. Up to this point, there hasn't been interest in developing therapeutics based on antimicrobial peptides for dealing with AFB.

On a different approach, the use of probiotics—bacteria that confer beneficial properties to the organism—is becoming a popular trend. Probiotics may prevent gut diseases by competing with pathogens for nutrients or by producing metabolites that directly cause damage to pathogens. A recent study determined that a combination of *Bifidobacterium* and *Lactobacillus* bacteria have affected *P. larvae* growth in vitro.[10] Although this synergistic effect means that several different species are needed to obtain the benefits, some of the bacteria used during the study are non-commensal of honey bees, which can lead to unknown imbalances. Feeding the wrong probiotic to bees can have negative action against either the commensal community or the bee itself.

In the framework of my graduate studies, I have sought for alternatives to the use of antibiotics for the prevention of AFB. I am researching on the efficacy of honey bee naturally occurring antimicrobial peptides against *P. larvae*. As part of my experiment's results, I have found interesting trends on how jelleine and melittin—antimicrobial peptides present in royal jelly—are highly effective against non-commensal bacteria, including *P. larvae* and other Bacillus species. Also, I have identified that honey bee gut commensal bacteria are highly adapted to these same peptides. I am working on in vivo studies as part of the validation of these peptides as safe prophylactics for the honey bee larvae.

In the second part of my project, I am attempting to develop a therapeutic probiotic based on the characteristic commensal gut bacteria *Snodgrasella alvi (S. alvi)*. The idea is that this bacterium can be used to deliver and secrete one of the adult honey bee antimicrobial peptides to the larvae, resulting in a therapeutic probiotic. Since characteristic commensal gut bacteria and antimicrobial peptides are scarcely present in the larvae, this probiotic could provide the physical and biological protection needed for the larvae to resist *P. larvae* infection.

Benefits for the Apiculture Industry

For over five decades, oxytetracycline has been the gold standard for dealing with AFB, although its continuous use has resulted in the emergence of resistant *P. larvae* strains which make it more difficult every day to prevent this lethal disease. Additionally, the use of antibiotics has several drawbacks previously mentioned. This project seeks two clear goals that can be easily translated to benefits and applications to the apiculture industry.

The first goal is the meticulous validation of naturally occurring peptides for the treatment and prevention of American foulbrood as an alternative

to antibiotics, and by meticulous, I mean there is validation of the targeted microorganisms, determination of the effective concentrations and identification of potential side effects. The second goal is the development of a therapeutic probiotic that can be used to feed highly vulnerable larvae (first stages of development).

Developing a probiotic with the ability to produce, deliver and secrete antimicrobial peptides is a highly rewarding approach since it decreases the costs of the chemical synthesis of the peptides and provides a very convenient and safe method of administration of these active compounds.

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Overwintering Honey Bees

FOUNDATION FOR THE PRESERVATION OF HONEY BEES, INC.

4-H ESSAY COMPETITION FIRST-PLACE WINNER

by: Libby Majors

Football, pumpkins, evening bonfires and countryside drives to see the changing colors of leaves. We can feel it. Summer ends and fall begins a change in seasons which causes trees to show their vibrant colors as nature prepares for a new season. Many are unaware that this transitional period, from summer to winter, is crucial to the American honey bee. While not native to the United States, the honey bee has developed many survival mechanisms since being introduced to America in the 17th century by Europeans (Horn, 2008).

The onset of fall is an important time for the honey bee. Colonies have gone through summer, expanding colony size, fighting off colony parasites, such as small hive beetles and Varroa mites, and utilizing floral resources to survive the summer dearth. Fall is the beginning of winter survival for honey bees. As the temperatures start to change, the bees reduce the intake of nectar and pollen in the hive and work feverishly to collect winter stores to survive the cold months. Propolis, collected from tree buds and tree sap, is used in the hive to seal any cracks and reduce the entrance size in an effort to keep cold air out. Then, like magic, cool air moves in and bees begin to cluster around the queen when temperatures are between 50 and 57 degrees ("Winter Cluster") in attempt to keep her safe and warm. If all goes well, the colony survives the winter months, and the cycle resumes in the spring.

As a beekeeper, overwintering honey bees has been a real learning experience. In my second winter of owning bees, my dad and I have experimented and feel we have honed our overwintering technique with three key practices that greatly increase the survival of honey bees during the winter.

First, colony health is key. According to Mr. Steve Turner, owner of Honeyton Farms, "The number one most important factor is treating hives for mites." As late fall arrives, we found it is essential to treat for Varroa mites. These pesky parasites, introduced in the 1980s to the United States (Rogers, 2018), will wreak havoc on a colony. The mites not only attach themselves to adult bees but also enter brood cells just prior to capping and causing colony destruction. If the colony is not closely examined, losses may be mistaken for winter mortality or queenlessness (Bessin, n.d.). After my first experience observing overwintering bees, I believe that one of our colonies absconded because of failure to treat for Varroa mites leading up to the winter months.

A second practice I use to increase my colonies' chances of survival revolves around food. Food is critical to survival of a colony over the winter. According to Arkansas apiary inspector Danny Brewer, "During wet summers, we will have plenty of forage, but during dry summers, a colony of bees may starve to death because of location or lack of foliage due to drought-like conditions." I learned this the hard way during my first year as a beekeeper.

Having successfully caught a couple of swarms with my dad late in the summer, I assumed my new colony would have time to build up stores for the winter. I supplemented feeding into the fall, thinking all was well. As spring approached, I was devastated to find bees dead with their heads stuck in cells, which is indicative of starvation. This was an important lesson for me that led to more research around how to increase bee survival through the winter months. My research led me to a solution that seems to be working. The Mountain Camp method of feeding bees is simple but effective by providing multiple benefits to a colony.

Mountain Camp feeding involves putting dry sugar inside the hive. Normally this is done by placing a piece of newspaper on the top bars, pouring dry sugar in, spritzing the sugar with water and replacing the inner cover, adding shims and then the telescoping lid. This allows honey bees direct access to food once the colony clusters. An additional benefit of this method of feeding is moisture control. The dry sugar absorbs moisture and prevents condensation from falling down onto the bees (Hubbard, 2016). This has proven to be very beneficial for us during the wintering season.

Above all else, the process of calling oneself a beekeeper involves one thing that is continual: Learning. In today's world, access to data through internet websites, social media and local bee clubs make learning so much easier than for those who came before us as beekeepers. I've found that, for the most part, beekeepers are eager to share their knowledge to help others be successful in this endeavor. This is good news for the future of our precious resource, the honey bee!

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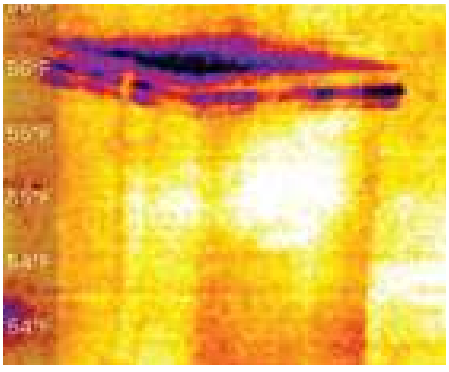

Hive showing bee clusters migrated up in the hive box. Picture taken using a SEEK infrared camera.

Mountain Camp feeding method showing how different colonies have utilized food stores.

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BIOSECURITY
& AMERICAN BEEKEEPING

by: Michael Hansen, Pesticide and Plant Pest Management Division,
Michigan Department of Agriculture and Rural Development

In 2001, the United Kingdom suffered an outbreak and rapid spread of Foot and Mouth Disease. Within days of the initial discovery, it was evident the disease had spread across the U.K., leading to as many as 10 million animals destroyed to stop the outbreak. Disease officials in the United States quickly realized swift action was needed to prevent a similar disaster from occurring here.

Like other animal industries, beekeeping activities flow across the nation. Bees are repeatedly moved across borders for pollination and honey production. Our borders are porous, laws between states are inconsistent and bees are moved thousands of miles for the opportunity to be placed near other beekeeping operations to pollinate the nation's crops. All the items listed in the above sentence should be part of the foundation for a beekeeping biosecurity plan.

The U.S. has had some success in applying biosecurity at our international borders, but it has taken some really hard work. The Federal Bee Act, as well as most state apiary laws, were first written in the early 1900s to limit the infection rate of American foulbrood (AFB). In the first two years of Michigan having its inspection service, 27% of the colonies inspected were found to have AFB. By destroying diseased colonies, and through careful inspection and education, rates dropped below 1%. Apiary inspection was not considered necessary when disease rates were low and were reinstituted when disease rates again got out of hand.

States like Michigan went through several cycles of building inspection programs when AFB erupted, only to have them cut when the rate dropped. Many of the once strict states now offer inspection only for the purpose of issuing health certificates for movement. The onus of managing most honey bee diseases falls to the beekeeper. Some are well prepared, but many are not.

Small Hive Beetle took less than a year to be found in every state. Detection was quick because the once quiet industry had become a web colony movement across the nation in every direction, making the mosaic difficult to sort out.

It's often missed that in the early 1990s, beekeepers were losing up to 80% of their operation in a year from Tracheal and Varroa mites. The industry saw a big change in the makeup of the United States' beekeeping population during that timeframe. Miticides helped slow the losses. But by 2006, we learned a new phrase—Colony Collapse Disorder (CCD). It took five years of intensive research to show there were six major factors contributing to bee decline. Today, we seldom see the classic symptoms of CCD, but it is still identified as a major problem.

In 2006, the United States Department of Agriculture (USDA) issued permits for the import of bees from Australia and New Zealand under the authority of the Federal Bee Act. Other countries—even those with known bee parasites—applied for permits. When the USDA denied the permits, the World Trade Organization ruled that since the U.S. did not have an established benchline for apiary pests and diseases—by international standards—they did not have a right to deny those permits.

The National Honey Bee Survey was developed in 2009. In 2010, apiary inspectors started to collect samples nationally to help the USDA accumulate the data needed to support the Federal Bee Act. When the data showed Slow Bee Paralysis Virus (SBPV) was not found in the United States, the agency rescinded Australia's permit. SBPV had been identified in Australia, and the USDA took steps to protect our bee population.

In 2019, Canada allowed the import of bees from South America. In response, USDA closed the border to Canada to prevent the transshipment of South American bees into the U.S. USDA and the Canadian Food Inspection Agency (CFIA) are working through a risk assessment process required to safely re-open the border for bee movement.

Conquering the biosecurity issue must start with beekeepers. Keeping bees healthy is incredibly important. Beekeepers who have adopted indoor storage practices know they will get the best results if they store only healthy bees. Even if they don't use an indoor facility, beekeepers must strive for bees free of disease with extremely low mite levels year-round to prevent virus transmission. Retired apiculturist Medhat Nasr shared that only a small percentage of Canadian bees are stored indoors, but they have adopted similar stringent controls to help bees make it through the winter.

Several excellent resources are available to beekeepers, including information from the Honey Bee Health Coalition and the *Indoor Wintering Guide* developed by Washington State and sponsored by Project Apis m. I especially like the resources on the Michigan Pollinator Initiative website at *www.pollinators.msu.edu*. Plus, other universities with leading apiculture programs are providing webinars, websites and virtual meetings. Beekeepers need to adopt best management strategies that work for them and then teach and expect that from their employees.

If you have American foulbrood, root it out of your operation and get rid of diseased equipment. Disinfect after each yard—use a chlorinated cleanser to clean your equipment. I have been in bee yards where 100% of the colonies had American foulbrood. Then at the next operation, there was no AFB. Do not be the one to transmit active AFB within your own operation.

If you have old antibiotics in your freezer, get rid of them properly. Locate a veterinarian who is willing to work with beekeepers and use only fresh treatments. Antibiotics lose potency quickly and mis-dosing a treatment can only lead to disease resistance. The Honey Bee Veterinary Consortium at *www.hbvc.org* is a good place to start if your state does not already have a way of connecting veterinarians and beekeepers.

If you are going to purchase bees, inspect them, sample them, send samples to the USDA lab in Beltsville, Maryland, or the Utah Department of Agriculture lab to know what you are dealing with. Also, send samples out for virus analysis and ensure you know what you're buying.

If you have questions, talk to your state apiary inspector. You can find an index of state and provincial apiarists at *www.apiaryinspectors.org*.

Beekeeping is unlikely to return to the stationary occupation it was 40 years ago. If bees are going to move, be good to yourselves and your neighbors and move only the best we can.

BIOSECURITY *in the* BEE YARD

by: Meghan Milbrath, Michigan State University

As beekeepers, we can learn a lot about biosecurity from people who work with other livestock. Recently, I was invited to train veterinarians in Hawaii on honey bee disease identification and management during clinics hosted at multiple farms all over the state. As employees of the Department of Agriculture and University Extension, we were extra careful. We wanted to make sure we could not be the cause of bringing disease into an operation.

I was asked not to bring any beekeeping equipment whatsoever, and when I arrived at each location, the tires of my car were sprayed with disinfectant prior to entering the property. Before I opened my car door, I was handed booties so the soles of my work boots would never touch the ground. I wore nitrile gloves and used only tools that were already present in the yard. We were practicing good biosecurity measures to minimize the chance of disease introduction.

I also raise pigs. When I get my feeder pigs from the breeding facility, there are clear signs directing me where to go—keeping me off most of the farm and far away from the breeder sows. Doors are locked to visitors, and all employees go through a thorough wash-in/wash-out process every day. The facility takes great care not to introduce new pathogens to the herd, because they know how quickly a disease can spread through animals in close contact.

And then we get to beekeepers. While there are certainly some beekeepers who practice excellent biosecurity, most beekeepers do not give biosecurity and disease risk the same level of planning and attention as many other types of livestock operations. Granted, there are many differences between beekeeping operations and other livestock. No other livestock is as mobile, crisscrossing around the country, and no other livestock intermingle as much (could you imagine if cattle drifted or robbed other yards?!). However, these characteristics of the apiculture industry are all the more reason why beekeepers need to be extra vigilant about biosecurity.

What Is Biosecurity?

Biosecurity is a set of everyday methods/practices/protocols performed to prevent or greatly reduce the introduction of diseases or pests to farm

animals and to contain the spread of any disease between farm animals. There are three main aspects to biosecurity: 1) Eliminating sources of infection from outside your operation, 2) limiting disease spread within your operation and 3) paying attention to the susceptibility of your animals. A good beekeeper should have a set of preventative measures designed to reduce the risk of introduction and spread of pests or diseases in bees. They should also have a plan to minimize the impact of pests and diseases on their bees and on other beekeepers.

Biological pests and pathogens are incredibly costly to beekeepers and can result in extremely large (but often unaccounted for) expenses to many beekeeping operations. Everyone knows that a healthy colony will make much more honey than a diseased colony, yet very few beekeepers actually account for the cost of diseased-caused crop loss in their balance sheets. Most beekeepers do not know the economic impacts of disease on their operation. Diseases and pests not only cause loss in honey yields but also cause damage to or loss of equipment, increased labor costs, treatment costs and loss of bees. When honey prices are low and pollination contracts can fluctuate, it is essential that beekeepers examine their operations to ensure that they are minimizing their losses from disease.

No matter how many hives you have, creating a biosecurity plan is the best strategy for protecting your business from losses due to diseases and pests. Your plan should include all partners and employees. It should be written down. And, it should be reviewed and updated every year. You should structure your plan to include everyday practices as well as protocols in the case of an outbreak or an emergency.

The Healthy Farms Healthy Agriculture program at *www.healthyagriculture.org* has many resources to help you understand the basic aspects of biosecurity, including biosecurity plan documents and templates so you can get started on building a plan for your operation. The program offers the following tips:[1]

- Remember, planning is a process. Start where you are now.
- Implement a few important things first. Add more later.
- Determine what will or will not fit in the daily routine.
- Plan ahead with protocols that everyone on the farm and visitors will need to follow if an outbreak occurs.
- Include a process for observing and monitoring herd health and for reporting unusual or suspicious signs.
- Be sure to communicate to employees and visitors about your biosecurity protocols and how they can comply.

What Should a Plan Include?

The first step is to evaluate your risk. Think about both pests and pathogens. Consider where disease can enter your operation—purchased equipment, robbing bees, contaminated extraction facilities or on the tools or hands of visitors. Also consider how easy it is for disease to spread within your operation. How do you move equipment? What hygienic measures do you take between yards? What periods are your bees especially stressed or susceptible to disease?

The second step is to make a plan. Use templates for other livestock or other countries (Canada[2] and Australia[3] have lots of guidelines). Take advantage of local professionals. Food animal production veterinarians are used to working with livestock producers to develop customized biosecurity plans for agricultural operations. Use state and federal resources—get to know your state apiary inspector, your extension specialists and Bee Informed Partnership tech transfer team members. All of these specialists can keep you up to date on current outbreaks and reportable diseases.

The third step is to actually use your plan. It won't be useful if you and others in your operation don't follow your own guidelines, so make sure you focus on changes that can be reasonably implemented.

Common Elements of a Bee Biosecurity Plan

1. Methods to reduce incoming contamination:
   a. Have a system for dealing with on-farm visitors, including other beekeepers, workers and customers.
   b. Vet sources of equipment, supplies and bees. Only purchase from people who also have good systems for monitoring and managing disease. If possible, sterilize incoming equipment before use.
2. Methods for eliminating spread within your operation:
   a. Keep written hygiene standards for workers and tools—clean smokers, hive tools and other apiary equipment of wax and propolis and practice frequent washing and disinfection.
   b. Implement practices to reduce robbing and drift.
   c. Develop disease surveillance and management plans for both general practice and emergency response. Early detection means easier control.
   d. Use a quarantine yard to isolate new or sick hives.
   e. Develop a schedule and budget for sample testing.
   f. Keep track of equipment and implement a barrier system (divide your operation into smaller subunits) to prevent operation-wide outbreaks or contamination.
   g. Develop a protocol for sanitizing extraction equipment.
   h. Control nuisance pests by cleaning or burning old equipment quickly or through targeted pesticide use. Clean up deadouts and old wax as quickly as possible. Consider the cost to your own operation as well as to others in your area.
3. Methods to reduce susceptibility:
   a. Identify times of high risk or stress and consider practices to improve health during these times.
   b. Focus on high nutrition.
   c. Deal with weak or queenless hives immediately.

When we think about changing practices, we often focus on the increased work and forget to account for the high costs that pests and pathogens bring to our businesses and the industry as a whole. Currently, honey bees in the United States experience incredibly high rates of disease—not only Varroa mites but also bacterial and fungal diseases like EFB and chalkbrood. These diseases result in an enormous economic loss for beekeepers in this country. While it may seem that implementing a barrier system or washing hive tools daily are extra work, it is not unnecessary work. Taking the time to create and implement a proper biosecurity plan can significantly reduce long-term costs and help protect the health of bees in your operation and throughout the country.

Resources

1. Healthy Farms Healthy Agriculture Biosecurity Plan: *healthyagriculture.org/prevent/biosecurity-plan*

2. Government of Canada Honey Bee Producer Guide to the National Bee Farm-level Biosecurity Standard: inspection. *gc.ca/animal-health/terrestrial-animals/biosecurity/standards-and-principles/honey-bee-producer-guide/eng/1378390483360/1378390541968?chap=0*

3. Plant Health Australia Biosecurity Manual for Beekeepers: *beeaware.org.au/wp-content/uploads/2019/05/Biosecurity-Manual-for-Beekeepers.pdf*

Commercial Beekeeper SPOTLIGHT

JAN LOHMAN & VINCE VAZZA
Vazza Farms, Inc.
Hermiston, Oregon

WHEN AND WHY DID YOU GET INTO THE BEEKEEPING BUSINESS?

Vince actually started in Idaho with leaf cutter bees to make money to go skiing each winter and bought a few honey bee colonies when he sold his leaf cutter bees. He began raising honey bees over 40 years ago in Idaho with Tony Noyes of Noyes Apiaries. We are the oldtimers now. Vince and Tony worked together for many years and still spend plenty of time talking bees. Vince and I got together in 1991, and I started helping with the bees on a part-time basis. Previously, I owned a bookstore in our eastern Oregon town of Hermiston but sold it a few years later and have been a full-time beekeeper for the past 30 years. As everyone knows, once you get involved with honey bees you no longer have time for anything else.

DESCRIBE WHAT YOUR BUSINESS CURRENTLY DOES IN THE INDUSTRY.

We were commercial beekeepers, running 2,300 colonies in eastern Oregon, California and Washington until 2017 (emphasis on pollination), as Hermiston is not an epicenter for honey production. We sold our commercial equipment and bees in 2017 and chilled for a few months. A friend gave us 24 colonies as a retirement present to use to teach a beekeeping class. They were huge and needed splitting, so we have increased our numbers over the past two years AGAIN! We do pollination in California and Oregon on a limited basis. Our bees pollinate almonds, pears and blueberries, and we produce some honey. We also love selling nucs to hobby beekeepers in the spring each year. I am also on the Oregon Master Beekeeper Program committee and teach and mentor for the program. It is a collaborative effort between Oregon State University and the Oregon State Beekeepers Association.

WHAT ARE THE FUTURE GOALS OF YOUR BUSINESS?

Our future goal is to stay under a semi-load of bees. It is too easy to just keep adding more and more so that your numbers continue to grow. We want to have some time for family and adventures.

WHAT ARE YOUR MAJOR CONCERNS ABOUT THE BEEKEEPING INDUSTRY AND HOW THEY WILL AFFECT YOUR BUSINESS?

Varroa is, of course, everyone's major concern. We have to get this right. It has been three decades, and we are still scratching our heads.

WHAT IS THE MOST PRODUCTIVE CROP OR FLOWER THAT YOU'VE SEEN YOUR BEES WORK?

In the early years of buckwheat, we had quite a successful crop, but that has changed over the years. More beekeepers want to go to buckwheat, and the plants do not produce honey as they did in the early years.

WHAT IS YOUR FAVORITE TYPE OF HONEY?

We love our local honey—not a very light honey but very flavorful. It is mostly produced with alfalfa with some local flavor from black locust trees and olive trees.

WHAT IS THE BEST BEEKEEPING ADVICE YOU'VE EVER RECEIVED?

Timing is everything! Keep your eye on the ball! There are so many amazing beekeepers who we have brainstormed with. This industry is so very lucky that we support one another.

WHAT IS YOUR FAVORITE BEEKEEPING TASK?

My favorite beekeeping task is building nucs in the spring. Vince would probably say it's finding new locations for placing the bees, especially when you feel like it will be a fruitful location.

A beautiful field of sunflowers.

WHAT BEEKEEPING TOOL OR PIECE OF EQUIPMENT DO YOU ENJOY WORKING WITH THE MOST?

Vince would probably say his forklift. I would say new equipment. Nothing feels better than replacing a damaged lid or box. We try to do this in the spring each year.

WHAT DO YOU THINK THE BEEKEEPING INDUSTRY WILL LOOK LIKE IN THE FUTURE?

We as beekeepers are very slow to change, so maybe much like it is today, but COVID-19 has certainly taught us about meeting with Zoom. Hopefully, eventually, we will have queens that make our beekeeping easier with Varroa.

Jan and Lola, her faithful four-legged beekeeper sidekick.

Vince Vazza and his wife, Jan Lohman, discuss taking their bee pollination business on the road in California and Oregon during the spring, in The Dalles, Oregon. (Associated Press)

WHAT IS THE MOST IMPORTANT PIECE OF ADVICE YOU CAN GIVE TO A YOUNG AND FUTURE BEEKEEPER?

I think the most important advice is to work with a beekeeper for a year. Gleen their knowledge and their support and get to know as many beekeepers as you can. Each one has their own way of doing things, and you will choose your path when you have that experience behind you.

WHY ARE YOU A MEMBER OF THE ABF?

We believe there is power in numbers, and as beekeepers, we need each other to be the best we can be. We also love to go to conferences and see our friends who are spread all over the U.S. It's the best.

PREVENTING THE SPREAD OF DISEASE IN YOUR APIARY

by: Kelly Kulhanek, PhD,
University of Maryland, College Park

Beekeepers today have their work cut out for them. Honey bees face a whole suite of health stressors that can interact and synergize to result in colony death. As a beekeeper, you can help support your colonies' health through the use of good management practices. Monitoring and managing parasites and pathogens appropriately is a vital component of keeping healthy colonies. But even with the best management practices, some level of infection is still likely to occur. That is why one of the most important things to consider is preventing the spread of diseases between colonies in an apiary.

Because honey bee colonies are typically kept close together in apiaries, if one colony gets sick, it's often only a matter of time before its neighbors become infected. Varroa, viruses, bacteria and fungi can all be transmitted between colonies. Varroa hitch rides on bees visiting other colonies during drift or robbing. Once in a new colony, these mites quickly jump onto other bees to feed or into brood cells to reproduce, vectoring viruses to adult and immature bees. Bees can also spread viruses, bacterial diseases, such as American foulbrood (AFB) and European foulbrood (EFB), and fungal Chalkbrood or Nosema spores to bees in other colonies through trophallaxis or other contact. Finally, beekeepers themselves can transmit disease with contaminated equipment, such as combs, hive tools and gloves.

One of the simplest ways to prevent disease spread within the apiary is through good hygiene. Sanitizing equipment between colonies can prevent the spread of bacteria, viruses and fungi. Hive tools can be cleaned with an alcohol wipe or placed in your smoker and exposed to an open flame for a few seconds to kill any residual pathogens (be careful, it gets hot). It may also be worth it to wipe down the bellows of your smoker between colonies, as you are touching it with the same hands that may touch an infected colony. It may feel excessive to perform these measures between every individual colony. If you only want to use these sanitation practices when necessary, then honing your disease identification skills is vital. You have to be able to trust your ability to know when you have a sick colony in order to respond appropriately and use good hygiene when necessary. If you're not totally comfortable with this skill set yet, it may be a good idea to be extra cautious—better safe than sorry.

When it comes to gloves, a lot of beekeepers prefer not to wear them as they can harbor and spread diseases between colonies. If you are going bare-handed, keep in mind your hands can also be reservoirs for bacteria and other pathogens, particularly in all that wax and propolis that gets stuck under your fingernails. If you notice disease symptoms in a colony, it is good practice to wipe or rinse hands between colonies. If you prefer to wear gloves, disposable nitrile gloves can be easily switched between colonies to keep sterile. A personal favorite method is wearing two layers of nitrile gloves. The outer layer comes into contact with the bees and can be easily switched out, and the under layer stays on. The double layer prevents most stings and makes switching the outer layer easy because they won't stick to your sweaty hands, which are contained within the inner layer. Leather or goat skin gloves are also popular but are harder to clean. You can still wipe them down between colonies as a precaution, although pathogens can hide between folds and seams in the fabric.

Another common route of disease transmission between colonies is through the mixing of equipment. While a major benefit of keeping colonies in apiaries is that you can trade boxes and frames between colonies as needed, this can also act as a route of disease transmission. It's important to keep in mind the health history of each colony you trade frames between. Brood, in particular, harbors bacterial diseases like AFB and EFB. Carefully inspect each frame of open brood cells for symptoms of disease before you introduce brood into another colony. Bees themselves can also harbor diseases, so when moving frames or boxes between colonies it may be best to remove as many adult bees as possible before doing so.

While the beekeeper can help prevent disease transmission between colonies through good hygiene, often, the bees themselves are a source of infection. Bees frequently move between colonies within an apiary. Many studies have shown that drifting is very common, and bees also visit other colonies during robbing when resources are scarce. Drifting or robbing bees can be infected with viruses, bacteria or fungi and can easily transmit these diseases to bees in colonies they visit. Some evidence suggests that crowding colonies within apiaries and the landscape increases the transmission of mites, bacteria and viruses. In fact, feral colonies will typically choose nesting sites up to one kilometer from another colony, allowing plenty of distance. The best solution may be to space colonies as far apart as possible, however, due to space and logistical constraints, this is rarely possible. Luckily there are a few other ways to manipulate your apiary to help reduce drift and robbing.

Making colonies look visually distinctive can help bees more accurately return to their own colony and decrease drift. Things like painting each colony a different color or putting unique markings above the colony entrance can help. Using hive stands of varying height can help bees distinguish between colonies. Evidence also shows that a circular arrangement may be better than a linear one, as the direction of each colony's entrance is varied. To prevent robbing, try to disturb your colonies as little as possible during periods of dearth. If you need to apply a mite treatment or supplemental feed, be as quick as possible. The longer colonies are open, the more likely they are to be robbed. If you notice some colonies are smaller than others, take extra precautions to protect them from robbing. Entrance reducers and robbing screens allow guard bees in small colonies a better chance and fending off unwanted visitors.

While all these measures can help prevent disease spread within the apiary, the most important measure is to be proactive and prevent diseases from taking hold in the first place. Actively monitoring for mites and inspecting brood for disease symptoms can help you identify problems in the early stages and apply successful management techniques before diseases have a chance to spread to other colonies. Learning to identify the early symptoms of a disease is critical. Regular colony health inspections should include monitoring for Varroa via sugar or alcohol shake and inspection of adult bees and brood for signs of disease. The earlier you start these preventative measures, the better chance you have of preventing disease from reaching a critical point where colony death could result.

By preventing diseases from spreading to multiple colonies, you are saving your bees and yourself a lot of headache in the long run! The following resources can help you become a master at early disease diagnosis and prevention.

Resources

1. Bee Informed Partnership Treatment and Diagnosis of Common Brood Diseases Manual: *mannlakeltd.com/diagnosis-treatment-of-common-diseases*

2 Bee Informed Partnership webinars: *beeinformed.org/education*

3. Honey Bee Health Coalition Varroa Guide: *honeybeehealthcoalition.org/Varroa*

WESTERN REGION APIARY INSPECTION PROGRAMS

by: Joey Caputo (Utah), Alyssa Piccolomini (Montana), Jessica Rendon (Oregon), Jack Peterson (Arizona), Darcy Oishi (Hawaii) and Laura Pottorff (Colorado)

UTAH

The Utah Apiary Program, founded in 1892, is among the oldest continuously operating bee inspection services in the country. Today's program operates under the Utah Department of Agriculture and Food's motto, "Protecting and Promoting Utah Agriculture." The program is a cooperative effort between the state and county governments, where both entities can appoint bee inspectors to assist beekeepers in the identification and suppression of disease and pest issues.

Honey Bee Health Conference hosted by UDAF.

The program registers and services all beekeepers, from the professional migratory beekeeper to the backyard hobbyist. Two state inspectors and nine county inspectors comprise the workforce of the current program. While inspectors have regulatory responsibilities, they pride themselves in being partners of the industry and community, not adversaries. The program offers

State bee inspector Stephen Stanko, right, with a Utah beekeeper.

health inspection services, in-house, state-of-the-art diagnostic testing and certification for interstate movement of honey bees.

Utah has 1,600 registered beekeepers that manage an estimated 26,000 hives. These hives pollinate Utah's alfalfa seed, apple, berry, cherry, peach, melon and squash industries. Utah produces over a million pounds of honey annually.

Big bee yard in Utah.

MONTANA

Montana's beekeepers are a very diverse group, and apiary locations are widely distributed throughout the entire state. Montana currently has 242,980 registered beehives distributed amongst 6,610 apiary locations. The state typically ranks in the top

Commercial yard in Colstrip, Montana, during sweet clover bloom.

five honey producing states and sees strong honey flows primarily July through August. Montana is known for producing wheat but also grows canola, sainfoin, alfalfa, barley and a variety of pulse crops.

Sideliner operation outside of Yellowstone National Park.

The Montana Department of Agriculture employs one state entomologist, whose primary role is to regulate the managed pollinators of Montana—the alfalfa leafcutting bee and the honey bee. Recently, the department received funding to hire two additional seasonal apiary inspectors. The state entomologist participates in the USDA-APHIS National Honey Bee Survey and frequently collaborates with the Montana State Beekeepers Association and various hobbyist beekeeping groups distributed throughout the state.

Montana is unique in that it has a three-mile radius law associated with all commercial apiary locations, and as of July 2019, it is now required that all apiaries, regardless of size, register with the state. Commercial operations make up most of the state's beekeepers, and nearly all of them migrate from Montana to California to pollinate almonds every spring.

OREGON

Some of Oregon's major pollination crops include seed crops (vegetable, cover crop and clover), blueberry, blackberry, raspberry, cranberry, cherry and pear. While Oregon does not have an official state apiary program or apiary inspector, several organizations are actively involved with the state's honey bees.

All owners of five or more colonies of honey bees within the state must register their hives with the Oregon Department of Agriculture (ODA).

Continuing with the Apiary Inspectors of America's (AIA) series highlighting the diversity and depth of apiary inspection programs across the United States, we're headed west.

The western region is comprised of the Rocky Mountain states, south to New Mexico and west to California, Oregon, Washington and Alaska. It includes Hawaii, Puerto Rico and the other island territories. These states have some of the largest rural regions in the country as well as some of the most populated metropolitan areas. This diversity in the landscape is reflected in the beekeeping community. One of the largest pollination events in the world occurs in California from early February to late March, when, as Stanford University reports, nearly two million hives are brought into 1.12 million acres of almonds, producing 80% of the world supply.

In 2019, 201 beekeepers registered a total of 75,918 hives. Hive registration fees are transferred to Oregon State University's (OSU) Honey Bee Lab, which focuses on honey bee health, nutrition and pollination. The lab's goal is to service commercial beekeepers, backyard beekeepers, producers and all interested citizens, and it provides beekeepers with diagnostic services including parasite and pathogen levels, colony nutritional status assessments and pesticide analyses.

The Oregon Bee Project is Oregon's pollinator protection plan between the ODA, the OSU Extension Service and the Oregon Department of Forestry (ODF) working together to: 1) Decrease pesticide exposure, 2) increase pollinator habitat, 3) reduce honey bee losses to pests and diseases and 4) expand our understanding of the state's native bee biodiversity. It has a number of initiatives to promote these goals, including training through pesticide recertification, outreach to the public through OSU master certificate programs (Oregon Master Gardeners, Master Beekeepers and Master Melittologist), showcasing land managers who exemplify pollinator protection and a statewide native bee survey (Oregon Bee Atlas).

ARIZONA

Arizona has no apiary inspection program, but state law requires beekeepers to have landowner permission to place hives on their property. Arizona also requires federal phytosanitary conditions be met for importing and exporting.

Stock yard in Arizona.

Like many other states in the region, a few large commercial beekeepers (less than 10) manage most of the bees.

COLORADO

Colorado is home to a small industry of commercial beekeepers that manage several thousand beehives. Some of them are legacy beekeepers, with beekeeping being the family occupation for generations. Over the last decade, beekeepers in Colorado have struggled to maintain healthy bee populations due to drought, lack of forage, diseases and mites.

In the mid-1980s, Colorado's bee inspection program switched from state funding to self funding via registration/licensing fees. In 1987, routine inspections were discontinued when the bee advisory committee began advocating for decreases in registration fees. In 1990, the registration fees were eliminated, and the program has not been funded ever since.

In the years following, the number of beekeepers in Colorado has increased significantly, yet the exact number of beekeepers in the state is unknown. The Colorado Department of Agriculture partners with research institutions to conduct surveys and honey bee health education projects and have also taken part in the National Honey Bee Health Survey.

HAWAII

Historically, inspection services in Hawaii were carried out by entomologists within the Hawaii Department of Agriculture. In 2011, a formal apiary program was created to protect the Hawaii beekeeping industry from pests and diseases as well as support the export and certification of queens. Today, the apiary program's two full-time technicians perform inspections and are supported by entomologists on each island.

The apiary program is administered by the biological control section chief and maintains a network of protections for the early detection and response to new races of bees and pests and diseases. No honey bee (alive or dead) is allowed entry into the State of Hawaii.

Hawaii produces queens on the islands of Kauai, Maui and Hawaii, following certification inspections conducted by state apiary staff. Queens are exported to the continental United States, Canada and several other countries. The majority of Hawaii's beekeepers are hobbyists, and even the state's professional beekeepers are small compared to continental standards. Larger operations can engage in local "migratory" honey production, chasing various nectar flows to produce distinct kinds of honey throughout the year.

As you can see, apiary inspectors hold a wealth of resources for all beekeepers. Whether you are a commercial or hobbyist beekeeper, the next time you have a question, concern, research idea or need beekeeping advice, reach out to your state inspector. Find your state apiarist and more information about the AIA at *www.apiaryinspectors.org*.

BEE NUTRITIONAL PRIMER:

URBAN VS RURAL

by: Dewey M. Caron, PhD

A recent *Catch the Buzz* from the folks at *Bee Culture* magazine, posted June 9, 2020, reprinted an article "The Buzz on Urban Bees" from *Illinois Times*. Author Carey Smith stated, "Urban beekeeping is a growing trend. It may seem odd to many to keep bees in an urban area, but bees in cities are actually more likely than rural bees to survive the winter as well as Colony Collapse Disorder (the main culprit of bee decline). This is due to the more varied diet and better immune systems of city bees."

Nutrition is identified as the first line of defense against multiple bee stressors, including Varroa, Nosema and chronic (long-term) pesticide exposure. Urban beekeeping has grown, and while we might believe the urban landscape can improve colony nutrition and overall colony success, there are few published studies that quantitatively measure colony success to local landscape variables—most have focused on honey production. A long time ago, Mike Burgett, John Ambrose and I wrote a chapter for a book titled *Urban Apiculture*. We stated that the suburban/urban environment was not necessarily favorable for bee colonies, especially in supplying nutritious pollen in the fall, and highly variable in offering honey surplus for beekeeper harvest.[1] The same holds true today.

Urban bee colonies, mostly managed by small-scale beekeepers, are less likely to survive the winter. Small-scale beekeepers lose two times the number of colonies compared with larger beekeepers. While "flowering trees, bushes and plants in urban areas provide a diverse selection of nectar and pollen for bees to forage," as stated in the *Catch the Buzz* article, a small number of published studies have demonstrated that urban bee colonies do not store as much surplus honey as bees located in agricultural areas.

In a study in western Tennessee, three apiaries in different agricultural areas were compared with one within an urban site. Study results demonstrated that "the landscape's composition significantly affected honey bee colony performance and development." Colony weight and brood production were significantly higher in colonies at the agricultural sites compared to the urban site. There was a higher number of queen and colony losses in the urban site. Urban colonies demonstrated "no significant weight gains."[2]

Authors of a study comparing apiaries from downtown Columbus, Ohio, to agricultural fields outside the city found no support "that the urban landscape is more favorable to honey bees than cropland." Colony food accumulation was negatively correlated with urban land cover in contrasting sites dominated by urban or agricultural land use. The influence of late-season floral availability, particularly goldenrods, plus clovers that bloomed mid-season (as determined by analysis of pollen collected from pollen traps), was the major advantage agricultural lands offered.[3]

But of course, one agricultural (or urban) site is not necessarily the same as another. Kirk E. Anderson, scientist at Carl Hayden Bee Research Center in Tucson, Arizona, examined overwintering success and colony strength for almond pollination in February of bees overwintered in two agricultural crop settings. Results revealed "colonies foraging on CRP land with a strong cover of clover species and alfalfa do more than three times as well than if they are put next to crop fields of sunflowers or canola." The bees with the more diverse forage adjacent to CRP lands were graded higher for almond pollination in February (78% in highest category vs. 55%).[4]

As for the contention that there is a "better immune system of city bees," the bees of urban beekeepers come from the same stock available to any beekeeper. There is no selection or variety of bees used by urban beekeepers that have a better immune system than any other bee stock. The understood relationship of "better" immunity is not necessarily the bee stock but rather the diversity of the bee diet. Multiple studies have demonstrated a diverse, varied diet is important—with pollen quantity and quality being a key to nutritional adequacy. Bee nutritional needs are poorly understood, but this area is currently getting better attention.

Nutritional research involving bees in cages are frequently utilized, rather than open field studies, to understand bee nutritional needs. Efforts are underway, seeking to identify plant components such as polysterols and metabolites of natural pollen that are critical micronutrients of the bee diet. As beekeepers, we feed a variety of protein/vegetable oil supplements. Investigating bee nutrition holistically can allow for a better comparison of such supplements—outside of the amount of diet consumption—toward identifying dietary sources that may fulfill bee nutritional needs.[5]

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BEE ENGAGED:

AN AVERAGE JOE'S GUIDE TO QUEEN MAKING

by: Joseph "Joe" J. Komperda, Sr., The Average Joe Beekeeper, Certified Master Beekeeper at Happy Busy Bees and Colorado State Delegate to the ABF

"Beekeeping is local," but it is also dependent on the goals and objectives of the beekeeper. Practices used by sideliners and hobbyists can vary greatly from techniques practiced by commercial beekeepers. Your experience, knowledge and skills will dictate the methods and processes you use for beekeeping.

When it comes to marking queens, there are two sides to the story. With hundreds, thousands or even tens of thousands of hives, a commercial beekeeper may not receive any return on investment (ROI) from marking scores of queens. From a business perspective, it may not make fiscal sense. But for the small-scale practitioner, queen marking may save money and headaches in the long run. There are both advantages and disadvantages to marking queens.

Personally, I have been averse to queen marking for years. If I "inherited" a marked queen, great! But why would I pay between $3 to $5 extra on the rare occasion I purchase a queen, just for a dot of paint (or a glued-on tag)? I have recently changed my thinking as I work with more "New Bees" on colony management.

In social media, you can read numerous comments by new beekeepers that indicate they cannot find their queen. Pictures of drones will be posted with

the question, "Is this my queen?" As experience grows, most people learn to find the queen by movement and worker bee reactions. My wife and I are adept at identifying the queen, but even with our beekeeping experience, at times, the queen is shy and just does not want to be seen.

Until the queen spotting skill is developed, a marked queen can help hone the ability to identify your queen. Purchasing a package or nuc with a marked queen can speed the queen identification learning curve, but sellers often do not mark queens, as the time and effort to mark does not produce a reasonable payback.

In addition to spotting the queen, one of the advantages provided by queen marking is in identifying that a colony has

swarmed. As a bee swarm rescuer, this Average Joe gets numerous calls from beekeepers with a swarm nearby. They swear it is not from their hive, yet after further questioning, there appears to be no other hives in their area. By their reckoning, the number of bees in their colony has not changed, so it "could not" have been their bees that swarmed.

This subjective "measurement" can be deceiving. If they had a marked queen and an inspection is performed about a week after they found the swarm, that look may reveal an unmarked queen, providing visible proof that the colony and the prior queen had swarmed. When rescuing a swarm, a marked queen usually indicates that the bees are from a managed colony rather than being a feral bunch.

Knowing a colony has swarmed facilitates recordkeeping and planning for future management activities. If you are beekeeping for honey production, you may use this data to estimate a lower yield due to worker bee loss in that swarm. Depending on the time of the season, the data may also point to the need for "combines" to build up colony size going into the fall. You also have a verified brood break, indicating that a mite control method has been implemented in your hive, which may change your mite mitigation strategy.

As you can see, a marked queen does provide advantages to the beekeeper. For the rest of this article, I will discuss paint marking, not marking via glued-on tags. As with any technique, tags have their advantages and disadvantages, but I will not cover those here.

Some beekeepers will not mark their queen for fear of damaging or killing her. I have seen some "old-timers" just grab the queen in their fingers, mark her and let her go. If you are a bit clumsy, like this Average Joe, you do not want to over handle this valuable bug that may cost you anywhere from $25 to $50 (or more) to replace. Tools such as plastic "pistons" with foam plungers and one-handed catch cages (photo on left) are available through various manufacturers to facilitate the marking activity.

A color-coding system exists to standardize the information for queen marking. Using the saying "Will You Raise Good Bees" helps remember the "code" of: Will (W) = White, You (Y) = Yellow, Raise (R) = Red, Good (G) = Green and Bees (B) = Blue. Knowing that queens rarely live less than five years in most conditions, these five colors are a good indicator of the queen's age (see table below).

COLOR MARKING CODES

ABBREVIATION & MNEMONIC	COLOR	YEARS ENDING IN	EXAMPLE
W ("will")	White	1 or 6	2021
Y ("you")	Yellow	2 or 7	2022
R ("raise")	Red	3 or 8	2018
G ("good")	Green	4 or 9	2019
B ("bees")	Blue	5 or 0	2020

One means of practicing your marking technique is to mark some drones. You will be placing a dot of paint on the thorax of your queen. Getting the proper amount of paint in the proper position without painting wings, antenna or legs can take a fine touch. Being a bit larger than a worker bee (and without a stinger), there is little to lose in practicing on the drones. You can perfect your technique and build confidence with little risk.

When marking, it is important to allow the paint to dry before releasing your queen, lest the marking is rubbed off before her royal highness returns to her "subjects." While you have your queen in hand, before releasing her back into the colony, it is a great time to grab a half of a cup of bees and perform a mite count. Whether you prefer a sugar shake or an alcohol wash, a mite count goes a long way toward effectively managing your bees (and you do not have to worry about shaking or worse yet, killing your queen).

So, as you can see, there can be advantages to queen marking. It can assist in queen spotting, thus producing increased confidence in your inspection skills. It can provide definitive proof that a swarm occurred. And, it provides information and data that can influence your colony management, including mite monitoring and mitigation. If you perform your own marking, you can also save a few dollars on the cost of a replacement queen.

Despite the advantages, there are also disadvantages. There are some costs, including monetary, to marking that may include markers and caging equipment. Plus, there is always the possibility of damaging the queen during the marking process. Additionally, there is the chance of rejection (and subsequent supercedure) by the colony if the queen is mismarked with excessive paint on the wings, antenna, legs, etc.

If you have never had a marked queen, perhaps now is the time to consider purchasing one or even marking her yourself!

Photos and diagrams by Joe and Debbie Komperda, Happy Busy Bees.

TESTING FOR POLLEN IN HONEY

by: Vaughn M. Bryant, PhD, Texas A&M University

Trying to find pollen in honey is one thing, trying to interpret the results is a lot more difficult. The process of recovering pollen from honey is not complicated and can be done easily with the right kind of equipment (and in some cases, the right type of laboratory). Because of the role pollen analyses play in honey and honey bee research, it is essential pollen recovery techniques produce accurate and repeatable results. Extracting pollen from honey is not a difficult process.

The original standard procedure, established during the early 1900s, was to dilute 10g of honey with 20ml of water, centrifuge the solution at a slow speed of 2,500 revolutions per minute (RPM) for five minutes and then examine what was retained in the bottom of the centrifuge tube. Subsequent researchers claimed other techniques were better.

Some of the later techniques focused on using a quantity of honey ranging from one to 20g, while the amount of water used to dilute the honey ranged from 20 to 100ml. Centrifuge speeds also varied from 2,000 to 4,500 RPM, and times varied from one to 10 minutes. One of the reasons there were so many techniques is because there is not much pollen in honey. Therefore, the loss of any pollen from honey can create problems in classifying the honey's true nectar sources and determining the honey's geographic location.

Think of it this way, suppose you had a bag of 20 marbles with 10 marbles that are black and 10 that are white. What if you reach into the bag, take out a handful and discard them? Now count the number and color of what you have left. Do you still have 50% of both colors? I doubt it. In other words, you no longer have a true representation of what was originally in the bag of marbles. Honey is the same way. If pollen is discarded either by filtering or during processing, you no longer have a true pollen profile of what was originally in the honey.

The two most successful pollen extraction techniques, proven through experimentation, are filtering honey to remove all the pollen or diluting it in alcohol before processing. The filter process, developed in 1983, consists of using honey diluted with ample amounts of water and carefully filtering it through a cellulose filter with openings no larger than two to three microns. Using that technique, there is no pollen lost during processing and analysis, but the process is time-consuming and requires special equipment.

The other technique, developed in 2001, is to dilute 10g of honey in 100ml of ethyl alcohol (ETOH) instead of water. By using ETOH, the specific gravity of the honey/ETOH solution (ETOH specific gravity of 0.7) is lowered and all pollen sinks quickly when centrifuged. Published data showed the ETOH method was as effective as the filter technique, but it was considerably easier and faster to use.

Beekeepers are thrilled to find out what their bees are collecting to make honey. They like to utilize the information gained from pollen analyses to increase sales and brag about their good honey. Some beekeepers believe they can get results much faster if "they" could do their own pollen study. I get requests that ask if they can visit my lab for a few days to learn how to do this. I try to discourage those eager callers, not because of my unwillingness to spend time with them, but because a few days is very inadequate. I usually respond by offering to work with them but add, "I have been doing this for over 40 years and am just now getting good at it!"

Being able to analyze the pollen contents of honey samples requires a "long learning curve!" This is not to say that it is impossible for a beekeeper to learn how to do this, but most of them do not have the scientific background, the equipment or the pollen reference collections needed to analyze pollen in honey. Aside from the botanical and entomological academic training needed, perhaps the biggest hurdle is learning how to identify the pollen types and then know the geographical regions where the different plants producing the pollen grow.

Worldwide there are over 352,000 angiosperms (flowering plants) from which honey bees can collect pollen and nectar. Each species of angiosperms produces a unique pollen type that is different from all others. Some are easy to identify using a light microscope at magnifications up to 1,200. For other pollen species, the only way to be certain of the precise type is to use the higher resolution ability of a scanning or transmission electron microscope.

The next major hurdle is making a modern pollen reference collection from known plant species and then using that collection to identify pollen found in honey samples. Some help can also come from pollen websites on the internet and from published articles and pollen atlases. Nevertheless, searching for the identity of some pollen types in honey can take hours or days, and the identity might remain unknown.

Perhaps the final hurdle is recognizing where a honey sample originated. Many consumers want to buy "local honey" from the area where they live. Unfortunately, all too often honey labeled as being "local" is not local at all. How do we know this? By examining the pollen in the honey and realizing that the nectar sources represented do not come from plants living in the "local area!"

In 2017, *Time Magazine* published an article about food fraud. The article focused on items sold in stores, which were mislabeled either by accident or on purpose. Honey fits into this category because there is no federal "truth in labeling" for honey products. Thus, labeled expensive and prized honey samples can sometimes contain nothing but common, inexpensive honey.

In 2011, I did a study of 60 jars of honey taken from the shelves of stores in 10 different states. I found that 76% of those samples were incorrectly labeled. Some of those samples might have been illegally imported, but without pollen, which was removed by filtering, it was impossible to determine the origin.

Honey producers have tried to get the Food and Drug Administration or Congress to insist on truth in labeling but to no avail. Therefore, testing honey is up to the producer, importer or beekeeper who is concerned and wants to sell honey that is correctly labeled.

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QUEEN Committee Report

by: Anna Kettlewell, *American Honey Queen Program Chair*

This summer, the American Honey Queen Program Committee met to discuss ways to enhance our promotional year for the American Beekeeping Federation, as many fairs, festivals and other staple events for the program have been cancelled. We must find new ways to promote honey, teach the public about our industry and engage our consumers. Your American Honey Queen Program Committee is up for the challenge, coming up with exciting promotional ideas and moving those ideas into action.

We have reached out to the ABF Board of Directors, our State Delegates Assembly, other committee members and all of you to contribute honey to the American Honey Queen and Princess for an educational YouTube and Facebook series that is highlighting honey varietals, the unique honeys of each state and the many forms and uses for honey. Our goal is to highlight at least one unique honey from each state, though, we'd love to highlight many kinds of honey from all states.

Information for the campaign can be found through the American Honey Queen Program's Facebook page. One of the most exciting parts of being the American Honey Queen or Princess is experiencing beekeeping in each state and trying the unique and special varieties of honey throughout the United States. We ask that our members bring this exceptional part of the American Honey Queen and Princess experience to them since much of their travel has been stalled this year. Contact me (information to the right) for more details on how you can help.

As we have several months of increased virtual and online meeting experience under our belts in schools and businesses, at church and in our social groups, we are continually seeking opportunities for the queens to present virtually throughout the rest of the year. Reach out to your local school, Rotary Club, county extension office or local beekeeping club to see if they'd like a guest speaker to remote in. The queens can make remote presentations through a variety of online platforms (Zoom, Skype, GoToMeeting, etc.). They become familiar using these platforms during their initial position training, as many of our trainers meet with them digitally, and they have had several opportunities this year to use the platforms.

Similarly, since many larger events were cancelled this year, we are available and open to sending the queens to smaller events throughout the nation. Many farmers markets have remained open, and this is a perfect venue where the queens can promote. Are travel restrictions in your state too much right now to host the queen or princess? Consider purchasing some of their recipe brochures to hand out at your sales booth or in your shop. Contact Tami Kuehl at *cbinvoices@cooknbeals.com* to order yours today. It's a great way to promote the virtual presentations that the queens can provide to your shoppers, also assisting the queens in having a productive promotional year for the ABF.

To quote a former American Honey Princess, "Let's all BEE promoters!" We need all your support to promote our products this year and to find unique opportunities in this new digital world (or some of our favorite traditional in-person promotions) to make ABF's promotional year successful. Contact me at *honeyqueen99@hotmail.com* or 414-545-5514 should you wish to help the committee. Whether it's a honey donation, promotional opportunity or virtual presentation lead, we are eager to hear from you and to put Mary and Sydnie to work for the ABF!

ABF VIRTUAL

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AMERICAN HONEY QUEEN REPORT

Mary Reisinger

INSTANT POT HONEY BOURBON CHICKEN
(SHUGARYSWEETS.COM)

- 2 lbs. boneless, skinless chicken thighs (or breasts)
- ½ C. apple juice
- ½ C. bourbon
- ¼ C. soy sauce
- ½ C. light brown sugar
- ¼ C. ketchup
- 2 Tbsp. honey
- ½ tsp. crushed red pepper flakes
- 4 cloves garlic, pressed
- ½ tsp. ginger
- 3 Tbsp. corn starch
- 3 Tbsp. water
- 3 green onions, sliced

In the bottom of your instant pot, start adding apple juice, bourbon, soy sauce, brown sugar, ketchup, honey, crushed red pepper flakes, fresh garlic and ginger. Use a whisk and mix well. Place your fresh or frozen chicken into the instant pot, making sure it's coated in the bourbon mixture.

Secure the lid to your pressure cooker and turn the release valve on top to seal. Turn on the instant pot and press manual (or pressure cook) on high. Set the timer for 12 minutes (or 18 minutes if using frozen chicken). Allow the pressure to build and cook. While it's cooking, mix your corn starch and cold water in a small bowl until combined. Set aside.

Once the chicken is done cooking, allow it to naturally release for five minutes. Then do a quick release. Remove your chicken from the instant pot and place it on a cutting board. Dice into bite-sized pieces. Turn your pressure cooker to sauté and slowly add in the corn starch mixture. Using your whisk, mix continuously until thickened. This will take about two minutes. Turn off your pressure cooker and return chicken to the sauce. Top with green onions and enjoy!

Hello fellow beekeepers—I hope you are well and busy harvesting honey! I'm currently mentoring some new beekeepers and can't wait to celebrate their first honey harvest. These past months have been unpredictable, to say the least, but we have been given a unique opportunity to expand our online presentations and social media reach.

Earlier this year, I gave a Facebook live presentation on the ABF Facebook page, similar to the presentation I give in schools. With slides and props, I reached nearly 900 people about the three types of bees, pollination, beekeeping and honey. Make sure to follow the American Honey Queen Program's Facebook page, where you can find our past videos, stay up to date on new ones and share our videos with your friends!

Over the summer, I met with Local Hive Honey's marketing firm about collaborating on a video marketing campaign. I look forward to promoting the American Beekeeping Federation, supporting beekeepers through buying American honey and educating about life as a beekeeper and the important role we play in people's everyday lives through providing bee pollination. I am excited to have been able to work with them to create professional-quality videos and reach thousands of people. Watch our Facebook page as this campaign unfolds!

I've also been keeping up with various virtual programs while the pandemic persists. I spoke to a school group in New Jersey, reaching almost 20 people. The teachers, students and parents were especially excited to learn about pollination and the pollination-dependent crops of New Jersey—there's more than 50! We also incorporated audience involvement through an anatomy countdown and waggle dance. Despite being unable to present in person, I answered the students' questions in real-time thanks to video conferencing software.

I had the pleasure of speaking about the American Honey Queen Program to more than 150 people during the Great Plains Master Beekeeping Program's Virtual Bee Fun Day. I stuck around afterwards to learn about some of the many facets of beekeeping, such as taking pictures for your beekeeping business, queen rearing and current research. For the event, I gave a presentation on educating customers about the many uses of honey. I discussed some tips and tricks to share with customers to make cooking and clean-up easier as well as ways to draw excitement about unique varietals of honey. You can find the presentation online by going to the Great Plains Master Beekeeping website at *www.gpmb.unl.edu*. Thank you to Gabrielle Hemesath, Dr. Judy Wu-Smart and Gary Reuter for this opportunity!

During my first in-person event since COVID-19 lockdowns began, I spoke to the Parker, Texas, City Council and was honored when they presented me with a proclamation recognizing my work as American Honey Queen. I spoke for 10 minutes on the importance of beekeeping in Texas and across the nation. I gave them information and statistics about local beekeeping so they can make informed decisions that will benefit honey bee health in the future. It truly was a pleasure to speak with the more than 30 city council members and citizens who were present.

With some spare time at home, I have been experimenting with some new recipes and wanted to share one of my new favorites: Instant Pot Honey Bourbon Chicken. It is easy to make gluten-free by substituting rum in the recipe instead of bourbon. I have made this recipe for my family a couple of times these past few months, and it quickly became a family favorite. See the recipe to the left!

We are excited to teach and speak at a variety of promotions and would love to come to your state. If you are interested in inviting Princess Sydnie or me to your event, please contact Anna Kettlewell at (414) 545-5514 or *honeyqueen99@hotmail.com*. Have a sweet day!

Queen Mary being honored and presented with a proclamation by the Parker, Texas, City Council for her work as American Honey Queen.

I look forward to some upcoming travel to North Carolina and hope in-person events and travel can resume soon! In the meantime, make sure to follow Sydnie and me on social media if you haven't already. You can find us on Facebook at AmericanHoneyQueenProgram and on YouTube at AmericanHoneyQueen. We have both been putting out great content on Facebook, making helpful YouTube videos and writing articles for our blog geared for grade school students at *www.BuzzingAcrossAmerica.com*.

Get excited for the honey varietal series rolling out now! We hope to highlight honey from all 50 states and showcase the unique qualities found in each varietal. If you have unique honey we could showcase in one of our videos or if you have an event going on in your area, please contact Anna Kettlewell at *honeyqueen99@hotmail.com* or 414-545-5514.

BEE CONNECTED

If you are a member of Facebook, you can be a fan of the ABF Facebook page. All you have to do is simply search Facebook for "American Beekeeping Federation" to access the page and click the "Like" button to become a fan.

Everyone is welcome. To date, we have more than 38,000 fans and are reaching new fans each day.

If you have a Facebook fan page for your business or local beekeeping association, let us know and we'll add you to our line-up.

Please feel free to post your beekeeping photos on our page, write on our wall and keep sending your friends to our page. Stay tuned for ABF updates, fun facts, recipes and photos of our ABF members doing what they do best!

AMERICAN HONEY PRINCESS REPORT

Sydnie Paulsrud

It's been a busy season for our little pollinating friends! Queen Mary and I will be busier as well, as we start getting back into the swing of promotions. Despite COVID-19 still lurking, we are booking flights to open states and learning more about our virtual presentation options. We are staying positive and learning how to make the best out of an unexpected situation.

BAKLAVA

- 1 (16-oz.) package phyllo dough
- 1 lb. chopped nuts
- 1 C. butter
- 1 tsp. ground cinnamon
- 1 C. water
- 1 C. white sugar
- 1 tsp. vanilla extract
- ½ C. honey

Preheat oven to 350°F. Butter the bottom and sides of a 9x13-inch pan.

Chop nuts and toss with cinnamon. Set aside. Unroll phyllo dough. Cut whole stack in half to fit pan. Cover phyllo with a dampened cloth to keep from drying out as you work. Place two sheets of dough in pan, butter thoroughly. Repeat until you have eight sheets layered. Sprinkle 2-3 tablespoons of nut mixture on top. Top with two sheets of dough, butter, nuts, layering as you go. The top layer should be about 6-8 sheets deep.

Using a sharp knife, cut into diamond or square shapes all the way to the bottom of the pan. You may cut into four long rows and then make diagonal cuts. Bake for about 50 minutes until baklava is golden and crisp.

Make sauce while baklava is baking. Boil sugar and water until sugar is melted. Add vanilla and honey. Simmer for about 20 minutes.

Remove baklava from oven and immediately spoon sauce over it. Let cool. Serve in cupcake papers. This freezes well. Leave it uncovered, as it gets soggy if it is wrapped up.

After visiting the University of Florida in the spring, I had my first live cooking demonstration, creating a sweet, healthy Elderberry syrup on the American Honey Queen Program's Facebook page. It was nice to interact with people while still staying safe

Princess Sydnie presenting virtually to a class of 25 Colorado first graders.

at home, giving them some tips to boost their immune systems with this recipe. For several weeks after, Mary and I worked hard to find creative ways to keep the honey bee promotions alive, creating new online content for our followers on Facebook, YouTube and our blog. The first video I published to YouTube (@AmericanHoneyQueen), highlights the important process of honey bee pollination. In my second video, I made a recipe using two completely different types of honey and discussed how the different honey flavors affect the taste of the recipe.

For my very first virtual school presentation, I presented to 20 first graders from Rice Elementary School in Colorado. It was a successful presentation, and I was eager to help students learn more about our little honey creators in a creative, effective way. They enjoyed learning about the process of pollination and how a queen in a hive is chosen. We had set up this promotion via Cisco Webex, a video conferencing app. It was incredibly easy to create an account and connect to their live, at-home class. They were muted while I presented and took turns asking questions when I was finished with my presentation. It was nice to know who was talking and asking questions, because only their face would be on the screen if they wanted to speak with me. If your school is using a virtual platform this fall, I'd love to present on that platform, too!

I thank Molly Sausaman, the ABF's Executive Director, for helping set up this opportunity!

Mary and I had a successful phone radio interview with a station by the name of Radio Caravan. We received the questions by email and then recorded our answers and sent them to the station. It was a convenient way to promote Texas beekeeping and honey from our homes. Though it was very different from a live, in-person interview, it sounded amazing once it all came together. It sounded very professional and authentic, almost as if we were actually there. It is now on Spotify, so anyone can listen to it anytime. For the interview, our host discussed with us what it takes to become the American Honey Queen or Princess and had us break down the important ways honey bees benefit our world. I think it's wonderful that Radio Caravan has guest speakers and portions of the radio show dedicated to help children and others learn more about agriculture in unique ways.

Princess Sydnie making a Facebook live post teaching the attendees how to make Elderberry Syrup using honey.

Mary and I will continue to create new content for the American Honey Queen Program's social media platforms and continue to learn about our favorite pollinators. I am excited for in-person promotions coming up in North Carolina and Arizona and hope I can visit your state soon. If you have an event in your area, live or virtual, and would like an American Honey Queen or Princess appearance, please contact Anna Kettlewell at 414-545-5514 or *honeyqueen99@hotmail.com*.

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Interested in advertising in the FM? Email Molly Sausaman: msausaman@abfnet.org

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