on Honey Notes

June 2016

Message from the President

Dear Fellow Honey Producers

Summer has arrived. We are seeing crops ahead of schedule after a very mild spring. This hopefully means we will have a great year of production in many of Idaho's agriculture industries.

In February 2016, the University of Idaho College of Agriculture and Life Sciences welcomed their 15th Dean in the history of the College – Dean Michael Parrella. He comes from UC Davis where he spent several years in a variety of leadership roles. Dean Parrella's background is in entomology. Recently, in his newsletter to ag leaders and media throughout the state, he wrote about the importance of honey production and some of the challenges faced by our industry. Dean Parrella will be one of our featured speakers at the 2016 annual convention. We thought you might enjoy reading his article about YOUR industry.

Mark your calendar for the Idaho Honey Conference: December 1-2, 2016 at the Red Lion Downtowner in Boise. See you at the annual conference.

Andrew Puckett, President

Idaho and Honey

Article written by Michael Parrella, Dean U of I College of Ag & Life Sciences:

There are about 250,000 flowering plants on earth that require pollination. Wind, gravity, birds, bats and insects are the forces that accomplish this. From an agricultural perspective, the most important is the European Honey Bee, *Apis mellifera*. In addition to providing the ecosystem service of pollination of many of our fruit, nut and vegetable crops, *A. mellifera* also produces honey. According to the Idaho Honey Industry Association, of the 2.66 million honey bee colonies in the United States from which honey was harvested, about 5% of these (or 120,000) are located in the state of Idaho. While some of these may become 'bees on wheels' and shipped off to places like California for crop pollination, virtually all of them produce honey. Idaho is considered a major honey producing state, and ranks approximately 10th in the US in total honey produced. It is interesting that many people become ill with only the thought of eating insects, but when it comes to the products created by insects, no one objects to eating honey or wearing silk (the latter is produced by *Bombyx mori*, the silk worm). Of course other products either gathered by bees (e.g., pollen) or produced by bees such as propolis (a resinous mixture collected from botanical sources and used as a sealant for open spaces in the hive) and royal jelly (a secretion that is fed to all bee larvae as well as adult queens) are considered by some to be 'health' foods. Finally, bee venom can be harvested and used for medicinal purposes such as treating arthritis and as an anti-inflammatory. The American Apitherapy Association (apitherapy = bee therapy) is devoted entirely to the medicinal use of products made by honeybees.

What is Honey and How is it Produced?

Honey is by made by bumblebees, some stingless bees and other members of the insect order Hymenoptera, but only honey bees produce honey of sufficient quality and quantity to be consumed by people. Many believe that honey is a mixture of nectar and pollen, but it is only comprised of nectar. Bees change flower nectar into honey by converting the sugars in nectar as well as by reducing the water content. Flower nectar is primarily composed of the complex sugar sucrose. The bees use enzymes to break this down into fructose and glucose that are immediately available as an energy source (as opposed to sucrose). From there another enzyme breaks glucose into acids and other materials. Bees store nectar in a special organ called the 'honey stomach' and it goes through a process of digestion (mixed with enzymes) and regurgitation (or 'bubbling) on their mouthparts to increase water evaporation. This may require as long as 20 minutes until the honey achieves storage quality (18% water with high sugar content that prevents fermentation). Honey is put into capped cells in the hive for storage and later use. High sugar and acid content together with thick viscosity and enzymatic activity prevent microbial growth. If stored properly, honey is considered to have an 'eternal' shelf life. Honey, perfectly preserved, has been found in Egyptian tombs thousands of years old.

It is interesting that despite the antimicrobial activity of honey, both the Centers for Disease Control and the World Health Organization recommend that honey not be fed to infants less than 1-year old because honey may be a source of *Clostridium botulinum* (botulism) spores. A study done on Microorganisms in Honey (Snowdon and Cliver, 1996) concluded that *The spores of* C. botulinum *are found in a fraction of the honey*

1/10th of a pound of nectar in its lifetime of about 3 months. When we take honey from a bee hive, it is always a good idea to keep in mind how much effort it took to produce that honey. Records indicate that humans began tapping honey more than 8000 years ago. Honey bees are generally a conservative bunch, so a hive usually produces 2-5 times more honey than the bees will consume in a year – it is only the 'surplus' honey that we harvest.

Keeping Bees and Extracting Honey

From a 30,000 ft. view, life as a beekeeper may seem a lucrative one. Hives in Idaho produce approximately 34 lbs. of honey per year. However, honey production will vary based on environmental conditions, location, availability of forage, maintenance of the hive, etc. Similarly, the value of honey will also fluctuate - in Idaho this generally ranges between $1.80-$2.03/lb. California Almond growers will pay as much as $180.00 per hive for pollination services for a blooming cycle that lasts only a few weeks. With 1 million acres of blooming almonds requiring 2 healthy bee colonies per acre for pollination, almost every honey bee colony in the US ends up in the central valley of California beginning in February when the blooming starts.

When I lived in Davis California, I kept 2 bee hives in my backyard. Even with this small number, the time it took was considerable - they required regular attention. A good analogy is to think of bees as livestock. It is like owning a dairy. It is a lot of work. To be considered a commercial beekeeper, you generally need to have a minimum of 300 hives, but many have thousands. One should not underestimate the amount of time and effort it takes to maintain this number of colonies in a healthy state. Despite a beekeepers best effort, approximately 40% of all colonies are lost every year. In 2014, President Obama initiated a national strategy 'to promote the health of honey bees and other pollinators' with the goal of reducing honey bee colony losses to no more than 15% per year within the next decade. Why are the bees dying? The suspect list includes cell towers, global climate change, GMO crops, habitat destruction/lack of forage, poor nutrition, lack of vigor in honey bee breeding, pesticides, parasites, microbial diseases, colony collapse disorder (CCD) and arthropod predators. Cell towers and GMO crops have been eliminated from this list, and although CCD has propelled the honey bee crisis into the national consciousness, this specific syndrome is rarely found today. Many have pointed to pesticides as the 'silver bullet' with the mentality that if we only ban a specific class of pesticides (specifically the neonicotinoids), the problem will be solved. Rarely are things so simple. Bee failure has multiple interacting causes, and researchers across the country are actively trying to recognize them so recommendations can be made to beekeepers. Few people understand that a honey bee colony is almost continually under attack by bacteria (American Foulbrood, European Foulbrood, Sacbrood), Fungi (Chalkbrood, Stonebrood), Microsporidia (*Nosema*), Viruses (Sacbrood Virus, Israeli Acute Israeli Paralysis Virus, Acute Bee Paralysis Virus, Kahmir Bee Virus, Chronic Bee Paralysis Virus, Deformed Wing Virus and Hairless Black Syndrome.) This list is expanding all the time. The virus problem is enormous because many of these are transmitted by the *Varroa* mite – a horrific parasite that feeds on adults and on developing bee larvae and pupae. Many bee keepers treat the hive directly with pesticides to control Varroa – consequently, the bees get exposure to pesticides in two ways: when they are out foraging for nectar and pollen, and again when they return to the hive. Almost all pesticides are toxic to bees; however, when applied according to the label (and that usually includes 'do not apply when bees are foraging') they can be safe to use. The problem with pesticides is an insidious one: the fact that bees are exposed simultaneously to many different materials – insecticides, fungicides, miticides (as well their inert ingredients) makes assessing the impact of this multiple exposure very difficult. In addition, although the pesticide levels are often very low, the research focus now goes beyond bee mortality and concentrates on the effect of overall colony health through the season. This too is difficult to measure. Brian Dennis, a Professor at the University of Idaho (Department of Fish and Wildlife Sciences) has shown that as the number of bees decline in a colony, the colony may reach a point of no return. Because the bees have such a complex hierarchy based on cooperation to achieve specific tasks in the hive, once bee numbers drop below a certain threshold, the colony can no longer function and it collapses. Dropping below this threshold number could be an internal reason why there is a 40% loss of colonies across the US annually.

At UC Davis I was a board member of the Honey and Pollination Center, located in the Robert Mondavi Institute for Food and Wine Science. One of the goals of the center was to expand research and education efforts addressing the production, nutritional value, health benefits, economics, quality standards and appreciation of honey. An urgently needed effort of this center was to try and standardize honey quality across the US and around the world. Adulterated and bogus products mislabeled as honey abound (Berfield 2013). These not only impact sales of honey from hard working beekeepers in the US and keeps prices low, but the poor quality is likely to turn off consumers.

We do have a number of faculty in CALS who work in the general area of plant-insect interactions, and have projects that address pollination with honey bees and native bees. Their work will be subject of a future article. In addition, as we develop the strategic plan for CALS and for Departments with the college this fall, we will consider the importance of apiculture and whether we need a faculty member who would focus all of their research and outreach on bees.

Berfield, S. 2013. The Honey Launderers: Uncovering the Largest Food Fraud in US History. Bloomberg News @ http://www.bloomberg.com/news/articles/2013-09-19/