HONEY BEE – COLONY HEALTH

Introduction

1. Different pesticides found in wax
    a. Found so far – 121 different types found in bee's wax
    b. Over half of the bee's wax found in the hives is contaminated with:
        i. Fluvalinate
        ii. Coumaphos
        iii. Amitraz
2. When Nosema and neonicotinoid (imidacloprid) are in the hive and attack the Honey Bee the mortality rate is increased.

3. 121 different pesticides found in Honey Bees.
4. Over half of the beeswax in contaminated with FLUALINATE; COUMAPHOS; AMITRAZ.
5. Nosema and neonicotinoids when combined (IMIDACLOPRID) increases the mortality rate.

- Majority of the nutrients come from the pollen.
- Pollen is resistant to enzymatic digestion.
- Symbiotic microbes will protect the food source.
- Bee bread takes about seven days to develop.
- Bee bread helps the whole hive fight off infections.
- Adult bees inoculate new bees as well as pollen with microbes. This starts the fermentation that start the bee bread.
    - Metabolic rate doesn't rely on the host genes. They rely on symbolic microbes.
    - It is important to maintain a healthy environment for microbes to grow and flourish.

- It is important to first diagnose the disease then diagnose the honey bee and treatment.
- It is more important to keep the honey bee healthy than treating the colony.
- Organisms that do not make the honey bee sick are called normal microflora or normal microbiotic.
- The different microflora's:
    - Resident microflora - always present
    - Transient microflora – changes with the season
    - Opportunists – they take advantage of opportunists to cause diseases.
        - Failure of hosts normal defense
        - Introduction of organisms into the unusual body parts
        - Disruption of the normal microflora

- The rectum of the honey bee becomes enlarged in the winter time.
    - It stores about 10^6microorganishmes
    - This mixture helps digest food and detoxify undigested food. These microflorae have been present in the bees for thousands of years.
    - Because of the closeness of the honey bees to each other, in the hive during the winter. Their digestive system starts to resemble each other. At the end of winter when, after they have their cleansing flight, they start to return to individual bees, relative to their digestive system.
    - The first spring flight is important for better health of the honey bee.
- A balance between symbolic and competitive promotes a well-functioning healthy organism.
- When a hive is found to have AFB the use of antibiotic treatment should not be used. Antibiotic treatment interferes with the normal flow of microflora.
- During the time of extreme temperatures, hot and cold, the use of antibiotic medication will allow the opportunists microorganisms to be established.
- One of the opportunists will cause, SEPTICEMIA, a poisoning of the hemolymph.
- Ambient temperature changes can cause the microflora to change within the honey bee. Then the opportunist's microflora may invade the honey bee body.
- Weather conditions effect the honey bee temperature, ph.
- The intestinal system follows the weather conditions.

Biological Control of Honey Bee Pests

Biological control of the Varroa Mite within the colony has not been tested. The Honey Bee lives in a highly sophisticated environment. Researchers have not found a parasitoids, predators, or pathogens that could establish itself within the hive.

Molecular Forensics for Honey Bee Colonies

To determine the exact cause of the death of hive a clean and professional environment must be maintained. Samples must be collected, stored, and transport in a clean vessel. The contents must be examined in a clean room. The use of lavatory equipment will be used to determine the pathogen.

Pesticides and Honey Toxicity in the US.

Pesticides from 1966 to 1979

1. Organochlorine
2. Carbamate
3. Organophosphorus
4. Pyrethroid

Colony numbers have declined 45% since 1966.

Changes

1. Genetically engineered crops
2. Two new systemic pesticides
    a. Neonicotinoids
    b. Phenylpyrazoles

Insect resistance is conferred by incorporating genes coding for insecticidal proteins produced by Bacillus Thuringensis (Bt) a widespread soil bacterium. While Bt is also delivered through traditional spray application, plants benefit from continuous production of Bt toxins through genetic engineering.

The first genetically engineered crop was soybeans and then cotton in 1997.
The changes were:

1. Herbicide tolerance
2. Insecticide properties
    a. By changing the genes of the various plants. When the insect comes into contact with the plant the gene is digested by the insect. This causes the insect internal organs to fall apart as the spores take over.

In 2008 the following plants were genetically engineered.

1. Corn
2. Potato
3. Tomato
4. Apples
5. Cranberries
6. Grapes
7. Peanuts
8. Rice
9. Soybeans
10. Sunflowers
11. Walnuts

Twenty-five independent studies conducted in 2008 Bt did not damage larvae of the Honey Bee.
The use of Bt has helped the Honey Bee by less spraying of crops.
The herbicide resistance has reduced the blooming plants.
One of the causes for poor Honey Bee health is poor nourishment.
It is suggested that hedge row be allowed to grow.

Neonicotinoids and Phenylpyrazoles Pesticides (NPP). The following was taken directly from Honey Bee Colony Health, page 147.

“these pesticides are extensively used in the US on field, vegetable, turf, and ornamental crops, some of which are commercially pollinated by bees. They can b applied as seed treatments, soil treatments, and directly to plan foliage. Neonicotinoids cause persistent activation of cholinergic receptors which leads to hyperexcitation and death. One neonicotinoid, imidacloprid, was applied to 788,254 acres in California in 2005. The phenylpytrazoles blocks the activation by endogenous GABA which leads to hyperexcitation and death.
Neonicotinoids and Phenylpyrazoles Pesticides (NPP) are different from the classic insecticides in that they become systemic in the plant. They can be detected in pollen

and nectar throughout the blooming periods. As a consequence, bees can experience chronic exposure to them, over long periods of time."

It is felt that NPP helps the various viruses to affect the Honey Bee causing sudden death. As of 2010 there is no strong evidence, either way, about NPP affecting the Honey Bee.

Varroa mites are the most damaging pest for Honey Bees in the US.
The varrocides that are used on mites is somewhat harmful to the Honey Bee. But deadly to the Varroa Mite.

Classification of Varrocides:

1. Organic
2. Synthetic organic
3. Natural products
4. Organic acid pesticides

Fluvalinate – first synthetic varrocides (Apistan)

1. The strips are legal to use in hives.
2. Spray is not legal.
3. Residue has been found in beeswax.
4. Limited use of eight weeks per year
5. When queens are exposed to fluvalinate they are smaller
6. Drones are less likely to mate.
7. Drones have less weight and sperm.
8. 2008 it was found that fluvalinate is no longer effective on Varroa Mites.

Coumaphos

1. Approved for Varroa and SHB control
2. Six weeks use per year.
3. 2001 it was found that varroa mites were becoming resistant to coumaphos.
4. Effect on the hive;
    a. Queens are smaller
    b. Queens have higher death rates
    c. Queens can be rejected by hive when introduced.
    d. Drones lower sperm count.

Amitraz – with drawn in 1994. Reported colony losses when using amitraz.
Used in the US as a veterinary miticide – TAKTIC.
In the Bee Culture, August 2017, page 44, January 1, 2017 FDA requires a prescription for Terramycin and Tylan.

Amitraz is being used in Canada in APIVAR. Amitraz is not legal in the US. It affects the brain causing it to become worker bee sooner than normal and causes death of pupa in the hive.

Fenpyroxmite – Hivastain – as of 2010 there was no resistance by the Varroa Mite. Tolerance in the Honey Bee is unknown.

Natural Product Pesticides

1. Thymol
    a. Exempt from EPA control because it is a food product used by humans.
    b. May increase brood removal and may increase queen deaths.
2. Menthol
3. Both kill Varroa Mites.

Organic Acid Pesticides

1. Formic acid
    a. Mite-away II
    b. Harmful to honey bees
    c. Reduces workers longevity
    d. Harms brood
2. Oxalic acid
    a. As of 2010 it was not legal in the US
    b. Highly effective in cooler climates when there is no brood.
    c. There must be a direct contact between varroa and oxalic acid.
    d. Has adverse effect on queens and brood.

Over the last twenty years 150 different pesticides have been found in Beeswax. Varrocides found in beeswax, pollen and bee bread are:

1. Amitraz
2. Bronopropylate
3. Flumetrin
4. Fluvalinate

The varrocides increase in volume from honey to pollen to bee bread. The highest residue is found in beeswax.

High Diversity of Pesticides in Bee Samples

Samples of 887 beeswax, pollen, bee bread and hive samples were found to contain 121 pesticides.

Beeswax foundation, which is pressed into sheets are used as foundation are contaminated with:

1. Fluvalinate
2. Coumaphos

The connection CCD is still unknown.

Varroacide residue found in the following amounts:

Varroacide	Honey	Bee Bread	Brood & Adults	Beeswax
Amitraz	0.6 ppm	1.1 ppm	14 ppm	46 ppm
Coumaphos	2 ppm	5.8 ppm	2.8 ppm	94 ppm
Fluvalinate	0.75 ppm	2.7 ppm	5.9 ppm	204 ppm
Bronopropylate	-----	0.01 ppm	2.2 ppm	135 ppm
Miticide clofenvinphos	-----	-----	-----	7.6 ppm
Miticide acrinathrin	-----	-----	-----	0.6 ppm

Pesticide residues of agrochemicals acquired by foragers are equivalent or higher in pollen, adult bees and occasionally honey, than in beeswax.
Fungicides often account for most of the pesticide content of pollen.

Conclusion
Look in the mirror for the cause of Death for the Honey Bee.
What will work:

1. Oxalic acid
2. Hivastain
3. Mite away II
4. Apiguard
5. Api-Life Var

Imidacloprid
After thirty minutes of oral doses, deficiencies in learning, memory, orientation and mobility were affected.
This affects the hive and specially the foragers. They come in contact with the chemicals.
Honey and bee bread stored in the hive could have a greater impact on the hive than the initial contact.
Nectar/Honey/Pollen that are stored for a long period of time the chemical could have a greater concentration than the original contact.
Pesticides in sublethel does penetrate the body and cells without kill the Honey Bee.

Numerous studies have been conducted on fungicides being sprayed on crops. And the results of Honey Bees using fungicide nectar and pollen.
Even if the fungicide is sprayed at night the Honey Bee comes in contact with fungicide.
Some of the fungicides change the behavior of the Honey Bee. The fungicide also acts a repellent for the Honey Bee towards the flower.

Twelve different fungi were tested from the hive. When the fungicides were applied to the plant and trees when in bloom. They had a negative effect on colony health. Because the effect they effect the Honey Bee process for storing their food.
Fungicides reduce the symbolic fungi in bee bread and the fungi in the colonies

Beekeepers should request from the grower information about the fungicide being sprayed on the crops.

Fungicides and high fruticose corn syrup have a negative effect on the hive fungal growth.

The continued and extensive use of formic acid, oxalic acid, high fruticose corn syrup will help develop high levels of chalkbrood.

Once Nosema is started in the hive the Honey Bee becomes more acceptable to pesticides and death will follow.

Glucose oxidase helps the hive maintain good colony health. It also helps the Honey Bee to secrete antiseptics in honey and bee food. When pathogens are introduced into the hive the amount of glucose oxidase is reduce and the hive health declines.

There are two connections between Nosema and pesticides.
The first is pesticides could reduce the health of the Honey Bee which then causes the pathogen to enter the bee. Second the pathogens could enhance the toxicity of the pesticides.
Nosema infection causes a stress in the hive and increase food consumption.

Through studies it has been learned that the hive is highly infected with pesticides and pathogens.

It is important that the colony be genetic diversified. When the hive is healthy the fitness has increased the following:

1. Higher rates of swarming
2. Increased foraging rates
3. Food storage
4. Drone production
5. Better thermoregulation
6. Increased foraging communication
7. Discovery of food further from the hive.
8. The fight against AFB is better.

Sacbrood and Nosema reduces the ability to forage for food.
Varroa decreases the number of forages and their body weight.
Hive beetles reduces colony numbers, brood area and flight.