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## Science behind Feeding Syrup during the Winter

There has been a lot of articles over the years about the best way to provide food for bees during the winter to help insure their survival; leave enough honey, provide a candy board, use a syrup feeder, etc. Unfortunately, most of the articles are based on tradition and not science which means that many beekeepers may be stressing their bees instead of helping them.

The following addresses the concerns and misinformation about winter feeding using basic biology and earth science, not anecdotal observations, to show how feeding syrup during the winter can help insure hive survival, assuming that Varroa is under control since without proper testing and treatment your bees are most likely doomed.

- *Bees like all living beings need water to metabolize food; proteins, carbohydrates and fats.*
- *Bees like all living beings need water to survive, since they lose water through respiration.*
- *Bees require a humidity level of 50%-60% to survive and raise brood.*
- *Sugar syrup (generally 2:1 for winter feeding) provides both water and nutrients combined.*
- *Sugar syrup is easy for the bees to consume, as long as it is easy to access.*
- *A nipple style feeder over the hole in the inner cover gives direct access to sugar syrup*
- *Fondant and candy boards both require water which is not available in the winter.*
- *2:1 sugar syrup has a freezing point of around 10 degrees Fahrenheit, lower when salt added.*
- *Heat rises so an insulating board above the inner cover captures and retains the most heat.*
- *Bees Do Not heat the whole hive, just the cluster.*
- *Heat from the cluster rises and accumulates under insulated inner cover.*
- *The temperature in an empty box with feeder above hive is higher than ambient due to radiant heat absorption during the day and through conduction from below.*
- *The feeding nipple is directly above the cluster at the warmest part of the hive.*
- *The warmer the weather the looser the cluster and the greater chance the bees can move around the hive, and between frames, to find honey.*
- *The colder the weather the tighter the cluster and the lesser chance of the bees moving around the hive, or between frames, to find honey.*
- *In cold weather the tight cluster can easily move up the heat column to get to the feeding nipple where the bees can access syrup which provide water and nutrients.*
- *The warmest part of the hive is below the insulated inner cover above the cluster.*
- *The coldest part of the hive is the outer walls which are furthest from the cluster.*
- *Moisture condenses on the coldest surfaces.*
- *Excess hive moisture will condense on the walls and drip down, away from the bees.*
- *Some heat and moisture, but not bees, will also exit through the ventilation gap between the feeder cap and the inner cover.*
- *By letting natural convection take place the hive humidity is maintained and brood can be effectively raised, whereas using a quilt board or other absorbent material will dry out the colony.*
- *Monitoring emergency food for the hive is critical, especially in cold weather.*
- *Successful overwintering requires the ability to monitor and add food as needed without disturbing the bees or opening the hive.*
- ***The Ultimate Universal 3-Season In-Hive Feeder solves all of the above winter feeding issues, while also providing for rapid Spring and Fall feeding; it also allows monitoring the syrup level and feeding without disturbing the bees or opening the hive.***

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