Apis m. Esoteria 21

HV/AC

HONEYBEES THERMAL REGULATION

What is the drought doing to our honey collection? For one, it is slowing it down. But, why and what can we do about it?

First, some plants do not put out as much nectar during real hot dry periods. There must be moisture at root level to draw up into the plant. Also, the dry very hot air can evaporate the nectar out of the blossom as the day warms up. I see this very graphically during sourwood nectar flow around my house. As the sun traverses the hill (750 ft. vertical relief) I can see the bees move to stay along the shade line. The flowers in the shade have more nectar than the ones that have been in the sun for several hours. Tomorrow the process starts over as the blossoms bring up more nectar during the cool evening and night.

The second big impact, which may be more important, is maintaining the correct temperature inside the hive. The honeybee is a master at thermal regulation. When there is brood present, the hive needs to stay in the 92-95 degree range.

HEATING

Starting in the springtime, as the outside temperature rises, the nectar and pollen flow begins the queen is stimulated to lay eggs. The cluster will increase its' activity to generate more heat. As the queen lays more eggs the cluster loosens up and their metabolic rate increases generating body temperatures around 92^{o}F. The honeybees can keep the brood area under the cluster in the 92-95 range with the ambient outside temperature hovering above 30^{o}F. The inside of the hive (outside of the cluster) will be nearly the same as the ambient outside temperature. This heating is a very costly endeavor. The bees must consume large amounts of honey from the storage areas in the hive body. If there is inadequate nectar flow caused by fluctuating low temperatures, the bees can

consume all the stored honey and starve to death. This collapse can occur quite rapidly.

As an aside, is that the bees try to keep the cluster about 72 degrees in the winter. Even when the outside temperature is way below zero, the cluster center will be 72 degrees.

AIR CONDITIONING

As our current record high temperatures and extra dry weather has settled in, the bees don't have to worry about warming the brood. They have to worry about cooling it. The colonies have had two months of nectar flow resulting in excellent brood rearing. The hives are fairly crowded. If the temperature inside the hive rises above 95 degrees, the brood will get broiled. I am led to believe this is a delicacy in the orient. But, to the beekeeper this can cause a disaster. We do not want the queen to stop laying eggs or the bees to die. To cool the hive, many bees switch over from collecting nectar and start collecting water. You can see this along a shallow creek, around buckets of water, puddles in the yard, bird baths, the house air conditioning condensation, or anywhere water collects, the bees will gather. The scout bees will search for the best collection points just like looking for nectar and pollen.

The bees will collect water and bring it back to the hive. I am not sure exactly how they transport it. Maybe in the honey stomach or held in their mandibles. I have seen high speed photographs of bees carrying a ball of water in their mandibles as they fly. Once they get back to the hive, they spit the water on their buddies and on the top bars. Sometimes you will see the water on the top bars if you open the hive in the early morning. By the heat of the afternoon the top bar water will evaporate. The evaporation of the water draws heat out of the air just like a swamp cooler (old time air conditioner).

VENTILATION

In order to aid in the evaporation, the bees set up an air circulation pattern in the hive. You will see lots of bees on the front porch fanning their wings. All their tails will be pointing in the same direction, in or out. The union boss for the bees determines if there should be a drawing air current or an exhaust current. I think the direction is determined by the need to draw humidity out of the hive or cooler air into the hive. There will also be honeybees positioned throughout the hive keeping the current going in the correct direction. These bees are beating their wings so fast I don't know what keeps them from going airborne. By the end of the day their toes probably hurt from holding on.

The beekeeper can aid in the cooling process by positioning the apiary where there is late afternoon shade. Sun beating down on the hive box can raise the hive's interior temperature significantly above the ambient air temperature. Have you ever seen the trick of frying an egg on the sidewalk? You can also open the telescoping cover and place a wedge, stick, or old queen cage under the cover to hold it open a little. This allows a natural convection current to develop. Screened bottom boards will also help cool the hive as this area will always be in the shade creating the coolest ambient air. Lighter colored paint will help reflect heat. The silver of aluminum covered telescoping tops will help reflect heat. I am not sure it would be worth the effort to develop some type of insulated top. Good management practices have served the beekeeper well for many years.

The reason you want to aid in the hive cooling is: Every bee employed in the cooling business is one not collecting nectar or making honey.

The over-arching benefit to this problem is the bees have no problem dehydrating the unripened honey and capping it.