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Basic Equipment Needed to Extract and Bottle Honey

Many people get into beekeeping for the purpose of producing honey. This, of course, is a worthy endeavor as honey can command a high price, when processed, packaged, and marketed properly. The demand for honey seems to be increasing globally so the need for this quality product will only grow. In this article, I will discuss the basic items needed to harvest and process liquid honey.

In general, the harvesting of honey from the comb occurs in the following basic steps:

- pre-extraction handling of supers >
- uncapping honey > extracting honey >
- filtering honey > allowing honey to settle > bottling honey.

Specialized equipment is needed at each step if one is to complete the process from harvest to bottle successfully. There are many beekeepers who produce and sell honey for a living. Correspondingly, the equipment available to accomplish these basic steps is diverse in order to meet the need of various beekeeping and operational styles.

Pre-extraction handling of supers

Bees collect nectar from flowers and store it in wax combs. The moisture content of nectar can exceed 80%. Thus, the bees have to bring the nectar back to the hive, place it in the cells, and evaporate the moisture off of it. They accomplish the latter by fanning their wings at the nest entrance, a process that over some hours or days reduces the moisture content to the target water range of 15.5 – 18.5%. When this feat is accomplished, the bees will place a thin layer of wax over the cell containing the now ripe honey (Figure 1).

(1) **Refractometer** – A refractometer is a device with which one can determine the sugar or moisture content of a liquid. These are useful because they make it possible for beekeepers to know if their honey is ripe. Sometimes, harvested honey can have a moisture content that is too high, making it

prone to fermentation. Refractometers can be used to determine this. Over the last 20 years, refractometers have decreased significantly in price, making them affordable to most beekeepers.

(2) **Dehumidifier** – Occasionally, beekeepers have to harvest honey from combs



Figure 1 – A medium frame of capped honey. The cappings need to be removed from this frame before the honey can be extracted. Photograph, University of Florida.



Figure 2 – A dehumidifier beside a stack of honey-filled supers. The dehumidifier will help dehydrate the honey to an acceptable moisture content. This is facilitated further if the room is warm and if fans are used to circulate the air. Photograph, University of Florida.

that have not been capped completely. In these instances, it is possible to dehumidify the honey to lower the moisture content to the acceptable range. This can be assessed using a refractometer. To remove moisture from the honey, the honey supers are stacked in a crisscross pattern in a small,



Figure 4 – A frame about to be uncapped (A) and in the process of being uncapped (B) Photograph, University of Florida.

Figure 3 – Hot electric knives. These have a built-in thermostat that helps keep the knives from overheating and burning the honey and wax. Photograph, University of Florida.



warm room (Figure 2). A dehumidifier, then, can be used to pull the moisture out of the air in the room, thus drying the honey. When using a dehumidifier, it is best to have a least one fan circulating air in the room to facilitate the drying process.

Uncapping honey

Once the honey is of sufficient moisture content, it is the job of the beekeeper to uncap their honey combs so that they can gain access to the ripe honey underneath the cell cappings. This process is accomplished a few different ways, from using a heated knife to cut off the cappings, to using highly mechanized equipment to achieve the same feat. Beekeepers will need the following or similar equipment to uncap frames prior to honey extraction: a heated uncapping tool, a capping scratcher, and an uncapping tank.

(3) **Heated uncapping tool** – As the name implies, tools of this type are used to cut the cappings from the cells, expos-

ing the honey underneath. This is usually accomplished using an uncapping knife. There are many types of uncapping knives. They range from the simple, where the knife is left in heated water until used, to the complex, where a machine contains many uncapping knives that slide up and down, removing the cappings from multiple frames at once. The most common tool used by the majority of beekeepers is the electric uncapping knife (Figure 3). This knife is heated using electricity, and it can be moved back and forth in a sawing motion over the face of the comb to remove the cappings (Figure 4).

(4) **Capping scratcher** - This, to me, is one of the most interesting looking beekeeping tools. It is a small tool with a handle on one end and a row of pointed metal projections on the other (Figure 5). These tools are used to scratch or scrape any cappings missed by the heated uncapping tool from the comb. Why can an uncapping tool miss cappings? The face of a comb is not a flat surface. Combs have contours, from low spots to high spots. However, most heated uncapping tools remove cappings in a straight plane, being unable to reach the cappings that are in the recesses of the comb. The capping scratcher can be used to uncap those few cells that are missed by the heated uncapping tools.

(5) **Uncapping tank** - An uncapping tank is a tub, either plastic or metal, over which the frames are uncapped and into which the cappings collect when they fall from the face of the comb. The best tanks



Figure 5 – A capping scratcher. It is used to remove cappings from depressed areas of the comb from which hot knives fail to remove the cappings. Photograph, University of Florida.



(l) Figure 6 – Uncapping bucket. This bucket would be better if there were a screen on the bottom to allow the honey to drain away from the cappings. (r) Figure 7 – Stainless steel uncapping tanks. The screen mesh allows the honey to drain from the cappings. Photographs, University of Florida.



have a mesh or other type of grate about two-thirds down into the tank to catch the cappings and leave them suspended over the bottom of the tank. This allows the honey adhering to the cappings to drain from the cappings and be available for adding to the settling tanks later. Good uncapping tanks have a gate at the bottom that can be opened to allow honey to drain from them. Uncapping tanks can be as simple as 5-gallon (~20 l) bucket (Figure 6) to the more industrial metal structures built exclusively for this purpose (Figure 7). In many commercial operations, the uncapping tank is a heated trough that lies underneath the uncapping chamber. The cappings fall into the tank and the honey can be collected and pumped to settling tanks.

Extracting honey

Honey is a viscous liquid. It does not naturally flow out of the combs unless



Figure 8 – Uncapped frame of honey. Photograph, University of Florida.

the combs are damaged significantly in some way. Because of this, it is necessary to extract honey from the combs after the frames are uncapped. This is usually accomplished using a simple device called an extractor.

(6) **Extractor** - Extractors are machines into which uncapped frames (Figure 8) are placed and spun to sling the honey from the comb. The honey slung from the comb hits the inside walls of the extractor, slides down the walls, and collects at the bottom of the extractor. Extractors come in all shapes and sizes. The smallest is a 2-frame, hand-spun extractor. This means that the extractor accommodates two frames and needs arm power to cause it to work. Extractors grow in size, complexity, and price from there. Commercial beekeepers tend to use extractors that accommodate 20+ frames (Figure 9) and extract both sides of the frames at one time. This is in contrast to most hobby-centric extractors into which the combs often are placed in such a way that the face of the comb faces the wall of the extractor. When this happens, the side of the comb facing the wall of the extractor gets extracted while the one facing the middle of the extractor does not. When just starting, I recommend going ahead and paying for the extractor that extracts both sides at one time (Figure 10).

Filtering honey

One of the amazing facts about honey is that it is good to eat as is, meaning that no further processing is necessary. That said, extraction can be hard on the wax combs that hold the honey. As a result, it is common for bits of beeswax, pollen, and even dead bees to collect in the extracted honey, making the honey in need of filtering.

(7) **Filters** – Filters are used to remove the small pieces of wax, pollen, and bee parts that the final consumer of the honey may find undesirable. The hobby-style filters usually are mesh bags, layered metal mesh (Figure 11), or similar products. The layered filters remove different sizes of debris as the honey progresses through the filter, usually filtering out the larger debris first and the finer debris last. In commercial operations, the honey may be heated at this point, not to cook it, but to make it easier to

pump through a fine filter that will remove most of the particulate matter in the honey.

Allowing honey to settle

Honey collects air bubbles during the processing stages. Furthermore, small debris may remain in the honey, even after filtering. Therefore, beekeepers let their honey settle in tanks prior to bottling it. This allows the air bubbles and small pieces of debris to rise to the top of the honey, leaving the crystal-clear honey at the bottom of the tank. In fact, the bubbles and debris that rise to the top of the tank form a type of “scum” (as it is called in the business) that does not look good inside a bottle of honey

(8) **Settling tanks** – Most commercial beekeepers use large settling tanks that are made of stainless steel (Figure 12). These are great tanks but they often are pricey. When I produced honey as a hobby beekeeper, I purchased and used a 30 gallon (~110 l) trash can as my settling tank. You can purchase honey gates from beekeeping supply companies. I did this and attached it to the bottom of the trash can...I mean set-



Figure 9 – A 33-frame extractor. Photograph, University of Florida.



Figure 10 – Frames placed into an extractor. This extractor is able to extract both sides of the frames at once. You can know this by seeing the frames' arrangement in the extractor. When frames lie perpendicular to the center of the extractor, the extractor can extract honey on both sides of the combs at once. When the face of the comb lies parallel to the center and walls of the extractor, the extractor can only extract one side of the frame at a time. *Photograph, University of Florida.*

tlng tank. This worked just fine. The key is that the tank needs to be clean, closed (so no vermin fall into it), and stored in a warm, dry location. Why warm? Warm honey flows from the tank better when bottling it. Why a dry location? Because honey can acquire moisture from the air, meaning that its moisture content can rise slowly.

Bottling honey

It does not take any specialized equipment to bottle honey. In fact, if your honey is maintained in settling tanks, you need only bottles to complete the task of bottling honey. The jars need to be clean and dry. If they are, you can hold them under the settling tank's lower gate. Open the gate, and out pours the honey (Figure 13). Of course, this is not the way commercial beekeepers do it. They often have bottling "assembly

lines," where the bottles are cleaned, passed down a conveyer belt, filled, and labeled. This type of machinery can be very expensive, but worth it if you are in the honey production and marketing business in a big way.

Miscellaneous equipment

There are other pieces of equipment that are not necessary when extracting and processing honey, but that are great to have as they make the process easier.

(9) Comb honey cutter – This specialized tool (Figure 14) is used to cut sections of honey-filled, capped combs for use as cut-comb honey. It is useful for beekeepers wishing to produce and market cut-comb honey.

(10) Hand trucks – Beekeepers with 10 or more hives will find that hand trucks are

useful tools for moving full, and empty, supers around the honey house. They will save your back. For that reason alone, they are worth having.

(11) Super stands – Supers of honey are very heavy. Often, these supers are stacked in honey houses on super stands, or elevated stands made to hold the load of the full supers placed on them. The best super stands are constructed in such a way to catch any honey that flows from the pre-extracted combs to the floor (which is a common occurrence). The even better super stands are mounted on short legs, between which hand trucks can be rolled to facilitate their movement.

(12) Hot water – This, of course, is not a piece of equipment or tool that facilitates the extraction of honey. However, I consider it a honey house necessity. Honey and pieces of wax get everywhere during the extraction process. This includes on the floor, counter tops, extractor, tanks, etc. It always is nice to use hot water to clean these surfaces.

(13) Sump/pump – A sump/pump usually takes the form of a stainless steel, hot water jacketed drum or trough into which the extracted honey falls, is heated, and settled briefly before being pumped from the drum, through pipes, out through a filter, and into a settling tank. These can be quite affordable and are useful mainly for moving honey from the extractor and into the settling tanks. I suggest that people with more than 50 or so colonies would find this to be a useful piece of equipment.

(14) Wax capping spinner – To the hobbyist, this piece of equipment is a luxury. To the commercial beekeeper, this piece of equipment is a necessity. Wax spinners are machines that spin the wax cappings really quickly, separating the honey from the cappings and producing a "dry" (or nearly honey-free) collection of cappings. These cappings, then, can be put into wax renderers for further processing.

(15) Wax renderers – A wax renderer usually is a stainless steel, water-jacketed drum into which dry (or honey-free) cappings are placed, heated, melted, and even



(l) Figure 11 – Honey passing through a filter, into a bucket. This particular filter has two mesh sizes. The upper mesh filters out the large debris while the lower mesh filters out the smaller debris. **(r) Figure 12** – Stainless steel settling tanks. *Photographs, University of Florida.*



Figure 13 – A 5 gallon (~20 l) bucket used as a settling tank. Just about any container can be made into a settling tank. The honey gate at the bottom of the bucket can be purchased separately from beekeeping supply companies. They can be attached to many types of containers. Photograph, University of Florida.

molded into blocks. These machines facilitate the quick and efficient processing of wax cappings.

The prudent beekeeper wanting to start his/her own honey house can purchase most of this equipment for \$500 – 1,000. However, those wanting quality equipment or equipment needed for honey production with 20 or more colonies will invest \$2,000 or more for the necessary equipment. Some of the most mechanized extraction systems can cost \$50,000 or more. I have seen beginner extraction kits that contain most items listed here (1 - 8) for around \$750.

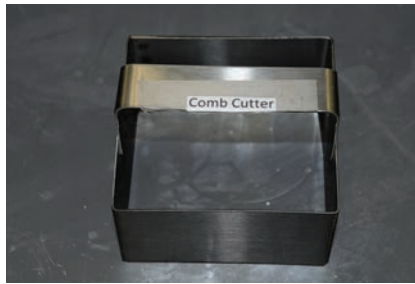


Figure 14 – Comb cutter, used to create cut-comb honey. Photograph, University of Florida.

For the budget-minded beekeeper, I recommend working with a local beekeeper or through your local beekeepers' association to borrow or rent the equipment. After all, hobbyists usually only need access to this type of equipment once or twice a year while the commercial operator will use it for weeks at a time. I think one of the benefits of a local bee club is the ability for the club to purchase the needed equipment and make it available to their membership.

As a final note, most areas in the U.S. have rules/regulations about bottling honey that will be sold. These are usually dictated by the respective state. Bottling often has to be done in a licensed or inspected facility unless your state has an active cottage food industry that is supported by the state (see, for example, information about the one in Florida - <http://edis.ifas.ufl.edu/in918>). Thus, having the right equipment to harvest and process honey can be only half of the game if you are going to sell honey, with the other half being having the correct facility in which to harvest/process it. Regardless, the right type and quality of processing equipment can make all the difference between having an enjoyable experience with your honey crop or dreading the process altogether. I recommend that beginner beekeepers get a few beekeeping years under their belts before diving into the financial obligation that comes with honey processing equipment. That way, they will know if they are going to stick with beekeeping and exactly what they are going to need.

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