

Comb Rotation

Beekeepers at all levels of experience benefit by implementing Best Management Practices (BMPs) in each aspect of their operations. Preventing the accumulation of diseases and chemical residues in wax comb is a component of hygienic BMPs. It is recommended that a beekeeper regularly rotate the comb in their operation to maintain relatively fresh and clean wax in their hives.

What is comb rotation?

Comb rotation is the regular replacement of older frames of brood comb with fresh foundation or empty drawn frames from honey supers. Old wax can be scraped off its foundation to allow the bees to draw new comb. Unless the wax is thoroughly removed, the foundation itself should also be replaced. Honey bees consistently use comb for food storage, brood development and structural support, and residues such as agrochemicals and pathogens can accumulate in wax after only a few years of use. Regular comb rotation helps limit exposure to these contaminants.

When and how often should comb be replaced?

Beekeepers should make an effort to replace at least 1/5 of their comb each season. This translates to an entire turnover of all brood comb in a hive every three to five years. In order to keep track of how old a frame of comb is, newly purchased frames or drawn frames from honey supers should have the date (i.e. month, year) marked on the top bars of the frames as they are installed into the brood chamber. If the comb is scraped off a frame and the foundation is not replaced, the date on the top of the frame will not reflect when new wax was drawn out. Unless the

marked date is updated, the entire frame should be replaced.

Frame replacement should occur at a time when the least amount of brood and food stores are present in the hive and before it is too late in the season for bees to draw out new wax. Ideally, this window of opportunity appears in the early season before spring buildup. Early spring is also ideal because colonies are expanding and brood nests are being built.

Beekeepers can remove one or two frames per season from the outer edges of the brood nest (positions 1 and 10 in a Langstroth hive) to avoid disrupting brood patterns. This gradual method ensures that approximately 20% of comb (two frames in a 10 frame box) is replaced each season.

Why is comb rotation important?

After several seasons, brood comb darkens from the accumulation of debris particles, cocoon residue from hatched pupae and the repeated wax polishing from housekeeping bees. Older and darker brood comb is thought to be attractive to bees and preferred by laying queens. Initial larval survivability can actually be higher in older comb than newer comb due to the accumulation of moulted larval cuticles from previous generations of reared brood, which leave pheromone cues to stimulate brood rearing behaviour from nurse bees (Medrzycki et al, 2010). It is not uncommon for a frame of comb to be retained in an operation for decades before ever being destroyed. Many beekeepers swap old frames amongst their various hives or sell these frames to other beekeepers via nucleus or full colonies. In the modern state of beekeeping, this practice of moving comb around in different hives and apiaries poses a biosecurity risk. As residues accumulate, the health risks associated with old comb begin to arguably outweigh the potential benefits to a colony of honey bees.

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Disease

Wax comb can act as a source of contamination of pathogen spores such as chalkbrood, Nosema and American foulbrood (AFB). Spores of AFB can persist for several decades outside of a host and, due to their microscopic size, they often go undetected by beekeepers until infections flourish in colonies. If AFB is detected in a hive, the most effective way of eliminating the infection is burning. Comb rotation is also a preventive Integrated Pest Management (IPM) practice. Removing old frames is a physical control method used to help manage American foulbrood and Vairimorpha (formerly Nosema). Cultural controls such as fumigation or irradiation can disinfect comb contaminated with Vairimorpha spores. More information on AFB and Vairimorpha control can be found in the third edition of the Canadian Association of Professional Apiculturists' publication "Honey Bee Pests and Diseases."

Chemical residues

Wax comb can also act as a sink for chemical residues, particularly lipophilic pesticides (i.e. pesticides that adhere to wax comb). Modern beekeepers are faced with a multitude of pests and pathogens that they must manage, partly by chemical means. Some miticides, like amitraz (Apivar™) and fluvalinate (Apistan™), and antibiotics used by beekeepers leave traces even after being removed from hives. As these residues accumulate in wax, the health of the bees exposed to them can become directly or indirectly threatened.

Honey bees and their developing brood are exposed to lipophilic pesticides in conventional beekeeping operations from a multitude of sources. In addition to the in-hive chemical treatments routinely placed by beekeepers are the pesticides from treated crops that bees carry back to their hives as they return from foraging trips, like organophosphate insecticides and various fungicides and herbicides. Exposure to several pesticides in the hive can reduce adult bee lifespan and weaken the developing brood, which in turn increases the fecundity of Varroa mites reproducing in brood cells (Wu et al, 2011). A colony weakened from chemical exposure is also more susceptible to pathogen infection. In-hive miticides used either historically or continuously may compromise queen health as well, which manifests as reduced egg-laying and early supersedure (Haarmann et al, 2002). Residues of miticides can even interact synergistically, in turn exacerbating their already negative effects (Johnson et al, 2009).

Beekeepers should not only be concerned with the effects these chemicals have on their bees; developing Varroa mites are exposed to low sub-lethal levels of miticides inside wax brood cells. This exposure is likely to induce resistance to synthetic miticides in populations of Varroa (Rosenkranz et al, 2009). Resistance to all of the currently registered miticides available in Atlantic Canada has been documented in some populations of Varroa mites around the globe.

What do I do with old wax once it is removed from the hive?

Some beekeepers rotate their comb by selling off a portion of it each year to other beekeepers in nucleus colonies. This is not necessarily a bad thing so long as the comb being sold is not excessively old and does not have high levels of disease or chemical residue impregnated in the wax. However, beekeepers who install new colonies from nucleuses should make an effort to rotate the comb from these nucs out of their operations as soon as possible. Wax comb can be melted down and made into candles and other wax products, but older, darker brood comb requires a great deal of straining to get the debris out of it. If nothing else, old comb can simply be culled and destroyed (e.g. burned).

How do I get my bees to produce new wax?

Wax production is a physiologically demanding process. Honey bees must consume five times as much honey per unit weight of wax produced, which is why bees typically produce the most wax during a honey flow. Bees will not produce wax unless they detect that there is a surplus of nectar or sugar syrup being brought into the hive. Many sources recommend feeding bees 1:1 sugar syrup in the spring to simulate or enhance a honey flow, enticing bees to draw out comb.

Resources:

Canadian Best Management Practices for Honey Bee Health [http://www.honeycouncil.ca/images2/pdfs/BMP_manu-al - Les Eccles Pub 22920 - FINAL - low-res web - English.pdf](http://www.honeycouncil.ca/images2/pdfs/BMP_manu-al_-_Les_Eccles_Pub_22920_-_FINAL_-_low-res_web_-_English.pdf).

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