



## 6 • PROPOLIS

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# The role of propolis as a natural barrier to the pathogens



In this section, we explain the role of propolis, especially in the context of an effective pathogen barrier.

One example of social immunity is the collection of plant resins by honey bees and its placement on the inner walls of the nest, also referred to as the propolis layer. Collecting and storing resins in the nest architecture affects the individual immunity, overall colony health, and supports bee antimicrobial defence mechanisms. Plants are not only a source of food for bees, but also a source of "curative" substances.

The process of human domestication of honey bees using smooth hive walls has also affected a very important natural colony defence mechanism, namely the formation of a propolis protective layer.

The propolis protective layer serves as the outer antimicrobial barrier around the colony, providing an improvement in the immunity of adult bees, better physical condition of colonies in spring after the winter, it supports the natural defence mechanisms of the bee against foulbrood and calcification of brood. In nursing bees - feeding brood, it helps to induce an

effective immune response after brood infection, leading to a reduction in infection about two months after such a bacterial challenge. After the outbreak of bacterial or fungal infections, bees increase the contribution of resins to the colony.

Propolis is not only a construction material, but has a significant protective function in creating a protective atmosphere in the hive. These volatiles from propolis have antibacterial effects on many bacteria, salmonella, staphylococci and other pathogenic and non-pathogenic organisms. Also interesting is the combination of these effects and the enhancing effect of propolis on adjacent cell junctions where bees create resonant gaps for communication and transfer of information.

Leaving **the propolis grid** on the hive ceiling is not recommended for a longer period of time, especially during winter, as it weakens colony's health. It is also not recommended to use the propolis tincture to bees, as this may lead to the destruction of beneficial microbioma in bees' intestine, which is essential for bee health and their survival.



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# Impact of construction and selection of materials on the amount of propolis in the hive

**Propolis forms part of the construction of the wax combs to reinforce the combs, as well as for better communication between bees. In this section, we explain how it is possible to support the amount of propolis in the hive environment.**

Domestication of honey bees has resulted in a reduction in the collection of resins, probably due to the fact that beekeepers have selected colonies that have less propolised the frames, in order to facilitate hive inspections. The collection of propolis is a relatively rare phenomenon, especially in the European honey bee population.

Bees do not form a propolis layer in standard hives because the inner walls of the nadstavkov are solid and smooth, which does not require the need to "seal" or "preserve" the hive walls. Instead, bees store propolis in scattered cracks and crevices occurring in the hive, and not as a continuous inner layer, as can be seen in the tree cavity.

It is possible to create a propolis layer for the health of the colonies by coating the inner walls of the hive with a propolis extract (approx. 13 % propolis in 70 % ethanol). Also, the bee colonies can be encouraged to create a natural propolis envelope itself in a standard hive by cutting the propolis grids so that the hive's inner walls can be overlaid with them. The smooth side of the propolis grid is attached to the wall and the rough side faces the colony. After filling the holes with propolis, the grid can be removed from the walls. In this method, only 9 frames should be used instead of 10 frames. Even if the inner walls of the hive are left plane, only scraped by a wire brush, or if 3 mm grooves are milled into the inner walls, which will bees also fill with propolis, the natural propolis layer is formed.

The time in which we live is gradually replacing the traditional materials used in the construction of hives as wood or straw used in the past. Beekeepers often prefer means and attitudes that take into account the effectiveness of their work, regardless of the needs of bees. For example, wood is replaced as a construction material with plastic materials. Air non-permeability

and higher thermal insulation can lead to mistaken conclusions about the unequivocal advantage of these hives also for the life of the colony. It has been shown that, at higher temperatures in the hive, not only pure wax is used as a construction material for wax combs, but it is a mixture of propolis and wax that is used to keep bees communicating through bee resonance. At higher temperatures, bees make a mixture of propolis and wax to induce resonance. If the combs built in colder environments are inserted into styrodur hives (*which are not allowed in organic farming anyway!*), where the temperature is higher, this may limit the communication of bees during honey flow. This is critical in case of using the plastic frames in brood nest where bees cannot form resonant holes at the edges of the comb.



It has been found that if bees are infected with brood calcification, they bring more propolis. At the same time, the disease is reduced by bacterial and fungal diseases. The picture below shows the amount of propolis used in the wooden hives (*picture above*) and styropor hives (*picture below*).

