

Hielscher Ultrasonics: Liquefaction of honey by ultrasonication

Ultrasound offers an effective method, crystals in honey to liquefy and destroy the yeast, without affecting the quality of honey.

Honey is valued worldwide for its delicious taste and its positive effects on human health. The natural product consists of honey, glucose, fructose, water, maltose, trisaccharides and other carbohydrates, sucrose, minerals, proteins, organic acids, vitamins, as well as of enzymes, yeasts and other heat-resistant microorganisms.

Undesired components in honey are temperature-resistant yeast and other microorganisms. They are responsible for the destruction of honey during storage. A high yeast level leads to a fast fermentation of honey. Also, the water content affects the rate of fermentation of honey. If the liquid content is reduced to 17%, a slowdown in the yeast activity can be measured. However, with the reduction of the water content, the probability of crystallization is increasing.

When honey is a supersaturated sugar solution, it crystallizes in a natural way. This happens when the sugar content exceeds 70% and the water content is approximately 18%. Then the glucose precipitates spontaneously from the supersaturated state, and by the loss of water a more stable saturated state of glucose monohydrate is produced. This forms two phases: a liquid phase above and a crystalline phase below. Thus creates honey in a semisolid state. This reduces the flowability of honey and is a serious problem for the marketing of honey.



[Hielscher UIP500hd](#) – powerful ultrasonic processor

Using ultrasound in honey can destroy undesirable constituents, such as crystals and yeast cells, without reducing the quality of honey. Ultrasound is an effective alternative to thermal treatment. If honey is heated to liquefy crystals, to reduce the water content, and to destroy the yeast this causes also a reduction in quality for themselves. Through the heating, the hydroxymethylfurfural (HMF) increases significantly. The allowed maximum value of HMF is 40mg/kg. Other adverse effects of thermal treatment are the browning of the natural honey color and the reduction of enzyme activity, thereby reducing the sensory quality of honey.

Ultrasound destroys yeast cells, removes crystals and prevents further crystallization in honey. In trials, the liquid state of the ultrasound-treated honey was stable for approximately 350 days (+20% more in comparison with the thermal treatment). Since the honey during sonication is exposed to minimal heating, ultrasonic liquefaction results in a greater retention of aroma and flavor. Sonicated samples show only a low HMF increase and a low decrease in diastase activity.

In comparison to the heating, the advantages of sonication are based in the gentle treatment of the honey. In contrast to the thermal treatment, by the ultrasonic treatment the quality of honey will not be affected negatively.

Hielscher Ultrasonics offers its customers a broad selection of high-power ultrasonic processors. Different types of honey require specific intensities and times of sonication. For this reason, the conduct of trials using a bench-top size sonication system is recommended. Preliminary tests should be conducted in batch mode, while further processing trials require a flow cell for pressurized recirculation or in-line testing.

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