

## SUBSTANTIATION OF THE PARAMETERS OF THE HONEY DECRYSTALLIZATION DEVICE

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### Relevance and problem statement.

The processes of heat treatment of honey occupy an important place in preparing it for sale or long-term storage. Due to their design features, the existing honey decrystallizers do not allow fulfilling the requirement that heating honey above 50 °C is unacceptable [1]. Therefore, the search for ways to improve the efficiency of heat treatment devices for honey plays an important role; it allows to reduce the cost of heat energy for heat treatment and improve the quality of honey [2,3,4].

### The main research materials.

The research were carried out on a test bench, on which the following samples were installed: honey, water, wax. Honey consists mainly of 38.0% fructose and 31.0% glucose dissolved in a small amount of water (13.0-20.0%). The temperature was maintained by an electric heater and was measured by temperature sensors, the signal of which was transmitted to a digital device. The method of obtaining melting diagrams was used — the dependence of temperature on time under constant external conditions. The study of the heating process of honey, water and wax is presented in Figure 1.

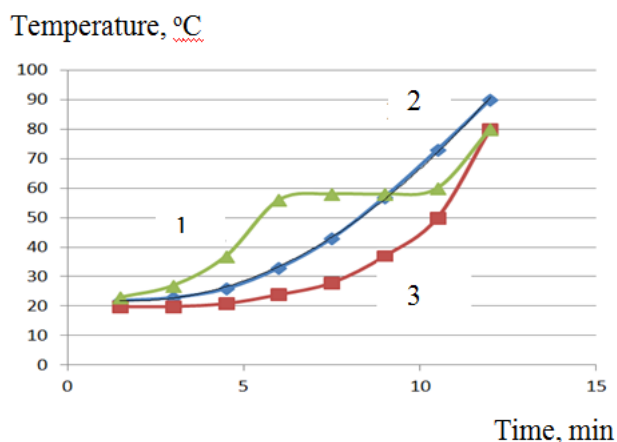


Figure 1. Dependence temperature of beekeeping on time: 1- wax, 2 - water, 3– honey.

A horizontal section was obtained for the wax, reflecting the suspension of temperature increase. The temperature corresponding to this section is the melting point. There is no such section for honey, this is because the melting point of fructose is + 185 °C, and glucose + 146 °C, that is, at ordinary temperature both fructose and glucose in pure form should be crystals of the corresponding compounds. When the temperature rises in the permissible range of 50 °C [1], it is not melting that occurs, but glucose and fructose crystals dissolve in water (curve 2) and the honey decrystallizes.

To implement the delicate process of honey decrystallization, we have developed and patented “Device for heat treatment of honey” [5]. The scheme of the device for heat treatment of honey is shown in Figure 2.

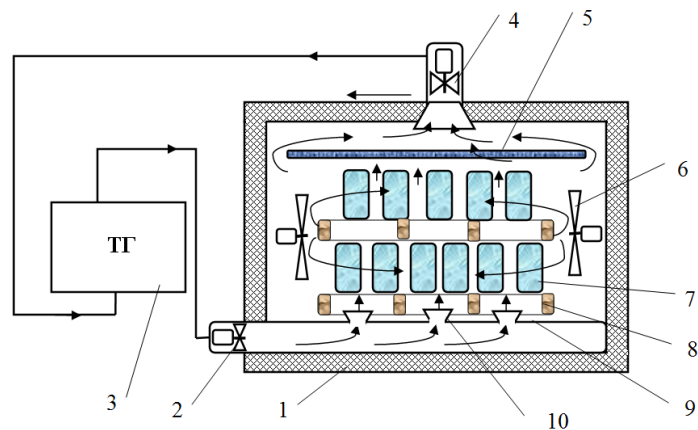


Figure 2. Honey heat treatment device: 1- heat insulated chamber, 2 - warm air supply fan, 3 - heat generator, 4 - recirculation fan, 5 - ceiling screen, 6 - internal recirculation fans, 7 - containers with products, 8 - pallets, 9 - air distribution channel, 10 - air distribution nozzles.

The principle of operation of the device for heat treatment of honey is as follows. At the bottom of the chamber 1, channels 9 are installed, equipped with nozzles 10 for air distribution. Fix fans 6 for internal recirculation. An exhaust fan 4 is installed on the roof of the chamber 1 and connected to the input of the heat generator 3. The supply fan 2 is connected to the output of the heat generator 3 and the input of channel 9. On pallets 8, containers 7 with honey are placed, a ceiling screen 5 is fixed above them. Turn on the heat generator 3 and fan 2, which begins to supply warm air through the channels 9 and nozzles 10 into the chamber 1. Next, turn on the fans 6 and 4, which provide air turbulence, and the screen 5 delays the warm air in the area of the containers 7 with honey, which reduces fuel consumption. Containers 7 with honey are kept in chamber 1 at the temperature specified by the program.

**Conclusions.** The use of a honey heat treatment device of the proposed design, due to the installation of internal recirculation fans from the inside in the center of the side walls of the chamber and the equipment of the air distribution channel with air distribution nozzles for turbulence of the heated air stream, simplifies the design and maintenance, and the installation of an exhaust fan reduces energy costs for heat treatment and improve the quality of honey decrystallization.

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