

# Applying of Ultrasonic Technological Devices in Liquefaction of Candied Honey

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**Abstract** – The article is devoted to studying of effecting of ultrasonic treatment on crystallized honey liquefaction.

**Index Terms** – Honey, ultrasonic treatment, liquefaction.

## I. INTRODUCTION

**C**RYSTALLIZATION (candying) of honey is a natural process of transformation of liquid honey to crystalline form with conservation of valuable properties. Natural honey is always in liquid form if it in combs and if the temperature is 20-30°C. Depending to crystal sizes the honey can be: at creamy consistency (crystals are not in differenced form), at granulated form (crystals with size of 0.5 mm are easy differenced in honey) [1].

## II. PROBLEM DEFINITION

The factors effecting on honey crystallization process are mass of sugar (glucose), mass of water, presence of crystallization cores, storing temperature, honey composition and mixing. It is necessary to heat the honey for preventing or delaying crystallization process. Herewith almost all crystals has dissolve. Crystals could be cores of crystallization. While heating of sugars higher then melting temperature it has place process of thermal destruction. Melting temperature of the fructose in honey is 95°C. While heating the honey to a temperature of 107-115°C it has place destruction of fructose and obtaining of water and caramel. As a result of it the honey gets dark color and unpleasant smell and taste[2].

For removing of crystallization cores, honey passed through the strainer (at first the metal strainer, then through silica sand, crushed granite, dense cloth).

## III. THEORY

Applying of intensive ultrasonic treatment for honey processing was studying by many scientists. Intensive ultrasonic vibrations in liquid medium initiate the generation of powerful microflows, areas of compression and depression. Dynamic mass transfer and small heating of honey under ultrasonic treatment assist in effective dissolution of crystals before destroying. Australian scientist Bruce D'Arcy in his thesis submitted results of experiments in processing of small mass of crystallized honey (250 ml) in glass volumes with 70 mm diameter and 79 mm height. Best results were achieved with ultrasonic device of 1000

VA power (diameter of transducer ending is 40 mm, vibration frequency is 20 kHz and vibrations magnitude is 12 micron). In thesis it was posed the problem of industrial dilution of big mass of honey in plastic bulks with tight throat. That problem wasn't solved [3].

## IV. EXPERIMENTAL RESULTS

Thus, the aim of experiments described in article is in studying of ultrasonic devices using in intensification of honey liquefaction. Ultrasonic devices were designed in Laboratory of acoustic processes and devices

Studying devices shown in Fig. 1. Maximum power consumption is 1000 and 3000 VA respectively. Frequency of ultrasonic treatment was about  $22 \pm 1.65$  kHz and processing intensity was 10 and 7 Wt/cm<sup>2</sup> respectively.



a – «Volna-M», b – «Bulava-P»  
Fig. 1. – Studying ultrasonic devices

Control of processed honey was performed by mercury thermometer (value of division is 0.1). Measuring ending of thermometer was immersed in treated medium for temperature testing. As a device for quantitative and qualitative testing of honey liquefaction it was chosen the medical microscope "Micmed-6" designed by "Lomo" firm.

Previous experiments were carried out by ultrasonic device "Volna-M" (see Fig. 1, a) at 3 liters honey bulks. The aim of experiments was control of honey temperature depending on ultrasonic treatment time. Processing was carried out in time intervals of 1 minute. After each stage of processing it was measured honey temperature, power consumption. Then the experiment was continued. Measuring results shown in table I.

TABLE I



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