

Study of Rennet Vibroextraction Process

E.D. ZAITSEV

Semipalatinsk Technological Institute of Meat and Milk Industry, Glinka Street 49, USSR

**SUMMARY:** Experiments have shown that extraction of rennet enzyme from lambs rennets in the regime of vibroturbulization (resonance) goes on scores of times faster than extraction in fixed containers and 1.5 times than in tore vibroextractor.

Increasing of mass-exchange rate is connected with the emergence of stationary waves, cavitation, hydraulic stroke, intensive mixing and gas saturation (vibroturbulization).

Vibroextractor working in resonance regime has been developed on the basis of data obtained.

**INTRODUCTION:** At present rennet extraction is carried out in fixed containers (vats) (Gracheva, 1975). The process of rennet extraction is rather long and takes 72 hours. Attempts of accelerating this process by using liquid nitrogen for preliminary treatment of rennets, supersonic effect on raw materials, pulse magnetic field, electroplasma treatment haven't found application in industry.

Rennet extraction in vibrational tore extractor with the volume of mixing chamber of 1 m<sup>3</sup> frequency - 24 cps and amplitude - 1.65 mm has made it possible to reduce extraction time to 1.5 hours and increase rennet activity (Limonov et al., 1984, 1989). However, the apparatus design and vibration parameters are not optimum for mass-exchange as they are far from vibroturbulization (resonance) state enabling further improving of extraction process.

The study of hydrodynamics and heat-exchange in tightly closed vibrating vessels (E.D. Zaitsev, 1987, 1989) has shown that resonance (the first mode of vibrations) occurred under frequencies of 30-40 cps and amplitudes of 4-5 mm while filling vessels with the diameter of over 20 mm with liquid to the level being 70-98 % of the vessel's height which is 400 mm. The resonance was accompanied by increase of dynamic and mean static pressure, intensive gas saturation and mixing of liquid (by vibroturbulization) as well as by cavitation, hydraulic stroke and stationary waves formation. Resonance vibrational conditions can be created in vibrational and pulse devices.

The mentioned above effects accompanying vibroturbulization phenomenon result in the increase of external heat-mass-exchange and may accelerate processes of salt diffusion into animal raw materials and that of rennet - into salt solution.

The aim of this work was studying the process of rennet enzyme extraction from lambs rennets in the regime of vibroturbulization which is optimum for heat-mass-exchange.

**MATERIALS and METHODS:** The unit for studying vibroextraction process consists of vibrational electrodynamical stand VADS-200A on the table of which a plexiglas vessel with diameter of 120 mm and height of about 400 mm was rigidly mounted. The vessel was filled with 4 litres of 10 % sodium chloride solution with adding of hydro-chloric acid to achieve pH of 5 and with 100 g of lambs rennets cut up to plates dimensions of about 10x20 mm. While experimenting, the frequency was 32 cps and the amplitude was 4 mm. Vibration parameters were measured by means of vibrostand VADS-200A block for measuring vibration parameters with the accuracy of 2 %. The vessel was tightly closed and extraction was carried out in the regime

of vibroturbulization during 20 minutes. After extraction the extract was poured out into extract collector and the refinement was poured over with a new portion of sodium chloride solution. After thrice-repeated extraction, salting-out by means of adding sodium chloride, rennet filtering-off and its air drying in a thin layer at room temperature were carried out.

Analysis of obtained by vibroturbulization and custom technology, rennet quality was carried out by standard methods at Semipalatinsk meat plant's laboratory ("Rennet Powder", USSR Standards 4979-45).

RESULTS and DISCUSSION: Experiments have shown that thrice-repeated extraction, each for 20 minutes in the regime of vibroturbulization results in the complete recovery of rennet enzyme from lambs rennets. Activity of obtained by vibroextraction rennet in different samples varied from 382000 to 708000 conventional units with salt content being from 44.7 % to 68 %, fat content - from 3.8 % to 11.1 %. The activity of rennet obtained by custom technology varied in the same range. Increase of extraction rate is connected with intensive mixing, gas saturation, cavitation, stationary wave formation and hydraulic stroke which are useful only for intensification of external heat-mass-exchange but also for the process of salt diffusion into rennet cells and that of rennet enzyme into salt solution.

On the basis of data obtained, experimental results, vibroextractor working in resonance regime has been developed. The experience of creating resonance conditions in vibroextractor for rennet recovery can be used in other vibrodevices, pulse columns as well as in apparatuses with dispersion-impulse power supply.

CONCLUSIONS: To intensify rennet vibroextraction process it's highly effective to use vibroturbulization (resonance) phenomenon which makes it necessary to select appropriate vibrations frequencies and amplitudes as well as dimensions of vibrodevices.

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