

## Efficiency of dehydration of hides of the animals with natural zeolite under conditions of vibration

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## INTRODUCTION

It is known that one of the methods of hide raw materials conservation is dehydration which involves drying or treatment of the hides by chemical agents. Decrease of hides moisture content to 16-20% not only provides for bacteriostatic conditions of the environment but also slows down the autolytic processes. Therefore in case of observing the required conditions the dried hides can be stored for a long time.

The hides are traditionally dried at 20-30°C under the conditions of natural air circulation [1]. In spite of relative simplicity of the equipment for this type of conservation, drying of hides is a complicated physico-chemical process largely depending upon temperature, humidity, air velocity, type of hides raw materials, etc. [2,3]. Therefore large fluctuations of temperature and humidity lead to defects of dried raw materials. Intensive drying may result in cracking of the face, stratification as a result of non-uniform drying of layers, increased shrinkage over the thickness and area, fattening of the face and multiple deformations of flesh side of hide. Reduced drying temperatures slow down evaporation of moisture, hence rotting of the raw materials is possible. All these factors complicate practical use of the method of hides conservation by drying. At the present time conservation by salt-free drying practically is not used for large hides and for the conservation of hides of small animals is of limited use. Previous materials described a possibility of use of natural zeolite tuff having high adsorption and ion exchange properties for dehydration of hides [4,5].

## PURPOSE OF WORK

To investigate the influence of vibration on the intensity of dehydration of cattle hides using a finely comminuted natural zeolite.

## METHODS

In the experiment fresh hides of the cattle (weight 20±2 kg) were used. From the back of the hide the pieces of the size 150x200 mm were cut and then a uniform layer of natural zeolite from Pegas layer was applied to the flesh side of the hide. To intensify the process of hides dehydration by zeolite a vibration stand was used, allowing to regulate the frequency of vibration from 5 to 50 Hz and amplitude from 2 to 5 mm.

## RESULTS AND DISCUSSION

Use of vibrations makes it possible to accelerate the heat- and mass exchange as a result of the increase of phases contact area and decrease of diffusion resistances. Results of investigations on the influence of vibration on the intensity of hides dehydration with the use of finely comminuted zeolite are presented in Table.

According to experimental data a vibration treatment of hides during 40 hours at ambient temperature 15°C on the flesh side of which zeolite was applied intensifies the process of dehydration. However, as can be seen from the obtained information, the degree of hides dehydration depends upon the frequency and amplitude of low frequency oscillations. Results of the experiments show that with the increase of frequency to 25 Hz the amount of removed moisture from the hides increases. However, further increase of the frequency leads to less significant dehydration of hides. In the course of the experiment it was established that independently of frequency of vibrations the highest dehydration of hides was observed at amplitude 2 mm.

In subsequent investigations the influence of ambient temperature on the intensity of hides dehydration by zeolite was studied under the conditions of vibrations with frequency 25 Hz and amplitude 2 mm.

As can be seen from the figure the most intensive moisture removal from the hide occurs during the first 25-30 hours of vibration treatment. And in this case the desired moisture content for hides being conserved by unsalted drying method is achieved after 30 hours at an ambient temperature 35°C; at 25°C – around 35 hours, and at 15°C – around 40-45 hours. The data obtained show that with an ambient temperature increase the process of hides dehydration by zeolite under the conditions of vibration is accelerated. With the increase of temperature from 5 to 35°C the velocity of hides dehydration of the cattle increases 2.5 fold.

However, increase of dehydration temperature above 35°C is undesirable, because, on one side this can bring to irreversible changes of proteins of derma of the hide and fattening of the hair [6], on the other hand – to decrease of the capacity of zeolites to absorb moisture [7].

## CONCLUSIONS

Based on the experimental investigations it was found that conservation process of cattle hides by the method of dehydration with the use of natural zeolite can be intensified by means of vibrations and increase of the temperature of the process up to 35°C and this will not entail quality deterioration of the conserved hides.

## REFERENCES

1. Gayevoy E.V. Primary processing of hides of rabbits. *Myasnaya industriya SSSR*. – 1960. – No. 5. – pp. 19-22.
2. Kasparyants S.A., Khludayev K.D. Tanning raw materials. – M.: Light and food industry. – 1983. – 199 pp.
3. Mikhailov A.N. Chemistry and physics of skin collagen: Monography. – M.: Light industry. – 1980. – 232 pp.
4. Kudryashov L.S., Ketselashvili D.V., Potipayeva N.N., Bayev V.V. Salt free method of hides conservation. *Myasnaya promyshlennost*, No. 4. – 1995. – pp. 27-28.

5.	K
	M
6.	C
	Ts
7.	L

Amplitude	
1	±σ
2	±σ
3	±σ
4	±σ



5. Kudryashov L.S., Ketselashvili D.V., Dozmolina O.A., Kim V.I. Effectiveness of hides dehydration by natural zeolite. *Myasnaya Industriya*. No. 1. - 1999. - pp. 30-31.
6. Conservation of small cattle hides by drying. *Myasnaya promyshlennost*. Foreign experience: Express-information. *Tsiniiteimyasomolprom*. - No. 19. - 20 pp.
7. Lukin V.D. Adsorption processes in chemical industry. - L.: Khimiya. - 1973, - 61 pp.

Table

Influence of frequency and amplitude of vibrations on moisture content of hides treated with zeolite

Amplitude, mm	Frequency of vibrations, Hz				
	5	10	15	25	35
1	21.6	20.3	19.2	18.5	18.0
$\pm\sigma$	0.12	0.10	0.22	0.09	0.21
2	20.8	19.3	18.1	17.7	17.5
$\pm\sigma$	0.13	0.20	0.09	0.14	0.16
3	22.1	20.1	18.9	18.7	18.3
$\pm\sigma$	0.23	0.16	0.14	0.18	0.12
4	22.9	21.2	19.2	19.4	18.8
$\pm\sigma$	0.08	0.19	0.23	0.13	0.10

