[Central Asian Problems of Modern Science and Education](https://uzjournals.edu.uz/capmse)

Volume 4
Issue 2 *Central Asian Problems of Modern Science and Education 2019-2*

Article 15

7-15-2019

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ELECTRONIC JOURNAL OF ACTUAL PROBLEMS OF MODERN SCIENCE, EDUCATION AND TRAINING JULY, 2019-II ISSN 2181-9750

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ELECTRONIC JOURNAL OF ACTUAL PROBLEMS OF MODERN SCIENCE, EDUCATION AND TRAINING JULY, 2019-II ISSN 2181-9750

UDC: 635.611:536.2

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Annotatsiya: Ushbu maqolada qovunlarni issiqlik-fizik hossalarini aniqlash bo‘yicha tajriba sinovlarning ba’zi natijalari keltirilgan. 20^0C dan 70^0C gacha bo‘lgan harorat diapazonidagi turli navli qovunlar etining issiqlik-fizik hossalari aniqlangan. Aniqlanishicha, issiqlik o‘tkazuvchanlik va harorat o‘tkazuvchanlik harorat ortib borishi mobaynida deyarli chiziqli qonuniyatlar asosida o‘zgaradi. Issiqlik o‘tkazuvchanlik va harorat o‘tkazuvchanlik koeffitsientlari uchun empirik (tajribaga asoslangan) ifodalar keltirilgan. Ushbu ma’lumotlar qovun qoqisini ishlab chiqarishda quritish uskunalarini issiqlik-texnik hisobini bajarishda foydali bo‘ladi.

Kalit so‘zlar: qovun, harorat, koeffitsientlari, issiqlik-fizik, тажриба, тадқиқот, .

Аннотация: В данной статье приведены некоторые результаты экспериментальныхисследованийтеплофизических характеристик мякоти дыни. Определены теплофизические характеристики мякоти дынь разных сортов в диапазоне температур от 20° до 70 °С. Установлено что теплопроводность и температуропроводность увеличивается с ростом температуры почти по линейным законам. Получены эмпирические выражения для коэффициентов теплопроводности и температуропроводности. Эти данные будут полезны при теплотехническом расчете сушильных установок при производстве вяленой дыни.

Ключевые слова: дыня, температура, коэффициент, теплофизик, исследование, эксперимент.

Abstract: This article presents some results of experimental studies of the thermophysical characteristics of melon pulp. The thermophysical characteristics of the pulp of melons of different varieties in the temperature range from 20 º to 70 ºC are determined. It has been established that thermal conductivity and thermal diffusivity increases with increasing temperature almost linearly. Empirical expressions for the coefficients of thermal conductivity and thermal diffusivity are obtained. These data will be useful in the thermal calculation of drying installations in the production of dried melon.

Key words: melon, temperature, coefficient, thermophysical, investigation,experiment.

Introduction: The thermophysical characteristics of the melon pulp characterize its heat storage capacity, the inertia of the temperature field distribution during heating,

ELECTRONIC JOURNAL OF ACTUAL PROBLEMS OF MODERN SCIENCE, EDUCATION AND TRAINING JULY, 2019-II ISSN 2181-9750

and has a significant impact on the dehydration process. Knowledge of the thermophysical characteristics of the melon is necessary for analyzing the movement of heat and moisture inside the pulp and when choosing the optimal drying conditions. To calculate the heat and mass transfer process, generalize the results in the criterial form and mathematical modeling of the melon pulp drying process, it is necessary to have real data on its thermal conductivity (λ), thermal diffusivity (α), heat capacity (C) and density (ρ).

The object and methodology of research: The object of the study are some varieties of Karakalpak melons recommended for drying: Ich-kyzil, Non-gusht, Shakar-palak, Ak-Kaun [1].

The method for studying the thermophysical characteristics of the pulp is based on the use of an integrated rapid method developed by A.S. Panin and V.D.Skverchak and which allows to obtain the values of the thermophysical characteristics in the process of heating the samples [2].

The theoretical basis of the method is the solution of the boundary-value problem of heating a spherical solid placed in the test medium. This method is universal and makes it possible to obtain reliable data at once on the three characteristics of the material under investigation: density (ρ), thermal diffusivity (α) and heat capacity (C).

The express method is based on the use of the heat-inducing properties of a thermocouple sensor, structurally made in the form of a chromel-copelled pointed probe. In the course of the experiment, the thermocouple sensor at t = 0 °C quickly fits into the material under study and records its heating over time using a secondary recording device (automatic millivoltmeter with color indication of readings).

Practical implementation: To implement this method, we have made an experimental laboratory setup that provides a quick entry of a thermocouple sensor into a melon pulp sample under investigation (Fig. 1).

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The experimental laboratory setup consists of a table-top 2 installed on platform 1, under which a heat-insulated container 3 is placed, where the sample of melon pulp 4 in volume of 3 cm^3 is placed. The container is heated by an induction coil 5 through a laboratory autotransformer 6 and has an external thermal insulation coating 7. A container 8 with thermal insulation is located on the table top and is equipped along the axis with a pipe 9 for passing the thermocouple sensor 10. The latter is connected to an automatic millivoltmeter 11, the scale of which is otted in degrees Celsius (ºC).

The principle of operation is as follows. The melon pulp sample is placed in the container 3 and the toggle switch 12 switches on the general power supply of the installation, then locking the clamp 13 and the thermocouple sensor 10 under the action of the load 14 rush down the pipe 15 and when the edge of the central pipe 9 reaches, the contactors 16 of the heating circuit of the thermally insulated container 3 turn on. the motion sensor breaks through the paper partitions 17 and pierces the melon sample under investigation to a certain depth. At the moment of sensor insertion, the cold ends of thermocouples are thermostated, since they were located in pipe 15, which is in water with melting ice. As the sample warms up, the millivoltmeter starts to show the temperature change over time.

Thus, four samples of melons in five repetitions were examined.

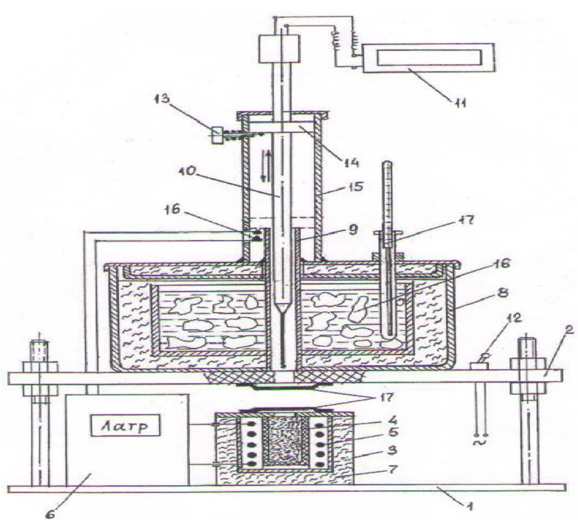

Fig. one. Experimental laboratory setup for determining the thermophysical characteristics of the melon pulp.

1-platform; 2-table top; 3-insulated container; 4-investigated sample melon pulp volume of 3 cm^3; 5-induction coil; 6-laboratory autotransformer; 7-heat-insulating coating; 8-tank with thermal insulation; 9-pipe for the passage of the thermocouple sensor;

10- thermocouple sensor; 11-automatic millivoltmeter; 12 toggle switch; 13-clamp; 14-load; 15-pipe; 16-contactors; 17-paper dividers 17.

Results and discussion: The processing of the obtained experimental data and the analytical calculation of the thermophysical characteristics were carried out according to the method described in [2], using the least squares method [3].

The values of thermal conductivity λ, thermal diffusivity α and heat capacity C for four types of melons in the temperature range 20 °C-80 °C were experimentally determined and are summarized in Table 1.

Since the obtained calculated values of thermophysical characteristics for melons with white pulp (Non-Gusht, Shakar-Palak and Ak-Kaun) differ slightly, for these sorts of melons one can generalize the dependence of the thermophysical characteristics on temperature in the form of curves shown in Figure 2. At this sample was dried to standard humidity W = 20-21%.

Table 1. Estimates of the coefficients α, λ and C for different types of melons

Estimated characteristics	Pulp of melons	Range of heating temperature, ^{0}C						
		20	30	40	50	60	70	80
Coefficient of thermal conductivity λ, $(\frac{Вт}{м \times К})$	Ich-kyzil	0,085	0,09	0,098	0,011	0,012	0,013	0,13
	Non-gusht,	0,08	0,09	0,095	0,0108	0,0113	0,0125	0,13
	Shakar-palak,	0,082	0,084	0,088	0,011	0,0115	0,0126	0,1
	Ak-Kaun	0,081	0,083	0,085	0,011	0,0116	0,013	0,12
Thermal diffusivity,	Ich-kyzil	0,7	0,74	0,78	0,86	0,92	1,07	1,08
	Non-gusht,	0,7	0,75	0,8	0,87	0,9	1,05	1,17

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α, (м$\frac{2\times10^{-7}}{c^2}$)	Shakar-palak,	0,695	0,76	0,79	0,88	0,91	1,055	1,172
	Ak-Kaun	0,67	0765	0,76	0,87	0,9	1,04	1,18
Heat capacity	Ich-kyzil	0,12	0,195	0,96	0,1	0,1	0,098	0,095
coefficient,	Non-gusht,	0,1125	0,12	0,094	0,1	0,098	0,097	0,097
C, ($\frac{кДж}{м^3\times K}$)	Shakar-palak,	0,113	0,125	0,095	0,11	0,11	0,1	0,1
	Ak-Kaun	0,115	0,12	0,092	0,95	0,95	0,92	0,92

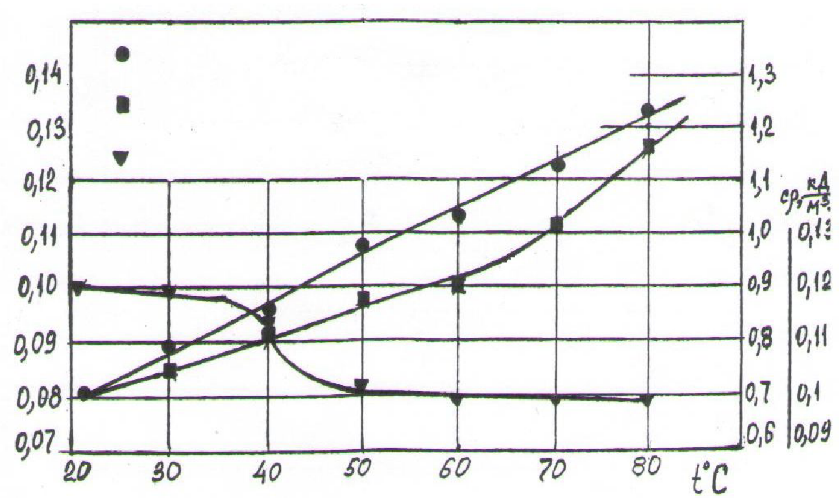

Fig.2. The average dependence of the thermophysical characteristics of melon pulp varieties Ak-Kaun, Non-Gusht and Shakar-Palak.

● – thermal diffusivityα, (м$\frac{2\times10^{-7}}{c^2}$)

■ – coefficient of thermal conductivityλ, ($\frac{Вт}{М\times К}$)

▼ - volumetric coefficient of heat capacity (C), ($\frac{кДж}{м^3\times K}$)

Analysis of the curves shows that with heating the samples up to 600 C, the values of α and λ linearly increase, which can be approximated by the following functions:

$$\lambda = 0,072+[(t-20)\ 7,24 \times 10^{-4}] \pm 2 \times 10^{-3} \quad (1)$$

and

$$\alpha = [6,36-(t-20) \times 0,107] \times 10^{-8} \quad (2)$$

The volumetric coefficient of heat capacity at temperatures t = 20 ... 40ºC varies slightly and equals cρ = 100-1150 KJ / m3 K, decreases sharply with increasing temperature from 40ºC to 55ºC and keeps to 80ºC linearly, i.e. cρ = 1000 KJ / m^3 K.

Thus, it can be stated that the thermophysical characteristics of the pulp for many melon varieties depend on the heating temperature, which must be taken into account when carrying out the drying process.

Conclusion: 1. The thermophysical characteristics of the pulp of melons of different varieties are determined in the temperature range from 20 °C to 70 ºC. It has been established that thermal conductivity and thermal diffusivity increases with increasing temperature almost linearly.

2. Empirical expressions for the coefficients of thermal conductivity and thermal diffusivity are obtained.

3. These data will be useful in the calculation of heat drying plants in the production of dried melon.

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