THE STUDY OF THE THEORETICAL FOUNDATIONS OF SUSPENDED PARTICLES IN LIQUID DURING THE PROCESS OF GRINDING FRUITS IN THE PRODUCTION OF JUICE WITH PULP

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ABSTRACT

It is well known that fruits are important sources of a number of mineral elements, contain water-soluble sugars, organic acids, fiber, pectin and protein substances. The bactericidal and medicinal properties of many fruits have also been revealed . These diverse qualities of fruits make them an essential part of the human diet. Dietary juices are an important element of food in the human diet, because along with fresh fruits and vegetables, they provide the human body with a set of all physiologically active substances - vitamins, macro and microelements, polyphenols and many others necessary for normal human life.

Key words: *theoretical foundations, physiological and biochemical processes**,** dietary juices, nutrients, stimulating effects.*

INTRODUCTION

The human body can only exist if there is a constant exchange of nutrients and water. Water exchange and related physiological and biochemical processes are extremely important for human life. It is known that without food a person can live for more than a month, and without water only a few days**.**

Fruit juices and natural drinks based on them, covering the body's need for water, at the same time have nutritional value. In order to satisfy the body's need for water and quench thirst **,** juices and drinks must have a certain physiological effect on the body, which depends on their refreshing ability, nutritional value, stimulating effect, harmonious taste and smell, and other properties. Fruit and vegetable juices, containing in their composition flavoring and nutrients, fully meet these requirements.

Juices are produced from almost all types of fruits and berries, both cultivated and wild. The largest share in world juice production belongs to apple juice, followed by grape juice. In recent years, the production of juices from subtropical fruits - citrus fruits and pomegranates - has been developed. The technology and technique of production of each of these juices has its own characteristics.

An inhomogeneous system consists of matter *a* (dispersion phase) and suspended particles *b* (dispersion phase). G_c - the amount of the initial mixture, kg , x_a- the content of substance *a* in the crushed product, wt.%; G_n - quantity of product, kg; x_0- - the amount of substance *b* in the sediment, wt.%; G_n - the amount of sediment kg; x_0- the content of substance *b* in the sediment, wt.%; ρ_a and ρ_b matter densities *a* and *b* .

In the absence of substance losses, the material balance of grinding can be represented as follows:

by total amount of substances

$$G_c = G_n = G_0 \quad (1)$$

by the number of suspended particles (dispersion phase)

$$G_c x_c = G_n x_n + G_o X_o \quad (2)$$

The joint solution of these equations allows you to determine the amount of crushed product

$$G_n = G_c \frac{X_0 - X_c}{X_0 - X_n} \quad (3)$$

amount of sediment

$$G_0 = G_c \frac{X_c - X_n}{X_0 - X_n} \quad (4)$$

The content of suspended particles in the crushed product and in the sediment is selected depending on the technological requirements and depends on the grinding method.

Separation efficiency is characterized by the separation sediment effect

$$Э_P = \frac{G_c X_c - G_n X_n}{G_c X_c} \quad (5)$$

Equations (4) and (5) also describe the mixing process. From equation (5), the concentration of suspended matter in the resulting mixture can be found

$$X_c = \frac{G_n X_n - G_0 X_0}{G_c} \quad (6)$$

where G_n and G_0 - the number of mixed products; x_n and x_0 - mass concentrations of suspended particles in these products; Gc is the amount of the final mixture.

Consider the motion of a particle under the action of a gravitational force in a viscous medium (Fig. 1.) The particle is affected by gravity G, the Archimedean force

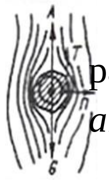

Fig.1. Forces acting on a particle in a viscous medium. *A and friction force T.*

The volume of a particle of arbitrary shape is proportional to the linear size to the third degree: $V = k_l l^3$, where k_l is a coefficient depending on the shape of the particle; *l* is the characteristic particle size (diameter).

If the density of a solid particle ρ_T and liquid $\rho_Ж$, then the particle is affected by the force of gravity $G = k_l l^3 \cdot \rho_T \cdot g$ and the lifting force $A = k_l \cdot l^3 \rho_j \cdot g$ directed in the direction opposite to the direction of gravity. Under the influence of the difference between these forces, the particle moves in the liquid.

Friction forces act on the unit surface of the particle from the side of the liquid T = $\mu_j \, d\vartheta/dn$ where is μ_j the coefficient of dynamic viscosity of the liquid dv / dn is the change in the velocity of the liquid in the direction normal to the surface of the particle. The amount of friction T depends on the surface area of the particle $k_2 l^2$ (where k^2 is the coefficient taking into account the shape of the particle) and is

$$T = k_2 l^2 \mu_j d\vartheta/dn$$

According to the second law of mechanics, the resultant of the forces of gravity, lifting and friction is equal to the mass of the particle multiplied by the acceleration:

$$k_l l^3 (\rho_j - \rho_j) g - k_2 l^2 - \mu_j dv/dn = k_l l^3 \, p_T dv/d\tau \qquad (7)$$

This equality is a differential equation for the settling of particles under the action of gravity.

The value of the Reynolds criterion determines the rate of sedimentation of a particle in a liquid under the action of gravity

$$v_0 = \frac{R_e \mu_j}{l \rho_j} \qquad (8)$$

Which in the case of laminar motion can be determined by the Stokes equation obtained after the transformation of equation (8):

$$v_0 = \frac{1}{18} \frac{g d^2 (\rho_T - \rho_j)}{\mu_j} \qquad (9)$$

where *d is* the particle diameter.

The obtained kinetic regularities of the deposition process indicate that the deposition rate increases with an increase in the size and density of particles and decreases with an increase in the density and viscosity of the medium in which the deposition occurs.

The maximum size of solid particles that can be deposited according to the Stokes law can be determined by the following formula

$$d_{max} \approx 1{,}56\sqrt[3]{\frac{\mu_j^2}{\rho_j(\rho_{\text{T}}-\rho_j)}} \quad (10)$$

The study of the theoretical foundations of suspended particles on a liquid during the grinding process led to the following conclusion: in the development of equipment operating in modern conditions and optimal modes, today it is very important to study the process from a theoretical point of view;

the use of energy-saving equipment in the production of juices, especially the improvement of the most energy-intensive process, is to improve the homogenization process and offer devices operating in optimal modes based on theoretical studies.

REFERENCES

1. F.Y.Khabibov, ORJamolova. Use of experimental planning methodology to study the final distillation of vegetable oils. Novateur publications journalnx- a multidisciplinary peer reviewed journal. VOLUME 7, ISSUE 6, June. -2021.
2. F.Y.Khabibov, F.Sh.Atamuratov. Development of a functional diagram "Acoustic-convective drying process ict". Novateur publications journalnx- a multidisciplinary peer reviewed journal. VOLUME 7, ISSUE 6, June. -2021
3. Islomova Z.K., Khabibov F.Y. Ghamroev H.H. “Samarqand noni” pishirish qurilmasi (tandir)ni tizimli tahlil asosida o'rganish. Fan wa technologylar taraққiyoti. Ilmiy-technician magazine. Bukhoro: 2022. No. 1, 121-126 b.
4. Khabibov F.Y., Niyazov Kh.Kh., Ismatova A.A. (2023). CURRENT STATE OF FRUIT AND VEGETABLE JUICE PRODUCTION. INTERNATIONAL BULLETIN OF APPLIED SCIENCE AND TECHNOLOGY, 3(6), 210–214. https://doi.org/10.5281/zenodo.8012176