

Annotation

Roik N.V., Kuznetsova I.V.

Mathematical model of stevia post-harvest processing

Theoretical and experimental studies became basis for the created mathematical model of forming high-quality indicators of stevia starting with its cultivation and ending with storage of dried leaves. Developing stevia model a hydrostatical mathematical model was used describing the mechanism of accumulating substances in plant leaves and establishing their balance due to breathing. At the level of microcirculatory cellules of cells movement of substances at the osmotic pressure from the root system was represented. Other mathematical model which also became the basis for developing a new one shows co-operation of two power systems determining physiological maturity of a plant. When creating the model one of basic quality indicators – porosity of leaves which depends on nature of the plant and drying conditions and also affects the quality of leaves during their storage is included. The mathematical model also takes into account time of the biological cycle of a plant which is characterized by its readiness for harvesting and further processing. Thus, this model allows expecting completion of the biological cycle in certain agroclimatic terms. Studies of purified from ballast substances juice of stevia leaves show that the more relaxation time of concentrations of the substances the more their original values compared to stationary ones. High concentrations of substances are stimulated by conformable streams on the border of phase division between different matters. Immeasurable transpiration of values of the extinction coefficient which depends on the porosity of the leaf apparatus shows the diffusion rate of substances in microcirculatory cells of a leaf into substance. The resulting studies show that the extinction coefficient cannot be large over 0.1 if the content of diterpenic substances does not exceed 11%. On the basis of conducted experimental researches on speed of moving substances cells of leaves it is found that this indicator does not exceed $0.1 \times 10^{-3} \text{ m}^2/\text{min}$. for stevia grown in agroclimatic terms of Ukraine.

Processing the results of studies on changes in moisture content, diterpene glycosides and flavonoids for two years, samples of stevia leaves dried at different temperatures were the basis of the regression equation. Data processing allows obtaining coefficients characterizing the degree of influence of one of the two parameters used during drying of the ground part of stevia: temperature and time.

Thus, conducted theoretical and experimental studies became the basis for obtaining mathematical model of stevia growing and regression equation of storing its leaves.

Key words: *stevia, post-harvest processing, diterpene glycosides, porosity of leaves.*