

Selection of a carrier for the extract of daucus carota root based on pharmacotechnological characteristics

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Actuality. The primary cause of cardiovascular diseases is atherosclerosis, which significantly affects the condition of the vascular system. Studying its pathogenesis leads to the conclusion that it is a chronic inflammatory disease that responds to any changes in the homeostatic system, primarily the immune system, lipid metabolism, and especially the condition of the endothelium. Research shows that a combination of biologically active compounds derived from plants helps reduce fat deposits and lowers the likelihood of developing atherosclerosis. One such source is the roots of cultivated carrots, which are known for their antioxidant and anti-inflammatory effects. Carrot roots are rich in carotenoids, vitamins, polyphenols, fiber, and minerals, which can capture reactive oxygen species and enhance the body's natural defence mechanisms, leading to a reduction in oxidative stress and a decreased risk of cardiovascular diseases.

Unfortunately, there are no pharmaceutical products on the Ukrainian market based on cultivated carrot root specifically for the treatment and prevention of atherosclerosis. Therefore, considering the obtained information, it can be concluded that the development of a drug containing cultivated carrot extract for the treatment and prevention of atherosclerosis is of key importance for pharmacy and medicine.

The aim of the study. Definition of pharmacotechnological properties of common carrot (*Daucus carota* L.) root thick extract and its mixtures with Neusilin® US2 in various ratios 1:1, 1:2, 1:3, 1:4 and 1:5.

Materials and methods. The objects of the study were the concentrated extract from the cultivated carrot roots (GCE) and its mixtures with excipients. The determination of bulk density, flowability, Carr's index, and Hausner ratio was

carried out according to the well-established methods of the State Pharmacopoeia of Ukraine 2nd edition, Volume 2 (SPU).

Results. Analyzing the results of bulk density before and after settling, it can be concluded that the mixture of thick extract from cultivated carrot roots with Neusilin® US2 in a 1:1 ratio belongs to powders of medium weight ($\rho_0=0.28\pm0.01$ g/ml, $\rho_{1250}=0.41\pm0.01$ g/ml). The mixtures with ratios of 1:2, 1:3, 1:4, and 1:5 have the following respective values: $\rho_0=0.19\pm0.01$ g/ml, $\rho_{1250}=0.26\pm0.01$ g/ml; $\rho_0=0.17\pm0.01$ g/ml, $\rho_{1250}=0.25\pm0.01$ g/ml; $\rho_0=0.15\pm0.01$ g/ml, $\rho_{1250}=0.22\pm0.01$ g/ml; $\rho_0=0.14\pm0.01$ g/ml, $\rho_{1250}=0.21\pm0.01$ g/ml, which are characteristic of light powders. An examination of the Hausner ratio, Carr's index, and angle of repose shows that the samples in all studied ratios (1:1, 1:2, 1:3, 1:4, 1:5) exhibit unsatisfactory pharmacotechnological properties, indicating insufficient flowability and segregation of the tablet mass. The analysis of the vibration compaction coefficient shows that the obtained mixtures have values greater than 0.21, indicating a high degree of particle cohesion in these samples. Based on this, the mixtures in the ratios of 1:2, 1:3, 1:4, and 1:5 are cohesive powders and exhibit strong cohesive properties. The analysis of the heterogeneity coefficient shows an increased degree of cohesion between the particles in all samples, which suggests a high degree of electrostatic interaction between the particles, the potential for particle clumping, and unsatisfactory flowability. The obtained results of the angle of repose prove that the samples in the ratios of 1:2, 1:3, 1:4, and 1:5 have low dispersibility and poor flowability, as their angle of repose exceeds 40°.

Thus, according to the generally accepted classification of material flowability, the mixtures in all ratios belong to the 7th class of flowability and may require technological processing, either by adding anti-friction substances or through additional granulation. This leads to the conclusion that the obtained samples may accumulate or adhere in the hoppers of tablet machines.

Conclusions. Thus, based on the obtained experimental data, it can be concluded that the samples with Neusilin® US2 have unsatisfactory pharmacotechnological properties.