PL1. INNOVATIVE TECHNOLOGIES IN THE FIELD OF CREATING EFFECTIVE PLANTS FROM AVICENNA RECIPES

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Abu Ali ibn Sina (980-1037) was born in the village of Afshana, Bukhara region in August 980. After studying medicine at Nuqs al-Qumri, at the age of 16-17, he became a renowned physician due to his keen mind and memory.

Ibn Sina wrote 280 works, 40 of them were devoted to medicine. His works had a great influence on the development of medicine and pharmacy in the modern world. Ibn Sina's main work on medicine and pharmacy is the Canon of Medical Science, which was widely circulated in Europe for many centuries and was used as a textbook for future doctors.

Ibn Sina was one of the first scientists to develop a systematic approach to the study of medicines and he described and classified plants.

In the "Canon of Medicine" Ibn Sina gives characteristics of medicinal raw materials, methods of manufacturing medicines and their use in the idea of infusions, decoctions,raw extracts, pills, etc. He described the use of more than 500 medicinal plants, 176 ofthem grow in Uzbekistan. These plants belong to various families and genera, many of them have been used to treat a wide range of diseases.

As a result of the work of the Institute of Chemistry of Plant Substances named after.acad. S.Yu. Yunusov isolated 1200 alkaloids, 500 flavonoids, coumarins, lactones and proanthocyanidins, 350 glycosides, 50 lipids, 30 polysaccharides from the flora of Central Asia. The chemical structures of 625 new alkaloids, 180 glycosides, 300flavonoids, coumarins, lactones and proanthocyanidins have been established. Pharmacological tests were carried out on 2000 natural and synthetic substances, 60 compounds underwent preclinical and clinical trials. 35 drugs have been introducedinto medical practice.

Currently, the Institute continues fundamental chemical and pharmaceutical research on secondary metabolites of medicinal plants included in the "Canon of Medicine" of Abu Ali ibn Sina, with the aim of creating new highly effective medicines based on them.

Traditional technologies for the extraction and purification of biologically active substances (BAS) from medicinal plants have a number of disadvantages that do notallow the extraction of many BAS in their native form. These disadvantages are: long time and multi-stage process, the use of toxic and explosive extractants, large losses oftarget products and solvents. Therefore, traditional technologies are constantly beingimproved.

In recent years, the technology for extracting non-polar and mid-polar biologically active substances using liquefied gases in subcritical and supercritical states (fluid extraction), which is a promising alternative to overcome the above-mentioned disadvantages, has become widespread.

The advantages of supercritical fluids (CO_2, refrigerant, freon, propane, etc.) include properties such as high diffusion, low viscosity, high selectivity and high dissolving ability. Among them, carbon dioxide (CO_2) is considered the preferred extractant dueto its non-toxicity, inertness, low cost, non-flammability and non-corrosiveness. FluidCO_2 extraction is

effective for extracting such non-polar compounds as lipids, fatty and essential oils, lipophilic flavonoids, steroids, etc. The use of CO_2 simplifies the technological scheme of the extraction process by eliminating the extractant regeneration stage; the extraction process is several times faster compared to other extractants due to changes in pressure, leading to a rapid transition of the liquid extractant into a fluid state. The resulting extracts often do not contain water-soluble ballast substances and traces of organic solvent. These factors make fluid extraction more economical and environmentally friendly.

As a rule, crude extracts of plant biologically active substances require purification from high-molecular ballast impurities. A modern method for purifying solutions and liquid extracts is the separation of substances using semi-permeable membranes. Membrane separation is used in technologies for obtaining polysaccharides, enzymes,nucleic acids and other protein products from plant materials.

Ultrafiltration is a process of membrane separation of liquid mixtures under pressure, based on the difference in molecular weights or molecular sizes of the components ofthe mixture being separated. The result of separation is two solutions, one of which is enriched and the other depleted of the solute contained in the original mixture. Theuse of this process in the separation of temperature-sensitive substances is of great importance, since during ultrafiltration the solutions are not heated and are not subjected to chemical attack, as is the case when filtering hot solutions or during distillation. Therefore, the ultrafiltration process has very low energy costs, approximately 20-60 times lower than distillation. Using ultrafiltration, you can notonly fractionate, but also concentrate liquid extracts.

To purify extracts by ultrafiltration, membranes with a pore size of 0.001-0.02 microns are used. Ultrafiltration is used when one of the components of the liquid system hasa molecular weight of 500 or higher. In many cases, ultrafiltration of the extract through a membrane that is permeable to the product but impermeable to contaminants produces a clear, clarified solution from which a crystalline product ofhigh purity can be easily obtained.

An effective method for preparative liquid chromatography under pressure is flash chromatography. This method is successfully used for the purification of plant extracts, purification of intermediate and final products, isolation and purification ofpeptides and oligosaccharides. In terms of the speed of separation of multicomponentmixtures and the quality of their purification, flash chromatography is not inferior toexpensive HPLC, but uses lower pressure (from 5 to 50 bar), which significantly savesconsumables and energy.

The use of new innovative controlled technologies - environmentally friendly fluid extraction, ultrasonic extraction, ultrafiltration, flash chromatography for theproduction of drugs, biologically active substances and concentrated extracts from medicinal and food plants, including plants described by Abu Ali Ibn Sina in the “Canon of Medical Science”, allows eliminate the use of organic flammable and toxic solvents from technological processes, reduce energy costs, increase the concentrationof target products in extracts, and improve their purity and quality.

In conclusion, it should be said that Abu Ali ibn Sina (Avicenna) was one of the greatest scientists of his time and had a huge influence on the development of medicalsciences and pharmacy. His works and achievements remain relevant to this day andcontinue to influence modern medicine.

Keywords: Avicenna, Canon of Medicine, Abu Ali ibn Sina