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# PICKLED ARTICHOKE (Cynara Scolymus L)GETTING NANOPARTICLES FROM THE EXTRACT, THEIR DIMENSIONS

**Turaev Dostonjon Erkin ugli**
**Email:**turayevdostonjon174@gmail.com
Physics teacher at Karshi International University

## ABSTRACT

*In order to find a reliable and economically convenient way of synthesis of nanoparticles from the specific properties of nanoparticles, their practical application in the use of modified materials, the study involved obtaining nanoparticles from the extract of the medicinal plant "Cynara Scolymus L" and studying their properties, Cynara Scolymus L. the rate of formation of nanoparticles from medicinal plant extract, their size and their stability depending on the concentration of metal salts, structural properties of microparticle and nanoparticle extracts obtained from dried leaves of Cynara Scolymus L., production of nanoparticles using metal salts from dried leaves of Cynara Scolymus L. and stabilization with polysaccharide sodium carboxymethylcellulose ,Conclusions and suggestions are presented on the results of the study of extracting the nanoparticle from the water-alcohol extract of the medicinal plant Cynara Scolymus L.*

***Keywords:****Prickly artichoke, nanoparticle extract, Polymer nanoparticles, Polyelectrolytes, Nanoparticle extraction, Cynara Scolymus, IR spectroscopy.*

## АННОТАЦИЯ

*С целью поиска надежного и экономически удобного пути синтеза наночастиц на основе специфических свойств наночастиц, их практического применения при использовании модифицированных материалов, исследование заключалось в получении наночастиц из экстракта лекарственного растения «Cynara Scolymus L» и изучении их свойства, Cynara Scolymus L. Скорость образования наночастиц из экстракта лекарственных растений, их размер и стабильность в зависимости от концентрации солей металлов, структурные свойства экстрактов микро- и наночастиц, полученных из высушенных листьев Cynara Scolymus L., получение наночастиц с использованием солей металлов из высушенных листьев Cynara Scolymus L. И стабилизации полисахаридом натрия карбоксиметилцеллюлозой. Представлены выводы и предложения по результатам исследования извлечения наночастиц из водно-спиртового экстракта лекарственного растения Cynara Scolymus L.*

***Ключевые слова:*** *артишок колючий, экстракт наночастиц, полимерные наночастицы, полиэлектролиты, экстракция наночастиц, Cynara Scolymus, ИК-спектроскопия.*

**INTRODUCTION**

*Topic relevance*: It is known that metal nanoparticles can enter the human body in different ways: through the mucous membranes of the respiratory tract and digestive tract, transdermally (for example, when using cosmetics), blood stream contained in the vaccine, etc. The risk of the spread of nanopathologies, although not yet fully understood, is undoubtedly high today and will likely increase in the future. Determining the causes of the pathological effects of nanoparticles and developing methods of combating diseases caused by the penetration of nanoparticles into the body are currently becoming the subject of a new trend in experimental medicine. Thus, it is very important to determine the ways in which nanoparticles affect living organisms and their detection.

*Research object and subject*A medicinal plant "Cynara Scolymus L" and an aqueous-alcohol extract were taken as a test. Studying the physical properties of nanoparticles based on various metal salts is a subject of research.

The purpose of the study. The purpose of this work is to obtain nanoparticles from the extract of the medicinal plant Cynara Scolymus L.

In connection with this, the main goal of this work is physico-chemical, structural study

**LITERATURE ANALYSIS FROM TOPIC SURFACE**

Currently, one of the rapidly developing directions of modern nanotechnologies is the extraction of nanoparticles containing macro- and microelements and vitamins from various medicinal plants and their use in the preparation of medicines.

In addition, obtaining stable concentrated aqueous-alcohol extracts and dispersions with defined physico-chemical properties based on nanoparticles obtained with the help of various metal salts and using them in various directions, including in the field of microelectronics - as optoelectronic sensors , can be widely used in the areas of medicine - in the creation of nanoparticle materials used for effective destruction of cancer cells, and in the areas of pharmaceuticals - in the creation of new drug preparations with nanoparticles.

Nanoparticles are solid colloidal nanoparticles of various shapes with sizes ranging from 10 nm to 1000 nm, which are composed of macromolecular materials and contain active substances that are dissolved, encapsulated or absorbed in the nanoparticle, or chemically bound to its base. includes

There are various methods of obtaining nanoparticles, the most widely used of which are: obtaining by electric spark method, obtaining by spraying method, obtaining nanoparticles by deposition from gas phase, method of obtaining nanoparticles by mechanical method and chemical methods, etc. The most important of these is the preparation of nanoparticles based on precipitation, i.e., precipitation of nanoparticles based on an electrochemical mechanism.

Natural polymers such as chitosan, gelatin, sodium alginate and albumin are often used to obtain nanoparticles [4,7]. The range of synthetic polymers used for the same purposes is very wide and includes various polytheists - primarily polymers and copolymers of glycolic, lactic, hydroxybutyric, hydroxycaproic acids, as well as polyanhydrides, polyteroesters, polycyanoacrylates, polyglutamic acid, polymalic acid, polymethyl methacrylate. In some cases, cross-linked derivatives of water-soluble polymers - poly-N-vinylpyrrolidone, polyvinyl alcohol, acrylic acids, polyacrylamide, polyethylene glycol - were used for these purposes [5,7].

Properties and properties of polymer nanoparticles must be optimized, and their structure and properties depend on the method of nanoparticle preparation. Thus, it is important to choose a suitable method that allows obtaining nanoparticles with predetermined properties.

Among the methods of obtaining polymer nanoparticles, the following can be distinguished:

- Methods of obtaining nanoparticles from ready-made macromolecules, including nanoparticles formed from amphiphilic polymers based on covalent or ionic bonding with each other and interaction of macromolecules.

Due to covalent or ionic interactions, as well as intermolecular forces;

- A method of obtaining nanoparticles based on the simultaneous polymerization of monomer

Synthesis of nanoparticles from prickly artichoke extract - during the research process, the turbidity of the extract solution was observed, and then the particles were observed to settle for a certain period of time. This shows the formation of magnesium metal nanoparticles through spectrophotometry. Symptoms appear in artichoke extracts over time. Nanoparticles, stabilizers are used in all cases to ensure the stability of the system. These stabilizers are usually polymers of natural origin - polysaccharides, gelatin, starch, agar-agar, etc., or polymers of synthetic origin and surfactants (surfactants). To increase the aggregative stability, we used sodium carboxymethylcellulose polysaccharide (Na-TSMS). For this, solutions were prepared in different proportions of Na-TSMS: "Cynara" extract Scolymus L., the introduction of Na-TSMS significantly prevents and reduces aggregation. When mixing the resulting artichoke extract solution with Na-TSMS solutions (C=0.1 base·mol/L), nanoparticles of different sizes are stabilized by Na-TSMS polysaccharide. To explain the interaction of Na-TSMS with nanoparticles - "Cynara Scolymus L ” can be used. The infrared spectroscopic analysis method was used. "Cynara Scolymus L." IR spectra of the extract. Edi is obtained with solutions of nanoparticles and metal salt nanoparticles in the presence of Na-TSMS. It should be noted that

**METHODOLOGY**

Methods. IR spectroscopy, potentiometric titration and electrolyte solutions, X-ray diffractometric analysis, electron microscopic studies, thermogravimetric analysis were used in the research.

The products used were established using IR spectroscopy techniques and based on published data [2]. Thus, the above results of preliminary study of Na-TSMS show that it is multifunctional. The presence of SOO-, SOOH groups in their macromolecules gives these polymers a characteristic feature.

**RESULT DISCUSSION**

In this work, to determine the interaction of Na-KMS nanoparticles - "Cynara Scolymus L." used the IR spectroscopic analysis method. "Cynara Scolymus L." The IR spectra of the extract were shown with nanoparticles and solutions of nanoparticles of metal salts in the presence of various proportions of polysaccharide Na-KMS. It should be noted that the IR spectra of all ratios of Na-KMS and the extract with different ratios had almost the same absorption bands and differed greatly in intensity and shift to some absorption bands. The structure of the used Na-KMS products was created using IR-spectroscopy methods and on the basis of literature data

We now turn to some structural features that explain the properties of Na-KMS. It is known that Na-KMS, in addition to polydispersity typical for high molecular compounds, has significant chemical heterogeneity; has a different quantitative ratio of functional groups in the chain and a different distribution pattern of these groups in the chain. Therefore, it can be considered a copolymer consisting of two types of units: D - glucopyranose with glycopyranose glycolic acid. In a neutral environment with a pH value of about 7, a mixture of both unsubstituted hydroxyl groups and ionized carboxyl groups is present in the Na-KMS macromolecule.

Quantitative analysis of Na-KMS spectra using information on the characteristic frequencies of individual functional groups made it possible to define all absorption bands and establish structural laws.

Thus, the above results of preliminary Na-KMS studies show that multifunctional; presence of SOO-, SOOH groups in their macromolecules gives these polymers specific properties of polyelectrolytes.

In the obtained IR spectra of Na-KMS: "Cynara Scolymus L." showed the presence of -OH groups located in the region of 3240 cm-1 in different proportions, as well as 1585 cm-1 and 1410 cm-1 belonging to Na-KMS carbonyl groups. With an increase in the content of "Cynara Scolymus L" extract, it shows a shift of these absorption bands to a higher frequency region with nanoparticles in the mixture, i.e. according to the ratio: Na-KMS:"Cynara Scolymus L." extract. = 20:80 -1593 cm-1; in the ratio of 40: 60 - 1597 cm-1; and in the ratio of 60: 40 - 1600 cm-1. Apparently, it causes the absorption bands located in the region to shift.

1585 cm-1 shows that the carbonyl group associated with Na-KMS is strongly adsorbed on the magnesium metal nanoparticles, which leads to the stabilization of the prickly artichoke extract - "Cynara Scolymus L". The above experimental data were confirmed by optical microscopic images of a mixture of Na-KMS solutions: "Cynara Scolymus L" extract. different proportions, it is shown. The size of the nanoparticles was determined from the image between 120 nm and 280 nm. It should be noted that the introduction of Na-KMS largely prevents aggregation and reduces the average size of nanoparticles. A nanocomposite is obtained by replacing the solution of thorny artichoke extract nanoparticles with Na-KMS solutions in different proportions, in which Na-KMS is stabilized with polysaccharide. As the concentration of magnesium sulfate salt increases, the size of the nanoparticles is observed. Thus, "Cynara Scolymus L." Synthesis of nanoparticles from medicinal plant extract by changing the concentration of polysaccharide Na-KMS with the introduction of metal salt, an aggregative stable nanocomposite was obtained, in which nanoparticles were stabilized by polysaccharide Na-KMS.

In order to confirm the above data, a study was conducted to study the size of nanoparticles obtained from medicinal plant artichoke extract - Cynara Scolymus L. using metal sulfate by atomic force microscope. Atomic force microscopy studies were performed on an Agilent 5500 scanning probe microscope at room temperature. In this work, we used silicone containers with a hardness of 9.5 N/m and a frequency of 145 kHz. The maximum scanning area for AFM in X, Y is 2.5 - 2.5 µm, in Z - 1 µm. (Table 1)

Medicinal plantCynara scolymus L.extract from liquid rate of formation of the resulting nanoparticles

| Concentration of salts, % | Nanoparticle formation rate, h | | |
|---|---|---|---|
| | NaCl salt | Mg SO4 salt | Ag NO3 salt |
| 0.01 | 5.40 | 3.28 | 1.22 |
| 0.02 | 4.18 | 1.91 | 1.05 |
| 0.03 | 2.90 | 1.87 | 0.83 |
| 0.04 | 2.12 | 1.40 | 0.54 |
| 0.05 | 1.81 | 1.22 | 0.18 |
| 0.06 | 1.43 | 0.86 | 0.12 |

As mentioned above, the synthesis of nanoparticles was carried out at room temperature with constant stirring until the color changed. Thus, in the course of research, it was observed that the color of the resulting solutions changed from light green to light brown with the formation of turbidity, which indicates the formation of nanoparticles. The formation of magnesium sulfate nanoparticles was recorded spectrophotometrically in the frequency range of 400 - 800 cm-1. To obtain spectrophotometric data, a certain amount of solution was applied to the substrate and spectroscopic data were recorded. (Table 2)

Medicinal plantsCynara scolymus L.based on liquid
size of nanoparticles obtained from the extract

| Concentration of salts, % | Nanoparticle size, nm (on average) | | |
|---|---|---|---|
| | NaCl salt | Mg SO4 salt | Ag NO3 salt |
| 0.01 | 130 | 110 | 140 |
| 0.02 | 130 | 130 | 150 |
| 0.03 | 150 | 160 | 150 |
| 0.04 | 200 | 180 | 160 |
| 0.05 | 200 | 220 | 180 |
| 0.06 | 250 | 250 | 200 |

The working principle of the atomic force microscope is based on the registration of the force effect between the surface of the studied sample and the probe. A nanotin tip located at the end of an elastic consul is used as a probe. A force acting on the probe from the surface causes the arm to bend. The appearance of ridges or depressions under the tip leads to a change in the force acting on the probe and, therefore, to a change in the magnitude of the deflection of the consul. Thus, by recording the amount of tilt, it is possible to infer the topography of the surface.

The forces acting between the probe and the sample are primarily long-range van der Waals forces, which are initially attractive and become repulsive as they approach.

According to the microscopic experimental data, the size of magnesium sulfate nanoparticles obtained using the extract of medicinal plant artichoke - Cynara Scolymus L. is from 30 nm to 200 nm. And the initial product is almost micrometric in size (1000 nm).

Thus, on the basis of experimental data, a nanocomposite of medicinal plant artichoke extract - Cynara Scolymus L. and an extract with nanoparticles stabilized by polysaccharide sodium carboxymethylcellulose, which can be used as a choleretic drug for the first time, was synthesized.

**CONCLUSIONS AND SUGGESTIONS**

The process of potentiometric titration of the prepared PK solutions was measured in a state where the solutions were constantly mixed and the temperature was constant at 22-24 °C. The spectrum of Na-KMS and carbopol polycomplex was observed to change in intensity and maximum states in comparison with the spectrum of carbopol or Na-KMS.

PKs are fundamentally different in terms of the properties of the components that make it up, that is, it was found that the obtained substance is an individual substance with new properties and structure.

- for the first time, nanoparticles were obtained from the extract of medicinal plant artichoke "Cynara Scolymus L".

- it was determined that the rate of formation, size and stability of nanoparticles obtained on the basis of dried leaves of medicinal plant thorny artichoke Cynara Scolymus L. depend on the concentration and composition of metal salts;

- it was shown that the rate of formation of nanoparticles, their size and their stability increase depending on the concentration of metal salts.

- Structural properties of microparticle and nanoparticle extracts obtained from dried leaves of Cynara Scolymus L. were studied;

- Nanoparticles were obtained from the dried leaves of Cynara Scolymus L. using metal salts, and the aggregate was stabilized with polysaccharide sodium carboxymethylcellulose;

- The shelf life of the extract obtained on the basis of dried leaves of Cynara Scolymus L. was studied and it was found that it meets the requirements of regulatory and technical documents;

- nanoparticles were isolated from the water-alcohol extract obtained from the artichoke plant Cynara Scolymus L. and its properties were studied.

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