Development of the composition, technology and study of the effectiveness of drops for oral administration "Ascorbicdrop"

Abstract

For normal life, many different substances are needed, among which vitamins play an important role. Everyone knows that the word "vitamin" comes from the Latin "vita" - life. This name is not accidental at all [1].

Vitamins are low molecular weight organic compounds, very small amounts of which are required for the implementation of various metabolic processes in the body. Most vitamins are indispensable because are not synthesized in the human body. In their natural state, they can be found in very small quantities in all foods of organic origin [1,2].

Insufficient intake of vitamins from food is a global problem, and not seasonal, as it is mistakenly believed. For a number of reasons, a modern person cannot get them in the right amount with food. Inadequate nutrition, physical inactivity lead to metabolic disorders in the body and increase the risk of developing serious diseases [3,4,5,6].

One of the main problems faced by drug manufacturers is sometimes a short shelf life. In order to preserve the pharmacological properties of drugs, they add preservatives to them or place them in a vacuum package. To date, the most effective way to solve this problem is to use a modified atmosphere with nitrogen.

The stability of solutions of easily oxidizable substances increases significantly if they are filled in an inert gas environment, for example, carbon dioxide, nitrogen or argon. This filling allows you to remove oxygen, this oxidizing agent that destroys unstable substances. The following factors influence the reduction of shelf life:

- oxidative processes,
- development of molds,
- reproduction of microorganisms.

All oxidative processes in the packaging of a medicinal product occur under the influence of oxygen. As a result of this reaction, medications deteriorate. With the help of a pure nitrogen environment, it is possible to reduce the O_2 content to a minimum level [9].

Key words: drops for oral administration, ascorbic acid, ascorbicdrop, stabilizers, quality indicators.

Introduction

Drops for oral administration (Guttaeoris) are a liquid dosage form intended for internal use, which is distinguished by a single group feature, drop dosage. They are distinguished into an independent group because the medicinal substances contained in them are given in such a concentration that a few drops are often enough for a single dose. For this reason, drops are prescribed in an amount usually not exceeding 10 ml.

Vitamin C (ascorbic acid) plays a fundamental biochemical and physiological role in the human body. It is necessary for the normal development of connective tissue, resistance to various types of stress, strengthening of the immune system, regeneration and healing processes, and maintenance of hematopoiesis. Vitamin C is an effective environmental protector. The ability of vitamin C to remove excess lead, copper, nitrosamines, arsenic, benzenes, cyanides from the body in the course of complex therapy has been proven. In addition, ascorbic acid is necessary for the body to protect against viral and bacterial infections, for the synthesis of steroid hormones, neurotransmitters, collagen and carnitine, for the absorption of iron, stimulation of macrophages and induction of endogenous interferon. Vitamin C multiply potentiates the activity

of recombinant forms of human alpha-interferon and therefore, as a synergist of immunomodulatory action and as an antioxidant, is introduced into many drugs [7,8,12].

Ascorbic acid ($C_6H_{12}O_6$) - an organic compound related to the known to us - glucose, is one of the main nutrients in the human diet, which is necessary for the normal functioning of connective and bone tissue. It performs the biological functions of a reducing agent and is a powerful antioxidant. Only one of the isomers is biologically active - L ascorbic acid, which is called vitamin C. In nature, ascorbic acid is found in many fruits and vegetables.

Liquid dosage forms occupy the main place (45-50%) in the formulation of modern pharmacies. A wide variety of liquid medicine prescriptions are manufactured in the factory. The focus of individual prescriptions on a specific patient, affordability and high public confidence in pharmaceuticals made in pharmacy testifies to the importance of maintaining and improving pharmacy production. Currently, drugs are widely used in medical practice for the treatment of various kinds of diseases in the form of drops.

Objectives of the research: to study the features, physical and chemical properties of drops "Ascorbicdrop", made with vitamin C. To develop a technology for filling bottles with nitrogen, to study the effect of preservatives on the stability of drops for internal use "Ascorbicdrop".

Results and discussion. To get started, we have compiled 4 different formulations of vitamin drops. We studied the quality indicators of the studied drops. For this, we took the dosage of ascorbic acid and green tea extract in the indicated amount by pharmacologists. Excipients must correspond to the composition and do not interfere with the pharmacological action of the drug.

Vitamin C (ascorbic acid). Ascorbic acid maintains healthy blood vessels, skin and bones. It stimulates the body's defenses, strengthens the immune system, helps to neutralize and remove foreign substances and poisons, and improves the absorption of iron.

Table 1. Selection of active and auxiliary substances for the composition development of drops "Ascorbicdrop"

№	Composition	I	II	III	IV
1.	Ascorbic acid	0.95 g	0.95 g	0.95 г	0.95 g
2.	Green tea extract	0.02 g	0.02 g	0.02 г	0.02 g
3.	Sodium bicarbonate	-	0.2385 g	-	-
4.	Sodium sulfite	-	0.02 g	-	-
5.	Glycerol	9.8 g	-	-	9.8 g
6.	Purified water	up to 10 ml	up to 10 ml	-	
7.	Ethyl alcohol 40%			up to 10 ml	up to 10 ml

Table 2. Quality assessment of prepared samples according to Ts 306766008-001: 2020 (at the moment of preparation)

№	Quality indicators	Norm	Sample analysis results			
			I	II	III	IV
1	Description	Transparent liquid, no inclusions	Transparent liquid, no inclusions	Transparent liquid, no inclusions	Transparent liquid, no inclusions	Transparent liquid, no inclusions
2	Chromaticity	Colorless to yellow liquid, no inclusions	Transparent liquid, no inclusions	Transparent liquid, no inclusions	Transparent liquid, no inclusions	Transparent liquid, no inclusions
3	Transparency	Transparent liquid, no inclusions	Transparent liquid, no inclusions	Transparent liquid, no inclusions	Transparent liquid, no inclusions	Transparent liquid, no inclusions
4	Weight (volume) of package content	10 ml (±10 %)	10.06	10	10.8	10.1
5	Dose and uniformity of dosing drops for oral administration	10 ml (±15 %)	10.06	10	10.8	10,1
6	PH value of droplets	from 2.5 to 8.5	4.06	5.11	2.91	3.32
7	Density, g/cm^3, not less	1.02-1.37	1.18	1.06	0.91	1.11

Table 3. Quality assessment of prepared samples according to Ts 306766008-001: 2020 (at the time of storage 6 months)

№	Quality indicators	Norm	Sample analysis results			
			I	II	III	IV
1	Description	Transparent liquid, no inclusions	Transparent liquid, no inclusions	Yellowish lemon liquid, with turbidity	Yellowish lemon liquid, no inclusions	Yellowish lemon liquid, with turbidity
2	Chromaticity	Colorless to yellow liquid, no inclusions	Transparent liquid, no inclusions	Yellowish lemon liquid, with turbidity	Yellowish lemon liquid, no inclusions	Yellowish lemon liquid, with turbidity
3	Transparency	Transparent liquid, no inclusions	Transparent liquid, no inclusions	Yellowish lemon liquid, with turbidity	Yellowish lemon liquid, no inclusions	Yellowish lemon liquid, with turbidity
4	Weight (volume) of package content	10 ml (±10 %)	10.06	10	10.8	10.1
5	Dose and uniformity of dosing drops for oral administration	10 ml (±15 %)	10.06	10	10.8	10.1
6	PH value of droplets	from 2,5 to 8,5	4.11	5.03	2.86	3.44
7	Density, g/cm^3, not less	1.02-1.37	1.17	1.07	0.92	1.10

The obtained samples with different compositions were studied for 6 months and compositions № 2, 3 and 4 in terms of quality do not meet the requirement of Ts 306766008-001: 2020. Sample № 1 in all quality indicators meets the requirements of ND.

Table 4, **The optimal composition of "Ascorbicdrop" drops for oral administration, 10 ml:**

Ascorbic acid	0.95 g
Green tea extract	0.02 g
Glycerol	9.8 g
Purified water	Up to 10 ml

In the process of packing with high-purity nitrogen, oxygen is displaced, that is, unfavorable conditions are created for the development of oxidative processes, bacteria and fungi. By itself, nitrogen has no effect on microorganisms and the condition of the packaging material. To avoid premature spoilage, the product is packed in nitrogen, which replaces oxygen [9,10,11].

Technological production scheme

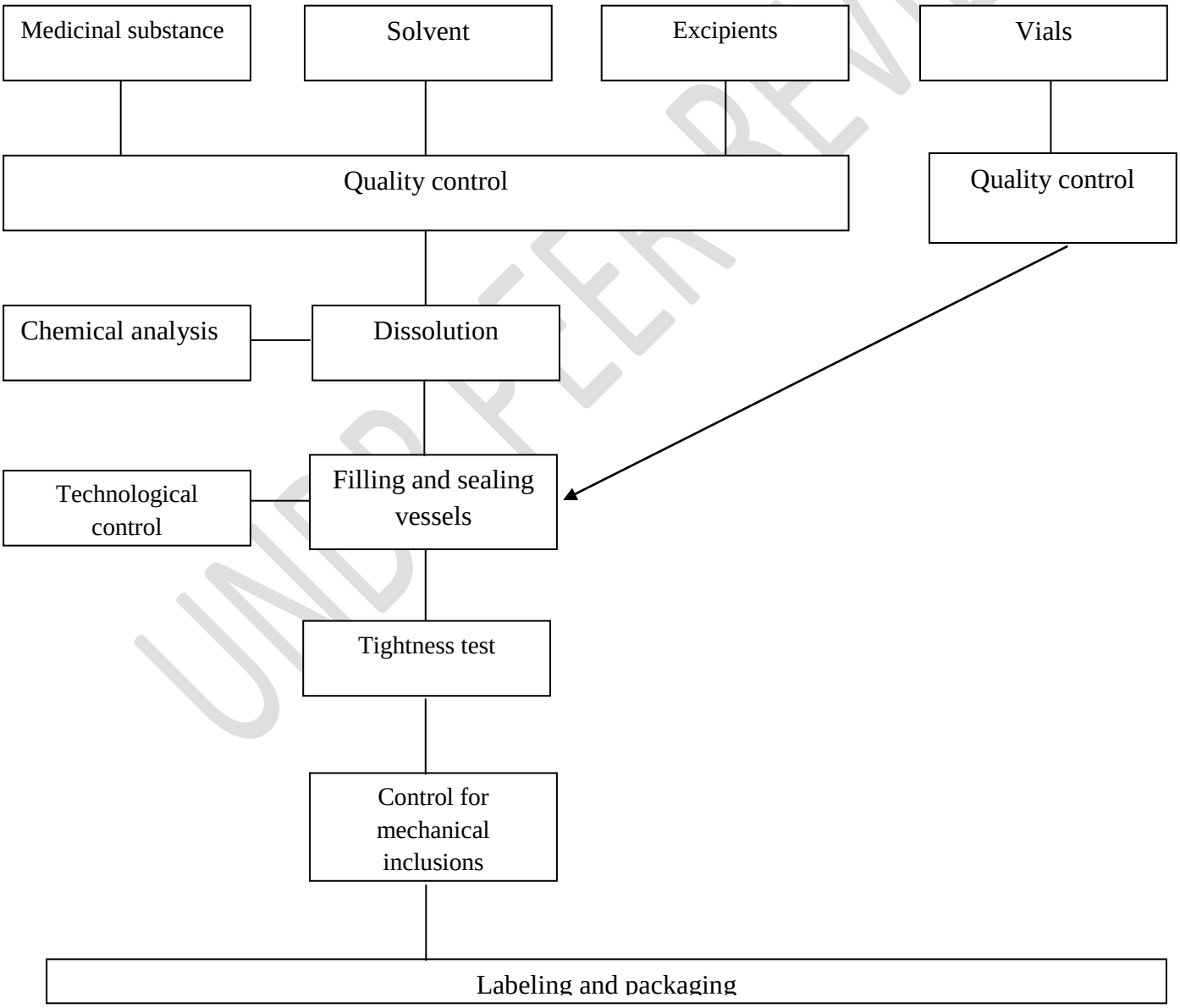

Figure 1. Technological scheme of drops "Ascorbicdrop"

Study of quality indicators of drops "Ascorbicdrop". Assessment of drops quality was carried out according to the methods given in the literature indicated below. The obtained indicators are shown in table № 5.

Table 5. Quality assessment of the prepared drops "Ascorbicdrop"

№	Quality indicators	Methods	Norm	Results
1	Description	Organoleptically	Transparent liquid, no inclusions	Transparent liquid, no inclusions
2	Chromaticity	Visually	Colorless to yellow liquid, no inclusions	Transparent liquid, no inclusions
3	Transparency	Visually	Transparent liquid, no inclusions	Transparent liquid, no inclusions
4	Weight (volume) of package content	BSt 64492-85	10 ml (±10 %)	10.06
5	PH value of droplets	EP 8.0	from 2.5 to 8.5	4.11
6	Density, g/cm^3, not less	SP XI	1.02-1.37	1.17

Table 5 shows that the results of the analysis of the optimal composition of "Ascorbicdrop" drops for oral administration correspond to the requirements of the ND, which is used in the preparation of a set of regulatory documents.

Study of drops effectiveness. There were no statistically significant differences in body weight and weight gain in either males or females between animals receiving the tested dietary supplements and control animals taking distilled water.

Dietary supplements to food usually have a mild effect on the body and, as a rule, do not have side effects. They do not accumulate in the body and are not toxic. Taking this into account, it becomes clear why the body can more easily tolerate the effects of dietary supplements than drugs of traditional medicine. The studied dietary supplements to food are effective for strengthening the immune system, accelerating metabolism, and normalizing the intestinal microflora. Recently, supplements for the regulation of metabolic processes in the body, which include the presented drugs, have gained particular popularity. Therefore, when assessing the effectiveness, biochemical tests of the studied additives were carried out. Tests to study the effect of dietary supplements “Ascorbicdrop” on biochemical markers of organ damage included the determination of total protein (TP), alkaline phosphatase (ALP) activity, aspartate amino transferase (AST) and alanine amino transferase (ALT) activity in the venous blood serum of animals and made it possible to ascertain an increase in the total protein in experimental animals by an average of 8-12%, which indicated the activation of the processes of protein metabolism and, thereby, an improvement in the energy supply of the biochemical processes flowing in the body.

Table 6. Influence of the studied dietary supplements on biochemical parameters

Group №	Statistical	observation	Biochemical indicators

	indicators	period	AlT, U/l	AST, U/l	ALP, U/l	TP, g/l
"Ascorbicdrop"	M ± t	before introduction	56.1±3.1,	114.8±5.4	313.4±34.9	66.69±1.3
		at the end	52.0±3.7	110.8±3.6	314.8±31.6	78.51±2.3

Indicators (ALP, AST and ALT) in all experimental groups did not go beyond the physiological norm and were not clinically significant, which indicated the real possibility of using these drugs as biologically active food additives that improve metabolic processes and preserve the physiological status of the body in optimal condition. And the presence of a tendency to a decrease in ALT activity suggests that the use of the tested dietary supplements reduces the damaging effects of free radicals, which can be associated with blood oxygen saturation and thereby confirm an increase in the general nonspecific resistance of the body due to the activation of AOS. The results of statistical processing of the data obtained indicate that the preventive intake of the studied dietary supplements by the animals causes a positive effect on the functions of the gastrointestinal tract and liver. The results obtained allow us to assume a positive effect of dietary supplements to food "Ascorbicdrop" on the declared functions: for all biochemical positions for the entire observation period, there was a reduction to the optimal norm of indicators in comparison of data before and after taking drugs by experimental animals.

Thus, the conducted studies objectively showed that under the action of the tested dietary supplements to food - "Ascorbicdrop" - a general strengthening effect is observed, an improvement in the general condition of the body and its antioxidant system, which ensures the normalization of the cardiovascular system, optimization of metabolism by improving blood circulation , normalization of the gastrointestinal tract.

Conclusion.

As a result of the experiments, the composition and technology of “Ascorbicdrop” drops were developed.

It was found that the drops "Ascorbicdrop" in quantitative terms meet the requirements of regulatory documents. In particular, the quantitative indicators of drops of complex composition were studied: the mass (volume) content of the package is 10.06 ml, Transparent liquid, without inclusions, the pH value is 4.11, density 1.17g/cm^3, the solution must not contain foreign substances.

Experimental evaluation allows us to classify dietary supplements as food "Ascorbicdrop" as effective, in the stated area, biologically active food additives.

References:

1. Svetlanova B. Review of the retail market of vitamins in 2003 / B. Svetlanova // Pharmaceutical Bulletin. - 2004. - № 3. - pp. 6-7.
2. Sakhnin V. I. Vitamins and their role in ARV / V. I. Sakhnin // Pharmaceutical Bulletin. - 2005. - № 11.
3. Denisenya G. Vitamin and mineral in one tablet / G. Denisenya // Pharmaceutical Bulletin. - 2001. - № 3. - p. 10.
4. Kim M.E., Stepanova E.F., Evseeva S.B. Syrups: composition, technology, current state of research (literature review) // Pharmacy and Pharmacology. № 3, 2014. - pp.7-14.
5. Sineva T. D. Syrups: classification, assortment, manufacturers // New pharmacy. -2008. - № 2. - pp. 64-70.
6. Yakusevich R.V., Evseeva S.B. Development of the composition and technological research of a corrected dosage form based on tansy flowers // Nano- and supramolecular chemistry in sorption and ion-exchange processes: materials of All-Russia. conf. with

elements of a scientific school for youth (Belgorod, September 14-17, 2010). - Belgorod, 2010. - p. 163.
7. Directory Vidal "Medicinal preparations in Russia". - Publishing house: Vidal Rus, 2021 – p.1120.
8. Tashpulatova A.D., Rizaeva N.M., Fayzullaeva N.S. Development of technology for medicinal syrup "COBALT-30" // Farmatsevtika jurnali. - № 2. - 2019. - pp.75-79.
9. Chueshov V.I. Industrial technology of drugs. In 2 volumes V.2. / V.I. Chueshov, M. Yu. Chernov, L.M. Khokhlova and others - Kh.: MTK Kniga, publishing house NFAU, 2002. – p.716.
10. SSt 2899-90 State standard. Syrups General technical conditions - Moscow: Publishing house of standards, 1998. – p.6.
11. State Pharmacopoeia XI. Ed. 2. General methods of analysis. Medicinal herbal raw materials. M.: Medicine, 1989. - pp. 160-161.
12. Technology for assessing the quality of antianemic syrup "ANTIANEMIN" / Fayzullaeva N.S., Zhalilov U.M., Yorkulov S.Sh., Umaralieva N.R. // Modern achievements of pharmaceutical nechnology and biotechnology. Proceedings papers. - Ed. 4 collection of scientific works. - Kharkiv, 2018. - pp.256-259.