**Tinctures (Tinkturae)**

Tinctures are called colored liquid alcoholic or water-alcoholic extracts from medicinal plant raw materials, obtained without heating and without removing the extractant. Tinctures were introduced into medical practice by Paracelsus and are still the official LF. In the GF XI edition, vol. II there is a general article "Tinctures".

To the State Register of Medicines Approved for Use in the Russian Federation (2004 year.) included more than 40 tinctures from the medicinal plant.

There are several classifications of tinctures, the main of which are the following:

*1. Depending on the composition of the feedstock.*

 According to this classification, tinctures are divided into:

* simple tinctures, which are made from one type of raw material;
* complex tinctures, which are made from several types of raw materials.

Most of the tinctures produced are simple, examples of simple tinctures are:

* tincture of belladonna;
* Valerian tincture;
* motherwort tincture;
* tincture of lily of the valley, etc.

The group of complex tinctures includes bitter tincture and others.

Earlier, elixirs were also referred to as complex tinctures - joint alcoholic solutions of extracts, tinctures, and other medicinal substances; now elixirs are considered as an independent group of extraction drugs.

*2.* Depending on the properties of the feedstock.

 According to this classification, tinctures are divided into:

* tinctures made from dried raw materials;
* tinctures made from fresh raw materials.

Most of the tinctures are made from dried raw materials, since the process of obtaining tinctures from fresh raw materials is seasonal.

To the State Register 2004 year... 8 infusions from fresh raw materials are included.

For example: tincture of fresh roots and rhizomes of valerian, is part of the drug "Cardiovalen".

*3.* Depending on the cooking method.

 According to this classification, tinctures are divided into:

* tinctures obtained by extracting biologically active substances from medicinal plant raw materials;
* tinctures obtained by dissolving dry and thick extracts.

Most of the tinctures are obtained by extracting (extracting) biologically active substances from medicinal plant raw materials. At present, only a tincture of chilibuha (from the group of simple tinctures) is obtained by the dissolution method.

If we generalize all the classifications, then most of the tinctures produced at the present time belong to simple tinctures made from dried raw materials by extracting biologically active substances.

The extractant for obtaining tinctures is most often ethanol of 70% concentration (tincture of lily of the valley, tincture of motherwort, tincture of valerian, etc.), less often 40% concentration (tincture of belladonna, tincture of Potentilla, etc.), even less often 90% concentration ( tincture of mint, tincture of capsicum) and 95% concentration (tincture of lemongrass).

According to the requirements of the general article of the GF XI edition, tinctures are prepared from non-potent raw materials in a ratio of 1: 5, but from potent raw materials in a ratio of 1:10. In this case, the raw material is taken by weight, and the tincture is obtained by volume, i.e. adopted mass-volumetric method.

Tinctures are produced at pharmaceutical enterprises and are produced in accordance with industrial regulations. The quality of tinctures is regulated by the General FS of the GF XI edition of "Tinctures" and private FS or FSP.

**Technological scheme for obtaining tinctures**

**BP - 1.** Sanitary preparation of production

**BP - 1.1. Preparation of industrial premises**

**BP - 1.2. Processing equipment**

**BP - 1.3. Sanitary preparation of technological clothing**

**BP - 1.4. Sanitary training of personnel**

**BP - 2.** Preparation of raw materials and extractant

**BP - 2.1. Grinding raw materials**

**BP - 2.2. Ethanol dilution**

**TP - 3. Extraction (extraction of biologically active substances) or dissolution of dry or thick extracts**

**TP - 4. Cleaning Extraction**

**TP - 5. Standardization**

**UMO - 6. Packing, packaging, marking**

**PO - 7. Ethanol recovery**

**Stage VR - 1.** "Sanitary preparation of production" is carried out in accordance with GMP rules (OST 42-510-98 "Rules for the organization of production and quality control of medicines (GMP)" and the National standard of the Russian Federation "Rules for the organization of production and quality control of medicines (GMP)" GOST R 52249 - 2004 year.) and consists in the sanitary treatment of industrial premises and equipment, preparation of process air and sanitary training of personnel.

**Stage VR - 2.** The original plant materials should be stored in separate rooms before processing. These areas should be well ventilated and protected from the penetration of insects and animals, especially rodents. Measures should be provided against the spread of animals and microorganisms introduced with plant raw materials. The preparation process itself consists in grinding the raw materials to the required size to the required size, as well as determining the compliance with the ND requirements for this type of raw materials and, if necessary, bringing them up to the standard requirements (for example: drying to a certain humidity).

Grass and root cutters, circular saws are used for crushing medicinal plant raw materials.

In the manufacture of complex tinctures, after grinding all types of raw materials, they are mixed in mixers with a rotating body or rotating blades.

 According to the rules GMP during sampling, weighing, mixing and other technological operations with plant raw materials, accompanied by dust formation, measures should be taken to maintain cleanliness, as well as to prevent cross-contamination (dust removal, allocation of special rooms, etc.).

The preparation of the extractant consists in carrying out calculations, measuring or weighing the components of the mixture, diluting and checking the concentration, etc.

**TP - 3. Extraction.** The extraction of biologically active substances during the production of tinctures is usually carried out in cylindrical or conical containers of various designs, which are called percolators (see section VII).

To extract biologically active substances in the production of tinctures, the following extraction methods are used:

Classic maceration. The main advantage of this method is the simplicity of execution, the main disadvantage is the duration and low depletion of raw materials.

Dynamic maceration. This method, in comparison with classical maceration, makes it possible to accelerate the achievement of equilibrium in the system, i.e., it shortens the extraction time, but does not increase the depletion of the raw material. There are the following types of dynamic maceration:

* circulation maceration;
* turbo extraction (vortex);
* Ultrasound extraction;
* grinding of raw materials in an extractant medium (ball mill, RPA);
* extraction using electrical discharges;
* centrifugal extraction (extraction is carried out in a filter centrifuge, the extractant under the action of centrifugal force passes through a layer of crushed medicinal plant material located on the periphery).

3. Fractional maceration (remaceration, bismaceration).

4. Percolation (filtering the extractant through the layer of raw materials at a certain speed).

 A description of these extraction methods is given in the section VII "Methods of extraction".

Obtaining tinctures by dissolving dry and thick extracts is used quite rarely, usually due to any difficulties in the technological process, such as:

* toxicity of raw materials;
* difficulty in grinding (for example, chilibukha seeds are solid raw materials);
* the difficulty of obtaining the extraction of the required concentration by this extractant

Currently, this method is used to obtain a tincture of chilibuhi (16: 1000). Wherein16 gdry extract of chilibuhi is dissolved in 900 ml of 70% ethanol, defended for 1 day. Then filtered, analyzed and adjusted with 70% ethanol to an alkaloids content of 0.25%. Sp. B. A tonic agent for the central nervous system.

**TP - 4. Cleaning the extraction.** The main method of purification of extracts in obtaining tinctures is settling at a low temperature (not higher than 100 C). The extracts are settled in cylindrical stainless steel tanks. The settling process is carried out until the precipitation ceases, usually 3-4 days, but not less than 2 days according to the GF XI ed., OFS "Tinctures".

During settling, mechanical inclusions and IUDs precipitate, the solubility of which decreases with decreasing temperature. The extraction after settling is drained from the sediment and filtered through Druk filters, press filters, i.e. filters operating under pressure. Vacuum filters cannot be used in this case, as the loss of valuable extractant may occur.

**TP - 5. Standardization.** Standardization is the establishment of compliance with the requirements of a standard (FS, FSP) or the establishment of uniformity of products. Standardization of tinctures is regulated by OST 91500.05.001-00 “Medicines quality standards. Basic provisions ", according to which the following quality indicators are mandatory for tinctures:

1. Description (color, smell, transparency).
2. Authenticity (qualitative reactions, chromatographic analysis, the nature of the UV spectrum).
3. Ethanol content (determination is carried out by boiling point or distillation method (GF XI ed., Issue 1, p. 26).
4. The content of biologically active substances (carried out by a chemical, physicochemical, or biological method. The biological method is used if cardiac glycosides are contained, the activity is expressed in frog units of action (ICU), or feline units of action (CED).
5. Dry residue (method GF XI ed., Issue II, p. 149).
6. The content of heavy metals (method GF XI ed., Vol. II, p. 149 - in tinctures, this figure should not exceed 0.001%).
7. Microbiological purity. The tinctures do not contain more than 104 aerobic bacteria, 2×102 yeasts and molds.

*If the tincture does not respond to any of the indicators, then bring it to the standard; wherein:*

1. If the tincture is not transparent, then it is filtered and checked for compliance with other indicators.
2. If the ethanol content does not match, strengthening or dilution is possible. It is better to use a similar tincture with a deviation of the indicator in the other direction, so that there is no deviation in the content of biologically active substances.
3. If the content of biologically active substances or dry residue does not match, it is possible:

- strengthening or dilution with a similar tincture, which has a deviation in the other direction;

- re-extraction using additional portions of raw materials.

4. If the content of heavy metals and microbiological purity is exceeded, the tinctures are rejected with the identification of the reasons for exceeding this indicator. Raw materials, equipment, and extractant can be sources of heavy metals.

**PO - 6. Ethanol recovery - ethanol return to production.**

Extraction of ethanol from waste raw materials is carried out:

- receiving wash water;

- by distillation.

These methods are described in detail in the methodological development of the department on the topic: "Alcoholometry".

**UMO - 7. Packing, packaging, marking.**Packing of tinctures is carried out using filling filling machines, piston filling machines (see the topic "Solutions") in bottles and flasks made of OS glass (medical light-protective). Packaging and labeling of tinctures are carried out in accordance with the law of the Russian Federation No. 86-FZ "On Medicines" and GMP rules.

**Storage of tinctures**

The storage of tinctures is carried out in compliance with all the principles of storing medicines (order of the Ministry of Health of the Russian Federation No. 377 of August 27, 1999 and No. 318 of November 5, 1997):

* by pharmacological groups;
* by toxicological groups;
* by state of aggregation;
* by type of LF;
* by physical and chemical properties.

A feature of the storage of tinctures, based on the physical and chemical properties, is storage in a cool, dark place. During storage of tinctures, precipitation is possible.