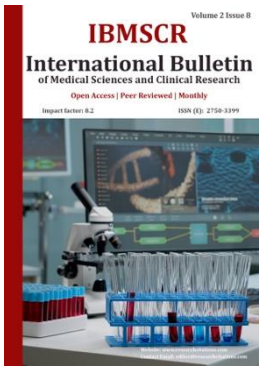

"PRODUCTION TECHNOLOGY FOR THE BIOLOGICALLY ACTIVE FOOD SUPPLEMENT 'MULTIVIT' HERBAL TEA"

Reipnazarov B.D.
Zuparova Z.A.
Khaidarov V.R.
Berdakh Karakalpak State University Tashkent State Medical University Tashkent Pharmaceutical Institute Email: vosiljonxaydarov@mail.ru
Tel: 998977257460
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In the current climate, one of the key challenges facing nutrition science, food technology and pharmaceutical science is the development of dietary supplements based on medicinal plant materials that possess high biological value, safety and functional benefits. The growing public interest in natural products for preventative purposes is driven by the increasing prevalence of vitamin deficiencies, a decline in the body's immune response, the impact of adverse environmental factors, chronic stress and an unbalanced diet. In these circumstances, the use of phytocompositions containing natural sources of vitamins, polyphenols, flavonoids and other biologically active substances is regarded as an effective means of replenishing deficiencies in essential nutrients and maintaining the body's functional state.

Aim of the study. In the current context, one of the pressing challenges facing nutrition science, food technology and pharmaceutical science is the development of dietary supplements based on medicinal plant materials that possess high biological value, safety and functional benefits. The growing public interest in natural products for preventive purposes is driven by the increasing prevalence of hypovitaminosis, a decline in the body's immune response, the impact of adverse environmental factors, chronic stress and an unbalanced diet. In these circumstances, the use of herbal formulations containing natural sources of vitamins, polyphenols, flavonoids and other biologically active substances is regarded as an effective means of replenishing deficiencies in essential nutrients and maintaining the body's functional state.

The aim of this study was to develop a scientifically sound production process for the dietary supplement 'Multivit' herbal tea, involving the selection of the optimal composition of the herbal blend, the determination of appropriate production parameters, the assessment of the quality indicators of the finished product, and the preservation of the complex of biologically active substances at all stages of the production process.

Experimental section materials and methods

Subject of the study: Rosehip fruits (Fructus Rosae (Rosa canina L.)), blackcurrant leaves and berries (Folia et Fructus Ribis nigri (Ribes nigrum L.)), cabbage leaves (Folia Brassicae oleracea L.), carrot root (Radix dauci sativa (Daucus sativus Hoffm.)), fruits of the common rowan (Fructus Sorbi (Sorbus aucuparia L.)), fruits of the sea buckthorn (Fructus Hippophaës (Hippophae rhamnoides L.)), calendula flowers (Flores Calendulae (Calendula officinalis L.)), pumpkin seeds (Semen Cucurbitae (Cucurbita pepo L.)), and stinging nettle leaves (Folia Urticae dioicae (Urtica dioica L.)).

The production process for 'Multivit' herbal tea comprises the following stages:

Preparation of production premises, raw materials and processing equipment for production in accordance with the requirements of SanPiN 0338-16 'Hygienic requirements for the production and distribution of biologically active food supplements'.

Preparation of premises, equipment and personnel. This stage is carried out in accordance with the requirements of OST 42-510-98 'Rules for the Organisation of Production and Quality Control of Medicinal Products'. The aim of this stage is to implement measures designed to ensure appropriate sanitary conditions for the production of herbal teas and, ultimately, the microbiological purity of the finished product. In addition, a full range of preparatory work must be carried out to ensure that the equipment subsequently operates at optimum efficiency.

Preparation of medicinal plant raw materials. At this stage of the manufacturing process, work is carried out to examine and unpack the medicinal plant raw materials.

Grinding of medicinal plant materials. The degree of grinding is standardised and determined by the intended use of the herbal tea. Mixtures for the preparation of infusions and decoctions (Species ad infusum et decoctum), intended for oral administration (tea), must have the following particle sizes: leaves and herbs – 4–6 mm; stems, bark and roots – 3 mm; fruits and seeds – 0.5 mm; flowers are included in the mixtures in their whole form. However, given that this mixture will be produced in 1.5–2.0 g filter bags, the medicinal plant material comprising the herbal tea in the filter bags was ground separately to a size of 2 mm. The plant material for herbal tea in 50 g 'angro' packs was ground to a size of 3.0–5.0 mm.

Sifting of medicinal plant material. The uniformity of the ground material is achieved using sieving mechanisms. Oscillating sieves are used for this purpose. The medicinal plant material to be sifted is poured onto the working surface of the sieve in a multi-tiered oscillating sieving unit. Multi-tiered sieves have several screens arranged one above the other, with the top screen having the largest apertures and the bottom screen the smallest. Such sieves allow the material being sieved to be separated into distinct fractions according to particle size. At all stages of grinding the medicinal plant raw materials, dust is sieved out through a sieve with 0.2 mm apertures. The plant material that passed through the sieve with 2 mm apertures was used to produce herbal tea for tea bags. Larger material was used for 'angro' herbal tea

Mixing of medicinal plant raw materials. The components of the herbal mixture were mixed in a drum mixer with a rotating housing. To ensure better mixing of the material, spiral baffles are fitted to the inner walls of the drum,

whilst inside it there are several longitudinal shelves with baffles. The drum mixer is a batch-type apparatus. Loading and unloading are carried out using a screw conveyor, which rotates in one direction during loading and in the opposite direction during unloading. Achieving a mixture of uniform composition presents certain difficulties, as the individual particles of the herbal tea vary in size, shape and mass. Consequently, they have a marked tendency to separate.

Quality control and rejection. Industrially produced herbal teas are tested against the following criteria:

authenticity testing;

external characteristics;

qualitative and/or histochemical reactions, chromatographic analyses;

numerical indicators (content of biologically active substances; moisture content; total ash);

permissible impurities (ground particles of raw material that have changed colour; other parts of the plant not intended for harvesting; organic impurities; mineral impurities);

microbiological purity;

compliance of packaging and labelling with the biologically active substances contained in the collection.

Packaging and labelling

Product packaging is carried out using packaging equipment. Before starting work, the following must be checked:

The cleanliness of the work area;

That there are no foreign objects in the workplace;

The cleanliness of the filling machine;

That the scales are working correctly and accurately;

Check that the heat-sealing machine is working correctly;

Wear a cotton-gauze mask or a dust respirator.

Products are packaged on workbenches. Packaging is carried out manually. The foreman supervises the sequence of operations, the quality of packaging and labelling. The packaging must be free from damage; the quantity of products taken for packaging, labelling and packing is recorded by the foreman in the loading and unloading log. The use of consumer packaging made of cardboard, paper and composite materials is carried out in accordance with GOST 33781.

Note:

1.The product may be packaged in consumer packaging and in other quantities in accordance with these Technical Specifications;

2.The product may be packaged in other packaging materials in accordance with the relevant technical specifications;

3.Consumer packs may be placed in cartons in quantities convenient for carrying.

Dietary supplements in the form of herbal tea, weighing between 1.5 and 2.5 g, are packaged as follows: for single use, in paper filter bags of domestic or imported manufacture, accompanied by a certificate of conformity, which are placed in cardboard packs of 10, 20, 30 or 50 pieces in accordance with GOST 7933, GOST 33781; in 50 g wholesale packs in cardboard cartons. The gross weight of the transport packaging must not exceed 15 kg.

Dietary supplements may be packed in wooden or cardboard crates in accordance with current regulatory documentation approved in the prescribed manner. The use of reusable returnable packaging is permitted. Other types, varieties and sizes of consumer and transport packaging made from materials authorised for use in the food industry by the Ministry of Health of the Republic of Uzbekistan, as evidenced by certificates of conformity, may be used.

Consumer packaging must be hermetically sealed. Packaging and materials used for packaging must ensure the preservation of the product. Packaging materials must have certificates of conformity and be authorised for use by the Ministry of Health of the Republic of Uzbekistan. Permissible negative deviations in the net weight of packaged products are in accordance with O'zDSt 8.022. By agreement with the customer, packaging in other types of containers that ensure the preservation and quality of the product and are authorised for use by the Ministry of Health of the Republic of Uzbekistan is permitted.

Labelling

Labelling of consumer packaging. Labelling of consumer packaging shall be applied by letterpress, offset printing or by affixing a label produced by screen printing, using indelible, odourless ink and producing a clear impression, indicating the following:

the name of the manufacturer;
the trade mark (if any);
the company's registered and manufacturing addresses;
telephone number;
the product name;
intended use of the product;
form of release;
composition;
directions for use;
contraindications;
net weight of filter sachet, g;
number of filter bags per pack;
date of manufacture of the herbal tea (day, month, year);
use-by date (day, month, year);
storage conditions;
label: 'Dietary supplement; not a medicine';
mark of conformity in accordance with O'z DSt 5.8;
reference to this organisation's standard O'zMSt 166:2024;
the inscription 'O'zbekistonda ishlab chiqarilgan' when the product is sold within the Republic of Uzbekistan, or 'Made in Uzbekistan' when the product is supplied for export;
a barcode with a registration number (where necessary).

In addition, inscriptions of an informational or promotional nature may be applied, provided they do not contravene the legislation of the Republic of Uzbekistan.

Transport marking

Transport marking shall be carried out in accordance with GOST 14192 by applying handling symbols to the transport packaging by stamping or stencil painting:

'This side up';
Keep dry';
'Protect from sunlight'.

Each unit of transport packaging shall be marked withinformation identifying the product:
the name of the manufacturer;
trademark (if applicable);
registered office and business address;
telephone number;
product name;
net weight of soluble granules, g;
number of packaging units, pcs;
gross weight, kg;
batch number;

number of packaging units per container;
date of manufacture of the herbal tea (day, month, year);
use-by date (day, month, year);
storage conditions;
mark of conformity in accordance with O'z DSt 5.8;
the designation of this standard: O'zMSt 166:2024;
the inscription 'O'zbekistonda ishlab chiqarilgan' when the product is sold within the Republic of Uzbekistan, or 'Made in Uzbekistan' when the product is supplied for export.

The marking shall be applied by affixing a label or by applying a clear impression using a stencil or stamp with indelible, odourless ink.

Safety and environmental protection requirements

The production of dietary supplements is neither toxic nor harmful.

Production and domestic premises must comply with the requirements of SanPiN 0338.

Manufacturing processes must comply with the general safety requirements set out in GOST 12.3.002 and SanPiN 0338.

Equipment must comply with the general requirements for equipment set out in GOST 12.2.003.

General fire safety requirements for the production process are set out in GOST 12.1.004.

The production process and the hygiene regime for the maintenance of process equipment must be carried out in accordance with the requirements of SanPiN 0338.

Only persons who have undergone training and instruction in occupational health and safety in accordance with GOST 12.0.004 are permitted to work on the production of dietary supplements.

Employees involved in production must complete basic hygiene training courses.

Only persons who have undergone a medical examination in accordance with the current order of the Ministry of Health of the Republic of Uzbekistan shall be permitted to work.

The process equipment used during operations generates harmful occupational factors (noise, vibration, temperature), which must comply with health and hygiene standards and regulations (SanPiN 0324, 0325, 0326).

The finished products do not constitute a source of environmental pollution.

Acceptance Rules

Acceptance rules – in accordance with GOST 24027.0.

Dietary supplements are accepted in batches. A batch is defined as any quantity of a product of a single name and form, manufactured according to a single formulation during a single production process and covered by a single quality certificate.

For product quality control, a sample comprising 3 per cent of the transport packages, but not fewer than three units, is selected from each batch by random sampling. From each selected transport unit, at least two product samples are taken in consumer packaging.

The selected samples are inspected for packaging quality, correct labelling and net weight.

To determine whether dietary supplements comply with the requirements of this standard, organisations shall carry out acceptance, periodic and certification tests.

Acceptance tests shall be carried out for each batch of dietary supplements against the following criteria:

appearance;

colour;
taste;
odour;
content of foreign matter.

Periodic tests shall be carried out for all parameters listed in Tables 1, 2 and 3 once every quarter.

Monitoring of the content of toxic elements, radionuclides, pesticides and microbiological parameters shall be carried out by an accredited testing laboratory under contract at least once every quarter.

If unsatisfactory results are obtained for at least one parameter, retests shall be carried out on a doubled sample taken from the same batch.

The results of the repeat tests shall be final and shall apply to the entire batch.

Certification testing of finished products shall be carried out in accredited laboratories to verify compliance with all the requirements of this standard of the organisation and the NISS of the Republic of Uzbekistan.

For herbal tea:

Ten sachets shall be sampled from each packaging unit. The mass of the combined average sample for testing shall be not less than 10 g.

To determine the compliance of dietary supplements with the requirements of this organisational standard, acceptance, periodic and certification tests shall be carried out.

Acceptance tests shall be carried out for each batch of dietary supplements according to the following criteria:

appearance;
colour;
taste;
odour;
content of foreign matter.

Periodic tests shall be carried out for all parameters listed in Tables 1, 2 and 3 once every quarter.

Monitoring of the content of toxic elements, radionuclides, pesticides and microbiological parameters shall be carried out by an accredited testing laboratory under contract at least once every quarter.

If unsatisfactory results are obtained for at least one parameter, repeat tests shall be carried out on a doubled sample taken from the same batch.

The results of the repeat tests shall be final and shall apply to the entire batch.

Certification tests on finished products shall be carried out in accredited laboratories to verify compliance with all the requirements of this standard of the organisation and the NISS of the Republic of Uzbekistan.

Transport and storage

Dietary supplements shall be transported by all modes of transport in covered vehicles in accordance with the rules governing the carriage of goods applicable to that mode of transport.

Vehicles must be dry, clean and free from any foreign odours.

It is not permitted to use vehicles that have previously carried toxic or strongly odourous goods, nor to transport food supplements alongside products with a distinctive odour.

Dietary supplements must be stored in clean, dry, well-ventilated storage areas free from foreign odours, at a temperature of between +2 °C and +25

°C and a relative humidity of no more than 70 per cent.

Dietary supplements must not be exposed to direct sunlight.

Manufacturer's Guarantees

The manufacturer guarantees that the dietary supplements comply with the requirements of the O'zMSt 166:2024 standard, provided that the consumer adheres to the conditions for transport and storage.

The shelf life of the dietary supplement is 24 months from the date of manufacture.

The physico-chemical parameters of the dietary supplement "Multivit Fitochoy", supplied as raw material in filter sachets, must comply with the requirements set out in Table 1..

Table 1

Results of the study of the physico-chemical parameters of the dietary supplement "Multivit" herbal tea

	Parameter names	Specifications
1.	Appearance, colour	A mixture of pieces of dried rosehip fruit (*Fructus Roae (Rosa canina L.)*), blackcurrant leaves and fruit (*Folia et Fructus Ribis nigri (Ribes nigrum L.)*), and cabbage leaves (*Folia Brassicae oleracea L.*), carrot root (*Radix dauci sativa (Daucus sativus Hoffm.)*), rowan berries (*Fructus Sorbi (Sorbus aucuparia L.)*), sea buckthorn berries (*Fructus Hippophaës (Hippophae rhamnoides L.)*), Calendula officinalis flowers (*Flores Calendulae (Calendula officinalis L.)*), Common pumpkin seeds (*Semen Cucurbitae (Cucurbita pepo L.)*), Stinging nettle leaves (*Folia Urticae dioicae (Urtica dioica L.)*). Colour: mottled green with yellowish, brownish or purplish flecks.
2.	Odour and taste	Has a characteristic odour. The taste is slightly sour and bitter.
3.	Surface of the tea leaves	Dry, not sticky
4.	Infusion	Bright, clear, brownish-brown
5.	Moisture content, %, not more than:	14

6.	Mass fraction of water-soluble extractives, %, not less than	20
7.	Mass fraction of ferromagnetic impurities, g, not more than	0.0005
8.	Content of foreign impurities	Not permitted

9.	Mass fraction of total ash, %, not exceeding, for herbal tea:	13
10.	In accordance with microbiological safety requirements	Must not exceed the values specified in TR TS 021/2011 (Annex 3)
11.	Active ingredient content: Vitamin C %, not less than Vitamin B1 Vitamin B_6	 0.99811 mg/ml 0.66910 mg/ml 0.49744 mg/ml

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