



**MODERN ASPECTS OF STANDARDIZATION AND QUALITY
CONTROL OF PLANT-BASED BIOLOGICALLY ACTIVE
SUPPLEMENTS**

Kamila Shayakhmetovna Mukhitdinova¹

Siyovush Askhatovich Mukhitdinov¹

Zakirjan Abidovich Yuldashev²

¹ Uzbek Scientific Research Institute of Chemistry and Pharmacy

² Tashkent Pharmaceutical Institute

E-mail: kamila-muhitdinova@mail.ru

<https://doi.org/10.5281/zenodo.17324128>

ARTICLE INFO

Received: 01st October 2025

Accepted: 07th October 2025

Online: 09th October 2025

KEYWORDS

*biologically active supplements,
plant raw materials,
standardization, quality,
control, safety.*

ABSTRACT

In recent decades, the Republic of Uzbekistan, as well as many countries worldwide, has experienced a steady increase in interest toward plant-based biologically active supplements (BAS). This trend is driven by growing public attention to disease prevention, a preference for natural remedies, and the dynamic development of the nutraceutical market. Nevertheless, significant challenges persist regarding the standardization, regulatory framework, and quality control of these products.

The aim of this article is to provide a comprehensive analysis of the current state of plant-based BAS usage, alongside the existing regulatory, standardization, and safety assurance challenges.

Introduction.

Plant-based biologically active supplements constitute an important subgroup of nutraceuticals widely used in disease prevention and health maintenance. According to international studies, the global BAS market grows annually by 5–8%, with a significant share represented by plant-derived products [1]. Despite high consumer demand, many plant-based supplements fail to meet established requirements in terms of composition, quality, safety, and efficacy, raising concerns among specialists and end-users alike. In the context of a rapidly expanding market, the need for standardization, implementation of scientifically justified evaluation criteria, and improvement of control mechanisms becomes increasingly urgent.

Countries with rich phytotherapy traditions—such as Japan, South Korea, and China—as well as the United States and European Union member states, exhibit the highest consumption of plant-based BAS. Interest in these products is also growing in the CIS countries, including Uzbekistan, driven by the popularization of integrative medicine and increasing demand for natural products.



In countries with well-developed pharmaceutical regulatory systems, diverse regulatory approaches are applied. In the EU, BAS are regulated as food products under Regulation (EC) No 1924/2006 and Directive 2002/46/EC, focusing on safety, labeling, and scientific substantiation of health claims. In the United States, the FDA oversees BAS under the Dietary Supplement Health and Education Act (DSHEA) of 1994. Japan and South Korea require strict registration processes that include clinical efficacy confirmation and hygienic production standards. China relies on pharmacopeial standards and a strong tradition of herbal medicine.

In Uzbekistan, plant-based BAS are increasingly in demand, particularly in the capital, where they account for 32% of pharmacy and online sales.

The national BAS regulatory framework includes several key components:

- **State registration:** mandatory for all BAS marketed within the country. Manufacturers and importers must provide documentation confirming safety and compliance with established requirements.

- **Voluntary digital marking:** from March 1, 2025, digital labeling of BAS has been introduced to increase market transparency, track product origin, and protect consumers from counterfeit products.

- **Compliance with EAEU requirements:** Uzbekistan adheres to the norms and standards established by the Eurasian Economic Union, including quality, labeling, and packaging requirements.

- **Supporting documentation:** legal sale of BAS requires state registration certificates, conformity declarations, and manufacturer quality certificates.

Despite positive developments, challenges remain due to the lack of clear national

1. **Counterfeiting and inaccurate composition:** products labeled as natural BAS often contain prohibited or undisclosed active substances.

2. **Absence of a unified raw material identification system:** high variability in plant material complicates standardization and quality control.

3. **Insufficient laboratory control:** limited availability of laboratories capable of comprehensive physicochemical, microbiological, and toxicological analyses.

To improve the quality, safety, and consumer trust in plant-based BAS in Uzbekistan, it is necessary to:

1. Establish a centralized, publicly accessible database of all registered BAS.

2. Develop modern laboratory infrastructure for independent analysis and quality control.

3. Enhance the training and qualifications of specialists and experts working in nutraceuticals, standardization, and pharmacovigilance.

Conclusion.

Plant-based biologically active supplements represent a promising direction in preventive medicine and healthcare systems. However, their safety and efficacy are directly dependent on the level of state control, scientific evaluation, and market transparency. International experience confirms the necessity of a systematic approach—from raw material standardization to mandatory control at all production and distribution



stages. Given the growing interest in plant-based BAS in Uzbekistan, especially within the framework of integrative medicine, it is crucial to establish an effective regulatory system that ensures quality, safety, and consumer confidence.

References:

1. Analysis of Nutraceutical Market Size, Share, and Growth. <https://www.skyquestt.com/report/nutraceuticals-market>
2. Adams, et al. (2018). Current trends in the analysis and quality control of food supplements based on plant extracts. *Analytica Chimica Acta*.
3. De Paepe, et al. (2009). The role of quality assurance and standardization in botanical safety. *PMC*.
4. Dlugaszewska, et al. (2019). Are dietary supplements containing plant-derived ingredients safe microbiologically? *Saudi Pharmaceutical Journal*.
5. Harnly & Wei (2012). Implementation of a “quality by design” approach to botanical dietary supplements. *PubMed*.
6. Kupferschmidt & others (2023). Pharmacopeial standards for quality control. *PubMed*.
7. Wikipedia contributors. Good manufacturing practice; European Pharmacopoeia; AOAC International.