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QUALITATIVE AND QUANTITATIVE ANALYSIS OF FAT-SOLUBLE VITAMINS IN VITAMIN-MINERAL COMPLEXES

***Jabborkhonova Nodirakhon Abdumalik kizi*[1], *Murzaev Rustam Kamilovich*[2]**

[1] Customs Institute of the Customs Committee of the Republic of Uzbekistan

[2] Central Customs Laboratory of the Customs Committee of the Republic of Uzbekistan

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Abstract

In this article, the qualitative and quantitative analysis of fat-soluble vitamins in biologically active additives consisting of 6 different vitamin-mineral complexes was investigated by the method of high-performance liquid chromatography. Fat-soluble vitamins in the samples were compared with the quantity indicated on the label of biologically active additives and the standard values for biologically active additives. The results obtained from the study samples showed that the fat-soluble vitamins in all samples corresponded to normal indicators.

Keywords: *biologically active additives, fat-soluble vitamins, high-performance liquid chromatography, vitamin A, vitamin E, vitamin D, antioxidant*

Indtroduction

Among physiologically active natural organic compounds, alkaloids, hormones, antibiotics, and other fat-soluble vitamins (A, D, E, K) occupy a special place. They are irreplaceable therapeutic agents necessary for the body and enhance the body's protective functions. Vitamins are widely used as food additives with antioxidant effects and are important in the diet and healthcare (Denisova L. V., Filimonov V. N., 2014). Therefore, monitoring the composition and levels of vitamins is crucial for the qualitative and quantitative analysis of pharmaceutical preparations, especially food-grade biologically active supplements.

High-performance liquid chromatography was used to determine the content of fat-soluble vitamins (A, E, D) in vitamin and mineral complexes (Baklykov A. V., Artemiev G. A., Glavatskikh S. A., Kopchuk D. S., 2017; Mikheeva E. V., Anisimova L. S., 2005; Mikheev E. V., Anisimov L. S., Pikul N. P., 2004; Methodology M 04–44–2006; GOST R 50928–96; De Lechneer A. P., 1979; Ruperez F. J., 2001; Salo-Väänänena P., Ollilainena V., Mattilab P., 2000). For vitamins A and E, a metal column filled with a 120 × 4 mm nucleosil C18 sorbent was used, and for vitamin D, a MZ-AquaPerfect C18 column of 200 × 4 mm was used.

Materials and Methods

When studying the composition of all samples taken for the study, it was established that all of them contain vitamins A, D, E.

Test solutions and standard samples were prepared in 6 different samples taken for the study, and 20 *μl* of samples and standards were sent to the HPLC for research, and a qualitative and quantitative analysis of fat-soluble vitamins was carried out (Fig. 1–4).

Calculations were performed according to the data of high-performance liquid chromatography, and the qualitative and quantitative analysis of fat-soluble vitamins is presented in (Table 1).

Figure 1. *Chromatogram of standard solutions of vitamin A (13.214) and vitamin E (17.841). Analysis conditions: column Nucleosil C18, 120 × 4 mm (5 μm); mobile phase methyl alcohol; flow rate 1 ml/min, absorption spectrum – 284 nm*

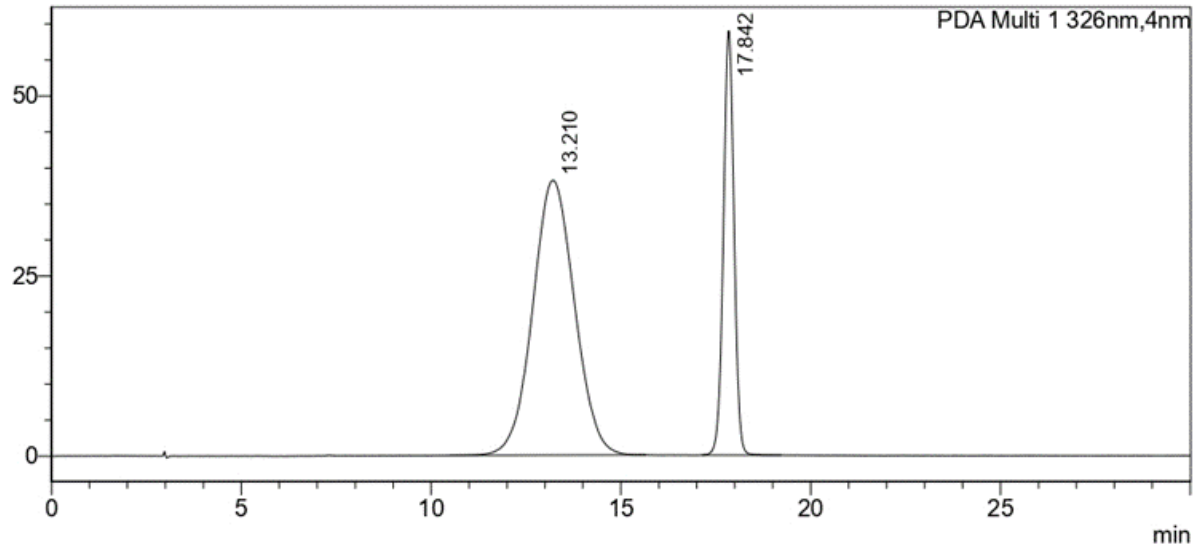


Figure 2. *Chromatogram obtained by high-performance liquid chromatography of vitamins A (13.214) and E (17.841) contained in the biologically active supplement "Supravit multi active"*

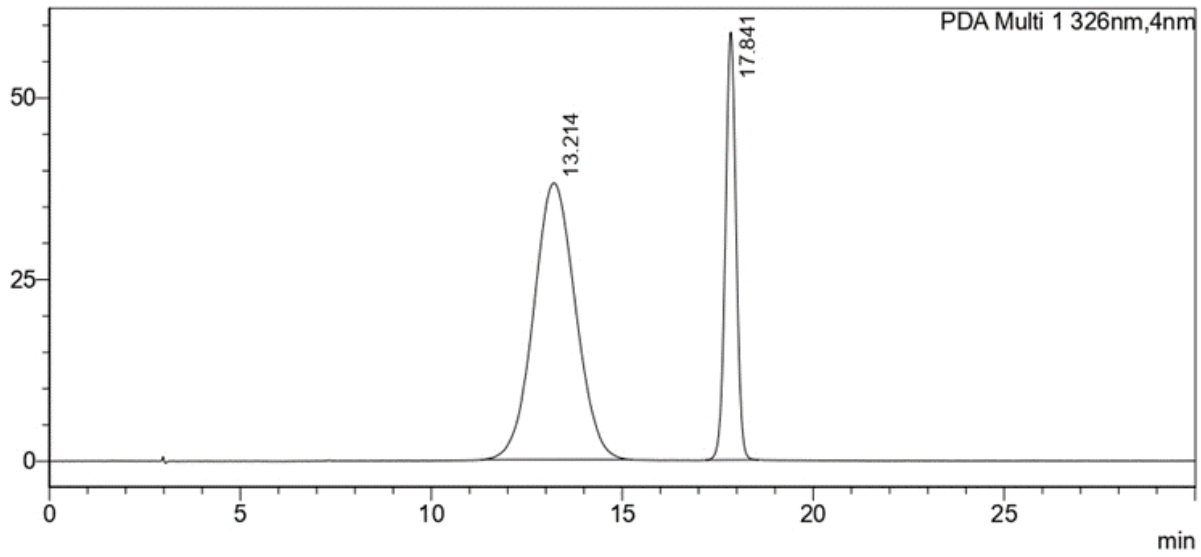


Figure 3. *Chromatogram of standard solutions of vitamin D (14.482). Analysis conditions: MZ-AquaPerfect C18 column 200x4 mm, (3μm); mobile phase methanol (70): acetonitrile (30); flow rate 0.8 ml/min, absorption spectrum-265 nm*

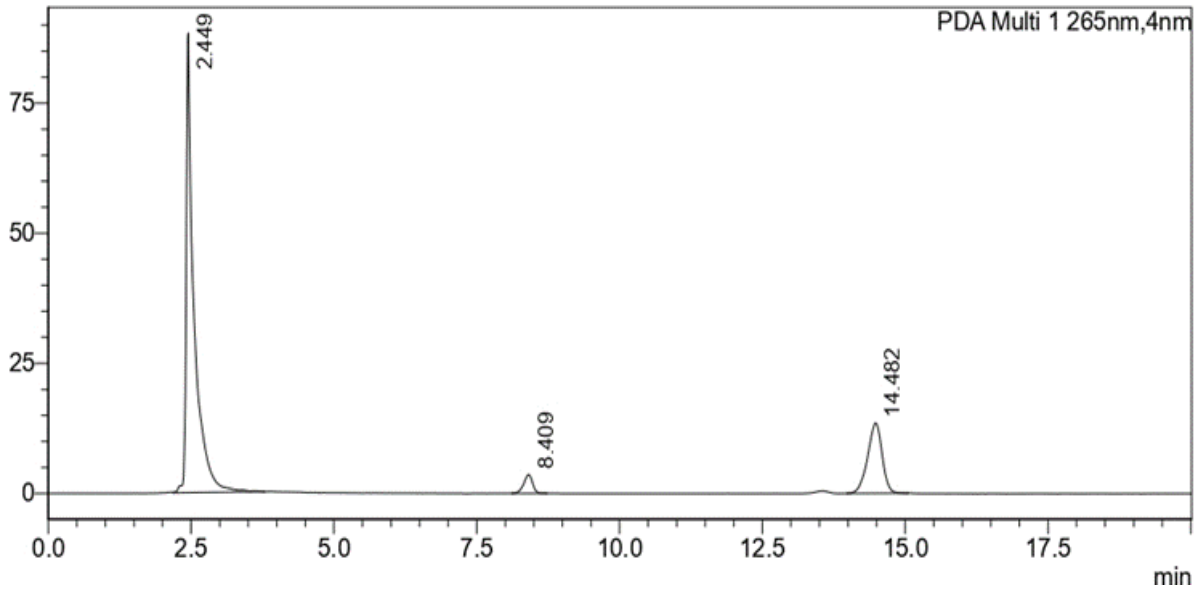
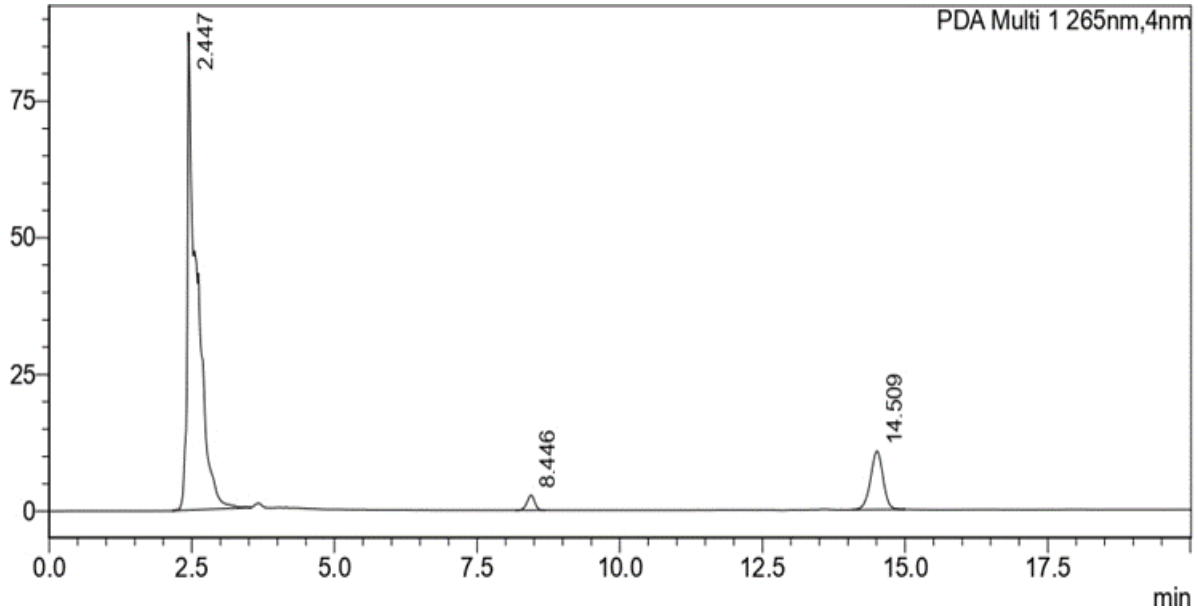


Figure 4. *Chromatogram of vitamins A (13.509) contained in the biologically active supplement "Supravit multi active," obtained by high-performance liquid chromatography*



Chromatographic separation of fat-soluble vitamins was carried out in the mobile phase. Methyl alcohol, the mobile phase, was used for vitamins A and E. The UV absorption spectrum was 326 nm for retinol acetate (vitamin A) and 284 nm for α-tocopherol acetate (vitamin E). A 70:30 ratio of the mobile phase methanol and acetonitrile was used for vitamin D. The UV absorption spectrum for cholecalciferol (vitamin D) was 265 nm.

As can be seen from the results obtained from the study samples, the fat-soluble vitamins in all samples corresponded to normal indicators. That is, the requirements of the Eurofarm standard indicate that the standard indicator for vitamins A, E, and D can be 10% less or 65% more than the indicator indicated on the package. In the samples we took as a study, it was found that all fat-soluble vitamins (A, D, E) are at the normal level.

Table 1. *Vitamin content in samples*

No.	Samples	Fat-soluble vitamins					
		Vitamin A		Vitamin E		Vitamin D	
		passport, µg/tab	Found mcg/tab	passport, µg/tab	Found mcg/tab	passport, µg/tab	Found mcg/tab
1.	Duovit	2646–4851	3050	9–16.5	12.5	180–330	265
2.	Komplivit	720–1320	805	1.8–4.9	3.4	–	–
3.	O-252 Life Factor	–	–	6.7–12.3	10.2	11.3–20.6	12
4.	Supravit multi aktiv	450–825	560	22.5–41.2	20	4.5–8	5.2
5.	Vitrum pre-natal	774–1400	880	18–33	20.5	9–16.5	13.8
6.	Multi tabs klassik	720–1320	860	9–16.5	12.8	4.5–8.25	6.5

Based on the results obtained from standard samples of vitamins, it is possible to conduct qualitative and quantitative analysis of water-soluble and fat soluble vitamins in vitamin-mineral complexes using the HPLC method.

Conclusion

In conclusion, it can be said that studies conducted using high-performance liquid chromatography have practically proven that water-soluble and fat-soluble vitamins in vitamin-mineral complexes give repeatable results with rapid, convenient, and high sensitivity, as well as statistical reliability.

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© Jabborkhonova N. A., Murzaev R. K.
Contact: nodirabarno@gmail.com