

SPECTROPHOTOMETRY FOR GEL ANALYSIS CONTAINING DRY EXTRACT OF BLACK CUMIN

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Thymoquinone (TQ) is one of the main biologically active components of the essential and non-volatile oils of *Nigella sativa* (black cumin) [1]. According to the literature, TQ exhibits antioxidant [2], anti-cancer [3], anti-inflammatory [4], antibacterial [5], antihistamine [5], and hypoglycemic [5] activities.

To date, pure thymoquinone is not used; instead, its raw materials—seeds and oil of *Nigella sativa*—are utilized. There are registered dietary supplements based on black cumin oil: "Nigenol" (in capsules), "Diabsol" (in capsules), "Oil of Grace" (for oncology, diabetes, hepatitis), cream "Baraka" (for cosmetology), and an ointment made from black seed (elcaptain ointment black seed). In Uzbekistan, there are no pharmaceutical products derived from black cumin.

The review of the current state of research in the fields of chemistry and pharmacology [5], as well as the development of pharmaceutical forms of thymoquinone, has led to the conclusion that the development and standardization of pharmaceutical products based on seeds, as well as the oil and dry extract of black cumin, with the aim of introducing them into medical practice as urological, proctological, anti-inflammatory, and oncological agents, is a relevant and promising task for pharmaceutical science.

The Institute of Pharmaceutical Education and Research is conducting research on the development of rational pharmaceutical preparations based on dry extract of black cumin (containing about 10% TC), namely gels, with the aim of introducing them into medical practice as anti-inflammatory agents for dental practice.

Gels are a promising pharmaceutical form as they have a pH close to that of the skin, can be prepared quickly, do not clog skin pores, distribute rapidly and evenly, and allow the incorporation of hydrophilic active substances. Preliminary experiments on the pharmacological activity of the obtained gel, conducted at the Research Center of "Med Standart" LLC, demonstrated its anti-inflammatory activity.

It is well known that the main issue in the standardization of pharmaceuticals is the development of methodologies for assessing and controlling their quality.

Objective of the study: To develop a method for determining the authenticity and quantitative content of thymoquinone (TQ) in its gel formulation.

Materials and Methods of the Study. In the course of our research aimed at developing a methodology, we examined the feasibility of using a spectrophotometric method of analysis. The object of the study was a dry extract of black cumin (with a thymoquinone content of 10%). For measuring the UV spectrum, we employed a spectrophotometer "UV-1800" (serial number

A11635372241) with a measurement range from 190 to 1100 nm, operating from 0 to 100% with an accuracy of 1% (Shimadzu, Japan).

Results and Discussion. The methodology for determining thymoquinone (TQ) in the gel is as follows: Approximately 1.00 g (accurate weight) of the gel is placed into a 100 ml conical flask with a ground stopper. Then, 50 ml of 70% ethanol is added, and the mixture is dissolved in an ultrasonic bath for 10 minutes. After that, the flask with the contents is cooled, and the volume of the solution is adjusted to the mark with 70% ethanol and mixed thoroughly (Solution A).

3 ml of the obtained Solution A is filtered through a Milipore filter with a pore size of 0.22 µm and placed into a 50 ml volumetric flask. The volume is then brought to the mark with 70% ethanol and mixed thoroughly (test solution B).

The optical density of Test Solution B is measured using a spectrophotometer at a wavelength of 255 nm, employing 70% ethanol as the comparison solution in a 10 mm layer thickness cuvette.

At the same time, the optical density of the TQ working standard solution (WS) is measured.

Preparation of the standard sample solution (WS) of TQ: approximately 19.2 mg (accurate weight) of TQ (pharmacopoeia monograph 42-2824-92, BP, EurPh) is placed into a 50 ml volumetric flask, dissolved in 30 ml of 70% ethanol, and the volume is adjusted to the mark with the same solvent and mixed thoroughly.

0.3 ml of the obtained solution is placed into a 25.0 ml volumetric flask, and the volume is adjusted to the mark with 70% ethanol. The solution is used freshly prepared. The content of TQ (X, g) in 1 g of the gel is calculated using the formula:

$$X = \frac{D_1 * m_0 * I * P * 1000}{D_0 * m_1 * 3 * 100}$$

where: D_1 – optical density of the test solution; D_0 – optical density of the reference solution of TQ; m_1 – mass of the sample, in grams; m_0 – mass of the TQ used to prepare the reference solution, in grams; P – content of thymoquinone in its reference solution, in %; The content of $C_8H_9NO_2$ (thymoquinone) must be at least 5 mg/ml in 1 g of the gel.

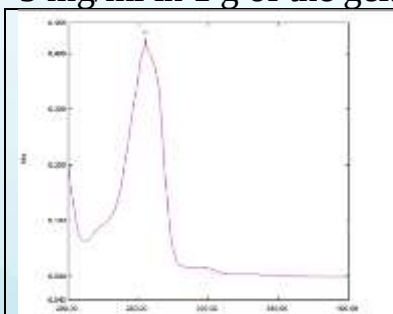


Fig. 1. UV spectrum of the solution of the working standard sample TX

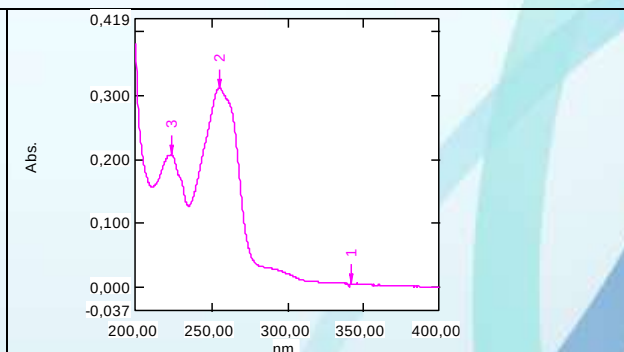


Fig. 2. UV spectrum of the solution of the gel of the dry extract of black cumin

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