ANALYSIS OF THE ELEMENTS OF NIGELLA SATIVA L VEGETABLE OIL AND ITS SIGNIFICANCE IN TRADITIONAL MEDICINE

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АНАЛИЗ ЭЛЕМЕНТОВ РАСТИТЕЛЬНОГО МАСЛА ЧЕРНУШКА ПОСЕВНАЯ (NIGELLASATIVAL) И ЕГО ЗНАЧЕНИЕ В НАРОДНОЙ МЕДИЦИНЕ

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ABSTRACT

In this article, the chemical composition of sedana (Nigella sativa l) plant is fully explained and "Cold pressing" method was used to fully preserve the beneficial chemical modes of sedana (Nigella sativa l) oil. Oil was extracted by pressing high-quality seeds of sedana cleaned in accordance with sanitary requirements with the help of "DD85-G" press equipment manufactured by the German company "AEN Engineering GmbH & Co.KG", analysis of macro-micro elements Avio200 ISP-OES Inductively coupled was analyzed in a plasma optical emission spectrometer (Perkin Elmer, USA). The accuracy of the device is high,

and it allows to measure the elements contained in the solution to an accuracy of 10^{-9}g.

АННОТАЦИЯ

В этой статье полностью объяснен химический состав растении чернушки (Nigella sativa l), и для полного сохранения полезных химических свойств масла чернушки (Nigella sativa l) был использован метод «холодного отжима». Масло получали прессованием очищенных в соответствии с санитарными требованиями сортовых семян чернушки на прессовом оборудовании «DD85-G» производства немецкой фирмы «AEN Engineering GmbH&Co.KG», анализ макро-микроэлементов Avio200 Индуктивно-связанный ИСП-ОЭС анализировали на плазменном оптико-эмиссионном спектрометре (PerkinElmer, США). Точность прибора высокая, он позволяет измерять элементы, содержащиеся в растворе, с точностью до 10^{-9}г.

Key words - nigella sativa l, campesterol, p-coumar, saponin, sitosterol stig-masterol, p-dihydroxybenzoic, ferulic

Ключевые слова – чернушка посевная, nigella sativa, кампестерол, п-кумар, сапонин, ситостерол. стигмастерол, п-дигидроксибензойная, феруловая

1. Introduction

Sedana (Nigella sativa L.) is a perennial herbaceous plant that grows up to 70-75 cm tall. It is currently cultivated in Southeastern Bulgaria, North America, Central and Southern Europe, Eastern and Southern Asia, Western Central Asia, as well as in the Near East (Pakistan, Afghanistan, Saudi Arabia, Iran), Northern Africa, Tunisia, and also in India. Additionally, sedana is cultivated in Lithuania, the southern and western parts of Ukraine, Moldova, Crimea, and the Caucasus region. In the European part of Russia, it grows in the south and in the Caucasus, and it can be found growing wild in some areas and cultivated in agricultural conditions. In Uzbekistan, it is widely cultivated in the Tashkent and Samarqand regions.

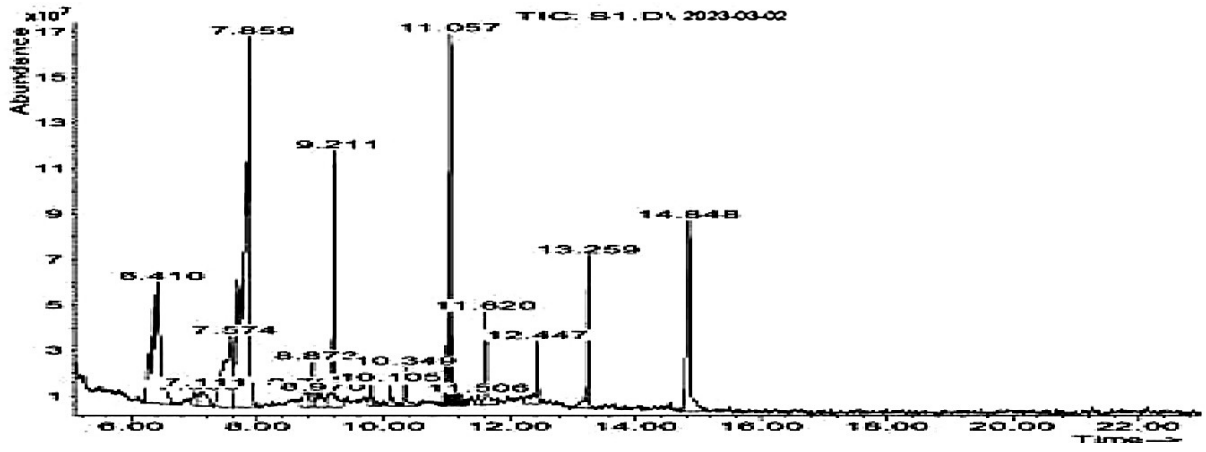
Sometimes, sedana is also used as a decorative plant among gardeners. Its stem is straight, slender, branched, and pubescent, with leaves that are lanceolate, entire, sessile, and opposite. The lower leaves of the stem are stalked, while the upper leaves are stalkless and arranged alternately. Its flowers are large, with 5-8 petals, and they are located separately within the axils of the branches. The fruit is a capsule with oily seeds, the seeds are three-sided and rough. It blooms from May to July, and its fruits ripen from June to August.

The chemical composition of Sedana is as follows-The active ingredient of sedana oil is a combination of important acids and a complex of terpenoid accumulations.

Table 1

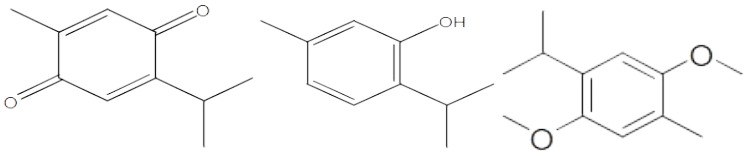
Sedana Seed Oil Composition of Fatty Acids

Trivial Name	Systematic Name	Acid Formula
Saturated Fatty Acids		
Myristic Acid	Tetradecanoic Acid	$C_{13}H_{27}COOH$
Pentadecyl Acid	Pentadecanoic Acid	$C_{14}H_{29}COOH$
Palmitic Acid	Hexadecanoic Acid	$C_{15}H_{31}COOH$
Margaric Acid	Heptadecanoic Acid	$C_{16}H_{33}COOH$
Stearic Acid	Octadecanoic Acid	$C_{17}H_{35}COOH$
Arachic Acid	Eicosanoic Acid	$C_{19}H_{39}COOH$
Behenic Acid	Docosanoic Acid	$C_{21}H_{43}COOH$
Lignoceric Acid	Tetracosanoic Acid	$C_{23}H_{47}COOH$
Monounsaturated Fatty Acids		
Myristoleic Acid	cis-9-Tetradecenoic Acid	$C_{13}H_{25}COOH$
Palmitoleic Acid	cis-9-Hexadecenoic Acid	$C_{15}H_{29}COOH$
Oleic Acid	cis-9-Octadecenoic Acid	$C_{17}H_{33}COOH$
Polyunsaturated Fatty Acids		
Linolenic Acid	cis-, cis-9,12-Octadecenoic Acid	$C_{17}H_{31}COOH$
Linoleic Acid	cis-, cis-, cis-6,9,12-Octadecenoic Acid	$C_{17}H_{28}COOH$
Arachidonic Acid	cis-, cis-, cis-5,8,11,14-Eicosatetraenoic Acid	$C_{19}H_{31}COOH$



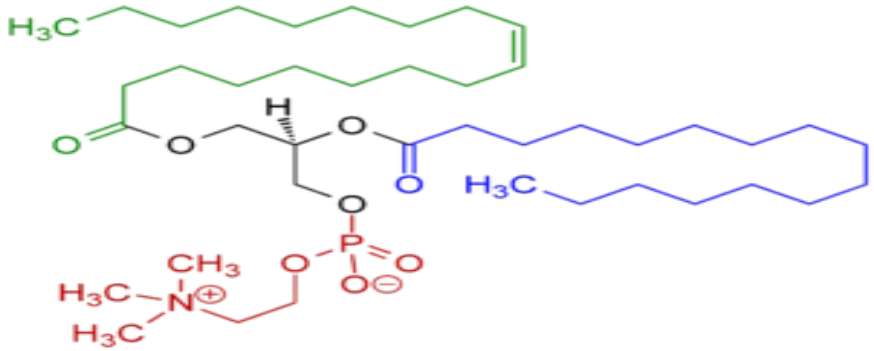
Picture 2.Terpenoid chromatogram of ethanol extract of sedana seeds.

According to scientific data, the main component of sedana oil is considered to be nigellone. Nigellone is described as a mixture of dithymoquinone and thymoquinone, hence, others refer to it as dithymoquinone [3,4,5].

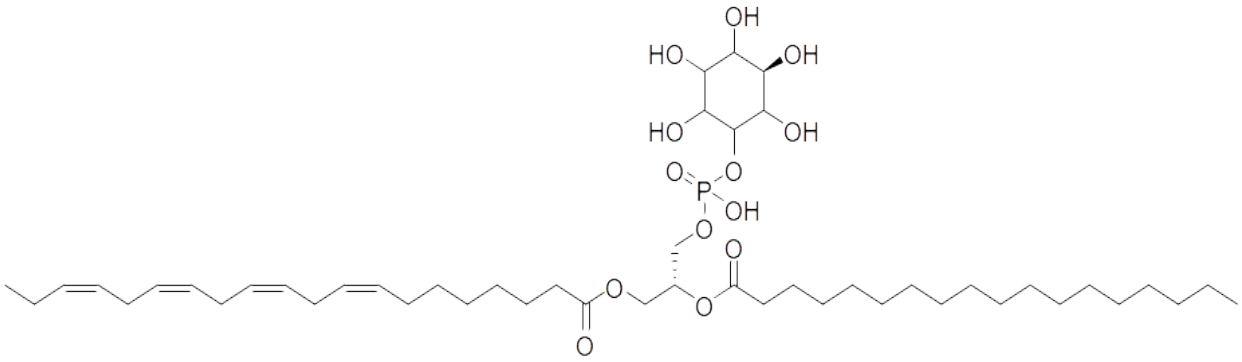


ThymoquinoneThymolThymohydroquinone

In sedana seed oil, there are derivatives of phospholipids such as phosphatidylcholine and phosphatidylinositol present. [6].



phosphatidylcholine



phosphatidylinositol

Some chemical elements are present in sedana seed oil in small quantities, yet they play an important role in metabolic processes and are necessary for human health[7]. Micronutrients are involved in enzymatic structures, influencing the biochemical activity of cells[8].

The presence of chemical elements in plant composition affects the geochemical properties of the soil and contributes to their absorption. Due to the

high solubility of these accumulations in water, they are easily absorbed by plant roots in ion form since roots are the main organ that absorbs these salts[9].

Experimental Section: To preserve the beneficial chemical compounds in sedana seed oil, the "Cold Pressing" method was used. For this purpose, the high-quality sedana seeds were pressed using the "DD85-G" press machine manufactured by "AEN Engineering GmbH & Co.KG" company in Germany, following sanitary requirements. The extracted oil was obtained by pressing sedana seeds, ensuring that the amount of oil extracted was 35% and the maximum temperature was kept below 45°C to guarantee the high quality of the product.

The fully dried sedana seed oil sample was prepared for mineralization, i.e., converting it to a clear solution, by digesting 200 mg of the sample in an analytical tare (FA220 4N). For the mineralization process, a mineralization system (MILESTONE Ethos Easy, Italy) was used. The sample (200 mg) was placed in the digestion vessel of the system and digested with 6 ml of nitric acid (HNO3) under infra-red irradiation (Distillacid BSB-939-IR) and 2 ml of hydrogen peroxide (H2O2) as an oxidizing agent. After digestion for 20 minutes at 180°C, the entire mixture was transferred to a separate conical measuring flask and diluted with distilled water (BIOSAN, Latvia) to a final volume of 40 ml.

The diluted solution was transferred to special vials for analysis in the AutoSampler section of Avio200 ICP-OES Inductively Coupled Plasma Optical Emission Spectrometer (Perkin Elmer, USA). The high precision of the system allows for the measurement of elements in the composition of the solution down to 10^{-9}g accuracy.

Table 1.

The data obtained from the analysis is as follows:

Element	Li (mg/100g)	Al (mg/100g)	Mo (mg/100g)	Te (mg/100g)	Se(mg/ 100g)	Sb (mg/100g)	Sn (mg/100g)	Sr (mg/100g)	K (mg/ 100g)
Nigella S	0.268	1.074	0	0,084	1.074	0	0,087	3.08	9.24
Ba (mg/100g)	Cr (мг/100г)	Mn (мг/100г)	B (мг/100г)	Ca (мг/100г)	As (мг/100г)	Fe (мг/100г)	Na (мг/100г)	Pb (мг/100г)	Cd (мг/100г)
0,053	0,34	0,072	0	10.73	0	3.26	3,985	0,016	0

V (мг/100г)	Zn (мг/100г)	Cu (мг/100г)	Ag (мг/100г)	Hg (мг/100г)	Co (мг/100г)	Ni (мг/100г)	P (мг/100г)	S (мг/100г)	Mg (мг/100г)
0,017	0,118	0,031	0	0	0	0,172	1.928	37.1	0,932

CONCLUSION - Sedana seeds were analyzed using inductively coupled plasma optical emission spectrometer (Avio 200 ISP-OES). As a result, the concentrations of macro and micro elements such as S-sulfur, K-potassium, Ca-calcium, Sr-strontium, P-phosphorus, Na-sodium, etc., were determined in the sedana seed oil. When comparing sedana seed oil to the food product hygiene standard, no traces of harmful heavy metal salts such as arsenic (As), mercury (Hg), or cadmium (Cd) were detected. In addition, the basis of sedana oil is fatty acids, and these acids are anti-inflammatory substances in the internal and external inflammation of the body.This shows that it is possible to use sedana oil as a food additive and in the inflammatory process of the body.

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