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Methods for the Identification of Caraway Ethers by Chromatographic Analysis

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Abstract: The cumin plant, belonging to the caraway family, belongs to the medicinal plants of Asia. The article describes methods of extraction and mass spectrometry of cumin plants. This paper shows an ethanolic extract of cumin. The method involves water-enzymatic extraction of crushed seeds: invention allows to increase the yield of extractive substances from vegetable raw materials and increase the content of prostix esters of substances in extracts.

Keywords: cumin family, cumin, medicinal plant, mass spectroscopy: ethanol extract of meat, water-enzymatic extraction, crushed plant solution, antioxidant substances in extracts.

Introduction

Cumin (cuminum cyminum lat.) is a herbaceous plant of the Umbelliferae family. Cumin is often confused with Cumin, not only because of the external similarity of seeds, but also for similar names. Like many oriental spices, Cumin has many names: Zira, Zera, Roman cumin, Kmin, Cammun and others. But, despite the similarity, these are completely different plants with different tastes and characteristics.

This spice is familiar to many as a seasoning for pilaf. Cumin is indeed considered one of the best seasonings for meat, as it speeds up its readiness during cooking and stewing and helps to digest it.

Cumin is added to vegetable dishes, rice dishes and other cereals, flavoring bread and pastries. Cumin seeds contain 3.5% essential oil and do not lose their medicinal value for seven years [1-10].

Traditionally used to treat fever, headache, anxiety, diarrhea, asthma and stroke, black seed oil has a strong anti-inflammatory effect. Black seed oil is rich in phenolic compounds used as an antioxidant and essential fatty acids, in addition to bioactive compounds such as sterols and tocols. In addition, yellowish oil contains proteins, amino acids, reducing sugars, mucus, alkaloids, organic acids, tannins, resins, toxic glucosides, metarbines, bitter substances, glycosidic saponins, crude fiber, minerals and vitamins. Among various oilseeds, black cumin oil is particularly interesting because it can be used in preparations containing phytochemicals with strong antioxidant properties and health benefits. Thymoquinone is the active compound in crude extracts. It has antioxidant/anti-inflammatory efficacy, as well as asthma, diabetes, encephalomyelitis, neurodegeneration, and carcinogenesis [11-20].

Fig-1.

Methods and results

From the prior art there are various methods for obtaining extracts from plant materials, which differ in the nature of the extractant (water, water-alcohol mixture, whey, liquefied gases), methods of physical impact (sonication).

One of the well-known methods is a method for obtaining an extract from plant raw materials of cumin, which includes extraction with water at a temperature of 95-100°C for 45-60 minutes.

The disadvantage of this method is a single extraction of the raw material with water, an elevated temperature and duration of extraction, which reduce the stability of biologically active substances, and a single extraction does not make it possible to obtain the optimal yield of extractives.

Also known is a method for obtaining plant extracts for the production of soft drinks, including water-enzymatic treatment of plant materials crushed to a particle size of 5-10 mm for 2 hours at a temperature of 40-45°C and pH 4.5-5.0. Then the extraction is carried out with a water-alcohol solution of 20% concentration in two stages: stage 1 - extraction process 10-12 hours, stage 2 - 4-6 hours with occasional stirring for 5 minutes every two hours. As an enzyme preparation, it is used in industry. The disadvantage of this method is the use of alcohol, which, on the one hand, limits the amount of dosing of plant extracts in soft drinks, and on the other hand, alcohol is undesirable in drinks that are consumed in large quantities by children. In addition, the disadvantage of this method is the duration of the extraction process.

The closest technical solution to the proposed method is a method for obtaining a plant extract with a high yield of selenium and biologically active substances. The method includes grinding plant cumin with a particle size of 5-8 mm at a temperature of 80°C for 3 hours.

Fig-2.

Discussion results

The technical results are achieved by the fact that the dry plant material from cumin seeds is crushed to a particle size of 2-5 mm and extraction is carried out in two stages: at the first stage at a temperature of 85°C for 30 minutes with separation of the liquid part; at the second stage, water-enzymatic extraction of the remaining solid part is carried out with one Visko Star cytolytic enzyme preparation at a temperature of 55°C for 3 hours with stirring every 20 minutes, followed by separation of the liquid part. The extracts of the first and second plums are combined and filtered.

The proposed method differs from the known one in that the water extraction of the plant raw materials used is carried out twice, only one enzyme preparation of the cytolytic action ViskoStar is used, the water-enzymatic extraction is carried out at the second stage, and the grinding of the raw material is carried out to smaller particles (2-5 mm). From the foregoing, it can be assumed that extraction, carried out twice with a higher degree of grinding of raw materials, will allow extractive and antioxidant substances to be more fully isolated from plant raw materials, and the use of only one expensive enzyme preparation will make it possible to reduce the cost of the proposed method for obtaining plant extracts.

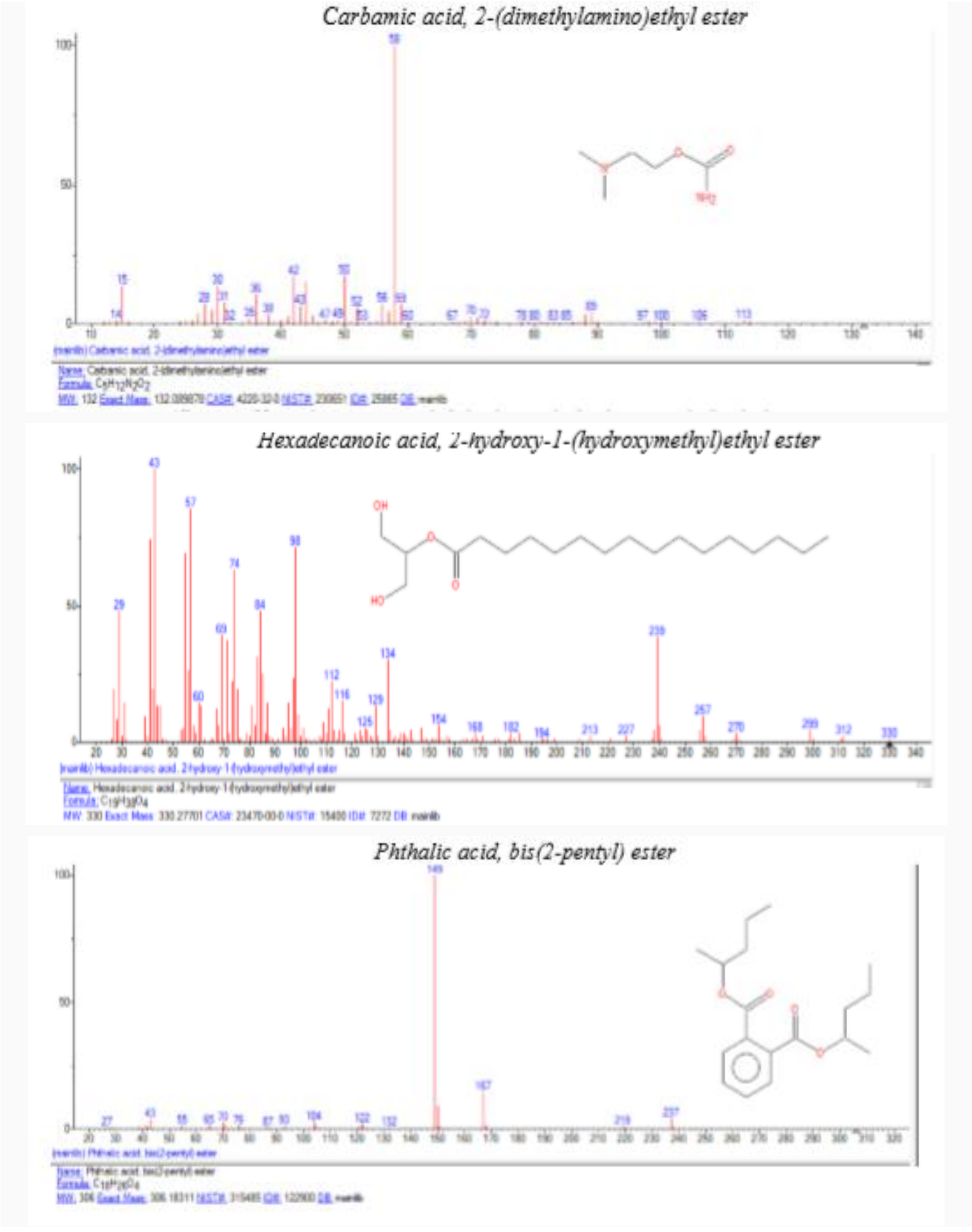
The ratio of raw materials: extractant (water) during the first extraction is 1:15 (mint 1:20), during the second - 1:8 (mint 1:10).

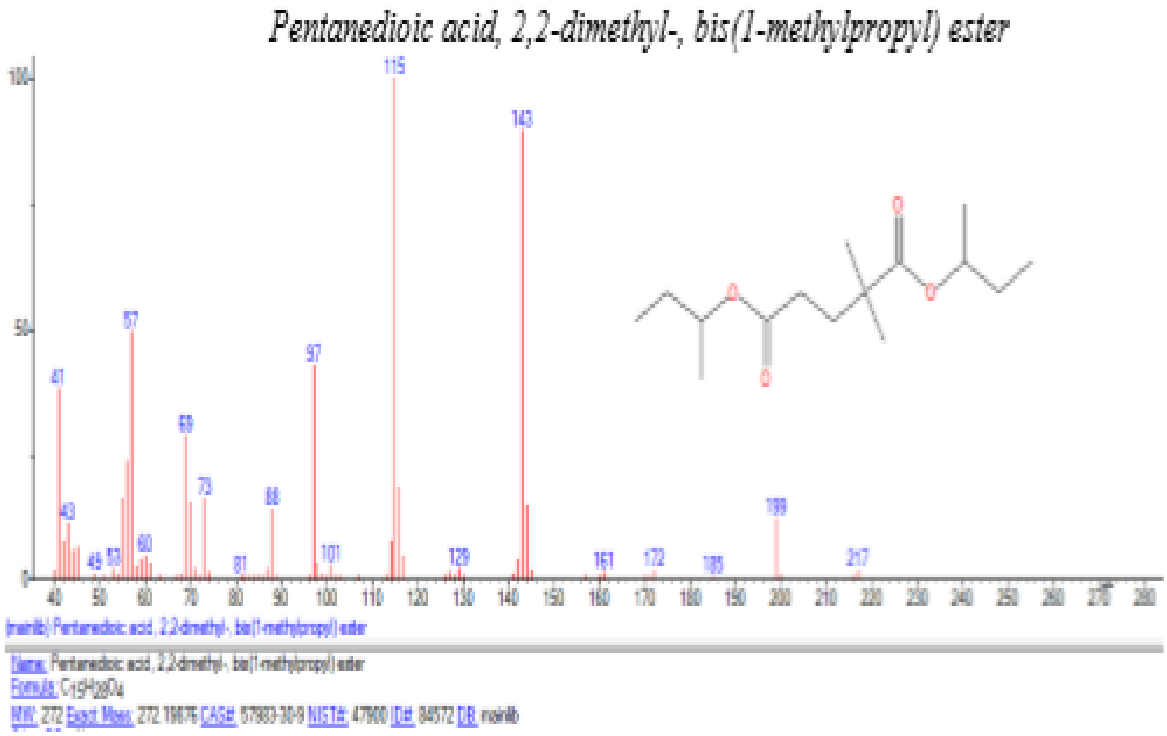
Visko Star was used as a cytolytic enzyme preparation. An example of the implementation of the method. Dry plant material: caraway seeds, crushed to a particle size of 2-5 mm and each separately poured with water at a temperature of 85°C in a ratio of 1:15 (mint 1:20). Extraction of raw materials is carried out at the same temperature for 30 minutes and stirring every 5 minutes. Then cooled to room temperature for 45-60 minutes. After cooling, the liquid part (first drain) is separated from the solid part by decantation. The solid part is re-filled with water at a temperature of 55 ° C in a ratio of 1:8 (cumin 1:10), the mixture is acidified with citric or other food acid to pH 5.5, an enzyme preparation of cytolytic action Visko Star is added in an amount of 0.01% to the mass of raw

materials and carry out enzymatic treatment for 3 hours at a temperature of 55°C and stirring every 20 minutes. Then the liquid part (the second drain) is separated from the solid by centrifugation. The extracts of the first and second plums are combined and filtered.

Experimental part

In the mass spectra of aliphatic ethers, the molecular ion manifests itself as a weak signal, and for ethers, as an intense signal. The main direction of molecular ion fragmentation is bond cleavage between α- and β-carbon atoms and heterolytic cleavage of the C–O bond. As a result, ions with a mass (m / z) equal to 31, 45, 59 ... M-46, M-33 appear.





Conclusion

For ethers, fragmentation occurs by loss of the alkyl chain. In ethers, the molecular ion or the M–H ion loses the CO group, and the bond between the oxygen atom and the aryl substituent is also broken. Also, in mass spectrometry, esters undergo rearrangements with elimination of an alcohol molecule or, in the case of aryl esters, with elimination of an alkene and the formation of a phenol.

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