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BIOLOGICALLY ACTIVE COMPOUNDS PRESENT IN FERULA MOSCHATA EXTRACTS

Annotation: The article describes the chemical and biological properties, complex substances of the composition of the ferula and the area of its distribution. The aim of this work was to study the chemical composition of the musky ferula plant in order to determine the biologically active substances present in it.

Keywords: Musk ferula, Ferula moschata, sumbul, mass spectrometry, traditional medicine, medicinal plant.

There are many medicinal plants in Uzbekistan, in which it is necessary to study the full composition of the chemicals present in them. One of these plants is Ferula moschata, popularly called sumbula, belonging to the genus Ferula, which is a perennial plant of the celery family - Apiaceae. Although there are various types of Ferula similar in appearance and morphological features, Ferula stink (Ferula assa-foetida) is widespread in nature. Musk Ferula mainly grows in Central Asia (Turkestan Range, Zeravshan, Gissar Range) on rocky slopes. More than 50 species of this plant are found in Uzbekistan. An herbaceous plant whose root smells strongly of musk, as a result of which the local population also calls it musk root, sassik carpet, ditch, ravshan, kamol, murcha kamol and others. In Arabic, the word "sumbul" means hyacinth (a genus of plants of the Asparagus family (Asparagaceae)). Musk ferula roots contain 2-4% essential oil, so it is used to flavor confectionery, in canning, in perfumery, and also in folk medicine. In medical practice, plant parts containing biologically active substances that have a positive effect on the human body are used. Basically, roots and rhizomes, leaves, bark, flowers, fruits and other parts of plants are used as a medicine. Ferula is used to treat convulsions, tuberculosis, plague, syphilis, whooping cough, toothache, diseases of the nervous system and other ailments, and is also used as a tonic, expectorant and anthelmintic.

Recently, chromatographic methods coupled with mass spectrometric instruments have become widely used as a method of scientific research in many analytical laboratories. These methods have become a routine technological platform for the study of both plant and non-plant secondary metabolites [1, 2]. However, there are not so many scientific articles covering the study of the chemical composition of medicinal plants by gas chromatography and high-performance liquid chromatography, coupled with mass spectrometry. This is especially true of the flora of Uzbekistan, where a huge arsenal of medicinal plants remains unexplored in full.

The glycan 3ꞌ-galactose, a milk oligosaccharide, was also found, the similarity of which reached almost 75% with the data from the NIST library. It is known that milk oligosaccharides are a family of structurally different complex glycans [4]. These oligosaccharides are mainly composed of a lactose structure that is modified by the addition of the sugars glucose (Glc), galactose (Gal), fucose (Fuc), N-acetylglucosamine (GlcNAc), N-acetylgalactosamine (GalNAc) and N-acetylneuraminic acid (sialic acid) (Neu5Ac). Human and cow milk contain only trace amounts of β-glycan oligosaccharides. It is known that GOS exhibit prebiotic activity [5], which resist small intestinal breakdown, having a positive effect in the colon [4]. Moreover, glycan oligosaccharides are able to modulate the immune system. In addition, glycan oligosaccharides are reported to inhibit the adhesion of pathogens to the surface of the gastrointestinal epithelium. These oligosaccharides are structurally similar to epithelial glycan receptors and prevent intestinal infections due to their ability to act as "molecular decoys" by blocking glycan receptors. There is literature evidence that this anti-adhesion or anti-infection effect of glycan oligosaccharide inhibits the attachment of enterohepatic E. coli, Salmonella enterica, or Chronobacter sakazakii [6] in Caco-2 cells and HT29 cells. Some studies have reported improved absorption of calcium ions due to glycan oligosaccharide fermentation in the gut. Since the mid-1980s, industrial production of glycan oligosaccharides has begun. Because of their biological activity, HOS are predominantly used as a functional ingredient in beverages, baby milk or baby food.

Picrotoxin, also known as cocculin, which is a poisonous crystalline plant compound, was also found among the numerous peaks in the chromatogram. The bitter taste of the plant may be due to this substance. The name picrotoxin is a combination of the Greek words picros (bitter) and toxicon (poison). Previously, it was used as an antidote (antidote) for poisoning with central nervous system depressants, especially barbiturates [7]. Picrotoxin acts as a stimulant of the central nervous and respiratory systems. Despite its potential toxicity to mammals at high enough doses, picrotoxin is sometimes also used as a performance enhancer in horses. It is classified as an illegal "Class I substance" by the American Riding Association. Substances that are classified as "Class I" may interfere with efficacy and have no therapeutic use in equine medicine.

Another substance found on the chromatogram of the aqueous-alcoholic extract is curcumol. Curcumol is known to be turmeric oil enriched with curcuminoids. Curcuminoids have a wide range of biological activities, including antioxidant, antibacterial, antifungal, antiprotozoal, antiviral, antioxidant, anti-inflammatory, and even anticancer properties.

gas chromatography and high performance liquid chromatography coupled with mass spectrometry analysis of the alkaline extract of Ferula moschata. Gas chromatographic analysis with mass spectrometry revealed bifenthrin eluting from the column at 7.99 minutes. Bifentrin is a pyrethroid insecticide used primarily against the red ant, affecting its nervous system. It is highly toxic to aquatic organisms, but not to mammals. It does not occur in nature and is obtained synthetically. It is likely that this substance was ever used as an insecticide and came from the soil.

It is known that tangeritin (elution time 8.38 min) is an O-polymethoxylated favone found in the peel of mandarin and other citrus berries. The literature describes that tangeritin strengthens the cell wall and acts as a defense mechanism of the plant against pathogens. It is also used as a marker compound to detect contamination in citrus juices. Tangeritin has been shown to lower cholesterol levels and has also demonstrated potential protective effects against Parkinson's disease [8]. There is evidence that tangeritin also has great potential as an anti-cancer agent. In in vitro studies, tangeritin induced apoptosis in leukemia cells, while remaining intact in relation to normal cells [9]. In studies with two human breast cancer cell lines and one colon cancer cell line, tangeritin blocked cell cycle progression in the G1 growth phase in all three cell lines without inducing apoptosis in tumor cell lines. Once tangeritin was removed from tumor cells, their cell cycle progression returned to normal [9].

gas chromatography and high performance liquid chromatography coupled with mass spectrometry analysis of the alkaline extract of Ferula moschata after solid phase extraction. Quercetagitrin or quercetagethin-7-O-glycoside was first isolated from the petals of Tagetes erecta (African marigold). Quercetagethins belong to the flavanoid O-glycoside family. These compounds contain the carbohydrate portion of an o-glycoside linked into a flavonoid structure.

Methyldiclophobe is a selective post-gutted herbicide for the control of wild oats and annual grass weeds found on brass, carrots, celery, beans, barley, wheat, parsnips, peas, potatoes, soybeans, oilseeds rapeseed, onions, sugar beet, and lettuce .

The result of the analysis of the acid extract of Ferula moschata after solid phase extraction. Harpagid, released at 6.08 minutes, is an iridoid glycoside (a cyclic monoterpenoid derived from 1-isopropyl2,3-dimethylcyclopentane) found in many medicinal plants. Although they are considered the main bioactive compounds associated with the anti-inflammatory efficacy of these plants, the mechanisms of their anti-inflammatory activity remain Literature: unclear. Harpagid has antibacterial, anti-inflammatory and antiviral activity.

Amarogentin, released at 6.23 minutes, is a chemical found in Gentian (Gentianalutea) or Swertiachirata [10]. The bitter bases of the gentian root are the secairoid glycosides amarogentin and gentiopicrin. In humans, they activate the bitter taste receptor hTAS2R50. They also exhibit antitumor activity in animal models that are inhibitors of topoisomerase I [10].

Conclusions: It should be noted that some chemical compounds identified by gas chromatography and high performance liquid chromatography coupled with mass spectrometry analysis can be formed during extractive processes. Thus, the 5-hydroxymethylfurfural component can be formed from fructose-containing compounds during acid treatment.

In general, the biologically active compounds present in the extracts of Ferula moschata support the medicinal use of the plant. This study identified some biologically active substances contained in the rhizome of the Ferula moschata plant, which also have a pharmacological effect, can be used for phytopharmaceutical purposes.

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