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MORPHOLOGY, NUTRITIONAL VALUE AND FOOD USE OF THE MEDICINAL PLANT TRIGONELLA FOENUM-GRAECUM

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Abstract. The following is a summary of the morphology, nutritional properties, and food quality of the medicinal plant Trigonella foenum-graecum. Trigonella foenum-graecum has been reported to have antiviral, antimicrobial, hypotensive, antioxidant, anti-inflammatory, and antitumor effects. Shows reduced cell viability of cancer cells exposed to fenugreek seed oil. Fenugreek oils and extracts have been found to be very important for food chemistry and nutritional value as natural agents due to their excellent antioxidant, antibacterial, antifungal activities in food, water, and as food additives discussed below.

Keywords. Steroid, saponin, antimicrobial, diabetes, emulsifier, reproductive diseases.

Аннотация. Ниже приведено краткое описание морфологии, питательных свойств и качества лекарственного растения Trigonella foenum-graecum. Сообщается, что Trigonella foenum-graecum обладает противовирусным, противомикробным, гипотензивным, антиоксидантным, противовоспалительным и противоопухолевым действием. Наблюдается снижение жизнеспособности раковых клеток при воздействии масла семян пажитника. Было установлено, что масла и экстракты пажитника играют очень важную роль в пищевой химии и повышении питательной ценности продуктов питания благодаря своим превосходным антиоксидантным, антибактериальным и противогрибковым свойствам в пищевых продуктах, воде, а также в качестве пищевых добавок, о которых будет рассказано ниже.

Ключевые слова: стероид, сапонин, противомикробное средство, диабет, эмульгатор, репродуктивные заболевания.

Introduction. Fenugreek (derived from Greek for hay) is also called methi in Bengali. The genus Trigonella includes more than 70 species, but Trigonella foenum-graecum L. is considered to be of unparalleled economic and scientific importance. Fenugreek (Trigonella foenum-graecum, diploid with 2n = 16) is an important aromatic legume spice widely used as a traditional food and medicine. The plant is grown in many Asian, Middle Eastern and European countries, and India, the leading producer of fenugreek, is recognized as a major consumer for its culinary and medicinal uses. Trigonella foenum-graecum L. is an annual plant belonging to the legume family, which has long been known as a crop with medicinal, food, and fodder value. This plant is also found in many scientific literature under the names "fenugreek", "shambala", "Greek hay", "helba", and "pajitnik". Trigonella foenum-graecum L. is a medium-sized, upright-growing annual plant, its height averages 30–80 cm, depending on agroclimatic conditions.

Main part. Today, fenugreek is widely cultivated in North Africa, Europe, West and South Asia, North America, Argentina, and Australia. Fenugreek is the oldest known medicinal plant in human history [1]. It has been used to treat diabetes and has also been used as a galactogogue. Hemp seeds are a good source of essential amino acids, especially leucine, lysine, and common aromatic amino acids. The plant has a well-developed taproot that penetrates deep into the soil. Lateral roots ensure efficient absorption of water and nutrients from the soil. The legume family is characterized by the presence of nitrogen-fixing nodule bacteria in its roots, a feature that is important in increasing soil fertility. The stem is erect, cylindrical, smooth or slightly hairy, and strongly branched.

The green color of the stem indicates its active participation in the photosynthesis process. Anatomically, the stem is composed of parenchyma, conductive tissues, and mechanical elements. The leaves are complex, trifoliate, and arranged alternately. The leaves are oval or obovate in shape, with smooth or slightly toothed edges. The leaf surface is smooth, and the underside is sometimes covered with fine hairs. Fenugreek leaves and seeds have been used as a spice in many ways throughout the world. Fenugreek powder is used as a spice, and the seed endosperm is used to firm fenugreek gum. In India, the leaves and seeds are used as flavoring and seasoning agents. [3] The leaves are 2–2.5 cm long, oblong, and toothed. Flowers 1–2, axillary, sessile. The calyx teeth are linear. Corolla-shaped. The pod is 5–7.5 cm long, with a long, persistent beak, often leaf-shaped, with 10–29 seeds, and no transverse stipules. The flowers are small, white or pale yellow, and are solitary in the leaf axils. The flower structure is typical of the legume family, with five petals and bisexuality. Pollination occurs mainly spontaneously, sometimes with the help of insects. The fruit is a pod, elongated, slightly curved in shape. Each pod contains 10–20 seeds. The seeds are angular, yellowish-brown in color, have a pungent odor, and are rich in biologically active substances.

Research observations. Recently, researchers have found that the seed contains 20%–25% protein, 6%–8% fat, 45%–50% dietary fiber [4], and 2%–5% steroidal saponin [5]. The seed has a distinctive pungent odor that affects the taste, color, and aroma of foods, making it highly desirable as a food seasoning in culinary applications in the countries where it is grown. Advances in nutraceuticals and the demand for functional foods have sparked interest in fenugreek as a functional food. Trigonella foenum-graecum seeds are small (5 mm long), hard, yellowish brown, and angular, flattened with a characteristic oblong-rhombic outline [6]. The seed holds a large horn-like white, hard yellow embryo in the center, bordered by a translucent endosperm. The physicochemical properties of fenugreek seed oil, such as acid value (4.75; mg KOH/g oil), saponification value (195; mg KOH/g oil), ester value 190.25, free fatty acid content (2.38; oleic acid/100 g oil), and refractive index 1.464, indicate fenugreek seed oil as a edible oil if its characteristic pungent odor is minimized. The fenugreek protein fraction has been found to be rich in lysine and comparable in quality to soy protein, so the seeds are used as food and have a high nutritional profile. The increasing demand for food means that there is a need to increase the production of alternative sources of edible oils. Therefore, this study focused on chia seed oil, which has many health benefits. Fenugreek seed oil (mainly composed of unsaturated acids, namely linoleic, linolenic, and oleic acids) [7] is used to flavor many canned foods and syrups, and as an ingredient in soma perfumes. Schuette et al. studied safflower seed oil obtained by Soxhlet extraction using petroleum ether. The seeds have a strong aroma and a bitter taste. The main chemical components found in fenugreek seeds are galactomannans (fiber), asapogenin, triamcinolone (an alkaloid), and 4-hydroxyisoleucine, which has anti-diabetic properties. It can also be used to treat breast cancer and other diseases. A plant cultivated throughout India.

Research results. The seeds and green leaves of Trigonella foenum-graecum are used for both food and medicinal purposes, a practice that dates back to ancient human history. The fresh green leaves of T. foenum-graecum, which are eaten as a vegetable, and the dried seeds are used as a spice in cooking, and in many countries such as India, both the leaves and seeds are used to add flavor to dishes; The seed is an integral part of the Bengali five-spice mix, making food delicious and imparting an appealing flavor during preparation. T. foenum-graecum seeds can be cooked or sprouted and can even be eaten raw; whole seeds are used as an antacid and against dysentery and indigestion. A cold water extract of T. foenum-graecum, known as fenugreek tea, has been traditionally used against respiratory tract infections (bronchitis and pneumonia) and, as it nourishes the body during illness, the plant has also been used to reduce fever when taken with lemon and honey. Trigonella foenum-graecum has been shown to have hypoglycemic,

antihypertensive, and hypolipidemic effects [9-10]. Fenugreek has also long been used to treat reproductive disorders, stimulate labor, treat hormonal disorders, increase milk supply, and reduce menstrual pain. The plant is known to have the ability to maintain blood glucose and cholesterol levels and is therefore beneficial for health in the prevention and treatment of diabetes and heart disease [7].

Trigonella foenum-graecum oil has a pungent odor with a bitter taste and is used as an insect repellent to protect food grains. As a spice, seeds are important ingredients in food preparation, and due to the presence of characteristic pungent aromatic compounds, seeds add flavor and color to foods, especially pickles, making them attractive and delicious. Fenugreek oil is used to flavor canned foods and syrups, such as artificial maple syrup, which is flavored with fenugreek seed extract, because the odor of T. foenum-graecum mimics the odor of maple syrup. Due to the presence of galactomannan gum in fenugreek seeds, its extracts are used as a thickening agent and food emulsifier in foods [9-11].

Conclusion. Trigonella foenum-graecum seeds are a good source of protein, fat, and sugar. When oils and spices like T. foenum-graecum are added to foods with salt and sugar, they inhibit the growth of microorganisms in foods. Trigonella foenum-graecum has antibacterial, antifungal, and antioxidant properties and therefore effectively inhibits the growth of microbial pathogens and helps preserve food products. Thus, food products wrapped in seed-coated paper remain fresh for a long time because pathogens such as bacteria and fungi do not grow on their surface, and therefore the shelf life of the food products is protected. Antibacterial activity Trigonella foenum-graecum oil has broad-spectrum antibacterial properties against bacteria associated with food spoilage, food poisoning, and foodborne diseases in humans. The antibacterial activity of T. foenum-graecum seed oil (100%) was determined in terms of zone of inhibition diameter (ZDI) and was recorded as 10, 20, 15 mm for Staphylococcus aureus, Escherichia coli and Salmonella typhimurium, respectively.

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