

MORPHOLOGY AND CHEMICAL COMPOSITION OF ONION (*ALLIUM CEPA L.*) AND EXTRACTION METHODS FOR ONION OIL

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ABSTRACT

This article explores the morphology and chemical composition of onion (*Allium cepa L.*), a widely cultivated and consumed vegetable with varieties of red, yellow, and white. The article highlights the nutritional value of onions, including their water content, carbohydrates, proteins, vitamins, minerals, and volatile oil. It delves into the historical significance of onions and their cultural symbolism. Furthermore, the article examines the chemical composition of onion fruits and leaves, including sugars, proteins, vitamins, minerals, and sulfur-containing compounds. It discusses the various extraction methods used to obtain onion oil, such as steam distillation, supercritical carbon dioxide extraction, and the distillation method. The main components of onion oil, particularly sulfur compounds, are also identified and their significance in flavor and medicinal properties is discussed.

Keywords: Onion, *Allium cepa L.*, morphology, chemical composition, extraction methods, onion oil, sulfur compounds.

Morphology

Onion (*Allium cepa L.*) is widely cultivated and consumed all over the world. Onion varieties of three different colors, such as red, yellow, and white, are commonly used in the food industry. Onion (*Allium cepa L.*) is a perennial o The plant is a plant, the diameter of the fruit is up to 15 cm, membranous. The outer coat is dry, yellow, rarely purple, or white; the internal structure is fleshy, white, green, or purple. The leaves are tubular, gray-green.

The fruit contains up to six seeds. The seeds are black, triangular, and small. Onion is a vegetable known for its unique taste and rich nutrition. Fresh onions contain 86.8% water, 11.6 % carbohydrates, 1.2% protein, 0.1% fat, 0.2% calcium, 0.05%

phosphorus, vitamins, niacin, potassium, zinc, and selenium. In addition, onions also contain about 0.03% volatile oil, which is the main component that accounts for the special flavor and physiological effects of onions and is also the main source of research on the health function of onions[1,2].

History. Onion (*Allium cepa* L.) has been a part of human food for more than 5 thousand years. In ancient Greece, the onion was considered a sacred vegetable. The fruit of the onion was considered a symbol of the structure of the universe. The ancient Egyptians paid attention to the spherical shape and concentric rings of the onion fruit as a symbol of eternal life and respected it[3].

Chemical composition of the fruit

Onion fruit contains 8-14% sugar (fructose, sucrose, maltose, inulin, polysaccharide), proteins (1.52%), vitamins (ascorbic acid), flavonoid quercetin, enzymes, saponins, potassium, phosphorus, and other mineral salts.

Yellow, purple, and green onion leaves contain sugar, proteins, and ascorbic acid. Fruits and leaves contain essential oil, which has a specific smell and sharp taste, sulfur-containing compounds, iodine, organic acids (malic and citric), mucilage, pectin, and glycosides. Onions contain a special odorous substance, mainly C-propenyl-L-cysteine sulfur oxide and sulfur compounds such as dipropyl disulfide, dipropyl disulfide, dimethyl propyl disulfide ether, and propenyl disulfide.

Chemical composition. Onion seeds contain essential oil consisting mainly of ascorbic acid, allyl propyl disulfide, and higher sulfides. In addition, they contain thiocyanic acid, n-propyl mercaptan, phytic acid, sugars, etc. The seeds contain 18-20% fat, and PP, E, C, B1, B3 B6 vitamins are available.

Onion oil (Onion oil) is extracted from the seeds of the onion (*Allium cepa* L.) belonging to the Liliaceae family, by crushing it by various methods. For food, onion oil is widely used as a spice, flavoring, and coloring agent.

Oil extraction method

The extraction methods of onion oil include steam distillation, solvent extraction, simultaneous distillation extraction, microwave vacuum extraction, supercritical carbon dioxide extraction, supercritical carbon dioxide extraction, etc. The general extraction process requires the processing of fresh onion seeds such as drying, grinding, and soaking.

General process: Onion seeds are crushed and mixed with liquid carbon dioxide and placed in an extraction vessel where the oil is completely extracted under high pressure and controlled temperature to completely dissolve the onion seed oil.[10]

The steam separation method is the oldest extraction method, it is easy to use and convenient for the production of oil in the food industry. The disadvantage of the

method is that the composition of the active substances is not completely preserved and the effect power is very high is low.

Supercritical carbon dioxide extraction is an ideal method for extracting onion essential oil. The species, yield, and efficiency of active substances are significantly improved, and this method has no solvent residues, the active substances are preserved intact and the natural properties are high [7,8,9]. Since supercritical carbon dioxide can dissolve oil, it is used to obtain onion seed oil, which not only has a high oil yield but is also purified from various other residues.

Distillation method is a kind of extraction method, the principle of which is basically that the same aromatic plant is placed in a distillation vessel, and then transferred to high-temperature steam (or spices and water are put together to boil), which The essential oil, which contains the aromatic components of the plant, diffuses into water vapor to form an azeotrope of oil and water. After that, the azeotrope is cooled, because the oil does not dissolve in water, so it separates from the water and forms the essential oil we need.

The distillation method is very convenient and does not require the use of a chemical solvent, so it is still very efficient.

Extraction method (melting method)

Alcohol, Sherwood oil (candle oil), and other liquid solvents are thoroughly mixed with plant raw materials, and the aromatic components contained in raw materials, plant wax, pigment, etc. are dissolved and released in the solvent. The solvent is then separated from the liquid mixture. The extract contains aromatic components, plant waxes, pigments, etc. The extract is then purified to obtain the essential oil.

Supercritical carbon dioxide method

Its principle: in the case of high pressure or low temperature, the density of carbonic acid gas is close to liquid and at the same time retains some properties of common gas. This is a new method that has gained international popularity in recent years. This method allows the extraction of essential oils at room temperature without the use of solvents harmful to the human body and better protects the natural activity of the product (traditional separation methods such as steam distillation, pressing and extraction have more or fewer disadvantages in the processing process, e.g. the natural active ingredients are easily destroyed, and organic solvents that may be harmful to the human body may remain in the final product.) However, the cost of this method is high and it has not yet been widely used.

The main components of onion oil. Onion essential oil obtained from fresh onions was determined by gas chromatography-mass spectrometry, and more than 60 types of sulfur compounds consisting of 16 main components were identified, including

propane disulfide ($\text{CH}_3\text{-CH}_2\text{CH}_2\text{-SS-CH}_2\text{CH}_2\text{CH}_3$) in sulfur content. constitutes 80%-93% of the total composition of onions, the sulfur content of propane disulfide ($\text{CH}_2=\text{CHCH}_2\text{-SS-CH}_2\text{CH}=\text{CH}$) is about 1%, which is the source of the onion's characteristic smell. Other major sulfides are cyclo-alliin 2500, rL -glutamyl-(+)-S-propenylcysteine-S-oxide 1300, S-(2carboxypropionyl)-glutamine 330, S-methylcysteine-S-oxide 200, S-propyl oxide 50, etc. The mixture of these volatile sulfur compounds of onion is responsible for its distinctive flavor and is an important source of the medicinal and nutritional value of onion oil.[12]

CONCLUSION

The composition of the onion plant and seed was studied. It was found that the seed contains 82% oil. Onion essential oil contains more than 16 components necessary for the human body, and it has been studied that it contains more than 60 types of sulfur compounds. Steam distillation, solvent extraction, distillation, microwave vacuum extraction, supercritical carbon dioxide extraction, and supercritical carbon dioxide extraction methods of oil extraction were studied. During the research, it was found that supercritical carbon dioxide extraction is the most effective method of extracting oil from onion seeds. Because the oils obtained as a result of this method do not contain residues of solvents and the natural composition of the oil is preserved.

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