



Review on Extraction of Garlic for It's Different Chemical Constituents

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ABSTRACT:

Extraction of phytochemicals from medicinal plants is an important first step in preparing different formulations. Various modern methods have now come to the forefront which preserve the phytochemicals and prevent their degradation as compared to the ancient method. the Various method of extraction techniques such as Microwave Extraction, Ultrasonic Extraction, Pressurized Fluid Extraction and Soxhlet Extraction, Supercritical Fluid extraction, maceration, infusion, percolation, decoction are explain.

Keywords: Methods; Soxhlet extraction, Microwaveassisted extraction, Ultrasonic-assisted extraction, Supercritical-fluid extraction, Microwave Extraction, maceration.

Introduction:

Garlic (*Allium sativum*) is one of the traditional herbals and utilized as flavoring

It is well known to acquire various phytochemical Several evidences highlight its pharmacological potential such as antibacterial, antifungal, anti-inflammatory and antiviral activities

In vitro studies verified its antiplatelets aggregation, anticancer and antioxidant activities

Moreover, in vivo studies, both in human clinical trials and in animal modeling, have demonstrated beneficial aspects of garlic against various threats including hyperlipidaemia, hyperglycaemia, and atherosclerotic plaque formation, respectively

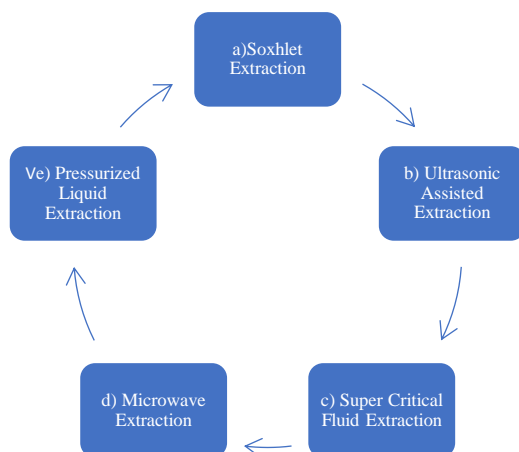
Alliin and alliin is one of the main biologically active components of garlic . They have a potential to reduce various ailments

Garlic cells encompass a (+)-S-allyl L-tysine sulfoxide commonly known as alliin an odourless compound along with alliinase enzyme which is present in the vacuoles produce diallyl thiosulfinate or allicin

Alliin and the enzyme alliinase or alwhere Alliin is converted to allylsulfenic acid by alliinase. Allylsulfenic acid is further converted to allicin by the reduction of water.

Alliin is an unstable compound and is liin lyase are located in separate regions in garlic and come in contact only when crushed or ground to produce allicin

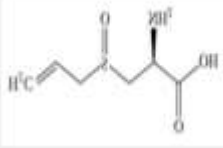
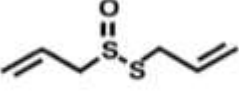
Alliin is converted to allicin enzymatically with the help of alliinase during cutting or grinding

**Methods:**

1. Soxhlet extraction
2. Ultrasonic-assisted extraction
3. Pressurized Liquid extraction
4. Supercritical-fluid extraction
5. Microwave Extraction

**Garlic****Synonyms:** Allium**Biological:** Garlic is the ripe bulb of *Allium sativum* Linn.**Family:** Liliaceae.

Different Chemical Constituent

Chemical Constituents	Structure of chemical Compound	Pharmacological Uses
Alliin		Prodrug of Allicin.
Allicin	 Allicin	Treatment in cancer

SOXHLET EXTRACTION

A mixture of garlic and ethanol in the ratio of 1:10, 1:15 and 1:20 (w/v) were carried out using 95% ethanol. 1 g of the sample was soaked in 200 ml of 95% ethanol for 48 hrs at room temperature. For soxhlet extraction, 1 g of fresh garlic was performed using a mixture of garlic and 95% ethanol in the same ratio of solvent to solid as maceration technique. The soxhlet condition was done for 1.5 hours at 70°C using soxhlet apparatus



FIG. Soxhlet Extraction

ULTRASONIC-ASSISTED EXTRACTION

Materials and method

Plant Samples : Garlic cloves were purchased from local market which was originated from China. During the project, all the samples were maintained in lab at appropriate conditions (dark, 25 °C)

Reagents : Methanol used was HPLC grade (Purity > 99.9 %) purchased from Sigma Aldrich (US) and deionised water used was purified by Q purification system (Millipore) (Massachusetts, USA) Milli

Pretreatments : 10 g of garlic cloves were blended with 100 mL deionised water for 1 min in a commercial blender for blended samples. For sliced sample, 10 g of garlic cloves were sliced into small pieces with equal size distribution and mixed with 100 mL deionised water.

Ultrasound-assisted extraction (UAE) was performed in an ultrasound cleaning bath (Sonorex DT1028/H, 500 mm × 300 mm × 200 mm interior dimensions) by the mode of the indirect sonication at the fixed-frequency of 35 kHz using as the working liquid.

The 100 ml sample flask was charged with the pre-treated sample mixture and placed into the ultrasonic cavity for extraction process.

Parameters optimised were extraction time (30 min, 60 min, 90 min, 120 min and 150 min), extraction temperature (25 °C, 30 °C, 35 °C) and particle size (Blended and sliced garlic bulb).

After sonication the solution was then separated from impurities by centrifugation at 3,000 g for 2 min. Then the solution is filtered to remove the undissolved garlic and stored at 4 °C

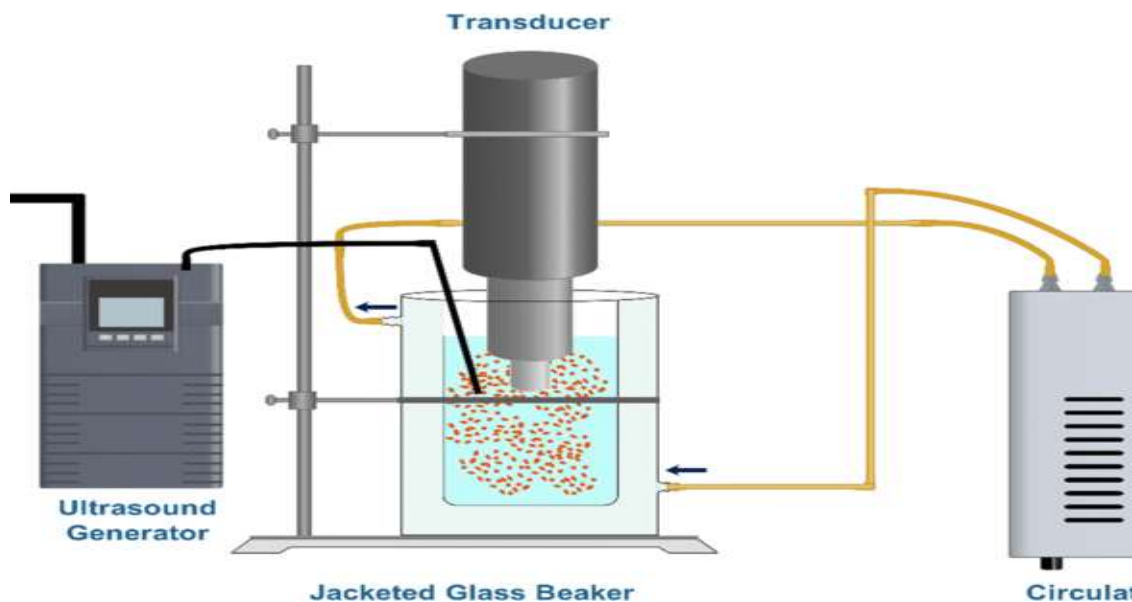


FIG . Ultrasonic Assisted Extraction

SUPER CRITICAL EXTRACTION

This method is qualitatively accurate, environmentally-friendly and efficient for extraction of garlic. The super critical fluids are more efficient for the extraction than organic solvents for their transport properties like mass transfer, diffusivity and its penetration ability (Brunner, 1994).

Carbon dioxide helps in the complete extraction and separation of the sample and has a quality advantage for its high selectivity. It also helps in the extraction of oxidation prone substances as it is not exposed to high temperatures or oxygen during treatment

Maximum efficiency and yield of garlic are obtained at a temperature between 35-50°C and pressure of 300-400 bar with ethanol as the solvent .

While in the paper by dynamic mode was used with 20g/min of CO₂ at a temperature of 50°C and a pressure of 100 psi. The garlic samples were cut, chopped and ground using a press for high yield of the enzyme

They are added to de ionized water and vortexed for a few seconds and incubated at room temperature for maximum yield of allicin. Homogenates preparation was done by adding de ionized water and Ayl phenyl sulfon was added as standard and analyse

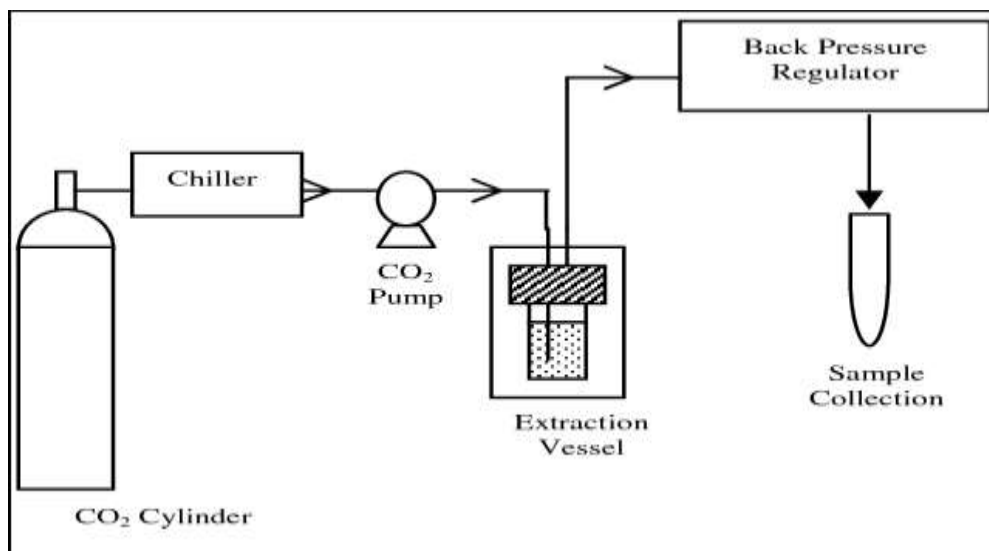


FIG. Supercritical Fluid Extraction

MICROWAVE EXTRACTION

This method improves the stability and the quantity of allicin and evaluated post extraction. Microwave extraction has several advantages viz., short extraction time, less solvent consumption, environment friendly, low cost and high quality.

Domestic microwave is used for extraction and involves two methods, one with solvent and the other is without solvent. The solvent assisted microwave extraction is more efficient as it helps in cell breakage .

Microwaves have a higher transforming capacity of allicin as garlic absorbs the microwave energy and converts it to heat energy. In , garlic samples were added to a round bottom flask with a condenser. The flask is further kept in a microwave extractor where the temperature, reflux time and percentage power are set for the extraction of allicin.

The solvent used for this method is usually ethanol along with pre fixed extraction temperature, time and microwave power. Excess exposure to microwave radiation leads to the decomposition of allicin.

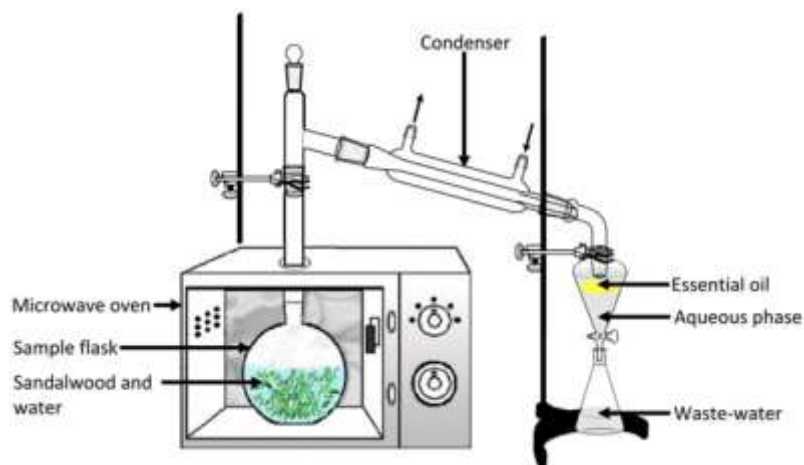


Fig: Microwave Extraction

PRESSURIZED LIQUID EXTRACTION

Materials and Methods

Plant Material : Fresh garlic was obtained at local supermarkets (Campinas, SP, Brazil). The outer skin of the garlic cloves was peeled off. The garlic cloves were cut into small cubes (approximately 0.3 cm on all side) using a kitchen knife. The garlic samples were prepared immediately before PLE extraction was performed in order to avoid the degradation of allicin.

Methods:

It is a method of extraction of compounds using liquids at high pressure. It has a simple operation, works faster and consumes lesser solvent than other techniques. Its working principle is that of static extraction with the assistance of superheated liquids and is a substitute for other extraction methods

Extraction is carried out at high temperatures and pressure that enhances the extraction performance as the solvent possesses high solubility and mass transfer properties

The sample is often pre-treated which includes cutting into pieces or ground for easier diffusion due to smaller particle size before extraction. Ethanol is usually adopted as the solvent for the extraction of allicin. It contains a HPLC pump, an extraction vessel consists of a blocking valve and back pressure, manometer, solvent reservoir and a sampling bottle.

The garlic was peeled and cut into pieces to keep the allicin intact before the extraction. The pressure, temperature and time were pre-determined before the extraction. The extraction of allicin was carried out at a fixed temperature of 313K and pressure of 6MPa

Once the sample is subjected to high pressure, ethanol was removed using vapour evaporation and allicin is extracted from the sample. Care was ensured while extracting and storage area must be clean, cool and dry.

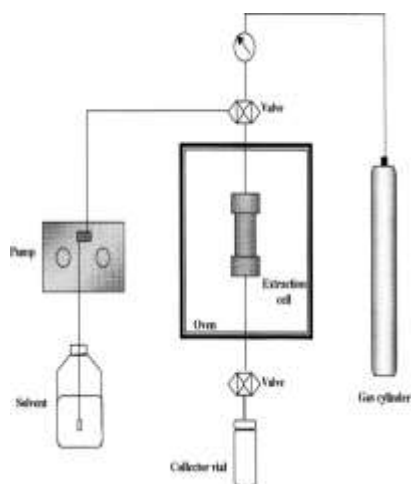


FIG: PRESSURIZED LIQUID EXTRACTION

CONCLUSION

In this paper, different methods of extraction of Garlic was discussed and analysed. The extraction process is very important for maintaining the stability as well as quantity of the garlic. The extraction process must be chosen according to the particle size of garlic and the end product required

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