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Study of Extraction of Eugenol from Cinnamomum Zeylanicum (Dalchini)

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Abstract — Spices enriched with pharmaceutically active ingredients that are helpful for health. Cinnamon is known both as a spice and as a medicine. Cinnamomum Zeylanicum (Dalchini) contain eugenol is one the important constituent used as essential oil in several applications. Essential oils are complex mixtures of volatile substances generally present at low concentrations.
This paper gives experimental studies on extraction of eugenol by conventional extraction techniques. The systematic investigation of effects of various operating parameters on percentage extraction of eugenol studied such as effect of solvent, temperature, speed of agitation, and particle size. The Ethanol is found to be best solvent while smaller particle size gives higher yield of extraction of eugenol from Cinnamomum Zeylanicum. At higher temperature the yield gets higher.

Keywords: eugenol, conventional extraction techniques, cinnamomum zeylanicum.

I. Introduction

Cinnamomum Zeylanicum has a place with the evergreen tree in the Laurel (Lauraceae) family. Cinnamon is utilized as enhancing as a part of treats, scones and cakes. It is likewise broadly utilized as a part of customary and current drug, scents and fragrance based treatment [1]. The cinnamon bark may likewise have a potentiating on insulin and can be utilized to treat sort 2-diabetes and to lower serum cholesterol [3]. The crucial oil of cinnamon contains both antifungal and antibacterial rule that can be utilized to avert nourishment decay because of bacterial sullying [2]. The fundamental segments of cinnamon bark oil are cinnamaldehyde while eugenol is the primary segments around 81-85% of cinnamon leaf oil. A business test of crucial oils from Cinnamomum verum contained roughly 63% cinnamaldehyde, 8% limonene, 7% eugenol, 5.5% cinnamaldehyde propylene, and 1-2% of an assortment of terpenoid mixes which are pinene, camphene as measured by gas chromatography/mass spectrometry [8].

Eugenol is key part in cinnamon and it is utilized as a part of perfumeries, flavorings, crucial oils and in pharmaceutical as a neighborhood clean phenylpropanoid, is an allyl chain-substituted guaiacol, which is feebly acidic, marginally dissolvable in water and dissolvable in natural solvents. It is a reasonable to light yellow fluid with a trademark and charming scent of cloves and a zesty sharp taste. Extensive amounts of eugenol are utilized as a part of cleansers and cleansers for their fiery fragrance [10].

In this work efforts are taken to carry out extraction of eugenol from bark powder of *Cinnamomum Zeylanicum* through conventional extraction techniques under different sets of operating conditions.

II. Materials and Methods

A. Plant Material

Cinnamomum Zeylanicum bark collected from local supermarket, Pune, Maharashtra. Pieces were grinded using electric grinder to obtain powder with homogenous particle size. Grinded powder was then sieved using mechanical sieve shaker of different mesh sizes to obtain raw material with various particle sizes. These sizes are collected and stored at room temperature.

B. Batch Extraction

The extraction procedure is done by batch extraction apparatus. Experiments were carried out with cinnamon powder various sizes (0.707-0.841 mm; 0.400-0.500 mm; 0.177-0.210 mm particle size). Various parameters were studied by conducting experiments.

C. Soxhlet Extraction

The objective of the soxhlet extraction was to determine the maximum content of the solute in the raw material. The

extraction was performed for 24 h with ethanol. Maximum concentration obtained by soxhlet extraction is 2750 ppm.

D. Analysis of Samples

The samples were analysed by UV- Spectrophotometer (model no.UV-1800; Shimadzu Japan) in the range of 200-400 nm. From literature the maximum peak occurs at wavelength 281 nm.

III. Results and Discussion

Conventional Batch Solvent Extraction

The objective of the batch experiment was to measure the global kinetics of extraction and to investigate the effect of operating parameters on percentage extraction of eugenol from, *Cinnamomum zeylanicum.*

A mass of 0.5 gm of Dalchini powder introduced into extractor containing 250 ml solvent, equipped with mechanical stirrer. All experiment were conducted at 30^0C (±1), unless otherwise stated. The effect of various operating parameters studied on percent extraction of eugenol.

A. Effect of Solvent

The effect of solvent on the percentage eugenol extraction was studied using various solvent such as Ethanol, Methanol, and Dichloromethane (DCM). The experiment was conducted with 0.5 gm (0.177-0.210 mm particle size) of *Cinnamomum Zeylanicum* powder with 250 ml solvent in batch extractor. The speed of agitation was 1000 rpm at room temperature. Figure 3.1 indicates the above results.

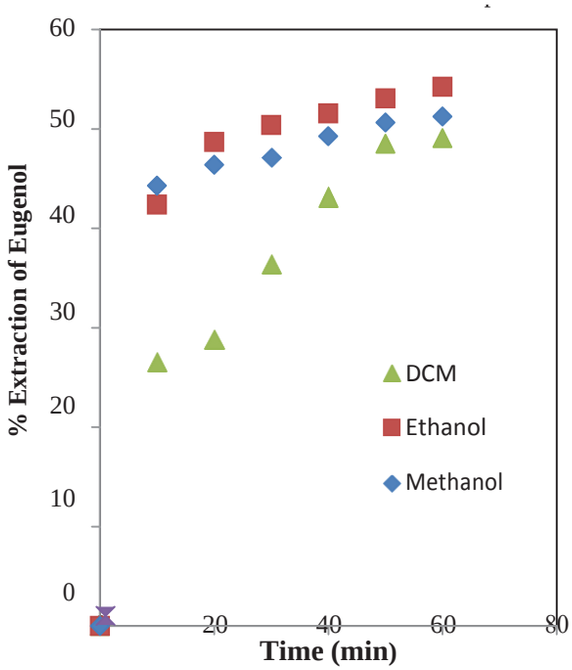

Fig. 3.1. Effect of solvent on percent extraction of Eugenol from Cinnamomum zeylanicum (temperature-300C, speed of agitation-1000 rpm, particle size 0.177-0.210 mm)

B. Effect of Temperature

The extraction of eugenol also influence by temperature and time. Generally, the percentage extraction increases with increase in temperature. The effect of temperature on the percentage eugenol extraction was studied at different temperature range 30 ^{0}C, 40 ^{0}C & 50^{0}C. The experiment was conducted with 0.5 gm (0.177-0.210 mm particle size) of *Cinnamomum Zeylanicum* powder with 250 ml solvent in batch extractor. The speed of agitation was 1000 rpm at different temperature in water bath.

From Fig. it clearly indicates that as temperature increases the percentage extraction of eugenol increased with time. This is because at higher temperature intermolecular interaction within the solvent increases. The molecular motion increases within the particle leads to greater penetration of solvent.

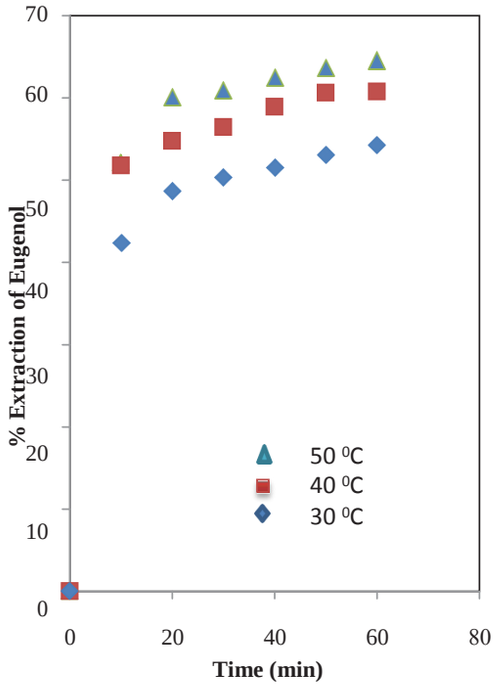

Fig. 3.2. Effect of temperature on percent extraction of Eugenol from *Cinnamomum zeylanicum* (Solvent-Ethanol, speed of agitation- 1000 rpm, particle size 0.177-0.210 mm)

C. Effect of Speed of Agitation

Speed of agitation affect yield percentage of eugenol. The effect of speed of agitation on the percentage eugenol extraction was studied at 500 rpm; 800 rpm; 1000 rpm. The experiment was conducted with 0.5 gm (0.177-0.210 mm particle size) of *Cinnamomum Zeylanicum* powder with 250 ml solvent in batch extractor at different speed of agitation. The Fig. shows that as speed increases the percentage extraction also increases. This phenomenon occurs because at higher agitation speed the degree of turbulence increases. This leads to rapidly rupturing of cell and interaction of solvent increases with the material.

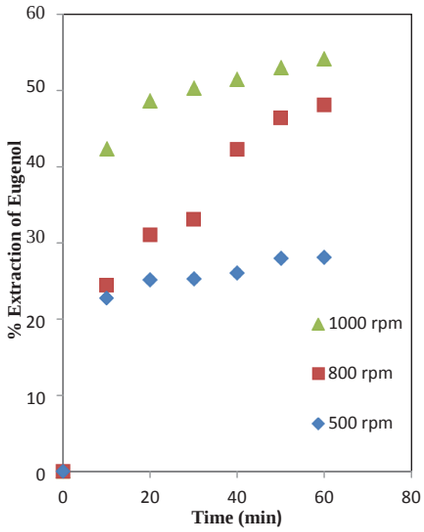

Fig. 3.3. Effect of speed of agitation on percent extraction of Eugenol from *Cinnamomum zeylanicum* (Solvent-Ethanol, temperature-30°C, particle size 0.177-0.210 mm)

D. Effect of Particle sizes

The particle size of plant matrix measuredly contributed to percentage extraction of compound. The effect of particle sizes on the percentage eugenol extraction was studied at particle size ranges (0.707-0.841 mm; 0.400-0.500 mm; 0.177-0.210 mm particle size). From Fig we can conclude that smaller is particle size greater is percent extraction. The particle surface area increases as size decreases, the porosity of material increases. This leads to greater penetration of solvent and yield of extraction increases.

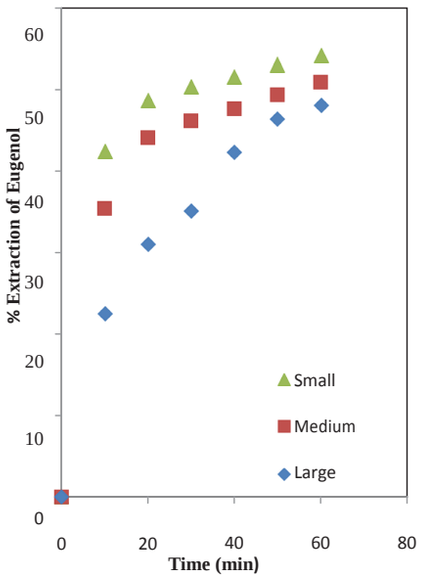

Fig. 3.4. Effect of particle sizes on percent extraction of Eugenol from *Cinnamomum zeylanicum* (Solvent-ethanol, temperature-30°C, speed of agitation-1000 rpm)

IV. Conclusion

The extraction of eugenol from *Cinnamomum Zeylanicum* was performed under different set of conditions. The ethanol was found to be best solvent for extraction of eugenol from *Cinnamomum Zeylanicum*. The effects of different operating parameters such as temperature, speed of agitation & particle size on percentage extraction of eugenol were studied. The percentage of eugenol was found to be increased with increase in temperature, speed of agitation whereas it decreases with increase in particle sizes. The maximum percentage extraction of eugenol for 54.22% for ethanol at 30^0C & 0.177-0.210 mm particle size at 1000 rpm speed reached at 60 min.

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