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Short Communication

Purification of Cinnamaldehyde from Cinnamon Species by Column Chromatography

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Abstract

Cinnamon belongs to the family of Lauraceae. This genus comprises over 250 species. It is widely distributed throughout tropical and sub-tropical areas. It is widely used as spice and used as herbal medicine. Cinnamon contains cinnamaldehyde, eugenol, cinnamic acid etc. Cinnamaldehyde gives flavour and odour to the cinnamon. The objectives of this work were extraction of cinnamaldehyde from cinnamon by batch studies and purify the cinnamaldehyde by using column chromatography. For the optimized physico-chemical parameters, the highest cinnamaldehyde concentration was observed to be 44.6mg/L and the concentration was increased to 52.0mg/L from the column chromatography.

Keywords: Cinnamon, cinnamaldehyde, extraction, folin-denis method, column chromatography.

Introduction

Cinnamon belongs to the family Lauraceae, and is one of the most widely used spices in the world. Cinnamon is traditionally has been used as herbal medicine to treat diabetes, rheumatism[1], aching joints and respiratory problems. The scientific studies have proved that a variety of biological active chemicals have been found in cinnamon which have immense medical potential. Some of the active chemical compounds[2] are cinnamaldehyde, eugenol, cinnamyl acetate, cinnamic acid[3] etc. Depending on their structural characteristics of these compounds[4] and biological properties they have medicinal property like antioxidant activity.

Cinnamaldehyde is the organic compound that gives cinnamon its flavour and odour. The major active constituent in cinnamon is cinnamaldehyde. Cinnamaldehyde is used in some perfumes and also used for flavouring food items like chewing gum, ice creams and beverages. Cinnamaldehyde has various medicinal properties such as antipyretic, astringent, antimicrobial activity[5], anti - inflammatory activity[6], antibacterial and cytotoxic effect[7-9]. It can be used as a fungicide.

Column chromatography is a technique which is used to purify individual compounds from the mixture of compounds. The main advantage of the column chromatography is simple, relatively low cost and disposability of the stationary phase used in the process. Silica gel and alumina are commonly used as stationary phase for column chromatography.

Material and Methods

Chemicals and reagents: Folin-Denis reagent, sodium carbonate, cinnamon powder, methanol, hexane, distilled water, silica gel and column chromatography.

Plant material: Bark of cinnamon was collected from the local market at Visakhapatnam, AP. The bark was cleaned and dried under sunlight for 24 h. The dried bark was powdered and used as a raw material and stored in an air tight container. Cinnamon powder was sieved by using different particle sizes ranging from 354 to 125 microns.

Preparation of the extract: 125 micron particle size of cinnamon powder (2g) was added with methanol (50% v/v) in conical flask and the volume was made 50 mL. Set the pH at 5. The solution was soaked for 3 days. After the soaking time, the solution was filtered using Whatman No.1 filter paper and the filtrate was heated to 65^0C and made up to 50 mL with distilled water and this solution was incubated with hexane for 2 h with 1:1 ratio. Cinnamaldehyde was estimated according to the method of Folin-Denis method[10]. This solution was used as a sample in the column chromatography.

Column chromatography: In column chromatography, 74 micron particle size silica gel was used as stationary phase. Before starting the experiment first insert a piece of cotton into the column towards outlet. Fix the column to the clamp tightly. Pour the sea sand of 1cm bed in the column. Add silica gel powder in the column up to 10cm length from the neck of the column. Run the solvent methanol in the column up to the bed was entirely wet. Add excess solvent on the top of the silica gel bed. Gently tap the column with hand or soft materials. After tapping gentle pressure can be applied. Before loading the sample in the column, little silica gel was added to the sample. Pour the sample and rinse the wall. Add sand on the top of the sample. The entire system was shown in figure 1. After collecting the samples for every 5 minutes from the column, take 1ml of sample from each test tube add 0.5ml FD regent and

1ml Na_2CO_3. Make up this solution up to 10ml with distilled water. After 30min read the absorbance at 700nm.

Results and Discussion

From the batch studies methanol was the best solvent for cinnamaldehyde extraction. For the optimized physico chemical parameters, the highest cinnamaldehyde concentration[11] was observed to be 44.6mg/L and the concentration was increased to 52.0mg/L from the column chromatography. The purity of cinnamaldehyde was improved by column chromatography. The results of the batch studies were shown in table 1 and figure 2 and column chromatography were shown in table 2 and figure 3.

Table-1
Effect of Extraction yield with Extraction time for Cinnamaldehyde

S. No.	Time (min)	Concentration of Cinnamaldehyde (mg/L)
1	10	10
2	20	13
3	30	16
4	40	18
5	50	19
6	60	20
7	70	20.5
8	80	21.5
9	90	22.5
10	100	25
11	110	35
12	120	44.6
13	130	40
14	140	38
15	150	35

Table-2
Effect of Extraction yield with Extraction time for Cinnamaldehyde after Column Chromatography

S. No	Time (min)	Concentration of Cinnamaldehyde (mg/L)
1	5	3
2	10	4.2
3	15	7.9
4	20	52
5	25	30
6	30	7
7	35	6
8	40	4.2

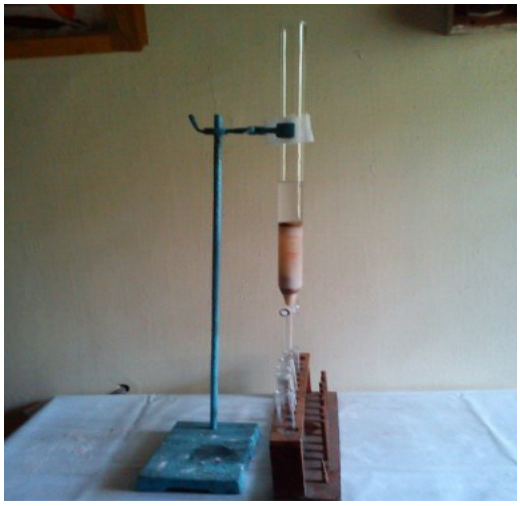

Figure-1
Column Chromatography

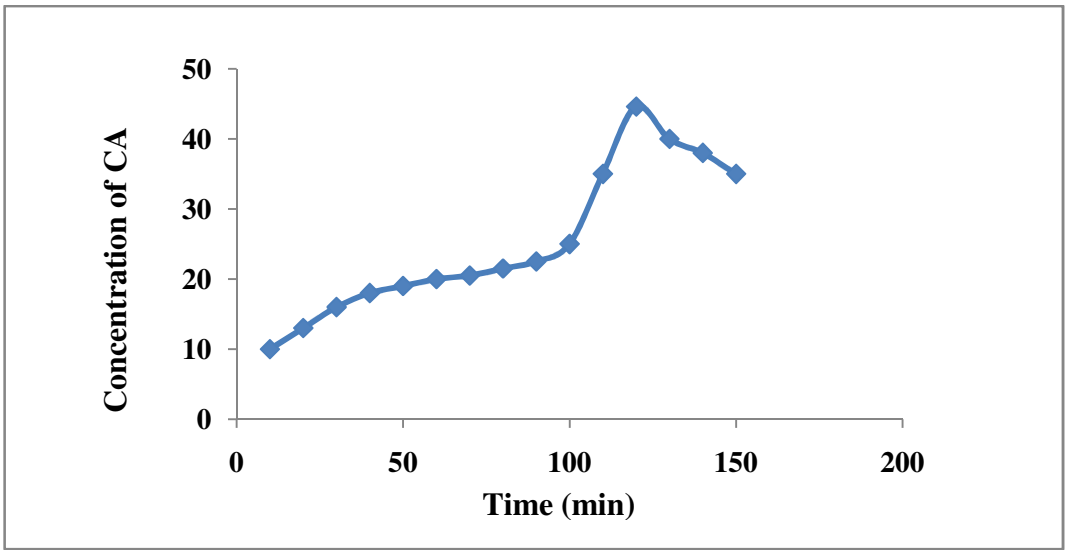

Figure-2
Effect of Extraction yield with extraction time for Cinnamaldehyde (CA)

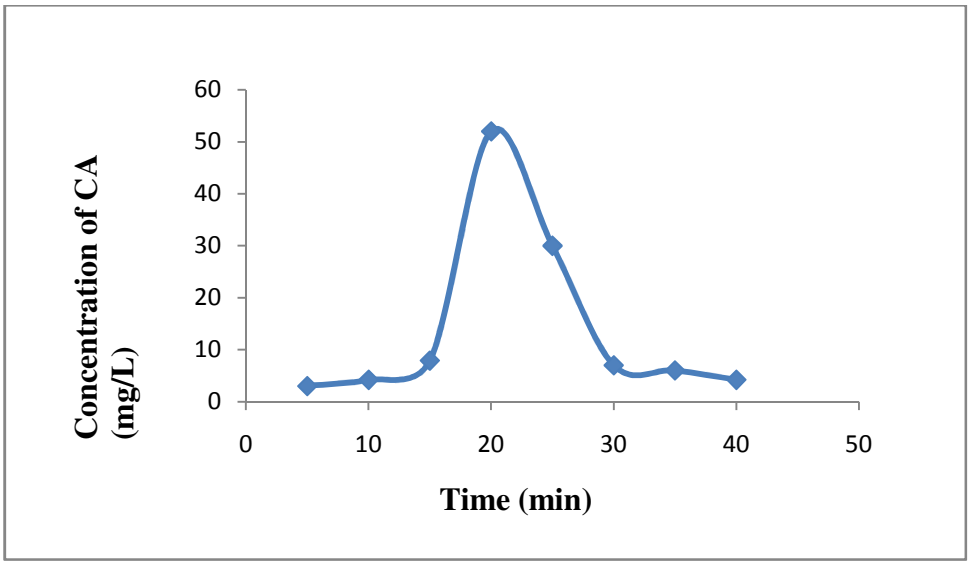

Figure-3
Effect of Extraction yield with extraction time for Cinnamaldehyde (CA) after Column Chromatography

Conclusion

Cinnamon contains active components like cinnamaldehyde, eugenol, cinnamic acid, cinnamyl acetate etc. Among all the active components cinnamaldehyde plays a vital role. In this present work the extraction of cinnamaldehyde from the cinnamon by batch studies and purification of cinnamaldehyde by column chromatography were performed. From the optimized physico-chemical parameters the cinnamaldehyde concentration was 44.6mg/L and it was increased to 52.0mg/L from the column chromatography. The purity of cinnamaldehyde was improved by column chromatography.

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