

Antibacterial activity enhancement of Cinnamon oil using aqueous dispersion of Tween 80

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ABSTRACT

The present study is to enhance the antibacterial activity of cinnamon oil by using 0.2% tween 80 and the results were compared with the normal cinnamon oil activity and cinnamon oil in the chloroform solvent against different micro organism like *Bacillus subtilus* (MTCC441), *Staphylococcus aureus* (MTCC96), *Escherichia coli* (MTCC443), *Pseudomonas aeruginosa* (MTCC741). Tween 80 solution aided in the penetration of the oil in the agar medium results more inhibitory zone activity against some antibiotics thus enhances the activity of the cinnamon oil.

Key words: Cinnamon oil, Tween 80, Antibacterial activity and enhancement.

INTRODUCTION

From the past centuries plants has been extensively used throughout the world for the treatment of many diseases since a large variety of compounds has been produced from same plant or by different plants. They are very much safe and cost reliable, having less side effects than compared to the synthetic drugs and useful for treatment of many diseases¹. Our present study is to determine the enhancement of the anti bacterial activity of cinnamon oil by admixing or dispersing the cinnamon oil in a 0.2% v/v tween 80 solution. Cinnamon herb is of great value to mankind². It is known for its antiseptic and antispasmodic properties. Cinnamon has proved to be extremely effective in treating numerous diseases such as astringent, warming stimulant, carminative, antiseptic, antifungal, anti-viral, blood purifier, and digestive aid, rheumatism, exhaustion, low blood pressure, stress and constipation. Due to the multitude of health benefits that cinnamon oil offers, it has been witnessing increasing growth in its

demand. The oil extracted from the bark can be a bit unsafe to use, therefore it is best to use the oil that has been taken out from the leaf³. Most people around the world are familiar with the sweet and pungent taste of cinnamon. Cinnamon is native to India, Malaya, Ceylon, China, Japan and Taiwan, where it is as common to them as an Oak tree wood. The oil is used for medicinal or flavoring purposes. *Cinnamomum zeylanicum* (Lauraceae) is the main source of cinnamon. The main constituents present in the cinnamon oil is cinnamic aldehyde (60-75%), eugenol (4-10%) and other are phellandrene, pinene, linalool, diterpenoids etc⁴. Four compounds- cinnamaldehyde, cinnamyl acetate, eugenol and anethole – also exhibited the strongest antibacterial activity⁵.

The penetration and the anti bacterial property of cinnamon oil was already studied, but the present study is based upon to enhance the antibacterial activity of cinnamon oil by using 0.2% tween 80⁶ and the results were compared with the normal cinnamon oil activity and cinnamon oil in

the chloroform solvent against different micro organism like *Bacillus subtilis*(MTCC441), *Staphylococcus aureus* (MTCC96), *Escherichia coli* (MTCC443), *Pseudomonas aeruginosa* (MTCC741) .

MATERIAL AND METHODS

Cinnamomum zeylanicum (Lauraceae) Barks were collected from Pallavaram town, Tamilnadu, India, during the period of full flowering and were authenticated by a botanist at Captain srinivasa moorthy, research center, Chennai, Tamilnadu, India.

Extraction of oil

The bark was collected in bulk, washed with water to remove dirt matter and then shade dried. The bark was milled to coarse powder using Kwalvwka pulveriser(Model no 121nm141) and the oil was extracted by steam distillation. The oil is separated from other constituents by using separating funnel.

Agar Diffusion Method

Anti bacterial activity ⁷

The Antimicrobial activity was evaluated by agar diffusion method employing 24hrs culture of 4 different test organism, viz. *Bacillus subtilis* (MTCC441), *Staphylococcus aureus* (MTCC96), *Escherichia coli* (MTCC443), *Pseudomonas aeruginosa* (MTCC741). The bacterial strains were initially inoculated in an 100ml of sterile nutrient agar broth and incubated for 37±1°C for 24hrs. respectively and were diluted with sterile water so as to get a test innoculum of 10⁶-10⁷cfu/ml solution(working stock).

The test organism from working stock were seeded into the sterile nutrient agar medium by uniformly mixing 0.2ml of the working stock with 100ml of sterile nutrient agar, cooled to 48 to 50°C in a sterile petridish. When the nutrient agar medium solidified, an hole of uniform diameter (6mm)was made using sterile aluminium borer. Different concentrations of Cinnamon oil (8,4,2,1,0.5%v/v) dispersed in 0.2% tween 80 solution, Cinnamom oil

Table 1: Inhibition zone (mm^a) caused by essential oil

Sample	Concentration of cinnamon oil (%V/V)	Inhibition Zone (mm ^a) (± S.D.)			
		<i>B.subtillus</i>	<i>S.aureus</i>	<i>E.coli</i>	<i>Ps.aeruginosa</i>
Cinnamon oil in tween 20 solution ^b	8	25 ± 0.12	26 ± 0.23	50 ± 0.16	43± 0.04
	4	24 ± 0.06	25 ± 0.11	45 ± 0.06	40 ± 0.44
	2	22 ± 0.22	21 ± 0.17	38 ± 0.14	36 ± 0.22
	1	18 ± 0.11	19 ± 0.22	33 ± 0.07	32 ± 0.31
	0.5	9 ± 0.11	9 ± 0.17		-
Cinnamon oil in chloroform	8	45 ± 0.19	47 ± 0.21	28 ± 0.23	36 ± 0.16
	4	39 ± 0.08	42 ± 0.09	27 ± 0.04	34 ± 0.11
	2	33 ± 0.31	34 ± 0.11	24 ± 0.51	30 ± 0.14
	1	21± 0.24	23 ± 0.22	22 ± 0.16	28 ± 0.31
	0.5	18 ± 0.21	17 ± 0.22	-	-
Ampicillin	-	46 ± 0.22	45 ± 0.31	29 ± 0.11	38 ± 0.19

^a Including the diameter of the well(6mm)

^b 0.2 %v/v aqueous solution of tween 20

Listed in Table I .*Bacillus subtilis*(MTCC441),*Staphylococcus aureus* (MTCC96) , *Escherichia coli* (MTCC443), *Pseudomonas aeruginosa* (MTCC741) were procured from the institute of microbial technology (IMTECH), India

in chloroform solvent, Ampicillin solution (20 µg/ml)⁸ were placed in each hole separately under aseptic condition. The plates were maintained at room temperature for 2 hrs to allow the diffusion of the solution into the medium. All the bacterial plates were then incubated at 37±1°C for 18hrs and the zone of inhibition measured. The results were tabulated in Table 1.

RESULTS

The inhibitory zone diameter of different concentrations of the cinnamon oil in 0.2% tween 80 solution and in chloroform solvent was measured against the all four organism. All concentrations of the cinnamon dispersions showed significant inhibitory activity but the activity was concentration dependent. The cinnamon oil dispersed in the tween 80 solution showing good inhibitory activity against *Escherichia coli* (50mm), *Pseudomonas aeruginosa* (43mm) compared to that of the *Bacillus subtilus* (25mm), *Staphylococcus aureus* (26mm). But in the case of cinnamon oil in chloroform showed opposite action of maximum activity against *Bacillus subtilus* (45mm), *Staphylococcus aureus* (47mm) when compared to that of *Escherichia coli* (28mm), *Pseudomonas aeruginosa* (26mm). The activity of ampicilline was good against all the micro organism. The results of cinnamon oil in 0.2% tween 80 was comparable with that of ampicillin (20 µg/ml).

DISCUSSION

The microbes are responsible for causing number of diseases in our body. From the past few years we were using antibiotics for complete recovery. A plenty of compounds from the green herbs having antimicrobial activity and still some of that compounds are used mainly in the tribal areas. But some compound showing less activity because of less penetration and absorption especially oils, for example cinnamon oil having less anti microbial activity (in case of agar diffusion method) due to the less miscibility with the water. Some surfactant can be used in hope of enhancing antimicrobial activity of essential oils. Especially in this experiment using of tween 80 solution aided the penetration of the oil in to the agar medium and results in more inhibitory zone. Tween 80 enhances the activity of the cinnamon oil. Thus an appropriate dispersion can be prepared for an essential oil particularly for the cinnamon oil in tween 80 which helps to enhance the therapeutic efficacy invitro. The results of this experiments would certainly helps to design an invivo experiment to get the real efficacy of this surfactant dispersion.

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