

A REPORT ON PERCENTAGE YIELDS OF CALCIUM CITRATE FROM CITRUS FRUITS AND HYDRODISTILLATION OF DRIED ORANGE PEEL AND CINNAMON BARK POWDER

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ABSTRACT

Objective: Present study was focused on a report of Percentage yields of different species of Citrus fruits and hydrodistillation of dried orange peel powder and Cinnamon bark powder.

Method: Different species of citrus fruits like *Citrus xhystrix*, *Citrus kama* (khatta), *Citrus limonis*, *Citrus pseudolemon* (galgal) and *Citrus sinensis* (sweet orange) were squeezed and treated with calcium chloride to get calcium citrate. Hydrodistillation of orange peel and Cinnamon bark powder was done by using cleverger apparatus for volatile oil lighter than water. Volatile oil from orange peel was obtained by hydrodistillation other than the standard ecuelle method.

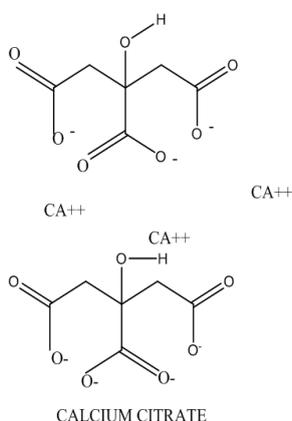
Result: The percentage yields of calcium citrate was found to be 9.83%, 25% and 25% and 10 %, 3% respectively from 100ml juice of different species of citrus fruits. The percentage yield of volatile oil from 30g dried orange peel and cinnamon bark powder was found to be 3.33% v/w for each.

Conclusion: Present report on the percentage yield of calcium citrate may help to select high yielding source of the salt. The hydrodistillation of orange peel was performed which further provide a new method and less time consuming, less tedious method for the extraction of volatile oil from citrus fruits peel.

Keywords: Citrus fruits, Calcium citrate, Hydrodistillation, Orange peel, Cinnamon bark

INTRODUCTION

Like citric acid, calcium citrate has a sour taste. Like other salts, however, it also has a salty taste. This should not be confused with the product commonly found in grocery stores labeled as "sour salt", which is simply powdered citric acid (which only resembles salt superficially)[1]. In many individuals, bioavailability of calcium citrate is found to be equal to that of the cheaper calcium carbonate [2]. However, alterations to the digestive tract may change how calcium is digested and absorbed. According to recent research into calcium absorption after gastric bypass surgery[3], calcium citrate may have improved bioavailability over calcium carbonate in Roux-en-Y gastric bypass patients who are taking calcium citrate as a dietary supplement after surgery. This is mainly due to the changes related to where calcium absorption occurs in the digestive tract of these individuals.



As we focus on the medicinal uses of calcium then we find that the salt is used as an anticoagulant and calcium supplement the salt is also used as an antioxidant[4-5]. Lemon oil may be used in aromatherapy. Researchers at The Ohio State University found that lemon oil aroma does not influence the human immune system, but may enhance mood[6]. Essential oils from number of plants have

been reported to possess different pharmacological activities like antimicrobial in *Melaleuca alternifolia*[7] and *Woodfordia fruticosa* [8], Antibacterial activity of essential oils and their major constituents against respiratory tract pathogens by gaseous contact[9], in acute otitis [10] as an expectorant[11], in chronic bronchitis[12], analgesic activity[13], anti-inflammatory activity [14-15], in the treatment of post operative nausea and vomiting and as an antimicrobial [16-17], essential oils from *Zingiber Officinale*, for inflammation, vomiting associated with gynecological surgery [18]. Essential oils from the leaves of *Woodfordia fruticosa* was identified as sesquiterpenoids (β -caryophyllene, γ -curcumen, gerrmacrene-D, β -selinene, elemol) and monoterpenoids (α -pinene, 2, 6 dimethyl-1, 3, 5, 7 octatetraene)[19]

MATERIAL AND METHODS

Plant Material

Fresh fruits of different four species of lemons namely *Citrus xhystrix*, *Citrus kama* (khatta), *Citrus limonis*, *Citrus pseudolemon* (galgal) and *Citrus sinensis* (sweet orange) were collected from 'Gharsi' village hills of Solan district of Himachal Pradesh.

Method

The fresh fruits were cut in two pieces and then squeezed to get juice separately from each species of lemon. The juice so obtained was filtered to remove all pulpy impurities. 15-20% solution of Sodium hydroxide was prepared and about 10ml of the solution was added to the juice to make it alkaline. 10-15% calcium chloride was prepared. Solution of calcium chloride was added slowly to the alkaline juice. As the solution of calcium chloride was added the alkaline juice gets precipitated. The calcium chloride solution was added till the puff colored precipitate obtained. The precipitate so obtained was filtered and dried in oven. The percentage of the calcium citrate precipitate obtained was weighed and the percentage yields were calculated and tabulated in table number 1.

Hydrodistillation of orange peel powder

Dried orange peel was grinded to get powder and then 30g of powder was added to a volumetric flask of 500 ml capacity. 250 ml

water was added to the flask and the clevenger apparatus assembly was adjusted. Clevenger apparatus for volatile oil which are lighter than water was used. The oil was extracted at the temperature of 75°C for 3 hours. The percentage of the oil so obtained was recorded and calculated.

Hydrodistillation of Cinnamon volatile oil [20-21]

30 g of cinnamon powder was added to the 500 ml volumetric flask and the clevenger assembly was adjusted. The temperature was adjusted to 75°C. The distillation was continued for 3 hrs. An amount of volatile oil appeared after 30 minutes and 1ml of volatile oil was

obtained after 3 hrs. The percentage yield was calculated and tabulated.

Microscopy of Cinnamon fiber

Small amount of Cinnamon bark powder was put on the slide. Few drops of Chloral hydrate solution was added and warmed on a lamp. 1-2 drops of Glycerin was added and observed under compound microscope at 10x and 45x. Picture of the magnified images were taken by mobile phone camera. On other side the powder of cinnamon was stained with iodine solution and same procedure were followed for its microscopic study.

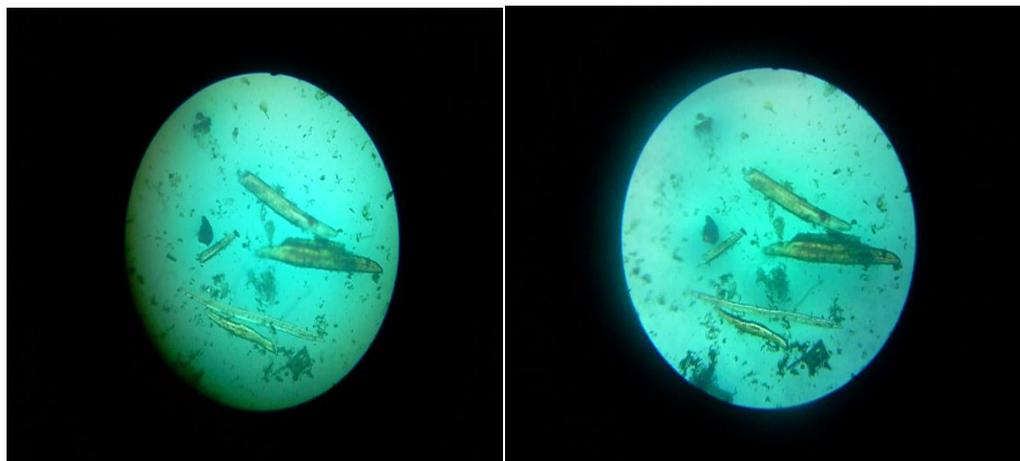


Fig. 1: Shows magnified images of Cinnamon fibers (without staining)



Fig. 2: Shows magnified images of cinnamon fibers (after staining)

Table 1: Shows percentage yields of calcium citrate from 5 different species of citrus lemon.

Name	Amount of Juice taken(ml)	Amount of calcium citrate	Percentage yield
<i>Citrus xhystrix</i>	100	9.83g	9.83%
<i>Citrus Kama</i> (khatta)	100	25g	25%
<i>Citrus limonis</i>	100	25g	25%
<i>Citrus pseudolimon</i> (galgal)	100	10g	10%
<i>Citrus sinensis</i>	100	3g	3%

Table 2: Shows percentage yield of volatile oil from orange peel and cinnamon bark by hydrodistillation.

Name	Amount taken	Amount obtained	Percentage yield
Orange peel	30g	1ml	3.33%
Cinnamon	30g	1ml	3.33%

RESULTS

Percentage yield of calcium citrate from different species was reported as 9.83%, 25, 25, 10 and 3. The percentage yield of volatile oil from the orange peel powder and Cinnamon powder was found to be 3.33%

Microscopic study

The microscopic study revealed the clear photos of magnified images of cinnamon powder fibers when taken through eyepiece lens by using the camera of mobile phone. The images of the stained powder fibers were not found to be clear (Figure 1&2).

DISCUSSION

Varied amount of calcium citrate was obtained from different species of lemon. New method was developed for the distillation of volatile oils from orange peel (*Citrus sinensis*). Hydrodistillation of 30g of dried orange peel powder provided 1ml of volatile oil. The extraction was done by hydrodistillation which is different from standard ecuelle method for extraction volatile oil from orange peel. From the above experiment it can be concluded that the percentage yield of calcium citrate from *Citrus unshiu*, *Citrus limonis* is more than *Citrus xclamentina*, *Citrus xhystrix* whereas *Citrus sinensis* (Sweet orange) provided only 3%. 25% of calcium citrate was obtained from *Citrus kamma* and *Citrus limonis* were reported. From the volatile extraction of orange peel it was concluded that the hydrodistillation of the orange peel also provide volatile oil which give new method for extraction of volatile oil from citrus fruit peel. The volatile obtained above the water in the clevenger apparatus which indicates that the oil is lighter than water. Volatile oil obtained in very less time than by the standard method ecuelle which make the experiment very simple. The hydrodistillation of cinnamon bark powder was performed. 3.33% volatile oil was obtained from 30 g of cinnamon bark powder. During hydrodistillation of Cinnamon bark powder two reactions were observed. First, the water collected below the lighter volatile oil in the clevenger tube is milky in colour. Secondly, the volatile oil obtained showed effervescence with chloroform when the oil was diluted with chloroform for spotting on TLC plate. Microscopy of Cinnamon bark was performed to check the fibers by two ways simply and after staining with iodine solution. The photos of magnified images were taken by using the camera of mobile phone. From the images and photos it was observed that the fibers in images from simple slides are clear and well identified (figure 1) but the images of stained fibers are not so clear (Figure 2). This study may help to take the photos of enlarged images from compound microscope without using any photomicrograph.

CONCLUSION

All sour citrus fruits were reported to provide more amount of calcium citrate than sweet varieties. Calcium citrate is a better intervention to all other available salts as calcium salt supplement, antioxidant and antacid. Present report on the percentage yield of calcium citrate may help to select high yielding source of the salt. The hydrodistillation of orange peel was performed which further lay a new method and less time consuming and less tedious method for the extraction of volatile oil from citrus fruits peel.

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