Preparation of Tartaric Acid from Tamarind Leaves

N.Y. Ghare

SSBT's College of Engineering & Technology, Bambhori , Jalgaon

nyghare@gmail.com

V.R. Diware

SSBT's College of Engineering & Technology, Bambhori , Jalgaon

vrdiware65@rediffmail.com

K.S.Wani

SSBT's College of Engineering & Technology, Bambhori , Jalgaon

wani.kishor@gmail.com

Abstract

Tamarind tree leaves are green colored economic raw material and with extraordinary properties such as long life. It comprises major concentrations of tartaric acid with pectin, potassium bitartrate in minor concentration. In this research percolation method is used for extraction of tartaric from tamarind leaves pulp. NMR spectra and UV spectrophotometer analysis was performed to analyze the composition of the obtained solid from the extraction process.

Key words: *Tamarind leaves Pulp, percolation, tartaric acid, extraction.*

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1. Introduction

The pea like pods contains tamarind fruit pulp. It has various medicinal uses. Leaves are eaten as a vegetable and are also used medicinally for treatment of various diseases. Approximately 170kg of fruit per year is available from tamarind tree.

Research work carried out by Kulkarni et al.(1979) concluded that for improvisation of crop best crop has to be identified.[1].In the study by Usha et al.,(1996) excellent yield was obtained by delayed flower trees.[2].As per the report by Singh et al.,(1997) local species of plant are best raw material for extraction of tartaric acid.

Shivanandam et al.,(1980) revealed that more research is required to select the best tamarind tree.[4].Extensive research work was carried out by Gullipalli et al.,(2013)

for production of tartaric acid from tamarind leaves.[5]

The analysis of tamarind leaves indicate that it contains tannins, phytic acid, hydrogen cyanide [6].The use of tamarind seeds for eating it is essential to separate testa from seeds by physical or chemical process. Otherwise it has bad effect on human health. (M.M.B Almeida)[7]. Tamarind seed husks contains tannin which is used for improvement of digestion in cows as per study by Bhatta et al. (2001). Evaluation of macro and micro-mineral The analysis of tropical fruits cultivated in the northeast of Brazil was studied by S. E. Atawodi et al [8].

2. Materials and Methods

2.1 Materials:

The materials used in this study included tamarind leaves, cold water, hot water, calcium carbonate, calcium chloride, sulfuric acid . All the chemicals and reagents used were of LR grade. Bottles made from plastic, flasks, cotton, stand, funnels, tape ,Test tube, Burettes stand, Separating funnel ,a knife were used[5].

2.2 Method:

Extraction of Tartaric Acid from Tamarind Pulp:

Water and tamarind pulp as taken in ratio of 1:2 by volume.In this temperature was varied from 25^0 C to 90^0C using hot plate with extraction time of 6 hours[5].After cooling for 6 hours with temperature maintaining at 10°C precipitate of Potassium Bi-tartarate was obtained. Then solution of potassium bi-tartarate in water was prepared. After this calcium tartarate was obtained by reaction with calcium carbonate. To this calcium chloride solution was added. The precipitates which were formed were filtered [5].This was acidified by using Sulfuric acid. Tartaric acid was produced after

30min with by product calcium sulfate. This was followed by washing with water. After evaporation for approximate 10 hours crystals of tartaric acid were obtained. [5].

3. Percolation Process:(figure 2).

a) Experimental setup:

The plastic bottle with lower end cut was used [5]. Cotton piece was taken and put into the upper end of test tube . Teflon tape was used for sealing of open end of test tube. To extract Tamarind leaves powder was fed. Firstly solvent was used for soaking the leaves powder in a percolator. The entire set up was covered with plastic bottle. Ethanol 70% and water 30% was taken in separating funnel and was placed in vertical position using stand. Using water percolation of leaves powder was carried out. To the obtained extract suitable quantity of hexane was added and mixed.The mixture was added to round bottom flask .For the analysis of extract Thin Liquid Chromatography was used.

3.1 Product Analysis Instrumentation:

a) NMR Spectroscopy:

b) UV-visible spectrophotometer:

Standard solution of tartaric acid 0.016 M was prepared .Diluted quantitative standards were prepared. Blank solution was prepared. A blank solution as well as samples were taken in cuvette. Diluted Quantitative Standards were prepared.

Calculations:

Standard curve was drawn by plotting the absorbance vs concentration of known solutions. [5].This was used to determine the concentration of unknown solutions.

3.2 Product Analysis Instrumentation:

Thin Liquid Chromatography: This method is a easy, fast and cheap for identification of a compound in a mixture [5]

Procedure: The micro cap into the solution was dipped .The end of micro cap was used with the suitable location available in the TLC plate. The prepared TLC plate was inserted in the developing jar. Potassium permanganate was used to dip TLC plate followed by drying.

R_f Value Determination :

Plate Length used = 2.5 cm

A – d spot = spot 1 --- 0. 3mm | spot 2 ---0.8 mm.

B –Migration of solvent level. = 1.5cm

Formula:

$R_f = d_{spot}/d_{solvent\ front} = 0.3/1.5 = 0.2$

$R_f = d_{spot}/d_{solvent\ front} = 0.8/1.5 = 0.53$

Fig 1:TLC SETUP

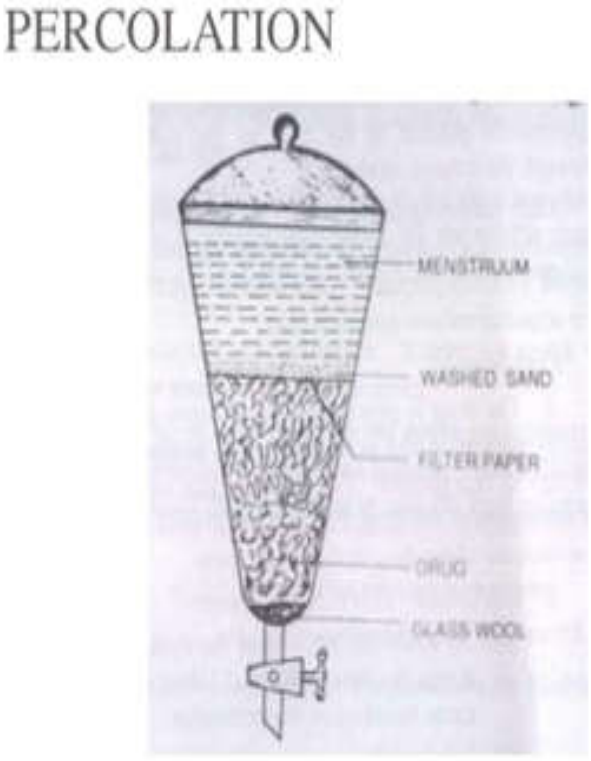

Fig 2 Percolation Method

4.Result and Discussion:

Sr.No.	Process	Pulp(g)	Potassium bitartrate(g)	Pectin(g)	Tartaric acid(g)
1	Earlier	500	18	15	35
2	Estimated	125	4.8	3.85	8.85
3	By experiment	125	4.9	4.2	4.2

Table 1: Weight Balance

Calculation for determination of concentration

Tartaric acid available in unknown sample= 0.01855

Tartaric acid concentration initially = 3.09**%** [5]

Sr.No.	Organic acid of reference	R
1	Tartaric Acid	0.13

Table1: Tartaric Acid Concentration in Tamarind Leaves

Concentration calculation:

Tartaric acid weight in new sample = ($C_4H_4O_6$ M *20*Molecular weight of $C_4H_4O_6$)/1000
= (0.00618*20*150.09)/1000
= 0.01855

Initial Tartaric acid concentration = (Wt of $C_4H_4O_6$ present in unknown sample*100)/ Initial wt of $C_4H_4O_6$ dissolved in water
= (0.01855*100)/0.6
= 3.09 % by weight

5. Conclusion

In the process which was developed in this research two useful chemicals potassium bitartrate and tartaric acid were obtained from tamarind leaves of good quality.

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