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EXTRACTION AND CHARACTERIZATION OF PECTIN FROM APPLE PEEL

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Abstract

Pectin is a complex polysaccharide consisting mainly of esterified D-galacturonic acid resides in an alpha-(1-4) chain. The acid groups along the chain are largely esterifed with methoxy groups in the natural product. There can also be acetyl groups present on the free hydroxy groups. Pectin was extracted from Apple peel powder by using 0.05M of two different acids Nitric Acid, Citric Acid, Pectin extraction was better in citric acid and nitric acid than hydrochloric acid. The pectin powder was prepared by triple extraction with citric acid solution (1%) and nitric acid separately through sedimentation, concentration, precipitation using ethyl alcohol, vacuum drying and grinding. Physico-chemical properties of pectin powder such as moisture content, total ash content, equivalent weight, methoxy content were studied. Pectin yield obtained from Apple peel using nitric acid was less as compared to using citric acid, may be due higher in molecular weight of citric acid less depolymerisation of pectin.

Keywords: Apple, Pectin, sedimentation, precipitation, citric acid.

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I. INTRODUCTION

Pectin are complex polysaccharides consisting mainly of galacturonic acid units being linked by α-(1→4) linkages. Pectin is a polysaccharide widely used in food and pharmaceutical industries is as thickening and gelling agents [1]. Peel is the major waste since entire fruit is used for preserve making after peeling. At present peel is either fed to animals or thrown into garbage [2]. Pectin gels are formed when the molecule chains are cross-linked, forming a three-dimensional network where water and co-solutes are retained [3]. Consumption of pectin has been shown to reduce blood cholesterol levels. In the large intestine and colon, microorganisms degrade pectin and liberate short-chain fatty acids that have positive influence on health [4]. Without the fermentation process, pectin would pass almost unchanged through the digestive system [5]. Increasing consumer awareness of a healthy lifestyle and the emerging trend to produce functional food has made pectin popular. It has been reported that pectin has numerous positive influences on health including improving colonic health, lowering of cholesterol and serum glucose levels, reducing cancer propensity, and stimulating the immune response [6]. Extraction is the most important process in the pectin production. Pectin

substances are usually extracted by chemical or enzymatic methods, with a process of physical and chemical multiple stages, in which involves hydrolysis, extraction and solubilization of macromolecules The extraction of pectin from fruit peels using weak organic acid such as citric acid has been intensively conducted in recent studies. In India apples are produced in plenty especially in Himachal Pradesh, Jammu and Kashmir, and Uttaranchal [7], this work aims to extract and characterize pectin from Apple.

1.1 MATERIAL AND METHOD

Apple was collected from local market, Citric acid (Merk India) , nitric acid (Merk India) Ethonol 99.1% .(sigma aldrich) and muslin cloths local market,silica gel (sigma aldrich), phenolphthalein(Merk India)

1.2 EXTRACTION OF PECTIN

Apple were washed inorder to remove the dirt, dust and to remove the residues of pesticide spray. The seeds were removed and the pulp were cut down into small pieces and then blanched with boiled water for 5 minutes to inactivate enzymes. Then filtered by hands through two cheese cloths or muslin cloths, after which the insoluble materials (pieces) were treated in warm absolute ethanol for 30 minutes to remove oil from pulp and then washed. Then pressed under hand pressure to remove excess water.The apple peel was dried in shadow for several days, when it was completely dried then the peel was finely powdered. 5 grams of the peel powder was weighed and put into 250 ml conical flask, added 150 ml distilled water. Citric acid and nitric acid in separate samples were added for maintaining different pH medium as reagents. the mixture was heated for each different pH medium of extraction while stirred at 60, 70 and 80° C for each different time 30,45 and 60 minutes. The hot acid extract was filtered through muslin clothes For each acid, three different pH medium of extraction at three of time and temperature, extraction was carried out and collected the extract separately for further experiments. The filtrate was cooled to room temperature, then the filtrate is dried in oven.

1.2.1 PURIFICATION AND CENTRIFUGATION PROCEDURE

Pectin containing aqueous extract was coagulated by using an equal volume (1:1) of 99.1% ethanol at 4^0C and was left for 3 hours. The precipitate (ethanol-insoluble fraction) formed was recovered through centrifugation and filtration, was washed with 55% and then with 75% ethanol.

1.2.2 PERCENTAGE YIELD OF PECTIN

The pectin yield was calculated using equation 1.

$$\text{Ypec}(\%) = \frac{p}{Bi} \text{ X} \quad \text{---------- (1)}$$

Where, Ypec (%)is the extracted pectin yield in percent(%), P is the amount of extracted pectin in g and Bi is the initial amount of Apple.

Condition	% yield of Pectin
Nitric Acid	44.2
Citric Acid	67.8

Table 1. % Yield of Pectin

11 CHARACTERIZATION OF PECTIN

2.1 MOISTURE CONTENT:

1g sample was weighed in desicator and was then dried for 1hour at 100^0C. Then cooled over silica gel. Percent moisture observed is added (1%) to obtained agreement with the Fischer method. The moisture content of pectin extracted from apple peel powder (APP) using citric acid and nitric acid was found to be 6.4% and 10.1% respectively. The pectin is very hygroscopic, for this reason, it must be preserved in closed dry atmosphere.

2,2 ASH CONTENT:

Ash content of pectin was determined by Ranganna's method (1995). Weighed 1.2g of pectin substance, and ignited slowly then heat 3-4 hour at 600^0C. Then cooled the crucible to room temperrature in a desicators and weighed properly. The process will be weighed till constant weight come and fina weight will be noticed.

$$\%ash = (W_2 - W_1)/W*100 \quad \text{----------(2)}$$

Where, W_2 – final weight of dish and ash,

W_1 - Weight of Dish

W - Weight of pectin sample.

2.3 EQUIVALENT WEIGHT:

Equivalent weigh is used for calculating the anhydrouronic acid content and degree phenolphthalein indicator Hinton's red indicator. Equivalent weight was determined by Ranganna's method (1995), 0.5 g sample was taken in a 250ml conical flask and 5 ml ethanol was added. 1g of sodium chloride to sharpen the end point and 100ml of distilled water were added. Finally 6 drops of phenolphthalein indicator or Hinton's indicator by purple color, This neutralized solution was stored for determination of methoxyl content.

$$\text{Equivalent Weight} = \frac{weight\ of\ sample\ x\ 1000}{ml\ of\ alkali\ x\ Narmality\ of\ alkali} \quad \text{----------(3)}$$

2.4 METHOXY CONTENT (MeO);

Methoxyl content or degree of etherification is an important factor in controlling the setting time of pectins, the sensitivity to polyvalent cations, and their usefulness in the preparation of low solid gels, fibres and film. It is determined by saponification of the pectin and titration of the liberated carboxyl groups. Determination of MeO group was done by using the Ranganna's method (1995). The natural solution was collected from determination of equivalent weight, and 25ml of sodium hydroxide (0.25N) was added. The mixed solution was stirred thoroughly and kept at room temperature for 30 minutes.

After 30 minutes 25ml of 0.25N hydrochloric acid was added and titrated against 0.1 N NaOH to the same end point as before like in equivalent weight titration.

$$\text{Methoxy Content\%} = \frac{ml\,alkali\,x\,Normality\,of\,alkali\,x\,3.1}{weight\,of\,sample} \text{ ----------(4)}$$

Condition	Moisture Content %	Ash content %	Equivalent weight	Methoxy content
Nitric Acid	10.1	6.66	510	5.4
Citric Acid	6.4	3.33	250	5.82

Table 2. Physical Characterisation of Pectin

111 RESULT AND DISCUSSION

3.1 EFFECT OF SOLUTION REAGENTS ON PECTIN EXTRACTION

3.1.1 Effect of extraction reagent on pectin yield extracted from Apple peel powder (APP) using nitric acid and citric acid as reagent at different treatment combination:

Pectin yield obtained from APP using nitric acid was less as compared to using citric acid, may be due higher in molecular weight of citric acid less depolymerisation of pectin. The percentage yield of pectin extracted by using nitric acid from APP ranged from 13%- 44.2% and citric acid ranged 21%-67.8%. The percentage yield of pectin at 2.0 pH was little more higher than 1.5pH and 2.5pH for 30 minutes extraction.Due to the higher molecular weigh of citric acid medium provides greater yield of pectin at 2.0 PH range.

Condition	PH 1.5	PH 2.0	PH 2.5
Nitric Acid	13%	44.2%	35.2%
Citric Acid	21%	67.8%	52.5%

Table 3 % Yield of Pectin at Different PH Range

1V **CONCLUSION**

The research emphasized on pectin extraction and characterisations from Applepeel In genereal, the research had been divided into three parts namely effect of reagents on pectin yield, effect on pectin yield by different parameters and characterisation of pectin. The results indicated that different extractants. pH, extracting temperature and time effect on the extraction yield. The best condition were, extracting temperature at 80^0C at 2.0 PH for 60mins and using nitric acid as extracting solvent. this gave yield of 67.8% on comparing both nitric acid and citric acid extraction the molecular weight of pectin from citric acid is high. From the results obtained, Apple gives a significant amount of pectin whereby it can be considered in commercial productiion of pectin along side with other sources.

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