

Pectin Extraction from Orange Peels by Using Organic Clay

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Abstract- The present work addressed to the development of the method which is the part of the process needed for the extraction of biopolymer like pectin from the orange peel, which is the waste of orange juice processing industry. Pectin is used by pharmaceutical industry, food industry and also widely used in cosmetics, herbal medicines, manufacturing of soaps. In this method we have used the organic clay as mineral acid instead of strong concentrated acid. These results demonstrated, that the pectin yield was affected by pH. At the low pH for red clay (4.3) maximum yield (4%) of pectin was obtained.

Keywords- Pectin, Orange peel, Acid extraction, pH, Organic clay.

I. INTRODUCTION

Oranges are now commonly enjoyed by many in the form of orange juice which is one of the most widely-consumed beverages today. With increase in production of processed fruit juice, fruit waste generated is increasing which consist of fruits peels, seeds and membrane residues. Orange is also used for other purposes other than general consumption. Orange is a fruit which has significant history, and will remain popular choice as source of vitamin and to aid in health maintenance. Orange peel contains pectin[1] which is natural biopolymer. This biopolymer is finding increasing applications in the pharmaceutical and biotechnology industry. From many years pectin is used in the food and beverage industry as thickening agent, a gelling agent, and a colloidal stabilizer.

In food application the pectin is used in dosage between 0.5 -1% and also used in cosmetics products [2]. Pectin is gelatinized in the presence of saccharine and small quantities of organic acids and this property is exploited by agro chemistry and pharmaceutical industries for pectin isolation. An orange specifically, the sweet orange peels are good source of pectin. Pectin is widely distributed in the cell walls of the roots, stems, leaves and oranges of higher plants. As orange waste, pectin is present in the high levels in orange peels and can be used as raw material for pectin extraction [3].

Recently developed extraction methods like Acid extraction method, Direct boiling (hot water) extraction method, Thermo mechanical extraction method, Microwave extraction method has been used for pectin extraction. In direct boiling extraction method a very low yield of pectin obtained from dried orange peel was reported using distillation apparatus as extracting at 85-90%. In thermo mechanical extraction method obtained

yield is poor and require the chemical aids. This method use high pressure boiler so it needs high steam consumption[4]. Microwave heating builds up considerable pressure inside a material and gave higher rate, amount of extraction [5] In acid extraction method commonly used acidifying materials are mineral acids including, hydrochloric, sulphuric and phosphoric acids. We have selected the acid extraction method for pectin extraction because it is new technology, simple to construct and operate at minimum cost [6]. The industrial processes generate the liquid waste and to treat this strong acidic waste high cost requires [7, 8] The development of environmentally benign methodologies [9] are necessary due to the environmental regulations and safety concern. The strong acids are corrosive and also harmful to the health. Taking this into consideration, we have used organic clay as mineral acid instead of the concentrated acids.

II. MATERIALS AND METHODS

All the chemicals and reagents used were of analytical grade. Natural red clay was collected near panvel region. Black and white clay was collected near satara region. The raw material used for extraction of pectin is orange peel. Orange peels [10] were collected from juice house. Materials used during laboratory work was knife, beaker, filter paper, digital oven, water bath, pH meter, grinder. Centrifuge model used was Eppendorf 5101R.

1. Sample preparation:

Fresh orange peels were cut by knife into small pieces then dried in oven on 55°C for 48 hrs. Dried orange peels were made into fine powder by grinder.

III. EXPERIMENTAL SECTION

1. Method to check the pH of Organic Clay:

Weighed the 10g of red/white /black clay into the container. Added 50 ml of distilled water to the clay. The ratio taken is 1:5 for clay:water. Shaked the container for about 2-3 min then allowed the clay to settle for 2 minutes. Measured the pH value of the water above the clay in the container by using pH meter. The pH of red clay, white clay and black was found to be 4.3, 7.2 and 5.2 respectively.

2. Procedure of Experiment:

10g of orange peel powder was added into each of 125 ml of double distilled water containing 0.5g each of organic red clay, white clay, black clay in three conical flasks. The conical flasks was capped with the help of rubber plugs. Water bath was preheated at a temperature of 80°C. Then the conical flasks was heated in preheated water bath at 80°C for 10 min and kept it for cooling overnight. Then next day it was filtered by whatman's filter paper under vacuum. In the filtrate added 20 ml of ethanol and then the extracted pectin was precipitated with thorough stirring, left for 30 minutes to allow the pectin to float on the surface. By using centrifuge the gel pectin was separated from the ethanol and water by centrifuge it at 9000 rpm for 10 minutes at 10°C and then jelly pectin was then dried at 50°C and -100 mmHg gauge pressure for two hours. Dried pectin is obtained. This pectin should always be stored in a cool and dry place, away from direct sunlight [11].

IV. RESULTS AND DISCUSSION

Yield of the Pectin

Yield percentage of pectin is based on the gram of peel sample taken and is calculated by formula as given below;

$$Y_{pec}(\%) = 100 \times (P/B_i)$$

Where,

$Y_{pec}(\%)$ = extracted pectin yield in percentage

P = amount of dry pectin in grams

B_i = initial amount of orange peel in grams

Observation was tabulated in Table 1.

Table 1. Yield of Pectin at different pH value.

S. No.	pH of organic clay water	Volume of pH solution (ml)	Volume of ethanol sample (ml)	Weight of dry pectin (gm)	Yield (%)
1.	4.3	125	20	0.40	4.0
2.	7.2	125	20	0.27	2.7
3.	5.2	125	20	0.32	3.2

Here, we have developed the new method to extract the pectin from orange peels by using organic clay instead of strong concentrated acids.

V. CONCLUSION

It is concluded that the process in which acid extraction technique is most suitable for industrial production. The result of analysis of variance showed that the effects of pH, on the yield of extracted pectin were found to be significant. These results demonstrated the successful extraction for pectin production with Organic red, white and black clay, providing potential benefits to industrial extraction of pectin from an economic as well as an environmental point of view.

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