The International Journal of Engineering and Science (IJES)
|| Volume || 13 || Issue || 12 || Pages || PP 07-09 || 2024 ||
ISSN (e): 2319 – 1813 ISSN (p): 2319 – 1805

Determination of pectin from Orange, Pomegranate, Lemon and Banana fruits

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----------*ABSTRACT*----------
In this study, the amount of pectin was determined from the peels of waste orange, pomegranate, lemon and banana fruits consumed especially in winter months. The pectin in these waste fruit peels was extracted using 100 mL of 50% ethyl alcohol-water mixture. HPLC method was used for pectin analysis. Calibration graph was drawn according to known pectin concentrations. Validation values of the method were measured. Extracted fruit peel samples were analyzed for pectin amounts by HPLC using the appropriate procedure.

KEYWORDS; *Pectin, Fruit peels, HPLC, Determination.*

Date of Submission: 27-11-2024 Date of acceptance: 06-12-2024

I. INTRODUCTION

Pectin is all around us. It is a major component of the cell walls of all land plants and in a normal western diet around 4–5 g of pectin are consumed each day [1]. Extracted pectin is widely used as functional food ingredient and it is listed among the ingredients of innumerable food products. Worldwide annual consumption is estimated at around 45 million kilograms, with a global market value of at least 400 million Euros [2]. n the food industry pectin is known primarily as a gelling agent and is widely used in the production of jams and jellies, fruit juice, confectionary products and bakery fillings [3]. The other major use of pectin is for the stabilisation of acidified milk drinks and yogurts. In all application areas the fine structure of pectin profoundly affects its functionality. Therefore, new solvents that befits to pectin extraction, which has less harmful to the environment, equipment and characteristics of pectin are being looked for. High contents of pectin can be found in almost all parts of fruits depending on the varieties and maturity stages [4-8].

To recover pectin from plant resources, microwave-assisted extraction (MAE) is more effective for the extraction of high-quality pectin than conventional heating [9-12]. Several studies of MAE for banana peel pectin extraction are presented in the literature, investigating parameters such as the influence of microwave power, extraction temperature and time [13-15]. Significant research has been conducted on the petkin content and bioactive properties of some fruits. [16-18].

In this study, pectin analysis was performed on waste orange, pomegranate, lemon and banana fruit peels consumed especially in winter months in our country. These fruit samples were extracted in a suitable solvent mixture. HPLC method was used for pectin determination in the obtained samples. Validation values of the method were measured.

II. MATERIAL AND METHODS

Chemicals

All chemicals used were of analytical grade and purchased from Merck. Ultrapure water was used in the preparation of solutions (18.2 MΩ cm^{-1}). Citrus pectin (CP), a typical homogalacturonan (HG) pectin, was purchased from Sigma-Aldrich and contains > 74% GalA. Orange, pomegranate, lemon and banana fruits grown in the south of our country were purchased from a well-known market. The peels of these fruits were removed and separated.

Instruments

Fruit samples were solubilized using a Milestone brand microwave digestion system (Ethos up, China). Pectin analysis in fruit samples was performed using a Thermo Ultimate 3000 (USA) brand HPLC equipped [17].

Extraction of pectin

Waste orange, pomegranate, lemon and banana peels were turned into small pieces with a knife. They were dried in the oven at 100 °C for approximately 4 hours. The samples that were brought to a fixed weight were crushed in an agate mortar and turned into powder. 1 g of these samples were weighed accurately. The extraction process was carried out by adding 100 mL of a mixture with a 50% ethyl alcohol/water ratio. 1 mL of 0.1 M NaOH solution was added to this and kept in the refrigerator at 4 °C [18].

III. RESULT VIEW

Working conditions of HPLC

The procedure appropriate to the selected method for pectin analysis in waste fruit peel samples was applied on the HPLC device. Accordingly, the operating conditions are given in Table 1.

PARAMETERS	CONDITIONS
Wavelength (nm)	712.00
Ordinate mode	Abs
SBW (nm)	1.50
Ave Time (sec)	0.100
Beem Mode	Double auto select
Beem interchange	Normal
Replicates	1
Fit type	Linear
Min R^2	0.800
Concentration	mg/L

Table 1. Parameters of HPLC for determination of pectin

Calibration of standard pectin

Standard solutions of pectin diluted with ethyl alcohol-water mixture at 25, 50, 100 and 200 mg/L were prepared and the chromatograms of these solutions were taken by HPLC. The values obtained are given in Table 2. It was observed that the sensitivity of the measured values was high.

STANDARD	CONCENTRATION: mg/L	DETECTOR RESPONSE INTENSITY
1	0	0.0004
2	25	0.02460
3	50	0.0508
4	100	0.2024
5	200	0.4250

Table 2. HPLC values of Pectin standard solutions

Determination of pectin in fruit peel samples

Using this method, pectin amounts of waste orange, pomegranate, lemon and banana fruit peel extraction samples were calculated as the average of 4 measurements at 95% confidence level. The results are given in Table 3.

FRUIT PEELS EXTRACT	PECTIN: mg/L
Orange	18.7 ± 0.5
Pomegranate	58.3 ± 1.2
Lemon	12.1 ± 0.3
Banana	23.8 ± 0.7

Table 3. Pectin amount in fruit peels extract samples

IV. CONCLUSION

Alkaline extraction method was preferred while analyzing pectin in waste fruit peel extraction samples. It was thought that more pectin would be released as a result of hydrolysis of fruit peel samples. This situation was confirmed with literature information. HPLC method was used in pectin analysis and its optimum conditions were investigated. Calibration of standard pectin solutions was performed with HPLC. It was determined that the detector response intensity was proportional to the concentration. The pectin amounts in orange, pomegranate, lemon and banana extract samples were determined by HPLC method.It was determined that the amount of pectin was higher in pomegranate fruit extract among fruit samples.

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