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Comparative studies of pectin yield from fruits using different acids

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ABSTRACT

Pectin was extracted from fruits such as orange, apple, guava and grapes using different acids. Hydrochloric acid, sulphuric acid and nitric acid were used for extraction of pectin from dried fruit pieces. The level of pectin differed in the fruits depending on the acids added during the process of extraction. Generally fruits are dried to determine the yield of pectin. Various drying methods were adopted in this study to extract pectin from above mentioned fruits. The resulting pectin content of fruits was compared with drying methods adopted.

Introduction

Pectin is a structural heteropolysaccharide contained in the primary cell walls of terrestrial plants. It has a high water-holding capacity, due to its physical and chemical nature. Pectin is used as a gelling agent and thickening agent. It gives the jelly-like consistency to jams. Pectin is extracted from guava, apples, blackberries, gooseberries, cranberries, grapes, plums. It can also be used to stabilize protein drinks, such as yogurt, and as a fat substitute in baked goods. It is produced commercially as a white to light brown powder.

Commercially pectins are categorized according to their methoxy content and whether they form gels quickly or slowly. Roughly speaking pectin can be classified as high methoxy pectin (>50% esterified) and low methoxy pectin (<50%esterified).*High methoxyl pectin* (HM-pectin) has degree of esterification more than 50 % and *low methoxyl pectin* (LM-pectin) has degree of esterification less than 50%. (Braddock,1999).

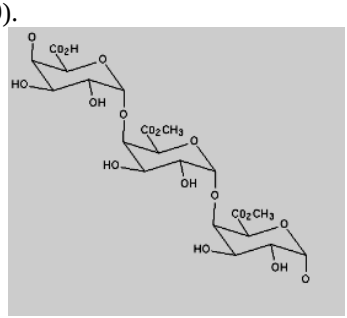


Figure 1: Structure of pectin

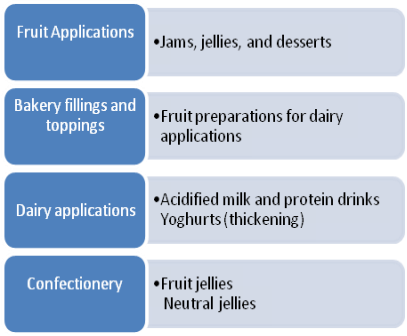
The degree of amidation indicates the presence of carboxyl groups in the amide form. The main use of pectin is as a gelling agent, thickening agent and stabilizer in food. The classical application of pectin is to give a jelly-like consistency to jams or marmalades, which would otherwise be just sweet juices. For household use, pectin is an ingredient in gelling sugar (also known as "Jam Sugar") where it is diluted to the right concentration with sugar and some citric acid to adjust pH. In some countries, pectin is also available as a solution or an extract, or as a blended powder, for home jam making. For conventional jams and marmalades that contain above 60% sugar and soluble fruit solids, high-ester pectin is used. With low-ester pectin and amidated pectin less sugar is needed, so that diet products can be made. Typical levels of pectin used as a food additive are between 0.5 – 1.0% - this is about the same amount of pectin as in fresh fruit.

This study was carried out with the following objectives:

- Identification of sources of pectin.
- Extraction of pectin from different fruits using different methods (varying the acids).
- Comparison of the pectin yield from different methods.

Product and application development by the major pectin producers has over the years resulted in a large expansion of the opportunities and applicability of pectin. Figure 2 shows the application of pectin.

Figure 2: Applications of pectin



Methodology

Fruits selected for pectin extraction were orange, apple, guava and grapes based on a maturity indices viz., acidity, TSS, specific gravity, firmness and color. Before the processing of orange, apple, guava and grapes the fruits were washed with clean potable water to remove the dust particles. Ripe fruits were sorted from the under ripe fruits and cut into pieces or into slices

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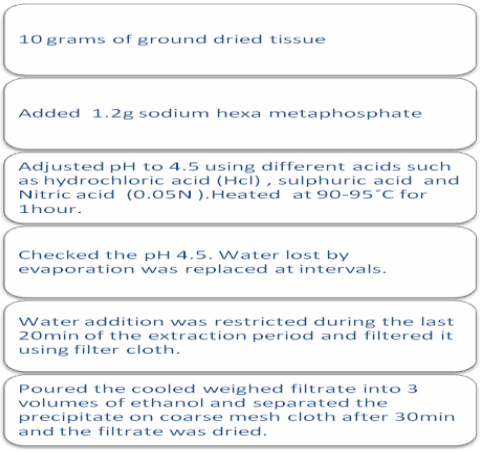
and were dried by sun drying method for complete removal of moisture. Fruit pieces were also dried in a tray drier for 1-3 hours at a temperature of 130˚C - 150˚C. The dried sample was ground in a mixer-grinder for the extraction of pectin. (Ranganna S, 2001)

Extraction of pectin

Pectin was extracted by following the standard procedure (Ranganna S, 2001). Pectin extraction was also carried out using different acids such as hydrochloric acid, Sulphuric acid and **Nitric acid according to the following procedure:**

Extraction of pectin



After drying the sample was weighed and the yield of pectin calculated and tabulated.

Pectin yield y_{pec} (%) = 100(P/B_i)

where ,

y_{pec} = Extracted pectin in per cent (%),

P = Amount of extracted pectin in g ,and

B_i = Initial amount of ground dried tissue (10g).

Results:

The present study gave the following results which are described below:

Fruits-orange, apple, guava, and grapes were selected for extraction of pectin. Pectin yield was calculated as per the standard analytical procedure (Rangana, 2001),as shown in Table 1

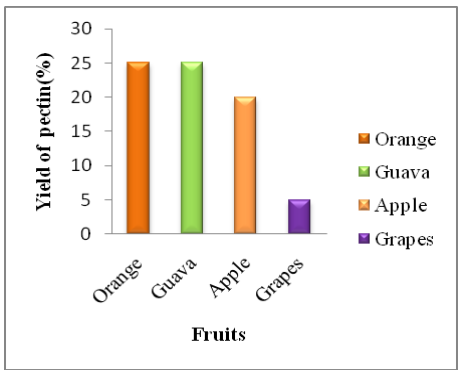


Figure 3 Pectin extracted from fruits (Ranganna, 1995)

The yield of pectin content was found to be high in orange and guava which was more than that of the pectin obtained from apple and grapes as shown in figure 3.

Comparison of Pectin Yield using Different Acids

Pectin was extracted from the fruits using different acids after they were dried under sun. The yield of pectin thus obtained is shown in table 2.

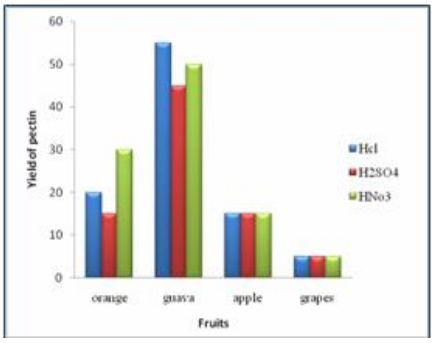


Figure 4 : Comparison of Pectin yield for different acids (sun dried sample)

Results indicated that the pectin content was found to be high using hydrochloric acid for all fruits as shown in Table 2. There was a considerable decrease of the pectin obtained from nitric acid and sulphuric acid. The yield of pectin for sun dried orange using nitric acid was found to be high when compared to the pectin content obtained from hydrochloric acid and sulphuric acid as shown in figure 4. The pectin content was same and did not change for apple and grapes even though different acids were used.

Pectin was also extracted from the fruits using different acids after they were dried in a *tray drier* for 1-3 hours at a temperature of 130˚C - 150˚C. The dried sample was ground in a mixer-grinder for the extraction of pectin.

Results of pectin yield for tray dried guava reported highest values using different acids as shown in table 3. The yield of pectin for tray dried orange using nitric acid was found to be moderate when different acids were used. However the pectin content did not differ much for grapes and apple using hydrochloric acid and sulphuric acid as shown in figure 5.

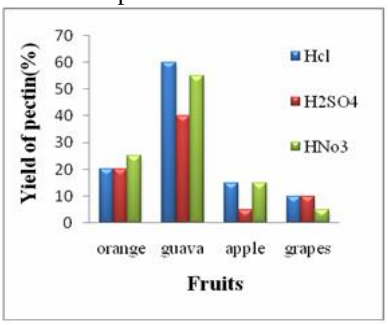


Figure 5: Comparison of pectin yield for different acids (tray dried sample)

Conclusion

Selected fruits were dried under sun and using a tray drier before extraction of pectin. During the drying process it was observed that there was a considerable difference in the pectin yield using different acids. The pectin content was found to be high using hydrochloric acid for all fruits that were dried under sun. On the other hand, guava reported highest values of yield after it was tray dried and pectin extracted using different acids.

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Table 1: Yield of Pectin

Fruits	Yield of Pectin(%)
Orange	25
Guava	25
Apple	20
Grapes	5

Table 2: Comparison of Pectin yield for different acids (Sun dried sample)

Type of Acid (0.05 N)	Yield of Pectin(%)			
	Orange	Guava	Apple	Grapes
Hydrochloric Acid	20	55	15	5
Sulphuric Acid	15	45	15	5
Nitric Acid	30	50	15	5

Table 3: Comparison of Pectin yield for different acids (tray dried sample)

Type of Acid (0.05 N)	Yield of Pectin (%)			
	Orange	Guava	Apple	Grapes
Hydro chloric Acid	20	60	15	10
Sulphuric Acid	20	40	5	10
Nitric Acid	25	55	15	5