International Research Journal in Global Engineering and Sciences. (IRJGES)
ISSN : 2456-172X | Vol. 2, No. 4, December 2019 - February, 2020 | Pages 172-180

Extraction of Pectin for Medicinal use

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ABSTRACT

An orange, specifically the sweet orange is the most commonly grown tree fruit in the world. The present work addresses to the development of part of the process needed for the extraction of value added products like orange oil and pectin from orange peel, which is the waste of orange juice processing industry. The outcome of the present work highlighted that the sweet orange peels are good source of orange oil and pectin and does have the potential to become important raw material for food processing industries. Two methods namely simple distillation & leaching have been explored for separation of oil from peels. The remains of cake in this part is further treated for isolation of pectin. It is concluded that the process in which orange oil is first extracted using technique of simple distillation followed by PH maintenance for the extraction of pectin is most for industrial production for isolation of pectin. These results demonstrate the successful extraction of orange oil and pectin, providing potential benefits for industrial extraction of pectin from an economic and environmental point of view.
KEYWORDS: Orange peel, pectin extraction, orange essential oil.

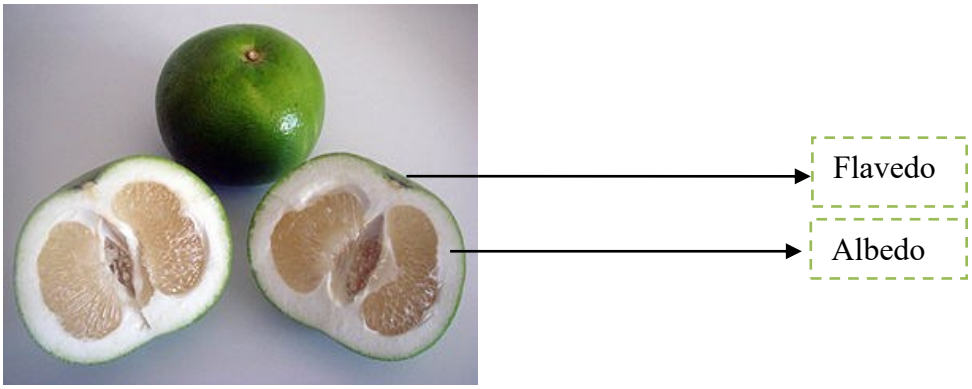
1.0 Introduction

An orange,specifically,the sweet orange is the most commonly grown tree fruit in the world.Orange trees are widely cultivated in tropical and subtropical climates for the sweet fruit, which is peeled or cut (to avoid the bitter rind) and eaten whole,or processed to extract orange juice &also for the fragrant peel.Citrus fruits are at the top not only in total production,but also in economic value.The albedo is the main source of pectin includes all the esterified polygalacturonic acids at different degree of neutralization.In the presence of saccharine and small quantites of organic acids(usually citric acid), pectin gelatinized,and this property is exploited by the agrochemistry and pharmaceutical industries for pectin isolation.Orange essential oil is present in small ductless gland contained in the peel of the orange fruits.The main constituent of orange peel essential oil is d limonene (present to the extent of at least 90%),which is the only hydrocarbon present.The d-limonene is extracted from orange rinds or solids.The rinds and pulp are sent to an evaporator and the d-limonene is steamed out.It is widely known for its pleasant scent and degreasing properties.d-limonene is currently being used in many applications such as chlorinated solvents replacements, hand cleaners and sewage treatments.The orange processing industry can get a complete makeover if due importance is given for separation of useful ingredient from orange peel.Pectin is extensively utilized by the food processes for conversion of low – grade fruits into quality products like jam,jelly,marmalade and candies.Fruits and vegetables waste materials are usually used for the extraction of pectin by soaking the fruit and vegetables in different PH.The present work explored the possibility of separation of essential oils and pectin from the ORANGE PEELS.

2.0 Materials and methods:

a)From fresh peels,the leftover

The peels of these fruits were passed through shredding machine to separate albedo(pectin rich) and flavedo (oil &pigment)portions.The albedo portion was minced mechanically and washed with cold water to remove the adhering .And washed with cold water to remove the adhering and other mucilages.The washed and minced albedo was then dried in a dryer at 65°c to reduce moisture content to 5-6%.The dried material was finally ground.



Raw Materials*:*

The raw material taken under examination for the extraction of ORANGE PEEL.
Orange peels are removed from fresh oranges which are procured from local market

Extraction of Pectin from Citrus Peels:

Twenty-five gram of the dried ground sample of citrus peels were mixed with water of PH(3-3.5),keeping substrate to water ratio 1:40 and then incubated at different temperatures for different time periods with frequent stirring. After incubation the contents were filtered through cheese cloth and pectin from the filtrate was precipitated by heating. The obtained pectin was dried in a vacuum oven at 40°c constant weight and ground finally to vary fine powder to study chemical quantity characteristics. Yield was calculated as dried pectin/100g dried citrus peels. Pectin extracted by separation process.

2.0 **Outline Of The Process*:***

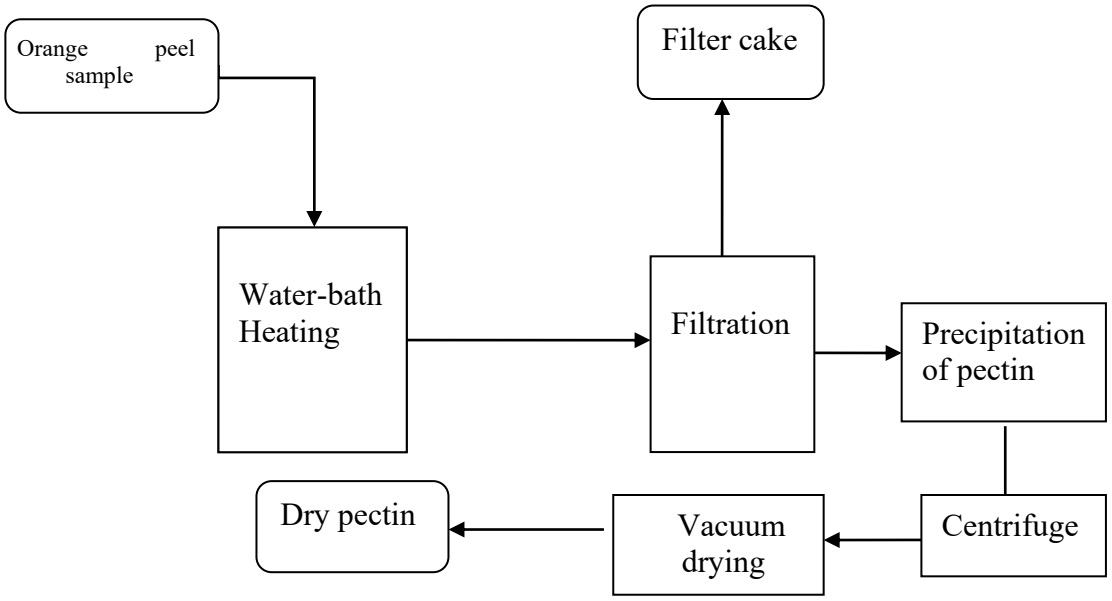


Fig: Extraction of pectin from orange peel

2.48 pH of water

Separation of albedo&flavedo

Pectin

Extraction Of Pectin Oil From Dried Orange Peel*:*

Simple distillation is employed for removal of essential oil from orange peel. Dried and fine grounded orange powder is added with known quantity of water which is simple distillated for approximately one hour. The solid remains of the residue and dried to obtain the dried cake. The distillated resulted in two phases , **oil and water**. Two phases are separated by separating funnel or by using evaporation method. Thus the oil is obtained for 350g of orange powder taken 8 ml of

oil and 126.3g of dried cake is obtained. The dried cake obtained can be used for cosmetics preparation and preparation of pectin.

Dried orange peel

powdered orange peel

distillation process

separation of oil

4.0. The Chemical Nature Of Pectin:

Pectins as defined for use in food are high molecular weight heteropolymers containing a majority (at least 65% by weight) of galacturonic acid units. The acid group may be free (or as a simple salt with sodium, potassium, calcium or ammonium) or naturally esterified with methanol. However, pectins are derived from the breakdown of more complex protopectins which are present in the plant tissue, and also contain a range of neutral sugars, including rhamnose, galactose, arabinose and lesser amounts of other sugars.These sugar units are present in a non-random structure, which consists of blocks ofdiffering character retaining fragments of the original plant cell wall structure. The use ofpurified enzymes has shown that pectin extracted under very mild conditions contains both linear blocks (smooth regions) consisting of homopolygalacturonic acid, and highly branched blocks (hairy regions) which themselves contain several types of structures.Pectins 171The regions of the pectin molecule which contain largely galacturonic acid units consist of a mixture of methyl ester, free acid and salt derivatives of the carboxyl group of the acid. Because commercial pectins are extracted under hot acidic conditions, many of the regions containing a high proportion of neutral sugars are hydrolysed, leaving mostlythe more acid-stable galacturonate blocks. In certain pectins, such as those from sugarbeet and potato, a proportion of the hydroxyl groups will also be acetylated. It has beenknown for a long time that the properties of pectin are dependent on pH, and on the percentage of acid group present in the form of ester (degree of esterification).

Commercial Pectin:

Properties, Modification And Function :

The pectin described above is normally from around 67–73% esterified. Apple pectin can, with great care, be extracted with up to 80% esterification. Pectin is readily degraded by aelimination mechanism at ambient temperature or above at neutral or alkaline pHvalues. The ester groups can be hydrolysed under either alkaline or acidic conditions, or by pectin esterases. Commercially, acidic treatment is most commonly used, producingpectins with around 60% of

ester groups which are 'slow setting'. Under identical conditions of 65% total sugar solids by refractometry and a pH of say 3.1, the gel will take much longer to set. The setting of these gels is both time and temperature dependent. The setting temperature depends on the rate of cooling. Slow-setting pectins permit gels to be prepared at higher sugar contents, valuable for sugar confectionery, biscuit jams, and so on. Because of the higher charge density on the slow-set pectin molecules, there is also a change in the pH requirements for gelation towards a lower pH in gels of otherwise similar composition.

Health and Safety Characteristics:

Pectin is a fine organic powder, and like flour, starch, and similar carbohydrate materials, has the potential to cause a dust explosion. It is therefore important to observe goodhousekeeping practices such as collecting up spilled material, and minimising dusting bycareful handling. A lesser but more common hazard is spillage of pectin solution or of powder pectin onto a wet floor, creating the risk of slips and falls. Pectin is not particular environmental hazard, but does have a significant BOD, and large spillages should be contained and disposed of carefully. Pectin is a component of the normal diet, and an approved food additive, and ingestion of pectin at reasonable levels is safe. As with any water soluble gum, it is inadvisable to consume large amounts of dry pectin which could swell and possibly risk obstruction of the gullet.

Nature of Pectin:

In all pectin applications, the action of the pectin is very dependent on the exact conditions in the product, pH, ionic strength and composition, the proportion of sweeteners and their nature, and, where fruit is present, the amount and nature of the pectin provided by the fruit.
It is therefore always wise to test any change in formulation, including a new season or source of fruit, on a small (saucepan) scale before embarking on full-scale manufacture.

❖ ***Dissolving Of Pectin:***

In most pectin applications it is essential to ensure that the pectin is dissolved before gelling conditions are reached.

- Pectin will not dissolve when near gelling conditions, and high methyl pectins in particular will not dissolve in sugar solutions of more than 20–25.
- As with most gums, it is vital to disperse the solid particles before they partially dissolve and stick together.
- This may be achieved either with a high shear mixing system(batch or in line) or by mixing the pectin with several times its weight of sugar, and stirring vigorously.
- Occasionally, the pectin may be dispersed in a sugar syrup and the mixture diluted with stirring to achieve a similar result.

Uses Of Pectin In Food Technology:

- To produce condiment jellies, glazes and marinades for chilled and frozen recipe dishes, and for other similar uses.
- Pectin/sugar solutions can be used to coat confectionery items, either chocolate or sugar coated, by standard panning techniques.
- Pre-dissolve the calcium lactate in the hot water D, and stir into the pectin solution, while
- maintaining a full rolling boil.
- Boil down to 1020g and remove from the heat and stir in ingredients E.
- Deposit as required.

- Final texture is quite firm and does not melt much in mouth.

Application Of Pectins:

- Pectin is one of the most versatile stabilizers available. Its gelling, thickening and stabilizing attributes makes is an essential additive in the production of many food products.
- Traditionally, pectin was primarily used in the production of jams and fruit jellies industrially as well as domestically and in low as well as high sugar products .It secures the
- Desires texture, limits the creation of water/juice on top of the surface as well as an even distribution of the product.
- With the change in lifestyle pectin is primarily sold for industustrial use.In some European market it is still sold for industrial use. In some European it is still sold to the consumers as an integrated component in gelling sugared…

Pectin is a key stabilizer in many food products.

❖ ***Fruits Appilication:***
Jams,jellies,and desserts

❖ ***Bakery Fillings And Toppings:***
Fruit preparations for daily applications

❖ ***DAILY APPLICATION:***
Acidified milk and protein drinks
Yoghurts (thinkening)

❖ ***Confectionery:***
Fruit Jellies
Neutral Jellies

❖ ***Beverages:***
Nutritional and Health products
Pharmaceutical and Medical Applications.

Packaging / Storage:

- **PACKAGING:**
  1 KG net plasting tin. 25 KG net cartons lined with polyethylene bag.
- **STORAGE CONDITIONS:**
  store cool and dry
- ***SHELF-LIFE*:**
  1 year minimum in original and unopened packaging

5.0.Result And Discussion:

TEST FOR PECTIN:

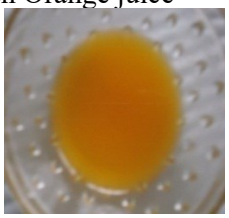
1) Simmer the chosen fruit in a little water. Simmer until it turns soft.
2) Place one teaspoon of the juice into a small jar. Leave it to stand until it turns co

3) Add 3 tablespoons of denatured alcohol or methylated spirits to the jar. Gently shake it and put down. Leave to stand for one minute. Check the result.

Look for the size of the jellied lump that will form in the jar.

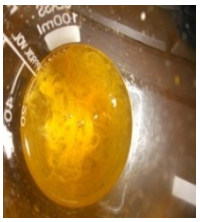
- A large, firm clump will tell you that the fruit contains a high level of pectin.
- Two or three smaller, softer lumps indicate a medium level of pectin.
- Lots of little, soft lumps tell you that the fruit is low in pectin.

Fresh Orange juice



ethanol

pectin



Formation of lump

FORMULA USED:

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

$$Y_{Pec}(\%) = 100 \times (P/Bi)$$

Where,

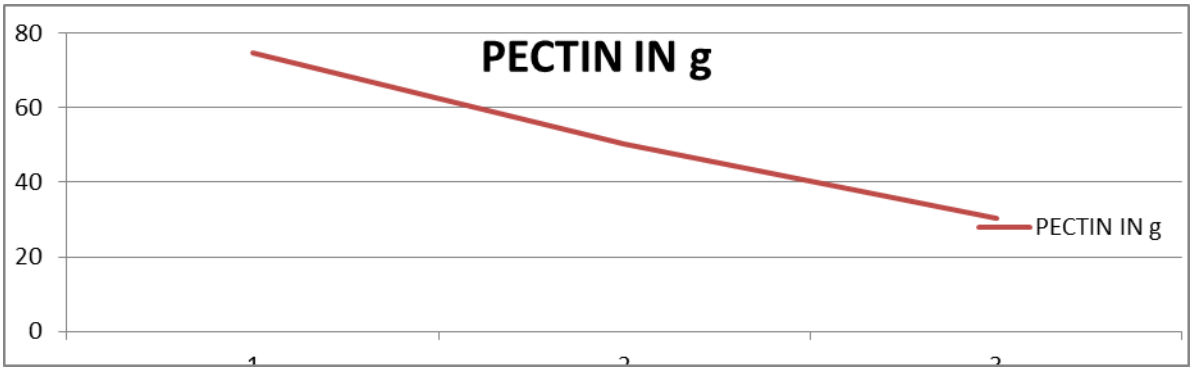
Ypec (%) is the extracted pectin yield in percent
P is the amount of dry pectin in g
Bi is the initial amount of orange peel in g

Example:

P=6.20, Bi=20; Yield of pectin:31%

GRAPH:

pH of water	Yield of pectin in gram
1.2	70.4
2.48	50.27
4.8	30.45



YIELD vs pH

The yield of pectin obtained is highest when the pH is low .The maximum overall yield of the pectin is obtained from orange peel residue sample through simple distillation .Therefore, in the process of orange oil and pectin extraction from orange peel.it is recommended on basis of results obtained, that to first extract oil using simple distillation and then isolate pectin.

6.0 Conclusion*:*

The present work is dedicated for the development of the part of the process technology and food technology needed for the extraction of value added products i.e.) orange oil and pectin from orange peel, which is the waste of orange juice processing industry. The present work reveal that the sweet orange peels are good source of pectin and oil and do have the potential to become important raw material for food processing industries. It is a found from the experimentation that the peels source, the extraction of pectin, when taken after extracting orange oil through distillation gives higher yield than other process. So it can be concluded that the process in which orange oil is extracted using technique of simple distillation is used in cosmetics. These results

demonstrate the successful extraction of orange oil and pectin, providing potential benefits for industrial extraction of pectin from an economic and environmental point of view.

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