INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE & TECHNOLOGY
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www.vmsindia.org

ISOLATION AND CHARACTERIZATION OF ORANGE PEEL PECTIN EXTRACTED BY VARIOUS DRYING METHODS

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Abstract:
Isolated orange peel pectin was subjected to four different drying methods namely microwave drying, sun drying, vacuum drying & hot air drying based on drying methods extraction period & pH was kept constant. The results indicated that best extraction of pectin (9.81%) was obtained by hot air oven at pH2. The alcohol purification was sufficient to yield of high purity which was confirmed by determining physicochemical characteristics i.e Moisture, Ash, Anhydrouronic Acid (AUA), Methoxyl content (MEO), Color, equivalent weight etc. The study was intended to identify if orange peels could be a potential source for pectin & optimum drying method could be determined. Thus it can be considered as a waste utilization in commercial, production of pectin.

Keywords: Pectin, drying methods, degree of esterification, Methoxyl content, Anhydrouronic acid.

Introduction:

Pectin is found in most plants, but is most concentrated in citrus fruits (oranges, lemons, grape fruits and apples). Pectin obtained from citrus peels is referred to as citrus pectin. The extraction of pectins can lead to large variations in the chemical structure of the final material. Pectins are industrially extracted from citrus peels and apple pomace by hot acidified water. (Okenfull, et al., 1991). Pectin readily forms gel under the conditions that characterize Jam i.e presence of dissolved sugar & fairly low in pH. Prior to the introduction of commercial pectin, home made Jam was gelled by 'Natural pectin in the fruit (Voragen, et al, 1995). Important uses of pectin includes stabilization of milk protein in drinkable yoghurt, soft drinks with milk & fruit etc (Thibault et al, 2001).

Pectins are a family of complex polysaccharides that contains 1,4 linked α-D galactosyluronic residues. Other pectic polysaccharides have been isolated from sunflower heads & apple fruit (Giannouli et al., 2004). Amidated pectins are replaced with amide groups, further the molecules contains regions of neutral sugars such as arabinose, galactose & rhamnose.

Commercial pectins can also be aminated. This improves gelling ability of low methoxyl pectins (Wada et al., 1978). Pectins have been utilized for their functionality in foods for many years. Industrial use has been mainly focused framed on tailoring the polymer to special need (Ridley, et al., 2001). Present study was aimed to identify the potential of orange peels for production and optimum drying method. Thus the study can be considered as a waste utilization in commercial production of pectin from citrus fruits.

Material and Methods:

Orange peels were procured from the local fruit market from Amravati. The AR Grade chemicals were used in the present study.

Methods:

The standard methods prescribed by Ranganna (1986) were used for the physicochemical parameters such as Moisture, Ash, pH, Methoxy content etc. Solubility (Fishman et al., 1984), Total Anhydrouronic Acid (AUA) (Mohammed and Hasen, 1995), degree of esterification (Owens et al., 1952).

Isolation of Pectins:

Citrus fruit peel powder (75g) blended with 400 ml Distilled water. The water was acidified using citric acid& pH was maintained at 2.0. This mixture was heated at 85° C, 120 min. It was passed through muslin cloth & cooled to room temperature. Isolation of pectin was carried out by ethyl alcohol as precipitating agent (95%) for 15 minutes stirring. The mixture was kept without stirring for 2 hours & filtered through four layered muslin cloth precipitate was washed 2-3 times by ethyl alcohol to remove impurities finally it was dried as shown in figure 1.

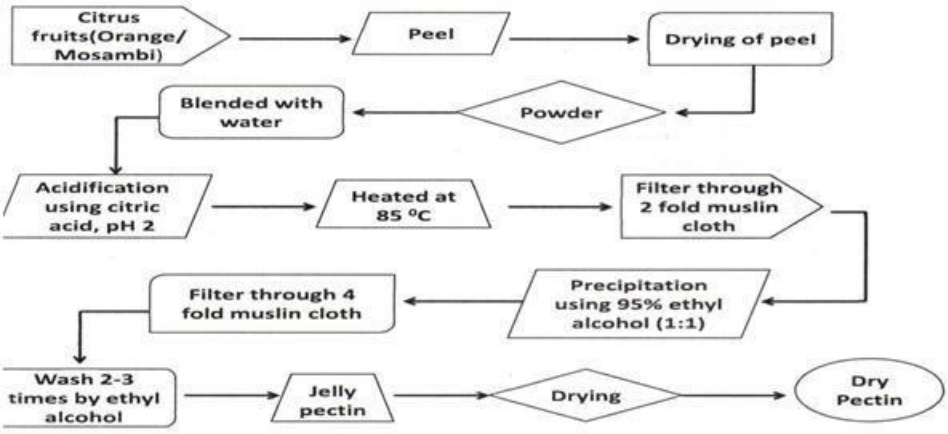

Figure1: Pectin Extraction Flow Chart.

Result and Discussion

Orange Pectin extraction by various methods such as Microwave Oven, Sun drying, Hot air oven and Vaccum Oven and characterization is shown in Table 1 & 2. The parameters determined were moisture (%), Ash (%), Methoxyl Content, Unhydrouronic acid, Degree of Esterification, pH, equivalent weight, (mg/mole), solubility in cold and hot water and in cold and hot alkali etc. Other parameters determined were temperature of the extraction, drying time etc.

Table 1: Characteristics of Orange Pectin dried by different methods

Parameters	Microwave oven	Sun drying
Moisture (%)	75.20	83.50
Ash (%)	2.77	2.87
* Meo (%)	5.14	5.02
* *AUA (%)	87.30	90.11
*** DE(%)	33.46	31.64
pH	2.90	2.58
Eq. Weight (mg/mole)	330.03	285.71
Solubility Cold Water Hot water Cold Alkali Hot Alkali	 Slightly Dissolved Slightly Dissolved Slightly Dissolved Fully Dissolved	 Insoluble Slightly Dissolved Slightly Dissolved Fully Dissolved
Temperature (0oc)	50.00	50.00
Drying Time (Hrs)	3.50	11.00
Colour	Dark Brown	Light Brown
Yield (%)	8.85	6.28

Table 2: Characteristics of Orange Pectin dried by different methods

Parameters	Hot air oven	Vacuum Oven
Moisture (%)	84.07	82.88
Ash (%)	2.92	2.66
* Meo (%)	4.90	3.22
* *AUA (%)	83.07	64.76
*** DE(%)	33.50	28.26
pH	2.85	2.68
Eq. Weight (mg/mole)	318.50	378.80

Contd…

Solubility Cold Water Hot water Cold Alkali Hot Alkali Temperature 0°c	 Insoluble Slightly Soluble Insoluble Slightly Soluble 50.00	 Insoluble Slightly Soluble Slightly Soluble Fully Dissolved 50.00
Drying Time (Hrs)	8.00	18.00
Colour	Light Brown	Dark Brown
Yield (%)	9.81	3.33

* MEO - Methoxyl Content
**AUA - Anhydrouronic Acid
***DE - Degree of Esterification.

Drying process affect extraction yield. Hot air drying at pH 2 gave extraction yield (9.81%) for orange peel. Purification using alcohol precipitation process was sufficient to yield pectins of high purity. The Anhydrouronic acid (AUA above 65%) indicates that pectin was pure. Degree of esterification (DE) & methoxyl contents (MEO) indicates that extracted pectin was low in methoxyl content.

Conclusion:

The orange peels could be a potential source for pectin production and optimum drying could be determined. Orange peels gave significant amount of pectin. Thus, it can be considered as a waste utilization in commercial production of pectin.

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