

QUALITY UPGRADATION OF JELLIES PREPARED USING PECTIN EXTRACTED FROM FRUIT WASTES

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Abstract: Pectin - a polysaccharide present in fruit cell walls - can be extracted from fruit wastes obtained after processing. The pectin thus obtained could be utilized for preparing jelly. Most of the jellies made using pectin from fruit wastes were found to have good quality. Those jellies with defects were given different corrective measures to upgrade their quality.

Key words: Jelly quality, jelly preparation, gel formation, organoleptic evaluation, pectin extraction

INTRODUCTION

Fruit wastes, which are highly perishable and seasonal, is a problem to the processing industries and pollution monitoring agencies. Suitable methods have to be adopted to utilize them for the conversion into value-added products (Nand, 1998). By-product recovery from fruit wastes can improve the overall economics of processing units. Besides this, the problem of environmental pollution also can be reduced considerably.

A valuable by-product that can be obtained from fruit wastes is pectin. Pectin exists in varying amounts in fruit cell walls and has important nutritional and technological properties, mainly because of its ability to form gels (Westerlund *et al.*, 1991). The pectin is used in manufacture of jams, jellies, marmalades, preserves etc. It is also useful as a thickening agent for sauces, ketchups, flavoured syrups and as a texturising agent in fruit-flavoured milk deserts. Besides, it finds numerous applications in pharmaceutical preparations, pastes, cosmetics etc. But, the single largest use of pectin is in the manufacture of jellies. About 80 to 90 per cent of the seven million kg of commercial pectin in the world is used to make jelly and similar products.

MATERIALS AND METHODS

The different fruit wastes selected for pectin extraction and preparation of jelly were jackfruit rind, nutmeg rind, passion fruit rind, mangosteen rind, pumello peel, mango peel, pineapple peel, citrus peel, banana peel and cocoa pod husk. Pectin was extracted from these fruit wastes using standard treatments (Madhav, 2001).

Preparation of jelly

Fruit wastes	Citric acid %	Water: fruit waste ratio	Time, minutes
Mango peel	0.75	3	60
Jackfruit rind and Nutmeg rind	0.75	1.5	45
Banana peel	0.75	1.5	60
Pumello peel	0.50	1.5	45
Passion fruit rind	0.75	3	45
Lime peel	0.5	3	60
Cocoa pod husk Mangosteen rind Pineapple peel	Quality of dry pectin obtained was very low. None of the treatments extracted pectin effectively		

Jelly was prepared by boiling the pectin extract with sugar (sugar is added at the rate of 3/4th the quantity of pectin extract) and citric acid (2.5 g per kg of pectin extract) till a gel consistency is reached. The end point was judged by sheet test (Jelly was taken in a spoon and allowed to fall. When it started falling like a sheet, cooking was stopped). Another criterion taken was the T.S.S. (The mass was boiled till 72° Brix was obtained). The jellies thus prepared were evaluated for their qualities by visual means as well as organoleptically. The qualities of different jellies were compared with that of guava jelly, which was taken as the standard.

Visual judgement

Setting property: Time taken for setting was recorded as the time taken by the jelly for attaining a proper set of required consistency after pouring in glass jars. Every jelly was

Table 1. Details of special treatments tried

Fruit waste	Special treatments tried	Purpose
Pineapple peel	Blended the pineapple peel pectin extract with pectin extracts prepared from different fruit wastes viz., mango peel and passion fruit rind at 1:1 ratio	Removal of syrupy consistency
Banana peel	(i) The peel was taken after scrubbing off the pulpy portion from the peel (ii) The extraction time was reduced to 25 minutes from 45 to 60 minutes	Removal of cloudiness
Pumello peel	(i) The chopped peel boiled in 1, 2, 3, 4 and 6% sodium chloride for 30 minutes and thoroughly washed with water before pectin extraction (ii) Dipped the chopped peel in lime at 2,4 and 6% for five hours and washed thoroughly with water before pectin extraction (iii) Chopped peel boiled with sodium hydroxide at 0.175, 0.25, 0.5, 0.75, 1, 1.5 and 1.75% for 30 minutes and thoroughly washed with water before pectin extract (iv) Blended with pineapple peel pectin extract at the ratio of 1 : 1	De-bittering of pectin To obtain gel consistency
Lime peel	Lime peel was treated with 1,2 and 3% sodium chloride by boiling for 30 minutes and kept overnight. Before extracting pectin, thorough washing was given	De-bittering of pectin
Passion fruit rind	(i) Jelly was prepared using reduced quantities of sugar viz., pectin extract and sugar in the ratio 1:0.75 (ii) Blended with that of pineapple peel pectin extract at 1:1 ratio	Removal of crystals To obtain gel consistency
Cocoa pod husk	Jelly was prepared by blending cocoa pod husk pectin extract with that of mango peel pectin extract at 1 : 1 ratio	Removal of syrupy consistency and syneresis
Mangosteen rind	Jelly was prepared by blending mangosteen rind pectin extract with that of mango peel pectin extract at 1 : 1 ratio	Removal of syrupy consistency and syneresis

examined for their consistency after setting viz., gel, firm and syrupy.

The bottle in which the jelly was kept, was tilted and examined for separation of water from it. The jelly in which separation of water noticed was denoted as weeping jelly. The jelly was examined for the presence of crystals. Cloudiness was determined by comparing with the clarity of guava jelly. Those jellies, which were not transparent, were denoted as cloudy jelly.

The different jellies whose quality did not come to the standard of guava jelly were selected out as a separate category. These were given different treatments for quality upgradation, to overcome their defects.

Organoleptic evaluation of jelly with the help of trained panel

A panel consisting of 10 semi-trained persons were served with the jelly samples for organoleptic evaluation. The characters analysed were appearance, transparency, colour,

consistency, taste, aroma, flavour and acceptability as bread-spread. For each character, average of the score value (given by the 10 semi-trained judges) was calculated. The jellies were assigned different characters based on their score acquisition as given below:

Very good	4.1 to 5.0
Good	3.1 to 4.0
Fair	2.1 to 3.0
Satisfactory	1.1 to 2.0
Poor	<1

Upgradation of jelly quality through special treatments

Based on the results of quality evaluation of jelly prepared from different fruit wastes, special treatments / method of preparation were tried for the following fruit wastes to improve their quality by correcting the defects identified.

RESULTS AND DISCUSSION

The jellies prepared out of pectin extracts from different fruit wastes were analysed for their

Table 2. Effect of corrective treatments on quality of jelly

Jelly	Defect noticed	Corrective treatments carried out	Improvement in quality of jelly
Pineapple peel	Syrupy consistency	Blended with passion fruit rind pectin extract at the ratio of 1:1	Gel consistency was obtained
Banana peel	Cloudiness	The extraction time was reduced to 25 minutes from 45 and 60 minutes	Cloudiness removed and jelly became transparent
Pumello peel	Bitter taste	Chopped peel boiled in 6% sodium chloride for 30 min.	De-bittering achieved.
		Chopped peel boiled with sodium hydroxide at 0.175% for 30 minutes and thoroughly washed with water before extracting pectin.	Bitterness removed considerably.
Pumello peel	Firm consistency	Blended with that of pineapple peel extract at the ratio 1:1.	Firm consistency was removed and gel nature was achieved.
Lime peel	Bitter taste	Lime peel was boiled with three per cent sodium chloride for 30 minutes and kept overnight. Washed well before pectin extraction.	Complete de-bittering was observed as evidenced by bitter-less jelly.
Passion fruit rind	Firm consistency	Blended with pineapple peel pectin extract at 1:1 ratio.	Firm consistency of jelly was changed to gel consistency.
Cocoa pod husk	Syrupy consistency and syneresis	Blended with mango peel pectin extract at the ratio of 1:1.	Gel consistency observed.
Mangosteen rind	Syrupy consistency and syneresis	Blended with mango peel extract at the ratio 1:1.	Defects removed and gained gel consistency

setting property, consistency, syneresis, colour, crystallisation and cloudiness in comparison with standard guava jelly. The treatments, which could overcome the defects noticed with different jellies, are given in Table 2.

Rate of setting and setting time

Almost all jellies, except that of passion fruit rind, lime peel and pumello peel exhibited slow setting, whereas passion fruit rind and lime peel jellies exhibited very fast setting nature and achieved proper set within 20 minutes. Pumello peel attained fast setting.

Consistency

Desirable consistency was obtained for jelly made from pectin extracts of mango peel, jackfruit rind, banana peel, nutmeg rind and lime peel. Jelly from pumello peel and passion fruit rind extracts were of firm consistency. The jelly from pineapple peel, cocoa pod husk and mangosteen rind extracts were denoted as

syrupy. Syrupy nature in jellies from pineapple peel, cocoa pod husk and mangosteen rind was corrected by blending their pectin extracts with that of passion fruit rind and mango peel respectively at 1:1 ratio. By this, the firmness of passion fruit rind jelly could also overcome. According to Ranganna (1986), a jelly will become syrupy, if it contain low amount of pectin, which is not sufficient enough to bind the sugar. Pineapple peel and cocoa pod husk were found to possess low pectin.

Cloudiness

Cloudiness - the loss of transparent nature - was observed only for banana peel jelly, whereas other jellies were transparent. Jelly became cloudy when pulp gets mixed in the extract. So extraction was carried out by scrapping off the pulp from peel as well as by reducing the time of extraction from 45 to 60 minutes to 25 minutes. The second treatment was found effective for extraction and the jelly prepared using such extracts were more transparent. Banana peel is

very soft and it may not require boiling for long time to extract pectin. By organoleptic evaluation, it was found that the single most hindrance in acceptance of lime peel of pumello peel jelly was its bitterness. Probably, this could be due to the presence of limonin and naringin as reported by Premi *et al.* (1995) and Berry (2001).

Several methods have been tried to reduce the bitterness of juice from citrus fruits. These include raising the pH of the juice (Renote and Bains, 1982), suppression of bitterness by addition of sweetening agents (Guadagni *et al.*, 1974), addition of p-cyclodextrin monomer for forming inclusion complexes of limonin (Konno *et al.*, 1981), conversion of bitter principles to non-bitter components in the juice by the action of immobilized bacteria (Hasegawa *et al.*, 1983) and treating the juice with adsorbent XAD-16 (Wilson *et al.*, 1989).

Pumello is a potential under exploited fruit of South India. No much product diversification or preservation methods are undertaken in the fruit. However, the attempts for extracting pectin from pumello peel and its subsequent utilization for product preparation is first of its kind in this

study. Instead of removing the bitter principles from the extract as done with juice (which appears tedious), treatments were given to the peel to make them get rid of components responsible for bitterness. Peels were treated with sodium chloride, lime and sodium hydroxide at different concentrations with and without boiling for extracting pectin.

Completely de-bittered and highly acceptable jelly was obtained with pectin extracts of peels boiled in 6% sodium chloride for 30 minutes before pectin extraction. The de-bittering might be due to the inactivation of the enzyme, which is responsible for conversion of laminar-A ring lactone to limonine (Maier *et al.*, 1969) at high temperature combined with high salt concentration. Further increase of salt concentration (6%) resulted in a salty taste to the product.

Jelly is a product, which is now becoming popular both for edible and cosmetic purposes. The preparation of good quality jellies from fruit wastes is certainly becoming a matter of very much importance, as it benefits the mankind in various ways.

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