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EXTRACTION OF PECTIN FROM VARIOUS BANANA FRUIT PEELS AND ITS FAT REDUCTION ACTIVITY

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ABSTRACT

The pectin a hetero polysaccharide which is mainly accumulated in fruit peels and used as food gelling purposes. Pectin is also needed in medicines, stabilizer in confectionery and main source of dietary fiber. This pectin can be used as dietary fiber supplement which helps for constipation and impaired digestive issues. It reduces the cholesterol naturally anti- diabetic activity and weight reduction. The present study was focused on the potential benefits of the non-citrus fruit peel as a source of pectin. This research emphasized on the pectin which was extracted from three different fruits namely Yellow banana *(Musa balbisiana);* Green banana *(Plantains);* and Apple peel powder using three different pH (2.0, 2.2, 2,5) respectively. This study has been distributed as effect on yield of pectin at physical parameters and characterization of the fat reduction activity. The output of the work reflected that the fiber rich non citrus fruit peels are good source of pectin and showing benefits of jelly for industrial use and it's commercially binder for pharmaceutics and also a source of weight reduction naturally.

Keywords: pectin, non citrus fruit peels, dietary fiber, ion..

INTRODUCTION

Fruits and vegetables are cultivated in India ranked third in world. In recent years, many research works based on fruit waste and reutilization of waste concern helping to world ecosystem burden and waste disposal management. The fruit processing industry releases approximately 45% of total industrial organic pollution (Mc Gready RM, 2006). The fruit wastes are rich source of vitamins fiber which is easily biodegradable materials and making them into useful products (Elizabeth *et al.,* 2014). Pectin a natural, vegetable agglutinate, biodegradable and renewable heteropolysaccharide It is specified as a fat emulsifier, gel forming agent, glazing agent, stabilizer, and are texture thickener in many industries (Chin NL, 2014). Pectin is present in most plants, highly accumulated in fruits of oranges, lemons, grapefruits and apples. Pectin extracted from non-sour citrus peels is named as non-citrus pectin. Pectin also be used to neutralize acidic protein drinks, to improve the yogurt mouth-feel and the pulp stabilizer in juice-based drinks and baked foods with fat neutralizer and stabilizer (Wosiacki *et al.,* 2001). Intake of pectin in food has reflected to reduce blood cholesterol levels and act as probiotic. The microbes present in the large intestine and colon degraded the pectin and release fatty acid which reflects on weight reduction and better health (Tang *et al.,* 2011). Pectin found in varying amounts in cell walls of fruits and has high nutritional and immunological properties (Knox *et al.,* 1990). The pectin in cell walls acts as the cement layer of the cellulose fibrils which joined to adjacent polymers. This pectinact as carrier of nutrients and water (Tamaki *et al.,* 2008). Pectin is a structural based polysaccharide in cell walls of terrestrial plants. It is appearing a white and brown powder which mainly taken from fruits, it is used in food as a gelly in jams and jellies. It is also added in dessert fillings, medicines, sweets, as a stabilizer in fruit juices and milk drinks (Braddock RJ, 2004; Sakai *et al*., 1999) .Pectin is commercially produced from citrus fruit peels and apple using hot water in acid medium. The extraction at pH from 1.5 to 3.0 and temperatures 60-100 °C for 0.5 to 6 hours are varied to give a product that has the best gelling capacity (Jain RK *et al.,* 1994; Canteri–Schemin *et al.,* 2005) Pectin in apple pomace is mainly occur in the form of protopectin, an acid soluble polysaccharide (Thibault *et al.*, 1991) Consumption of pectin helps to reduce blood cholesterol levels. The microbes in the large intestine and colon, microorganisms degrade pectin and liberate fatty acids that have good impact on health (Tang *et al.,* 2011). In the commercial pectin microwave-assisted extraction, high acidic and maximum temperature is used. It is a very easy and rapid mechanism. 12 hr process, but a great demand of large liquid phase demand. This leads to better quick extraction processes, This is an efficient and environmental eco -friendly recovery for the production of bioactive compounds (Kroyer GT,1995; Fishman *et al.,* 2006) It also acts as good binder for drugs in showing good bioavailability and drug release activity (Khule *et al.,* 2012) Hence the work is to establish a cost based time consuming process of and optimization of pectin from the peels as a waste reuse and make a jelly for confectioneries and its fat reduction activity in our life.

MATERIALS AND METHODS

The citrus fruits peels of Orange, Lemon and Moambe were collected from fruit shops. All were rinsed in the water to remove the dirt and fungi. They were cut into mini pieces, then blanching in hot distilled water for 5mins in order to inactivate enzymes. It was filtered by hands by muslin cloths and insoluble materials were subjected to warm absolute ethanol for 30 mins for removing oil from the peel pieces. This was dried then grinded and stored in tightly closed container at room temperature until use. The collected sample of the non-citrus fruits namely Yellow banana (*Musa balbisiana*), Green banana (*Plantains)*, and Apple peels undergo physical parameters such as pH, temperature and turbidity respectively. The optimization was carried out by changing in pH using hydrochloric acid and citric acid concentrations.

Extraction of pectin

5g of the peel powder was taken in 150ml distilled water in a beaker. Hydrochloric acid or citric acid was mixed for adjusting pH medium (2.0, 2.2 and 2.5) pH medium as optimizers. Extraction was done by hot water bath procedure. The mixture was boiled for each different pH of medium of extraction and stirred at 60, 70 and 80^{0}C with different time 40, 50 and 60 min. The extract was purified by homogenization through muslin cloth and was cooled to room temperature. Pectin in extract was precipitated by using water and (10:10) of .1% ethanol at 4^{0}C and kept for 3 hours. The precipitate formed through centrifugation and purification, was washed with 55% and 75% ethanol. The concentration of pectin was estimated by its Spectro photometrically at 525 nm.

Fat reduction Assay by

a. Zone of clearance

10g of peptone, 0.01g of calcium chloride, 0.55g of sodium chloride and 1g of agar was taken in a flask with 100ml of distilled water considered as solution A. Solution B was shown to be 10g of tween 80 in 100 ml of distilled water. Both were sterilized in autoclave.90ml of the solution A and 10 ml of the solution B was taken and poured in the Petri plate. Two wells were created in which 100 µl of lipase in one well as a control and pectin sample was added in another. The samples were kept for 24 hr. at room temperature. The zone of clearance was formed.

b. Lipase assay - Titration method

0.1g of the sample was taken along 1g of calcium chloride with 2ml of lipase was added with 8ml of distilled water. The sample according to the different pH was titrated with 0.05N sodium hydroxide noting the time of the titration should not exceed 10 min. The formation of pale pink color was the final point.

RESULT AND DISCUSSION

The pectin which was extracted from three different Non-citrus fruit peels namely Apple, Yellow banana (*Musa balbisiana*) and Green banana (*Plantains*) respectively. The optimization of pectin extraction was carried out by three different pH concentration (2.0, 2.2, 2.5) respectively using HCL and Citric acid by centrifugation and purification process with ethanol (Fig 1 and 2). The coagulated pectin was separated into a jelly form and as a dried pectin. The properties of different peels were analyzed in Table 1.

S. No	Sample	pH	Temperature	Turbidity
1.	Apple	6	26	0.67
2.	Yellow banana	7	27	0.52
3.	Green banana	7	27	0.48

Table 1: Physical parameters of the sample

The estimation of pectin was carried out by colorimetric method. In which the pectin benefits the body's detoxifying capabilities which helps in regulating the use of sugars and cholesterol which improves gut and digestive health (Dr. Axe, 2014). The concentration of the pectin was found to be high in apple peel when compared to other Non- citrus fruit peels.

PH	SAMPLE (mg/l)		
	Apple	Yellow Banana	Green Banana
2.0	42	36	24
2.2	56	50	48

Table 2: Extraction of pectin using hydrochloric acid

PH	SAMPLE (mg/l)		
	Apple	Yellow Banana	Green Banana
2.0	24	20	14
2.5	36	17	13

Table 3: Extraction of pectin using citric acid

Therefore, from the table 1 and 2 we have found out that the concentration of pectin was found to be high in apple peel when compared to other Non- citrus fruit peels (Wang, 2007). In the pH 2.2 and 2.5 using HCL and Citric acid the concentration of the Apple peel was found to be 56 mg/l and 36 mg/l.

Fig 1: Coagulated pectin after ethanol addition and filtered

Fat reduction activity

The fat reduction process was done by the zone of clearance and lipase activity through titration method. Lipase is the main enzyme that breaks down the dietary fats in human digestive system (Winkler *et al.,* 1990). In tween 80 agar plate, the pectin concentration of reducing fat activity was analyzed through zone of clearance. The reduction of fat activity was found to be more in Apple peel pectin of 2.2 pH concentration. The Apple peel pectin can reduce 30% of fat reduction. Thus, the titration values were noted in which the apple peel pectin with pH 2.2 concentrations contains higher source of fiber content, 24.8% of apple pectin concentration reduces fat.

CONCLUSION

The pectin, a polysaccharide is used as a stabilizer in foods. The pectin was extracted from various citrus fruit peels and its optimization by varying pH using hydrochloric acid and citric acid and noticed its fat reducing activity. In this research, we concluded that lemon peel pectin contains high yield pectin and reduces maximum amount of fat content. In which the pectin is the best and cheapest

way to reduce fat activity. To reduce the environmental pollution the dumped lemon peels are used as a good source of pectin for its fat reduction activity.

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