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Essential Chemicals in Selected Fruit Peels from Manila, Philippines

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Abstract. The environment is continually deteriorating. Biodegradable wastes increase with increasing population. The problem in wastes affect the integrity of the earth. Problems in health and nutrition are common. Finding important chemicals from fruit peels like total sugars or carbohydrates, as well as alkaloids will help address daily challenges in nutrition and health. This study aimed to determine the phytochemicals present in the peels of the selected fruits obtained from Manila, Philippines. Specifically it aimed to determine the presence of total sugars and alkaloids. Further it aimed to obtain the amounts of total sugars and alkaloids in the fruit peel samples analyzed. All fruit peels qualitatively showed the presence of reducing sugars as well as glycosides. Pomelo, rambutan, longgan, and mangosteen contain tannins. Lanzones contains alkaloids. Sugars and alkaloids for lanzones gave the highest intensity in the phytochemical screening done. It was only lanzones which gave positive results to all tests related to alkaloids. The amounts of total sugars in both the diluted and undiluted (20% decoction) fruit peel samples showed a range of 1.801 to more than 164 ug/ml concentrations. The alkaloidal contents of lanzones showed 0.0312 mg/ml level at 1:9 dilution.

Keywords: Sugars, Alkaloids, Fruit Peels

1. Introduction

1.1. Background

Human and animal wastes are biodegradable. Kitchen wastes make up the bulk of household wastes. Crop residues and animal manure are now being used to build up organic matter in the soil. Such practice supports sustainability as it replenishes nutrients by recycling all elements [1]. By looking at the phytochemistry of wastes like fruit peels, possible nutritional and medicinal substances may be discovered.

Carbohydrates, contain sugars and are integral parts of nutrition. It was shown in a study that compared with the higher-income food-sufficient households, children in the low-income food-insufficient households consumed fewer calories and total carbohydrates, but had a higher cholesterol intake making them more overweight [2] Carbohydrate and sugars therein are important. Lately, even livestock are monitored especially of this nutrient. Other substances considered are protein, calcium, vitamin A, Vitamin B complex and zinc [3].

Alkaloids may be present in fruit peels. In one research β-carboline alkaloids are of great interest due to their diverse biological activities. It is said to intercalate into DNA,inhibit CDK, Topisomerase, and monoamine oxidase, and to interact with benzodiazepine receptors and 5-hydroxy serotonin receptors. It has also demonstrated sedative, anxiolytic, hypnotic, anticonvulsant, antitumor, antiviral, antiparasitic as well as antimicrobial activities which are important pharmacologic discoveries [4]. *Carica papaya*. seed extract may be used for pharmaceutical drug development as a male contraceptive. It prevented ovum fertilization, reduced sperm cell counts, caused sperm cell degeneration, and cell lesion in the testicles. This is due to the observed presence of alkaloids in papaya [5].The alkaloids dauricine and daurisoloine have been isolated from *Menispermum dauricum* DC. Dauricine showed an antiarrhythmic effects [6]. Potatoes contain

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glycoalkaloids and polyphenols which may be used as antioxidants and precursors for steroid hormones. It is also essential for its fiber contribution [7]

The result of this study will find better use of fruit peels. Pharmacologic preparations may be developed and nutritional substances discovered. Local government units will be able to plan for better recycling of kitchen wastes particularly, fruit peels.

1.2. Objectives

This study in general aimed to determine the phytochemicals present in the peels of the selected fruits obtained from Manila, Philippines. Specifically it aimed to determine the presence of total sugars and alkaloids. Further it aimed to obtain the amounts of total sugars and alkaloids in the fruit peel samples analyzed.

1.3. Scope and Limitation

The research used only seven sample fruit peels namely rambutan, lanzones, pomelo, longgan, dalandan, ponkan, mangosteen. It determined the different phyto chemicals using qualitative chemical tests. Spectrophotometry was used to determine the quantitites of alkaloids and total sugars in the samples analyzed.

2. Methodology

2.1. Research Design

This study made use of the descriptive, exploratory design. Both qualitative and quantitative tests were used to describe the unknown components of the fruit peel samples analyzed.

2.2. Locale of the Study

The fruit peels were gathered from Manila, Philippines. The samples were stored, prepared and analyzed at the University of the Philippines, Manila

2.3. Sample Collection

The fruit peels were gathered from vendors in Manila, Philippines. These were placed in separate brown bags and stored inside the refrigerator overnight.

2.4. Sample Preparation.

The peels were separated from the peels. The peels were washed with running water for ten minutes, damped with a clean cloth, air dried and comminuted. Twenty percent aqueous and thirty percent ethanolic extracts were used for the phytochemical tests. The samples were prepared for spectrophotometric analysis according to the procedure followed.

2.5. Phytochemical Screening

The acidity and different components tannins, glycosides, reducing substances, alkaloids, plant acids, saponins, proteins, mucins, flavonoids,of the test sample were analyzed following the phytochemical tests from the Plant Chemistry Manual of the Department of Pharmaceutical Chemistry Faculty, 2008 [8].

2.6. Quantitative Determination of Alkaloids

Preparation of solutions Bromocresol green solution ($1X10^{-4}$) were prepared by heating 69.8 mg bromocresol green with 3 ml of 2N NaOH and 5 ml distilled water until completely dissolved and the solution was diluted to 1000 ml with distilled water. Phosphate buffer solution (pH 4.7) was prepared by adjusting the pH of 2 M sodium phosphate (71.6 g Na_2HPO_4in 1 L distilled water) to 4.7 with 0.2 M citric acid (42.02 g citric acid in 1 L distilled water).Atropine standard solution was made by dissolving 1mg pure atropine (Sigma Chemical, USA) in 10 ml distilled water. For the standard curve, aliquots (0.4, 0.6, 0.8, 1 and 1.2 ml) of atropine standard solution were accurately measured and transfered each to different separatory funnels. Then, 5 ml pH 4.7 phosphate buffer and 5 ml BCG solution were added and shaken with 1, 2, 3 and 4 ml of chloroform. The extracts were collected in a 10-ml volumetric flask and then diluted to adjust volume with chloroform. The absorbance of the complex in chloroform were measured at 470 nm

against blank prepared as above but without atropine.The plant materials were ground and extracted with methanol for 24 h in a continuous extraction (soxhlet) apparatus. The extracts were filtered and methanol was evaporated on a rotary evaporator under vacuum at a temperature of 45 C to dryness. The residue was dissolved in 2 N HCl and then filtered. One ml of this solution was transferred to a separatory funnel and washed with 10 ml chloroform (3 times). The pH of this solution was adjusted to neutral with 0.1 N NaOH. Then 5 ml of BCG solution and 5 ml of phosphate buffer was added to this solution. The mixture was shaken and the complex formed will be extracted with 1, 2, 3, and 4 ml chloroform by vigorous shaking. The extracts were collected in a 10-ml volumetric flask and diluted to volume with chloroform.. The absorbance of the complex in chloroform was measured at 470 nm [9].

2.7. Quantitative Determination of Total Sugars

Anthrone at 0.2% was prepared with sulfuric acid as solvent. Glucose solution at 100ug/ml was prepared. A range of serial dilution for glucose solution was made (10-100ug/ml) in a volume of 1 ml each. A blank of distilled water of 1 ml was also prepared. To each tube, 4 ml of anthrone was added, mixed and covered with glass marbles. These were incubated in boiling water bath for 10 minutes. Cooled to room temperature and absorbance were measured at 620nm after setting to zero absorbance (100% transmittance using the blank).The standard curve was drawn. The same procedure was employed for the20% decoction fruit peel samples [10].

3. Results and Discussion

Based on the phytochemical screening conducted, all fruit peels qualitatively showed the presence of reducing sugars as well as glycosides. Pomelo, rambutan, longgan, and mangosteen contain tannins. Lanzones contains alkaloids (Tables 1 and 2). Sugars and alkaloids in lanzones showed high intensity with the qualitative tests used. Only lanzones yielded positive results to all tests related to alkaloids

By analysis using spectroscopy, it showed that all seven samples tested contain carbohydrates from a 1:99 dilution until the undiluted form of 20% decoction. The standard curve gave a slope b equal to 0.01752, and y intercept(a) equal to 1.7154 and an r of 0.9339. In general, the amounts of sugars are relatively high in all seven samples even with the 1:9 dilution. Most readings went beyond 164 ug/ml between 1:9 and 1:4 dilution (Table 3). It is expected then that increasing the decoction percentage will likewise increase the amount of sugars. From the prepared decoction of the fruit peels used, a range of 0.1801 mg/ml (lanzones at dilution of 100) to 1.64 mg/ml (ponkan, dalandan, pomelo, longgan at dilution 10) and beyond of total sugars were obtained across dilutions. With the recommended daily allowance of carbohydrates for children at 130 g/day [11], nutritional deficit with the said substance should not happen then even in low-income families since even fruit peels contain it. The preparation of higher fruit peel decoction concentrations for cooking, drinking and incorporation of whole fruit peels in other food preparations as additives to cakes, breads, cookies, juices or cocktails will increase its carbohydrate utilization. The peels however must be free of other chemical contaminants prior to use.

With the standard curve for atropine having a slope b equal to 1.25179, and a y intercept (a) equal to 0.05817 and r equivalent to 0.9728, the amount of alkaloids in lanzones was determined. A 0.0312 mg/ml alkaloid content was measured from lanzones. As the dilution factor used was 10, from 20g/20ml source of the fruit peel, 0.312 mg/ml alkaloid was obtained. Potential medicinal products may be obtained from fruit peels since it contain alkaloids even as it was diluted from the primary source with hydrochloric acid. Fruit peels accumulate daily in kilograms and in tons every month. Finding alternative uses for it in relation to nutrition and medicine is best.

4. Conclusions

All fruit peels qualitatively showed the presence of reducing sugars as well as glycosides. Pomelo, rambutan, longgan, and mangosteen contains tannins. Lanzones contains alkaloids. Carbohydrates (sugars) and alkaloids for lanzones gave the highest intensity in the phytochemical screening done. It was only lanzones which gave positive results to all tests related to alkaloids. The amounts of total sugars in both the diluted and undiluted fruit peel samples showed a range of 1.801 to more than 164 ug/ml concentrations.

With dilution factor of 10, 1.64 mg/ml total sugar was obtained from 20g/20ml selected fruit peel samples. The alkaloidal contents of lanzones showed 0.0312 mg/ml level at 1:9 dilution. Since the dilution factor used was 10, from 20g/20ml source of the fruit peel, 0.312 mg/ml was obtained.

Table 1: Phytochemical Screening of Mangosteen, Ponkan, Dalandan and Lanzones

	Mangosteen	**Ponkan**	**Dalandan**	**Lanzones**
pH	5	4	4	6
Tannins	Blue-black ppt	Yellowish brown solution	Black solution	Black solution
Glycosides	Bluish green fine ppt	Cream to brown fine ppt	White fine ppt	White fine ppt
Alkaloids				
Mayer's	Cherry red solution	Brownish yellow solution	Brownish yellow solution	Brownish yellow solution with brown ppt
Valser's	Cherry red solution	Brownish yellow solution with fine cream ppt	Brownish yellow solution	Brownish yellow solution With red ppt
Wagner's	Cherry red solution	Brownish red solution	Brownish red soln	Reddish brown solution with brown ppt
Dragendorff's	Cherry red solution	Red orange solution	Orange solution	Reddish orange solution with brown ppt
Plant acids	Brownish black solution;no stable and dense froth	Light brown solution; no stable and dense froth	Light brown solution; no stable and dense froth	Light brown solution; no stable and dense froth
Saponins	No froth; <1cm temporary on standing	No froth; <1cm temporary on standing	No froth; <1cm temporary on standing	No froth; <1cm temporary on standing
Liebermann Burchard	Dark red solution with red ppt	Bloody red to black solution	Greenish black to black solution	Brown turbid solution to brownish black solution
Salkowski	Bloody red to two layers (upper-black turbid, lower-yellowish clear solution)	yellow to blood red solution to two layers (upper- clear black , lower-dark red solution)	yellow to blood red solution to two layers (upper-clear reddish brown, lower- black solution)	Red to blood red solution to two layers (upper-clear reddish brown, lower-dark red solutionz)
Satd alcoholic solution of cholesteol	Amber solution	Light orange solution with crystal white formations	Brownish yellow solution	Brown solution with brown ppt
Flavonoids Standard 2N HCl in 1 propanol	Black solution with white gelatinous ppt Red coloration	Brownish black solution with fine white ppt Yellowish orange solution	Black solution with fine white ppt Brown solution	Brown solution with brown ppt Yellow orange solution

Table 2: Phytochemical Screening of Pomelo, Longgan and Rambutan

	Pomelo	Longgan	Rambutan
pH	4	4	3
Tannins	Blackish brown ppt	Blackish brown ppt	Blackish brown ppt
Glycosides	White fine ppt	White fine ppt	White fine ppt
Reducing substances	Brick red ppt	Brick red ppt	Brick red ppt
Alkaloids			
Mayer's	Light yellow solution	Yellow solution	Yellow orange solution
Valser's	Yellow solution with fine brown ppt	Yellow orange solution	Yellow orange solution
Wagner's	Red solution with very fine black ppt	Red solution with very fine black ppt	Red solution with very fine black ppt
Dragendorff's	Yellow orange solution	Yellow orange solution	Yellow orange solution
Plant acids	Yellow solution; no stable and dense froth	Amber solution; no stable and dense froth	Brownish yellow solution; no stable and dense froth
Liebermann Burchard	Brown solution to two layers (upper-yellowish clear , lower-red turbid solution)	Brown color to two layers (upper-dark brown, lower-dark red solution	Yellowish to two layers (upper-clear colorless, lower- light brown solution
Salkowski	Brown solution to two layers	Brown solution to three	Yellowish solution to two

	(Upper- clear colorless, lower- amber solution)	layers (top-clear brown, middle-dark red, bottom-clear light yellow solution)	layers (clear colorless, lower- yellow solution)
Saturated alcoholic solution of cholesteol	Yellow solution with very fine white ppt	Yellow solution with very fine white ppt	Brownish yellow solution with very fine white ppt
Flavonoids Standard 2N HCl in 1 propanol	Brownish yellow solution Yellow solution	Lime green solution Yellowish red solution	Blackish brown solution Yellowish red solution

Table 3: Concentration of total sugars in selected fruit peels

Concentration of total sugars (ug/mL)							
	Mangosteen	**Ponkan**	**Dalandan**	**Lanzones**	**Pomelo**	**Longgan**	**Rambutan**
20% decoction	>164	>164	>164	>164	>164	>164	>164
1:1	>164	>164	>164	145.1	>164	>164	>164
1:4	>164	>164	>164	110.05	>164	>164	>164
1:9	139.25	>164	>164	39.4	>164	>164	93.65
1:99	8.4	26.95	2.45	1.801	22.5	37.75	12.75

5. Recommendations

Though it was established using qualitative and quantitative chemical tests that the selected fruit peels contain total sugars, further analysis must be done to determine the exact amount of sugars in peels that exceeded the absorbance limit of 5.00 with concentration of 164 ug/ml. Elucidation of the varied sugars and alkaloids present in all fruit peels and lanzones peels respectively is highly recommended. Isolation, and purification of the alkaloids in Lanzones peels is suggested in preparation for medicinal and other related formulations.

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