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ISOLATION AND CHARACTERIZATION OF MUCILAGE FROM DURIAN AND RAMBUTAN SEEDS

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ABSTRACT

Plant mucilages are found as common ingredients in cosmetic, pharmaceutical, food and non-food industries due to their low cost compared to the synthetic polymers. The synthetic polymer such as excipients suffer from many disadvantages such as high cost, toxicity, non-biodegradability and environmental pollution caused during their synthesis. In the present study mucilage was isolated from the seeds of Durian and Rambutan fruits and characterized by physicochemical properties. This includes organoleptic evaluation, solubility, pH, angle of repose, bulk density and tapped density. Taking all the above parameters into consideration, the study has revealed that the mucilage obtained from Durian and Rambutan seeds were good candidates to use as a tablet binder and also for further studies.

KEYWORDS: *Durian, Rambutan, Mucilage, Physicochemical properties*

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INTRODUCTION

Mucilages are thick gluey substance produced by nearly all plants and some microorganisms. It is polar glycoprotein and an exopolysaccharide. Mucilage is used in medicine for its demulcent and glued properties. Today, the whole world is turning towards finding suitable alternatives for the synthetic compounds used in pharmaceutical industries from natural sources [1]. The synthetic polymer such as excipients suffer from many disadvantages such as high cost, toxicity, non-biodegradability and environmental pollution caused during their synthesis [2]. Natural polymers like mucilages are easy to isolate, purify and are non-toxic and biocompatible. They are biodegradable and will not cause environmental pollution [3].

In the present study, the seeds of Durian (*Durio zibethinus*) and Rambutan (*Nephelium lappaceum*) were selected for isolation of mucilage. The seeds of Durian and Rambutan, contain a high proportion of carbohydrates and it also being used for different therapeutic purposes [4]. The plant exudates (Acacia, karaya, and Tragacanth) have been used as the traditional gums for pharmaceutical purposes and they still find significant applications [5-8]. These gums are labour intensive and carry premium price and their use will probably continue to decline. However there are no reports on isolation and characterization of mucilage of Durian and Rambutan seeds. Hence, the present study is planned to isolate and characterize mucilage of Durian and Rambutan seeds.

MATERIALS AND METHODS

Collection and authentication of plant materials

The fruits of Durian and Rambutan were purchased from local market in Malaysia and authenticated by botanist (Fig. 1 and 2). The seeds were removed from the fruits, shade dried and powdered.

Isolation of mucilage from Durian and Rambutan seeds

The powdered Durian seeds (50 g) were soaked in distilled water (250 ml) for 24 h in a round bottom flask, boiled for 1 h under reflux with occasional stirring and kept aside for 2 h for the release of mucilage into water. The material was filtered through a muslin bag and hot distilled water (50 ml) was added through the sides of the marc and squeezed well in order to remove the mucilage completely. Equal volume of ethanol was added to the filtrate to precipitate the mucilage and kept inside a refrigerator for one day for effective settling [2]. It was filtered and dried completely in an incubator at 37º C, powdered and weighed. The powder was stored in a desiccator until further use. The similar procedure was followed for the isolation of mucilage from Rambutan seeds.

Physicochemical properties of mucilages [9].

The physicochemical properties such as solubility, loss on drying, swelling index, angle of repose, tapped and bulk density were determined for isolated mucilages according to the standard procedure.

Organoleptic Evaluation of Isolated mucilage

The isolated mucilages were characterized for organoleptic properties such as color, odour and appearance.

Solubility of mucilage

One part of dry mucilage powder was shaken with different solvents and the solubility was determined.

pH of mucilage. The mucilage was weighed and dissolved in water separately to get a 1%w/v solution. The pH of solution was determined using pH paper.

Swelling Index of mucilage

The swelling index is the volume (in ml) taken up by the swelling of 1 g of test material under specified conditions. The swelling index of the mucilage was determined by accurately weighing 1g of mucilage, which was further introduced into a 10ml glass-stoppard measuring cylinder. 10ml of water was added and mixture was shaken thoroughly every 10 min for 1 h. It was then allowed to stand for 3h at room temperature. Then the volume occupied by mucilage was measured.

Determination of bulk density and tapped density

The bulk density was calculated by 1 gm of mucilage was introduced into a 10 ml measuring graduated cylinder. The cylinder was tapped manually for 100 times with same speed. Then noted the volume (tapped density) continued another 50 tapping and noted the final volume. This volume was noted as bulk volume. Based on the bulk and tapped density both the Carr index (%) [(Tapped – Bulk) X 100/Tapped] and Hausner ratio (tapped/bulk) were calculated.

Determination of angle of repose

Angle of repose was determined by fixed funnel method. Funnel with the end of the stem cut perpendicular to the axis of symmetry was secured with its tip at a given height (H) above a graph paper placed on a flat horizontal surface. The material was carefully poured through the funnel until at apex of the conical pile so formed just touches the tip of the funnel. The mean diameter (2R) of the base of the powder cone was determined and the tangent of the angle of repose is given by $\tan \alpha = H/R$, where α is the angle of repose.

Identification tests for carbohydrates, proteins, mucilage and gums

Aqueous solution of extracted mucilages from Durian and Rambutan seeds were used for chemical characterization. Test for carbohydrates, tannins, chloride and sulphate were performed using standard procedure.

Fig.1. Durian fruits and seeds

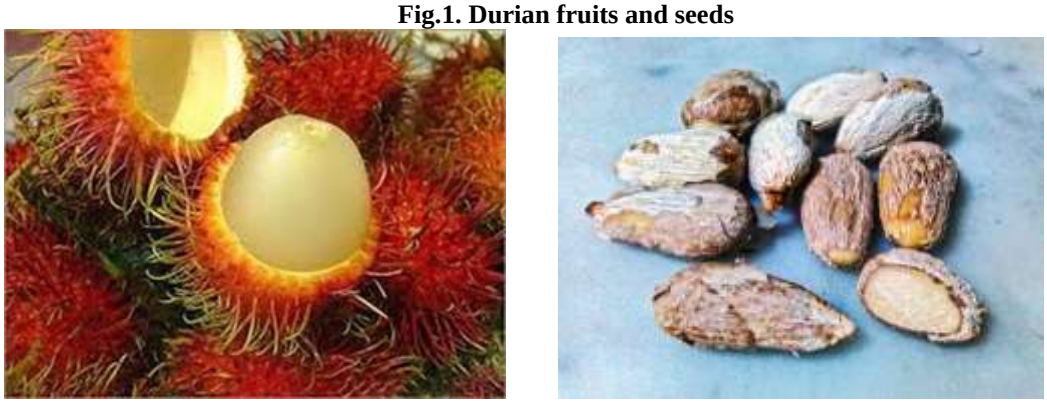

Fig.2. Rambutan fruits and seeds

RESULTS AND DISCUSSION

Plant mucilages are found as common ingredients in cosmetic, pharmaceutical, food and non-food industries due to their low cost compared to the synthetic polymers. In view of the rising costs and fluctuations in availability of the synthetic polymers, scientists are engaged in finding suitable alternatives to these. Such an effort would be welcomed both locally and internationally. Hence, in the present study we were interested to isolate mucilages from Durian and Rambutan seeds available in local market of Malaysia. The Isolated mucilages were characterized by using physicochemical properties.

Durio zibethinus

The seeds of *Durio zibethinus* are crushed and the mucilage is isolated by dissolving in water and precipitating in 96% ethanol. It is then let to dry in room temperature. The percentage yield of the mucilage by ethanol precipitation was found to be 10.96% (Table 1).

The morphological and physical evaluation of isolated mucilage shows, it is brownish white powder, with characteristic odour and lustrous appearance in nature. When dissolved in lukewarm water, it gives neutral, colloidal solution that shows it is soluble in lukewarm water, practically insoluble in ethanol, acetone, ether and chloroform.

Identification test showed it formed transparent angular masses when mounted in 96% ethanol and formed a blue colour when mounted in iodine solution. The pH of the solution of *Durio zibethinus* mucilage was found to be in the range of 6 to 7, which indicates near neutral. The swelling index was found to be 13.8.

Result of chemical test shows presence of carbohydrate, which is generally constituent of mucilage. While the absence of tannins, chloride and sulphate showed the purity of the mucilage. The isolated mucilage was studied for its physiological parameters such as angle of repose, bulk density and tapped density. The angle of repose was found to be 18.43°. The bulk density and tapped density were found to be 1.24 g/ml and 1.48 g/ml respectively (Table 2).

Nephelium lappaceum

The seeds of *Nephelium lappaceum* are crushed and the mucilage is isolated by dissolving in water and precipitating in 96% ethanol. It is then let to dry in room temperature. The percentage yield of the mucilage by ethanol precipitation was found to be 3.30% (Table 1).

The morphological and physical evaluation of isolated mucilage shows, it is whitish brown powder, with characteristic odour and lustrous appearance in nature. When dissolved in lukewarm water, it gives neutral, colloidal solution that shows it is soluble in lukewarm water, practically insoluble in ethanol, acetone, ether and chloroform.

Identification test showed it formed transparent angular masses when mounted in 96% ethanol and the particles stained blue colour when mounted in iodine solution. The pH of the solution of

Nephelium lappaceum mucilages was found to be in the range of 6 to 7, which indicates near neutral. The swelling index was found to be 9.1.

Result of chemical test shows presence of carbohydrate, which is generally constituent of mucilage. While the absence of tannins, chloride and sulphate showed the purity of the mucilage. The isolated mucilage was studied for its physiological parameters such as angle of repose, bulk density and tapped density. The angle of repose (29.35°) indicated that the powder was having passable flow. The bulk density and tapped density were found to be 1.29 g/ml and 2.26 g/ml respectively (Table 2).

Taking all the above parameters into consideration, the study has revealed that the mucilages obtained from Durian and Rambutan seeds were good candidates to use as a tablet binder and also for further studies.

Taking all the above parameters into consideration, the study has revealed that the mucilage obtained from Durian and Rambutan seeds were good candidates to use as a tablet binder and also for further studies. In Malaysia, only few units are manufacturing mucilages on commercial scale. USA, Switzerland and other European countries are producing these in large scale. Most of the Malaysian needs are mainly met by import. These natural polymers isolated from the plant sources may be used as alternative binding agents in the drug formulations. This may reduce the cost of production and environmental pollution.

REFERENCES

[1] Anastas PT, Warner JC. Green Chemistry: Theory and Practice. New York: Oxford Press; 1998.

[2] Kulkarni GT, Gowthamarajan K, Satish Kumar MN, Suresh B. Gums and mucilages: therapeutic and pharmaceutical applications. Nat Prod Rad 2002a;1:10-7.

[3] Kulkarni GT, Gowthamarajan K, Brahmajirao G, Suresh B. Evaluation of binding properties of selected natural mucilages. J Sci Ind Res 2002b;61:529-32.

[4] Ashraf MA, Maah MJ, Yusoff I. Estimation of antioxidant phytochemicals in four different varieties of Durian (*Durio zibethinus* Murr.) fruit. Biochem Bioinfor 2011;5:131-5.

[5] Sirisompong, W., Jirapakkul, W., Klinkesorn, U., (2011). Respond surface optimization and characteristics of rambutan (*Nephelium lappaceum* L.) kernel fat by hexane extraction. *LWT*- Food Sci Tech 44, 1946-1951.

[6] Thitilertdecha, N., Teerawutgulrag, A., Kilburn, J.D., Rakariyatham, N., (2010). Identification of major phenolic compounds from *Nephelium lappaceum* L. and their antioxidant activities. Molecules 15, 1453–1465.

[7] Thitilertdecha, N., Teerawutgulrag, A., Rakariyatham, N., (2008). Antioxidant and antibacterial activities of *Nephelium lappaceum* L. extracts. Food Sci Tech 41, 2029–2035.

[8] Tyler V, Brady LR, Robbers JE. Pharmacognosy, 8th edition, Lea and Febiger, Philadelphia, USA, 1988, 43.

[9] Senthil Selvi R, Gopalakrishanan S, Ramajayam M, Soman R. Evaluation of mucilage of Caesalpinia pulcherrima as binder for tablets. Int J Chem Tech Res 2010;2:436-42.

Table 1: Percentage yield of mucilage from Durian and Rambutan seeds

Tests	Observation
Description	Brownish white powder
Solubility	Soluble in lukewarm water, practically insoluble in ethanol, acetone, ether and chloroform
Odour	Characteristic
Appearance	Lustrous
Identification : **a) Mounted in 96% ethanol** **b) Mounted in iodine solution**	Transparent angular masses Particles stained blue
pH (1% w/v)	6-7
Swelling index	13.8
Test for carbohydrate (Mollish test)	Positive
Test for tannins (Ferric chloride test)	Negative
Test for chloride (Silver-nitrate test)	Negative
Test for sulphate (Barium chloride)	Negative
Angle of repose	18.43º
Bulk density	1.24 g/ml
Tapped density	1.48 g/ml
Carr index (%)	16.21
Hausner ratio	1.19

Table 2: Physicochemical Characteristics of mucilage from *Durio zibethinus*

Plant sources	Amount of plant material (g)	Percentage yield of mucilage (%)
Durian (*Durio zibethinus*)	**50**	10.96
Rambutan (*Nephelium lappaceum)*	**50**	3.30

Table 3: Physicochemical characteristics of mucilage from *Nephelium lappaceum*

Tests	Observation
Description	Whitish brown powder
Solubility	Soluble in lukewarm water, practically insoluble in ethanol, acetone, ether and chloroform
Odour	Characteristic
Appearance	Amorphous
Identification : **a) Mounted in 96% ethanol** **b) Mounted in iodine solution**	Transparent angular masses Particles stained blue
pH (1% w/v)	6 to 7
Swelling index	9.1
Test for carbohydrate (Mollish test)	Positive
Test for tannins (Ferric chloride test)	Negative
Test for chloride (Silver-nitrate test)	Negative
Test for sulphate (Barium chloride)	Negative
Angle of repose	29.35°
Bulk density	1.29 g/ml
Tapped density	2.26 g/ml
Carr index (%)	42.92
Hausner ratio	1.75