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Study of carbohydrate, biochemical and nutritional value of pineapple, rambutan and grapes

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Abstract
Pineapple, rambutan and grapes fruit are the staple fruit crops in Asia, Europe, Ameria and also all over the world. Fruits are mostly used as fruit, juice and source of different types of food products. These fruits are traditional and common fruits having the health benefits and nutritional value. The study was conducted to evaluate the carbohydrate content as represented by glucose, total soluble solids and micro-macro nutrient content in pineapple, rambutan and grapes. Nine fruits were collected from 3 plants for each sample of fruit. Total of 27 fruits were collected for Pineapple, rambutan and grapes. Samples were collected randomly following the completely randomized design. Fruit glucose content was found higher in grapes and rambutan than in pineapple. PH content was found higher in grapes than in rambutan and pineapple. In addition, total soluble solids (TSS) content was the highest in grapes. Potassium content were higher in grapes compared to the pineapple and rambutan. However, Phosphorus content was the highest in rambutan and calcium content was the highest in grapes. Moreover, magnesium (Mg) content was higher in pineapple than in grapes and rambutan. Comparatively more micronutrients were found in pineapple than in rambutan and grapes. Fe, Zn, Na and Mn were found higher in pineapple and rambutan than in grapes. The highest correlation with fruit and TSS was found in grapes followed by rambutan and pineapple. The results conclude that grapes and rambutan contain better biochemical (glucose, TSS and pH) than pineapple as well as nutrient content was better in grapes and pineapple than in rambutan.

Keywords: fruit, glucose, TSS, nutrient content

Introduction
Fruits keep a superlative role in daily food habit and health benefits. Fruits are a vital edible and favorite food among the food menu. It is extensively grown all over the world. Fruit is rich a lot of nutrition and used as food consumption as the healthiest alternative food content from fruit source. Fruits contain a form of sugar that delivers the body high levels of mobility and heat energy and which can be easily broken down in the body. Moreover, this sugar is not glucose, which rapidly raises the level of blood sugar but also the fruit sugar like fructose [1, 2]. Fruits comprise a great source of many vitamins and minerals, fiber, fat and proteins. They also contain micro and macro nutrient content like sodium, potassium, calcium, magnesium, iron, sulfur, phosphorus and chlorine, as well as vitamins A, beta-carotene, B1, B2, B3 and B6. The substance of oxytocin, which is present in the date, is used in modern medicine to facilitate birth. In fact, oxytocin means "rapid birth." It is also known to increase levels of mother's milk after birth [2].
It was suggested [3] that nutritional quality was found different in different varieties of water apple fruit. They also recommended that it might be variation in different varieties of fruit. It was stated [4] that nutrient content was affected by environmental factors in Kiwi fruit and rich in fibre, fat and proteins. It was reported [5] potassium content and total sugar were different in different varieties of dates and olive fruit. It was recommended [6, 7, 8] that nutrient and carbohydrate content significantly difference in different fruit species [9]. It has been reported that date fruits, depending on the variety and location as well as weather, contained significant nutrient content but a quite variable amounts of macro-elements (calcium, phosphorous, potassium etc.) and micro-elements, (iron, zinc, copper etc) respectively[10,11,12]. However, few literatures related to the present research are found. The study of the investigation of the carbohydrate and nutritional value of pineapple, rambutan and grapes fruit for healthy benefits in Hail region is totally new. The following objectives were undertaken

1. To determine the macronutrient (P, K, Ca, Mg) and micronutrient (Fe, Zn. Mn, B, Mo, Cu and Na) content in pineapple, rambutan and grapes fruit.
2. To evaluate the carbohydrate as represented by glucose and biochemical content (TSS, pH) in pineapple, rambutan and grapes fruit.

Materials and Methods
Materials
Pineapple, rambutan and grapes fruit were harvested and collected at the same time from the experimental field, University of Malaya, Kuala Lumpur and farmers Farm in Serdang, Malaysia.

Methods
Design for sample collection
Nine fruits were collected from 3 plants for each sample of fruit. Total of 27 fruits were collected for Pineapple, rambutan

and grapes. Samples were collected randomly following the completely randomized design (CRD).

Sample preparation
Pineapple, rambutan and grapes were thoroughly washed with distilled water, cut using a sterile knife and were blended by using a sterilized automatic juice blender and distilled water as 1:0.5, frut: water ratio. Then the juice samples were filtered and kept in the freezer to analyze. The 5ml of juice were used from each sample.

Carbohydrate as Glucose determination
Glucose was determined by using glucose refractometer. Three drops of juice sample were placed on the disc of the meter and data were displayed and documented.

Biochemical content as TSS and pH determination
Total soluble solid (%brix) was determined by Refractometer. PH was determined by pH meter.

Nutritional content analysis
Micronutrient content, potassium (K) was determined by Horiba Scientific Nutrient meter (Made in USA) and P, Ca, Mg and micronutrient (Fe, Zn. Mn, B, Mo, Cu and Na) were determined by MOA Spectrophometry.

Statistical Analysis
Data were analyzed statistically. Standard error (SE) and Least Significant difference Test (LSDT) was employed.

Results and Discussion
The highest (15.5%) fruit glucose content was exhibited in grapes (Table 1). Glucose content was found higher in grapes (15.5%) and rambutan (13.2%) than in pineapple (5.5) (Table 1). Total soluble solids (TSS) content was 16.5 % in grapes followed by 15.8 and 12.4% in rambutan and pineapple. However, pH content was found higher in grapes and rambutan than in pineapple (Table 1). Potassium content were higher in grapes compared to the pineapple and rambutan (Table 2). However, Phosphorus content was the highest in rambutan and calcium content was the highest in grapes. Moreover, magnesium (Mg) content was higher in pineapple than in grapes and rambutan (Table 2). Comparatively more micronutrients were found in pineapple than in rambutan and grapes (Table 3). Fe, Zn, Na and Mn were found higher in pineapple and rambutan than in grapes. The highest correlation with fruit and TSS was found in grapes followed by rambutan and pineapple (Fig.1).
For the above results it can be observed that the highest Glucose, TSS, pH and nutrient content was found in grapes compared to the others fruits. It may be due to the location and environmental factors like light and temperature affected the fruits. It was stated[9] that nutrient and carbohydrate content were significantly difference in different fruit species [6,7,8]. It has been observed that date fruits depending on the variety and location as well as weather, contained significant but a quite variable amounts of macro-elements (calcium, phosphorous, potassium etc.) and micro-elements, (iron, zinc, copper etc) respectively[10,11,12]. It was reported [6, 13, 14] that potassium content and total sugar were different in different varieties of dates and olive fruit. It was suggested [4] that nutrient content was affected by environmental factors in Kiwi fruit. It was stated [3] that nutritional quality was found different in different varieties of water apple fruit. They also recommended that it might be variation in different varieties and location of fruit.

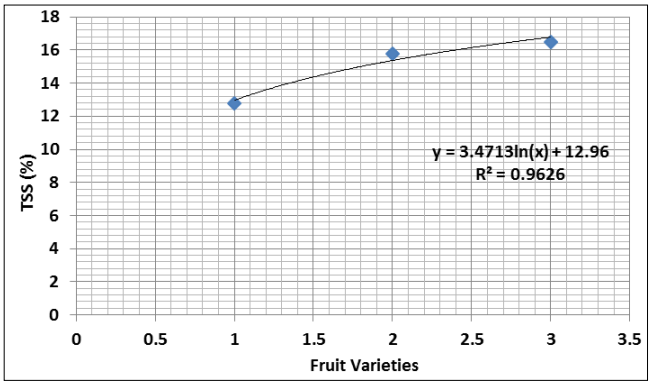

Fig 1: Correlation between the fruits varieties and TSS (Total soluble solids) content. 1= Pineapple, 2= Rambutan, 3 = Grapes

Table 1: Glucose, TSS and pH content. Mean±SE (n=3). Same letters (a, a) showed no difference at 5% level of significant by Least significant difference (LSD) test.

Fruits	Glucose (%)	pH	TSS (%)
Pineapple	8.5±0.01b	5.8±0.01b	12.4±0.1b
Rambutan	13.2±0.02a	6.5±0.01a	15.8±0.2ab
Grapes	15.5±0.03a	6.6±0.02a	16.5±0.1a

Table 2: Macro nutrient content in pineapple, rambutan and grapes. Mean±SE (n=3).

Fruits	P (mg/100g)	Ca (mg/100g)	Mg (mg/100g)	K (mg/100g)
Pineapple	70±0.5	35±0.2	172±0.8	110±0.7
Rambutan	91±0.3	30.5±0.1	19.69±0.01	45±0.4
Grapes	38±0.2	37.9±0.1	40.5±0.1	195±0.6

Table 3: Micro nutrient content in pineapple, rambutan and grapes. Mean ± SE (n=3).

Fruits	MN (mg/100g)	Fe (mg/100g)	Zn (mg/100g)	B (mg/100g)	Mo (mg/100g)	Cu (mg/100g)	Nab (mg/100g)
Pineapple	2.5±0.1	5.5±0.1	10.5±0.01	1±0.01	5.5±0.1	0	26.5±0.5
Rambutan	6±0.2	1.2±0.01	9.5±0.2	0	0	0	14±0.2
Grapes	0	0.3±0.01	0.5±0.001	0.4±0.001	0	0	8.1±0.1

Conclusion
It can be concluded that grapes and rambutan contain higher carbohydrate (represented as glucose), biochemical (TSS and pH) content than pineapple. Moreover, macro contents were found better in grapes than in rambutan and pineapple. In addition, micronutrient were found higher in pineapple that in

grapes and rambutan.

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