

SELECTED MALAYSIAN RARE FRUITS HAVE POTENTIAL MEDICAL VALUE AS ALTERNATIVE MEDICAL TO SUPPORT DIABETES PATIENT

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Abstract

In Malaysia have more than 370 species of fruits that have been found and only sixteen types of fruits are classified as primary fruits. The remainder are classified as a rare fruit or underutilized fruits because it is difficult to be discover and mainly grown wild in places such as village, forest, hamlet etc. This research focused on the type of Malaysian rare fruits that have medical value to treat diabetes. This research objective is to identify the type of rare fruits that have potential nutrient to treat diabetes. The questionnaire was developed based on medical value and type of rare fruit. As a result, the rare fruits that been identified to have medical value can be used to treat diabetes in Malaysia while ensure the continuity of the Malaysia's rare fruit. In addition, people can use the information on these rare fruits as a source of alternative medicine to cure and treat diabetes.

Keywords: Medical Value, Nutrient, Rare Fruits, Diabetes

Introduction

There is a lot of local fruit which has nutrition in Malaysia since this country is one of the local fruit exporters globally. Most local fruits found in Malaysia have high commercial value for global markets such as durian, mango, banana etc. According to Muniam (2012), these local fruits have been increasing in demand at the domestics and overseas markets because of its taste and nutrition of value. Fruits are good to eat because they tasted delicious and give health benefits to the human body which provides carbohydrate, dietary fiber, vitamins and minerals to balance the human diet (Lim, 2012a). In Malaysia have more than 370 species of fruits that have been found and only sixteen types of fruits are classified as primary fruits and the rest are classified as rare fruits or new fruits. Rare fruit can also be known as underutilized fruit species (Ismail, 2017). In addition, according to Dandin and Kumar (2016),

rare fruits are not commercially viable because there is not enough research on commercial exposures and no complete botanical information on rare fruit. This was endorsed by Amarasiri (2015) that nowadays, most people are not aware about the nutritional value and health benefit of the rare fruit which they can gain from consumption it frequently compares with primary fruit. One of the contributors to the rise in number for the diabetes patient is because they are not controlling the number of junk food consumption that leads them to an unhealthy lifestyle. This is claimed by Leonard (2017) who mentioned that junk food such as fast food, processed food and snack have high in calories, sugar and fat but it is low in nutrients that can lead to disease such as diabetes. Apart from the taste, local fruit contains nutrients such as various types of vitamins and minerals according to the type of fruit

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that plays an important role in the health of the human body such as rare fruit can be alternative medical to help diabetes patient. Fruits are good to eat because they tasted delicious and give health benefits to the human body which provides carbohydrate, dietary fiber, vitamins and minerals to balance the human diet (Lim, 2012b). Those type of nutrient can be used to treat disease such as diabetes, high blood and so on.

Research Question

What are the rare fruits that have potential nutrient as medical value to treat the diabetic in Malaysia?

Research Objective

To identify rare fruits that have potential nutrient as medical value to treat diabetes in Malaysia.

Research Limitation

The limitations that have been identified in this research are respondent's honesty and understanding for the topic. First, respondent's honesty happens when the survey was distributed to the respondent, the researcher assumed that all respondent answer with honest and adhere to the question. Furthermore, the answer from the respondent have effects of the data and result in the research. Respondents have adequate knowledge about the topic and questions in this research. Some of them might not fully understand the question and what are this research is all about. Thus, this misunderstanding might lead to data misleading and affect the data's survey.

Literature Review

Rare Fruits

According to Aman (2016) rare fruits are hard-earned fruits and the information about them are limited. Most of the fruits are grown with primary fruits and some make these fruit trees as shaded trees in the yard. This is because the rare fruits are not widely grown and only found in villages that jointly with the main fruits or at the edge of the forest. This is supported by Halim and Masdek (2016) whom states that most of the rare fruit in Malaysia has not being cared properly and grown wild in the village, forest, hamlet etc. (Lin *et al.*, 2008) most of the rare fruits are still unknown and less exploration or research regarding the real potential to see whether the fruits are fresh or processed for added values such as new products or medical value.

1. Asam Gelugor (*Garcinia Atroviridis*) Lim (2012c) and Aman (2016) mention that Asam Gelugor (*Garcinia Atroviridis*) is one of the rare fruits that can only be found in Peninsular Malaysia.

Lim (2012c) explains that this fruit contains a lot of nutrients such as Iron (Fe), Hydroxycitric Acid (HCA), Malic acid, which can help to exhibit antioxidant, to promote weight loss activity and increasing glycogen development, thus lowering appetite. Block (2015) agrees that the extraction from the Asam Gelugor (*Garcinia Atroviridis*) can be used to give treatment for obesity and diabetes. Plus, Asam Gelugor (*Garcinia Atroviridis*) can also be used to increase body strength, maintain healthy skin, increase body metabolism levels and keep the muscles or joints from becoming fragile (Ahmad, 2017) Figure 1 shows the image of Asam Gelugor (*Garcinia Atroviridis*).

2. Belimbing Buluh (*Averrhoa Bilimbi*) According to Aman (2016) that Belimbing Buluh (*Averrhoa Bilimbi*) usually planting around the house or orchard with another plant. Lim (2012c) mentions that Belimbing Buluh (*Averrhoa Bilimbi*) fruit has a lot of nutrient that can use an antioxidant, antimicrobial, and antihypercholesterolemic and this fruit has taste extremely sour but have a high nutrient in the vitamin and some people will eat this fruit in raw as salad, ulam, rojak and jeruk or used in cooking such as curries, masak lemak, asam pedas and so on in Malaysia. Belimbing Buluh (*Averrhoa Bilimbi*) has its own medical potential to be convert into medicine to treat cough, flu, irritation, burns, diabetes, high blood pressure and so on (Zakaria, 2008). Figure 2 shows the image of Belimbing Buluh (*Averrhoa Bilimbi*).

3. Nona Fruits (*Annona Squamosa*) Lim (2012c) and Aman (2016) mention that Nona Fruits (*Annona Squamosa*) is mainly being plant around the house at the village and found wild in pastures, forests and along roadsides. Anem (2012) mentioned that Nona Fruits (*Annona Squamosa*)



Figure 1. Asam Gelugor (*Garcinia Atroviridis*).



Figure 2. Belimbing Buluh (*Averrhoa Bilimbi*).

has a lot of goodness that can be compared with other primary fruits such as protein, vitamin C, calcium and phosphorus. This Nona Fruits (*Annona Squamosa*) has its own benefit in medical value because according to Lim (2012c), the extracts from Nona Fruits (*Annona Squamosa*) have the potential medical value as anticancer activities, antiviral activity, antidiabetic, antioxidant, antithyroid etc. To make it more effective to treat the diabetic, this antidiabetic effect of Nona Fruits (*Annona Squamosa*) plant can be combined with the marketed existing antidiabetic to get more benefits (Tomar and Sisodia, 2012). Figure 3 shows the image of Nona Fruits (*Annona Squamosa*).

Type of Nutrient to Treat Diabetes

The nutrients are necessary for treating diabetes on the human body. Lim (2012c) states that most of the edible rare fruits are rich in micronutrients and vitamin if compares to staple foods. The nutrient of this rare fruits can be consumed by the human body to restore nutrient balance and enhance the function of the human body. There are nutrients that can be used that have the potential to treat diabetes. The Table 1 shows the type of the nutrient that can be found in the fruits and it has their own function to treat diabetes. These



Figure 3. Nona Fruits (*Annona Squamosa*).

nutrients are necessary for treating diabetes on the human body.

Materials and Methods

The research design that is suitable for this research is exploratory as mentioned by Saunders *et al.*, (2016) that the exploratory study will be asking questions to explore what is happening and gain insight about the topic and understanding the problem. Especially if there is a limited amount of information and research have been conducted on these rare fruits. Therefore, it is wise to apply the exploratory as the research design as it will help the researcher to explore which type of rare fruits that have the best medical value potential to treat diabetes.

The methodologies choice that suitable in this research is qualitative. This is because qualitative is the one method that a researcher can used to explore the medical value potential to treat diabetes especially if they are using exploratory as their research design. Qualitative method is used a non-numerical data and the data collection will the techniques such as interviews (Saunders *et al.*, 2016).

One of the research method parts, are questions designed to collect the data from the respondent. The questionnaire is one of the ways to collect the data from respondent which required the respondent to answer a set of questions that have been prepared by the researcher. Daniel and Turner (2010) mentioned that the questionnaire on the research will be designed as dig deep into the respondent's experience and knowledge to gain the maximum data during the interview session. In addition, the questionnaire also designed based on the research questions to get the answer that can help to solve the problem in the research.

Table 1. Composition nutrient that has the potential to treat diabetes.

No	Nutrient	Description
1	Magnesium (mg)	Lack of Mg can cause an influence level of sugar in the body and low of Mg level can cause diabetes to the body
2	Niacin	Low of use dosage have a good effect on the blood lipids and lipoprotein
3	Potassium (k)	Control insulin in the body and balancing the insulin levels to maintain the health
4	Vitamin C	Improve glucose tolerance and reduce the Sorbitol (harmful sugar that can lead to diabetes and kidney damage)
5	Zinc (zn)	Lack of zinc can develop from diabetes because it can against viral infections and protect beta cells from damage
6	Vitamin B6	Improve glucose tolerance and lack of Vitamin B6 can cause severe damage to the nervous system by high blood sugar
7	Fibre	Level the fibre in the human body can influence rates of diabetes which the higher fibre was associated with a lower incidence of diabetes
8	Iron (Fe)	Iron deficiency can cause the patient to suffer from high kidney failure because kidney has a role to control sugar level in the body, but excessive iron excess can cause damage to muscle tissues to interfere with the ability to move glucose from the red blood and disturb insulin production

Source: Diabetes.Co.Uk (2018); Gray (2015); Campbell (2007)

For the sampling, the researcher determines to use the non-probability technique such as judgment sampling to allow the researcher to get the necessary data from the selected suitable respondents for this study. In addition, the nonprobability sampling, the respondent will be selected based on a few criteria as the sample for the research (Cooper and Schindler, 2014). In this research the researcher chooses 10 respondents that consists pharmacists from Pusrawi International College of Medical Sciences (PICOMS). This is because PICOM is one of the colleges has an education based on medical. The pharmacist has in-depth knowledge of medicines, this allows them to give advice on side effects that may occur if the medicines need to be used over a long period of time. Moreover, the pharmacist also gives the advice about health related to the nutrition, effective ways to healthcare, vitamins, minerals and herbs can be provided by a pharmacist when needed.

The qualitative interview offers the details information in understanding people's experience based on their knowledge if this interview conducted by experience research can cause difficulties to adequately perform the interview (Majid *et al.*, 2017). Interview is the method that has been used by researcher to collect the data for the research and to find answers for research questions (Kumar, 2016). The interview conducted with the respondent selected have been their based on their criteria which is are (i) wide experience in pharmacy; (ii) high knowledge and information in nutrient contains. This research used semi structured interview to conduct an interview in order to collect the data. According to Merriam (2009), semi structured interview allows the researcher to respond in order to control the situation and to the emerging worldview from the respondent. The participant was given the freedom to discuss freely with the researcher based on the interview question and researcher can use the sub-questions to gain more information that can help the research. This research also used case study to focus and detail information about rare fruits. This is because the case study is being used to focus on the type of rare fruit that has potential medical value to treat the diabetic in Malaysia. The case study in research method is an in-depth inquiry into topic or situation within the real-life setting and the questions for the case study involve the "how" or "why" to explain some present circumstance (Yin, 2008).

For this research, the researcher focuses more on the qualitative data analysis because data from the interview session must be extracted to get the important information that can be helpful for research. The data analysis is the valuable information that was extracted from raw data

(interview session) to explain the situation under an investigation (Johannesson and Perjons, 2014). The research uses the thematic analysis to analyze the data interview in order to highlights the important data and labelled them according to the theme to enable the understanding in the current situation. thematic analysis gives the benefit to the researcher because it has system flexibility and accessible approach to analyses qualitative data (Clarke and Clarke, 2013). The researcher looks the data such as nutrient that helps to treat the diabetes to help the researcher easily to detect important data from the interview. The important data that can help the research such as identifying type of nutrient contain in the rare fruits that can help to treat the diabetes. The Figure 4 show the data collection process for this research.

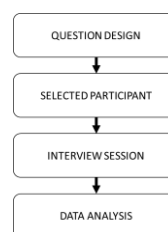


Figure 4. Data Collection Process.

Results and Discussion

From the interview session with the respondent, the researcher found that those three rare fruits have potential medical value that can treat diabetes in Malaysia. Those three rare fruits have a lot of nutrient that can help people to treat diabetes. The intended rare fruit are Belimbing Buluh (Averrhoa Bilimbi), Asam Gelugor (Garcinia Atroviridis) and Nona Fruits (Annona Squamosa). The Table 2 below is nutrient composition per 100 g edible portion for those rare fruits.

The fruit that have higher potential to treat the diabetes is Nona Fruits (Annona Squamosa). Nona Fruits (Annona Squamosa) have a lot of goodness that can be compare with other primary fruits such as protein, vitamin C, calcium and phosphorus (Anem, 2012). Nona Fruits (Annona Squamosa) has the ability as a medical value because it has nutrition that extracts from Nona Fruits (Annona Squamosa) to treat diabetes (Lim, 2012b). The composition in the Nona Fruits (Annona Squamosa) per 100/g has the medical value to treat diabetes which was Fe, Vitamin C, mg and K. This rare fruit has contained the nutrient compare with other rare fruits in this research. The list of nutrient composition of Nona Fruits (Annona Squamosa) has Fe in this rare fruit

Table 2. Nutrient composition per 100 g edible portion for those rare fruits.

No	Nutrient Composition	Asam Gelugor (<i>Garcinia Atroviridis</i>)	Belimbing Buluh (<i>Averrhoa Bilimbi</i>)	Nona Fruits (<i>Annona Squamosa</i>)
1	Fibre	12.2g	0.7/g	4.4/g
2	Iron (Fe)	6.9mg	0.4/mg	0.60/mg
3	Potassium (K)	351mg	84/mg	247/mg
4	Niacin	0.4mg	1.2/mg	0.883/mg
5	Vitamin C	3.6mg	15.7/mg	36.3/mg,
6	Protein	-	0.7/g	-
7	Magnesium (Mg)	-	-	21/mg
8	Zinc (Zn)	-	-	0.10/mg
9	vitamin B-6			0.20/mg

Source: Tee, *et al.*, (1997), USDA (2010)

have 0.6/mg which the importance of the Fe in the human body that can help the sugar level in the body's sufferer of diabetes. This fruit have the nutrient that does not exist on other rare fruits in this research which is magnesium, zinc and vitamin B6. In addition, rare fruits have an element nutrient to expand the arteries and relaxing the heart muscle which was magnesium as much as 21/mg. magnesium is the nutrient that helps to maintain muscle and nerves, regulates blood sugar levels, promotes normal blood pressure, and prevents heart attacks. Nutshell compare to other fruits, Nona Fruits (*Annona Squamosa*) have more potential to treat diabetes. This is because Nona Fruits (*Annona Squamosa*) have all nutrient that required to treat diabetes which is iron (Fe), Vitamin C, Magnesium (Mg) and Potassium (K). In addition, Nona Fruits (*Annona Squamosa*) has the balanced nutrient compare to other fruits in this research. Because nutrient must be balanced in order to get the best treatment for diabetes. Those nutrients have its own function such as maintain muscle and nerves, regulates blood sugar levels, promotes normal blood pressure, and prevents heart attacks. According to the traditional nutrition practised by villagers to treat diabetes, normally Nona Fruit will be eaten as raw or transform it to become juice.

Next the rare fruit that has potential to treat diabetes among those rare fruits in the research is Asam Gelugor (*Garcinia Atroviridis*). After the analysis, the researcher found that the Asam Gelugor (*Garcinia Atroviridis*) have the potential as a medical value that can treat the diabetes among the rare fruits in this study. This is supported by Block (2015) who explain that the extracts from the Asam Gelugor (*Garcinia Atroviridis*) fruits can be used to give a treatment of anti-obesity effect. Three main nutrients have been identified in Asam Gelugor (*Garcinia Atroviridis*) that have the ability to control the sugar level in a human body which are Fe, Vitamin C and K. The total amount of Iron (Fe) in the Asam Gelugor (*Garcinia Atroviridis*) is 6.9/mg can give the effect to the human body because it can

help the sugar level in the body of people who suffered from diabetes. But excessive iron excess can cause damage to muscle tissues to interfere with the ability to move glucose from the red blood and disturb insulin production. So, taking the nutrient such as Fe must be balanced so not too high or low to the body to get the full potential that can treat diabetes. The nutrient effect of the rare fruits found in this study is to treat diseases found in the human body, such as diabetes, hypertension, reducing fat in the body and so on. Asam Gelugor 9 *Garcinia Atroviridis*) also has the potential to treat another disease which is there a nutrient such as hydroxy acid that helps the people to lose their weight and control cholesterol in the human body. It also has a bad effect because consuming too much of this rare fruit will cost bad effect for the patient, such as stomach ache because this rare fruit have nutrient is sour (acid content) which was citric acid, tartaric acid, malic acid, ascorbic acid and hydroxycitric acid. Asam Gelugor (*Garcinia Atroviridis*) has the potential to treat diabetes based on the analysis of all expert. However, nutrient intake should be balanced as excessive intake can cause side effects to the patient. As an example of excessive iron intake can cause damage to muscle tissues to interfere with the ability to move glucose from the red blood and disturb insulin production.

Lastly, Belimbing Buluh (*Averrhoa Bilimbi*) has the potential to become medical value to treat diabetes but it is not as strong as Asam Gelugor (*Garcinia Atroviridis*) and Nona Fruits (*Annona Squamosa*). This rare fruit have medical value to treat diabetes and blood pressure and another respondent just mentioned this rare fruit have some nutrient can be used as medicine to help diabetes. This is support by Zakaria (2008) mention that Belimbing Buluh (*Averrhoa Bilimbi*) has its own potential to become medicine to the society such as treat cough, flu, irritation, burns, diabetes, high blood pressure and so on. The medical value to treat diabetes which is Fe, Vitamin C, and K. those types of element of the rare fruits have abilities that can

help treat diabetes when this nutrient can control the sugar level in the human body. The functioned of another nutrient which was vitamin C as much as 15.7/mg in this rare fruit has the ability to help accelerate the wounds on the skin, strengthen the immune system, prevent fever and supply collagen in the skin of the human. Vitamin C helps to prevent damage to blood vessels caused by diabetes because patients have weak blood glucose control. This shows that the vitamin C has the function to treat diabetes and another disease that faced by a human. In addition, in this rare fruit has Potassium as much as 80/mg is lower between those rare fruits in this research, but it also can help as a nutrient for improving the health of the human pancreas. the nutrient such as fiber can influence rates of diabetes which the higher fiber was associated with a lower incidence of diabetes. Fiber can be an important part of the diet because it can help to improve the health of the human body in a multitude of ways because it can process more slowly, lower-calorie and lower-fat. This fruit has extremely sour taste but have a high nutrient in the vitamin C. But this fruit have lower nutrient between the other two fruits in this research. Some of the nutrients in this rare fruit will give the bad effects to the eater if eaten too much because it has acid content. This is because rare fruit has a high-level nutrient that sour (acid content) which was oxalic acid, nonanoic acid, hexadecenoic acid, octadecenoic acid and hydroxy citric acid. In addition, excessive eat fruit can give a bad effect such as for cause kidney stones in the human body because this fruit contains high levels of oxalic acid. Each one of the nutrients in the rare fruits has their own function to treat diabetes. But the patient must take this kind of rare fruits following order from expert to balance the nutrient in the body because excessive nutrient such as potassium or Oxalic Acid can give the damage to the kidney consolidate to a fewer number and allow computing services to be distributed across available servers. Based on traditional nutrition practiced by villagers, there are ways to eating this rare fruit to get the benefit from it. diabetic patients need to drink stewed water from Belimbing Buluh that can help to lower the sugar level in the body. Second, to eat belimbing buluh in order to balance the excessive acid content which is the fruit will be rolled together with cucumber to be used as a drinkable juice at any time. Consistent with the above statement, cucumber can lower uric acid levels in the body to maintain kidney health. This is supported by Asmadi (2016), the liquid contained in cucumber can help to detoxify the body and the practice of eating cucumber can eliminate kidney stones.

Conclusions

In a nutshell, there are three types of rare fruits that have potential as a medical value that can help people to take care their diabetes. The results show that Nona Fruits (*Annona Squamosa*) have more potential to become medicine between other fruits because it has balance nutrient to contributed to the people to treat diabetes and it has a lot of nutrient that do not exist on other fruits such as magnesium, Zinc and Vitamin B6 (USDA, 2010). The second fruit that have potential is Asam Gelugor (*Garcinia Atroviridis*) because it has higher nutrient that can be used to treat diabetes. Lastly is Belimbing Buluh (*Averrhoa Bilimbi*) that have potential to take care diabetes but not strong compared to other fruits because it has same nutrient but lower between other fruits. The Nona Fruits (*Annona Squamosa*) shows that it has more nutrient compared to other fruits in this research. It evidently exhibits that the Nona Fruits (*Annona Squamosa*) have more potential to treat the diabetes compare to other fruits.

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