

## MORPHOLOGICAL CHARACTERS, ELEMENTAL ANALYSIS AND NUTRITIONAL VALUES OF *DIOSPYROS DISCOLOR* WILLD. (FRUIT)

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### Abstract

*Diospyros discolor* Willd is known as velvet apple belong to the family Ebenaceae, collected from Bogyoke Village, Thanlyin Township, Yangon Region from January to May 2020. The morphological characters of this plant were identified by using of the literatures. Elemental analysis and nutritional values were carried out by using the powder samples of these fruits. In morphological characters, it is dioecious, evergreen and young leaves are pinkish to pale green. Male flowers are 3-flowered axillary racemes and female flowers are solitary axillary cymes. The female flowers are slightly larger than the male flowers. Sensory characters of powdered fruits were pale-brown, pungent odour, sweet taste, texture with the granular. In elemental analysis, the concentration of potassium was found to be 75.988%. Moreover, in nutritional values of the fruits, carbohydrate is found to be the highest 80.69%.

**Keywords:** Morphological characters, elemental analysis, nutritional values.

### Introduction

Ebenaceae family of only 3 genera and about 500 species distributed in the Indo-Malayan region. There are five genera according to Lawrence (1951), seven according to Hutchinson (1973), Willis (1973) and Kumanr and Subramanian (1987) recognize three genera and Takhtajan (1987) recognizes only two genera.

The Ebenaceae is a family of flowering plants belonging to order Ericales. It includes ebony and persimmon among about 768 species of trees and shrubs. The family is distributed across the tropical and warmer temperate regions of the world. *Diospyros discolor* (commonly known as velvet apple or velvet persimmon) is a tree of the genus *Diospyros* of ebony trees and persimmons. Its edible fruit has a skin covered in a fine, velvety fur which is usually reddish-brown and soft, creamy, pink flesh, with a taste and aroma comparable to a peach. (<https://en.m.wikipedia.org>)

*Diospyros discolor* taste is crisp when mature and will soften slightly as it ripens. The taste is sweet and the flavour has been likened to banana flavoured apples or strawberry - mango yogurt with hints of berries and bubblegum. Darker red fruits are sweeter than lighter colored varieties. (<https://www.specialtyproduce.com>)

Chemical elements are the basic building blocks of human lives for different functions. Although the elements mostly fall into the same category for plants and animals, there are a few exceptions. Some of the major and minor elements that human bodies use to function properly are potassium, calcium, iron, zinc, chlorine, copper, manganese, phosphorus, rubidium and sulphur. Minerals are essential for good health. In fact, it plays an important part of how human body obtains energy from our food. (Davis, 2003)

The most essential need of man is food. Food in the form of carbohydrate, fats and proteins are stored in the various parts such as roots, leaves, fruits and seeds. Fruits and nuts have a special place in the traditional culture and everyday life of the people. Fruits are life-enhancing medicines packed with vitamins, minerals, antioxidants and many phytonutrients. They have unique nutrition-profile that help human body free from diseases and keep it healthy. (May Thu, 2016)

Some of the health benefits of velvet apples include their ability to improve heart health, increase circulation, treat gastrointestinal disorders, clear skin irritation, build strong bones,

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detoxify the body, boost the immune system, lower blood pressure and relieve respiratory distress. When topically applied or consumed the pulp of velvet apples has shown remarkable ability to reduce inflammation and irritation on the skin and is often turned to in alternative medicine as fastest way to heal skin conditions and burns. (<https://www.healthbenefitstimes.com>)

The purposes in the research paper are to obtain the knowledge of morphological characters, to analyze the concentration of elements and to reveal the nutritional values of the fruits of *Diospyros discolor* Willd by doing related tests.

## Materials and Methods

The plant *Diospyros discolor* Willd was collected from Bogyoke Village, Thanlyin Township, Yangon Region, from January to May 2020 at the Department of Botany, East Yangon University. The identification of this plant was carried out by referring book of Flowering Plants (1998), Flora of Java (1965), Flora of Hong Kong (2007) and [https:// www.biologydiscussion.com](https://www.biologydiscussion.com). The fresh sample of this fruits of edible parts (Fig.1a) thoroughly washed and cut into small pieces and dried at room temperature for two weeks. After that they were pulverized by grinding machine to get coarse powder (Fig.1b) and stored in air tight containers to prevent from moisture and air borne contamination for elemental analysis and nutritional value tests.



**Figure 1(a)** Pulp of fruits



**Figure 1(b)** Powder of fruits

## Results

### Morphological characters

Scientific Name	- <i>Diospyros discolor</i> Willd
English Name	- Velvet apple
Myanmar Name	- Katte-par
Family	- Ebenaceae

*Diospyros discolor* Willd is dioecious, evergreen, without any latex, deep tap root and much branched tree which grows up to 15 meters. Leaves are simple, alternate, oblong up to 30 cm long and 12 cm wide and coriaceous with entire margin, obtuse (rounded) base and acuminate apex. Leaf's upper surface is dark green, glabrous and glossy while lower surface is pale green silver hairy and petiole 1.5 cm long and densely pubescent. When young, leaves are pinkish to pale green colour. Inflorescence is 3 flowered axillary racemes in male flower and solitary and axillary cymes in female flower. Flower is creamy white, bracteolate, short pedicel, bisexual, regular, actinomorphic, tetra-merous and hypogynous. Sepals are four, synsepalous, sepaloid, deeply lobed contorted, 1.0 cm long and 0.5 cm wide in male and 1.4 cm long and 0.8 cm wide in female and inferior. Petals are four reflexed lobe, synpetalous, petaloid (creamy white), 12 cm long

and 0.5 cm wide in male and 1.5 cm long and 0.6 cm wide in female, campanulate, coriaceous, contorted in bud and imbricate, inferior. Stamens are numerous in male and four in female flower. Filament 0.6 cm long and slender, epipetalous, anther dithecous, introrse, basifixed, longitudinal dehiscence and inferior. Carpels are none in male (pistillodes) two to eight in female, numerous carpellary, syncarpous, multilocular, one or two ovules in each locule, axile placentation, style four cornate at the base, stigma entire and ovary superior. Fruit is globular, 8 to 10 cm in diameter, orange to red with velvety fur. The fruits are often borne in pairs, very close together on opposite side of a branch. Seeds are oblong up to 3.5 cm long and 2 cm wide, two to eight seeds per fruit with brown colour. (Figure.2 and 3)

### Male plant



(a) Habit



(b) Leaves



(c) Inflorescence



(d) Flower



(e) Sepals



(f) Corolla



(g) Epipetalous stamens



(h) Stamens

**Figure 2** Morphological characters of *Diospyros discolor* Willd

### Female plant



(a) Habit



(b) Inflorescence



(c) Flower



(d) Sepals



(e) Corolla



(f) Epipetalous stamens



(g) Carpel



(h) Fruits



(i) Seeds

**Figure 3** Morphological characters of *Diospyros discolor* Willd

### Sensory Characters

Colour	-	Pale-brown
Odour	-	Pungent
Taste	-	Sweet
Texture	-	Granular

### Elemental Analysis

The determination of mineral elements such as potassium, iron, manganese and ruthenium were mentioned.

The results of EDXRF were shown in Table (1) and (Fig.4)

**Table 1** Elemental analysis of the powdered fruits of *Diospyros discolor* Willd

No	Element	Concentration (%)
1	K	75.988
2	Fe	12.875
3	Mn	6.634
4	Ru	4.503

**Nutritional values**

Nutritional values of fruits of *Diospyros discolor* Willd was studied at the Food Industries Development Supporting Laboratory (FIDSL). From the result, it was found that moisture, ash, protein, fiber, fat, carbohydrate and energy.

The results were shown in Table (2) and (Figure.5)

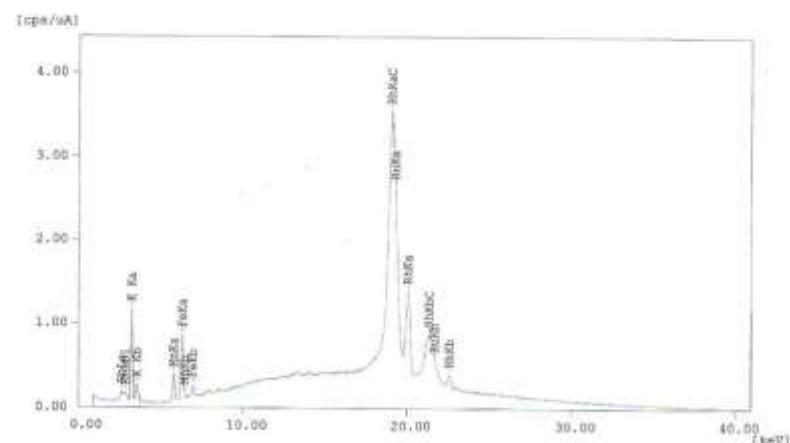
**Table 2** Nutritional values of the powdered fruits of *Diospyros discolor* Willd

No	Element	Result (%)
1	Moisture	6.72
2	Ash	2.80
3	Crude Protein	2.82
4	Crude Fiber	6.67
5	Crude Fat	0.30
6	Carbohydrate	80.69
7	Energy Value (Kcal/100ml)	339

Sample : Dr Ghazar Than  
Operator: Dr MYN  
Comment : Pallet  
Group : Solid Air  
Date : 2020-01-23 13:55:59

**Measurement Condition**

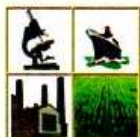
Instrument: EDX-720 Atmosphere: Air Collimator: 10(mm)  
Analyte TC kV uA FI Acq.(keV) Anal.(keV) Time(sec) DT(%)  
Si-U Rh 50 36-Auto 0-40 0.02-40.00 Live= 100 40

**Quantitative Result**

Analyte	Result	[3-sigma]	Proc.-Calc.	Line	Int.(cps/uA)
K	75.988 %	[ 1.335]	Quan-PP	K Kα	7.4687
Fe	12.875 %	[ 0.229]	Quan-PP	FeKα	6.2929
Mn	6.634 %	[ 0.172]	Quan-PP	MnKα	2.4463
Ru	4.503 %	[ 0.310]	Quan-PP	RuKα	6.5824

**Figure 4** Elemental analysis of the powdered fruits of *Diospyros discolor* Willd





# Myanmar Food Processors and Exporters Association (MFPEA)

Food Industries Development Supporting Laboratory (FIDSL)

UMFCCI Tower, 7<sup>th</sup> Floor, Room No.(4), No.(29), Min Ye Kyaw Swar Road, Lanmadaw Township, Yangon, Myanmar.



## LABORATORY ANALYSIS REPORT

FIDSL-Ad-06-02- 02497 /20

- 1 Company's Name : Dr. Ohmmar Than
- 2 Address : Botany Department (E.Y.U)
- 3 Phone No. : 09-5407203
- 4 Date Received by Lab : 25.5.2020
- 5 Sample Number : 1461/2020
- 6 Product Name : Velvet apple powder
- 7 Test Performed date : 9.6.2020
- 8 Type of Test : Nutrition Package
- 9 Date of Issue : 16.6.2020
- 10 Results

(This Laboratory analysis report is based solely on the sample(s) submitted by the customer.)

Sr. No	Test Parameter	Test Method	Result
1	Moisture	AOAC-2000(934.01)	6.72%
2	Ash	AOAC-2000(942.05)	2.80%
3	Crude Protein	AOAC-2000(920.152) (Kjeldahl Method)	2.82%
4	Crude Fiber	AOAC-2000 (978.10) Fiber Cap Method	6.67%
5	Crude Fat (Ether Extract)	AOAC(Buchi Soxhlet Method)	0.30%
6	Carbohydrate	By Difference	80.69%
7	Energy Value ( kcal / 100 ml )		339

Method - AOAC 17<sup>th</sup> Edition.

Nutrition Facts		
1 package ( 100 g )		
Energy	339	kcal
Protein	3	g
Fat	0.3	g
Carbohydrate	81	g

San San Myint  
Manager  
FIDSL  
16.6.2020

End of the Report -----

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(This laboratory analysis report shall not be reproduced except in full, without written approval of the laboratory.)

(မိတ်ဆွဲခန်း၏ စာဖြင့်ရေးသားသောတူညီချက်မရရှိပဲစမ်းသပ်အခြေလွှာများကို အပြည့်အဝမှလွှဲတစ်စိတ်တစ်ပိုင်းဖြတ်ယူအသုံးပြုခြင်း၊ မိတ္တူကူးခြင်း၊ ပြုပြင်ဆင်ခြင်း)

**Figure 5** Nutritional values of the powdered fruits of *Diospyros discolor* Willd

## Discussion and Conclusion

*Diospyros discolor* Willd is a dioecious, evergreen tree over 30 m tall and crown conical. Leave's upper surface is dark-green, shiny, glabrous and lower surface is silver hairy and young leaves are pale-green to pinkish and silky-hair. (Fig.2b) Male and female flowers are produced on separate trees (Fig.2 and 3). Both flowers are necessary for pollination and fruit set. Fruiting generally occurs during summertime with fruits ripening from 2-4 months after flowering. Very beautiful dark-red coloured fruit with velvet-like skin. Fruit is about the size of an apple, with mildly sweet flavoured, somewhat mealy, flesh. Fruits are highly esteemed in some areas, but barely known in most parts of the world. (<https://toptropical.com>)

Some minerals are essential for a normal healthy body. In the fruits of *Diospyros discolor* Willd, the mineral element contents such as potassium (75.988%), iron (12.875%), manganese (6.634%) and ruthenium (4.503%) were observed in Table (1).

Potassium is a very important mineral for the proper function of all cells, tissues and organs in the human body. (Gregor, 2008). Potassium is needed for normal heart function. A high dietary intake of potassium has been shown to protect from a number of conditions, that effect the cardiovascular system, kidneys and bones (Sarit Anavi, 2013). The health benefits of potassium include relief from stroke, high blood pressure, heart and kidney disorders and anxiety and stress. (<https://zerbos.com>)

Iron is a mineral vital to the proper function of hemoglobin, a protein needed to transport oxygen in the blood. Iron also has a role in a variety of other important processes in the body. A shortage of iron in the blood can lead a range of serious health problems, including iron deficiency. (<https://www.medicalnewstoday.com>). It also increases the rate of healing of cells, boosts the speed of hair growth, makes circulation more effective and optimizes metabolism. (<https://zerbos.com>)

Manganese plays a vital role in the metabolism of nutrients by serving as a cofactor in a variety of chemical processes in human body. It is considered an essential nutrient because the body requires it to function properly. People use manganese as medicine (<https://www.webmd.com>). Manganese plays a variety of roles, such as aiding metabolism, helping regulate blood sugar, contributing to decrease inflammation, reducing premenstruate cramps and more. (<https://www.healthline.com>)

Ruthenium compounds are encountered relatively rarely by most people. All ruthenium should be regarded as high toxic and as carcinogenic. Compounds of ruthenium stain the skin very strongly. It seems that ingested ruthenium is retained strongly in bones. (<https://www.lenntech.com>)

Nutritional values are required in diet to maintain good health. The resultant data of nutrient contents in velvet apple (*Diospyros discolor* Willd) fruits are shown in Table-2. Velvet apples present the moisture content is 6.72%. Moisture assays can be one of the most important analyses performed on a food product. It helps regulate the body temperature. Velvet apples consist a large amount of ash is 2.80%. Ash refers to the inorganic residue remaining after either ignition of organic matter in foodstuff. (May Thu, 2016). The contents of protein is 2.82% in velvet apples. *Proteins* are essential nutrients for human body. It is an important building block of bones, muscles, cartilage, skin and blood. As a fuel, proteins provide as much energy density as carbohydrates. Human body uses protein to build and repair tissues. (<https://www.webmd.com>)

Like many fruits, velvet apples present the amount of fiber and fat are 6.67% and 0.30%. Fiber has various health benefits. Fiber is important to digestion and regularity, weight management, blood sugar regulation, cholesterol maintenance and more. Fiber may reduce appetite and decreases the rise in blood sugar after big carbohydrate meal. Fat is essential for several bodily functions. It is an energy source and it protects the skeleton and nerves. Fat is necessary to create hormones and helps feel full after eating. (<https://www.livescience.com>)

The content of carbohydrate in velvet apples is the highest 80.69%. Carbohydrates are one of the main types of nutrients. They are the most important source of energy and needed to do work. Carbohydrate derivatives are involved in reproduction, the immune system, the development of disease and blood clotting. (<https://www.medicalnewstoday.com>)

Velvet apples fruits are most often eaten raw like normal apples, but is also included in various dessert dishes in certain beverage. The flesh fruits can be mixed with other tropical fruits for salads or desserts. Some people are used despite the unpleasant smell, because the velvet apples have high nutrient contents that can be very beneficial for a variety of health issues.

In conclusion the velvet apple fruits are packed with nutrients, minerals and other useful organic compounds (Table-1 and 2). The fruits are a major source of potassium (75.988%). So consuming the fruits lower cholesterol due to the fiber content (6.67%), velvet apples are a great diet choice for vascular health. The fruits can greatly decrease the risks of stroke, heart attack and blood clots. Thus the velvet apple fruits are more useful for Human diary diet or supplement food and health.

### Acknowledgements

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10. <https://www.lenntech.com>
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