Experience in commercialising *Canarium odontophyllum* Miq.: A potential superfruit of Sarawak

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Presentation Outline

1) Introduction
2) Production of dabai (*Canarium odontophyllum*) in Sarawak.
3) Nutritional properties and economic potential of dabai
4) Commercial enterprises and local market

Dabai-The tree

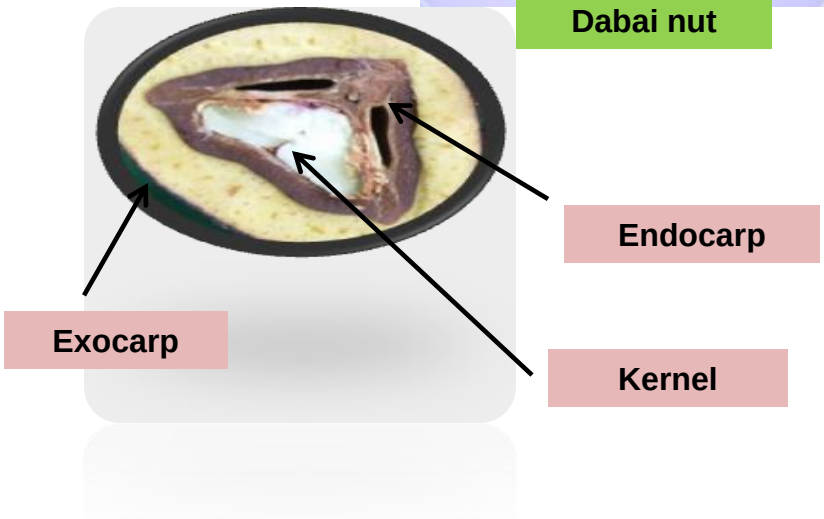
- Family :Burseracea
- Contains about 75 species of trees - mainly found Asia, the Pacific, and in tropical Africa (Leenhouts, 1956).
- Tree is resiniferous, 8 to 25 meters tall with a girth of 15 to 60 cm (d.b.h).
- The stem is a straight bole with erect, semi-erect or horizontal branches (Sim and Lau, 2011)

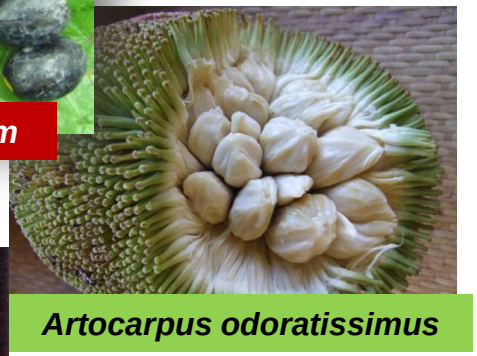
Dabai-The Fruit

- The fruit of dabai is ovoid to ellipsoid, slightly triangular in cross-section, 25-35mm (length) × 17-20mm (diameter) and glabrous (Lemmens *et al.,* 1995).
- Aril= yellow, exocarp=dark purple to black.
- Endocarp is a hard shell and the seed can also be eaten as a nut.
- Rich source of protein, fat, carbohydrates and minerals like sodium, calcium and iron (Shakirin *et al.,* 2012).
- Is sought after because it has a delicious creamy taste and a unique aroma.

Dabai fruit

Dabai nut

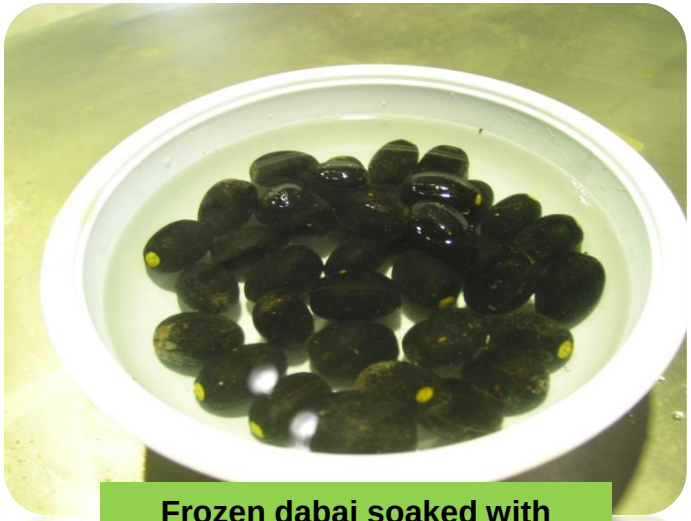




- One of the six most popular local indigenous fruits in Sarawak that have good potential for commercialisation (Voon, 2003).
- Relatively pest and disease free.
- Has the ‘green marketing’ advantage and can be produced under the Integrated Fruit Production (IFP) system (Lau, 2011).

Major problem: Short shelf life

Frozen dabai



Frozen dabai soaked with boiling water

- Has high respiration production rate- has a short life under non-cold chain handling practices (Ding and Tee, 2011).
- Dabai with pedicel removed can only last for two or three days under ambient temperature (Sim and Lau, 2011).
- Frozen dabai, after one year, can still retained acceptable appearance, flavour and taste when prepared by blanching in boiling water for five minutes (Lau and Fatimah, 2007).

Production of Dabai in Sarawak

Main production areas of dabai in Sarawak

- **Found naturally along river banks in Sibu, Sarikei, Kapit and Limbang divisions.**

- **Primarily concentrated in the central region of Sarawak.**

- **Good standing trees =13, 012 trees (based on 20% sampling size) with estimated average production of 650.6 metric ton per season (C.Y. Lau, personal communication, November 12, 2009).**

- **Since 1985, the institution has performed number of studies on the collection, documentation, conservation and improvement of this fruit (Chai *et al.,* 2008).**

Superior clones-Laja & Lulong

Dabai Laja

Dabai Lulong

Launching of dabai clones by Sarawak's Deputy Chief Minister Datuk Patinggi Tan Sri Dr. George Chan Hong Nam in 2006.

- 2 selected dabai clones were launched in 2006.
- Vigorous and they begin to bear fruits five years after planting.
- Initial yield- 10 kg/tree and can gradually increase to 80-100 kg/tree when the tree reaches 10 years and above (Lau and Voon, 2007).
- 'Laja' is triangular with concave sides while the seed of 'Lulong' is more rounded or convex on its sides.

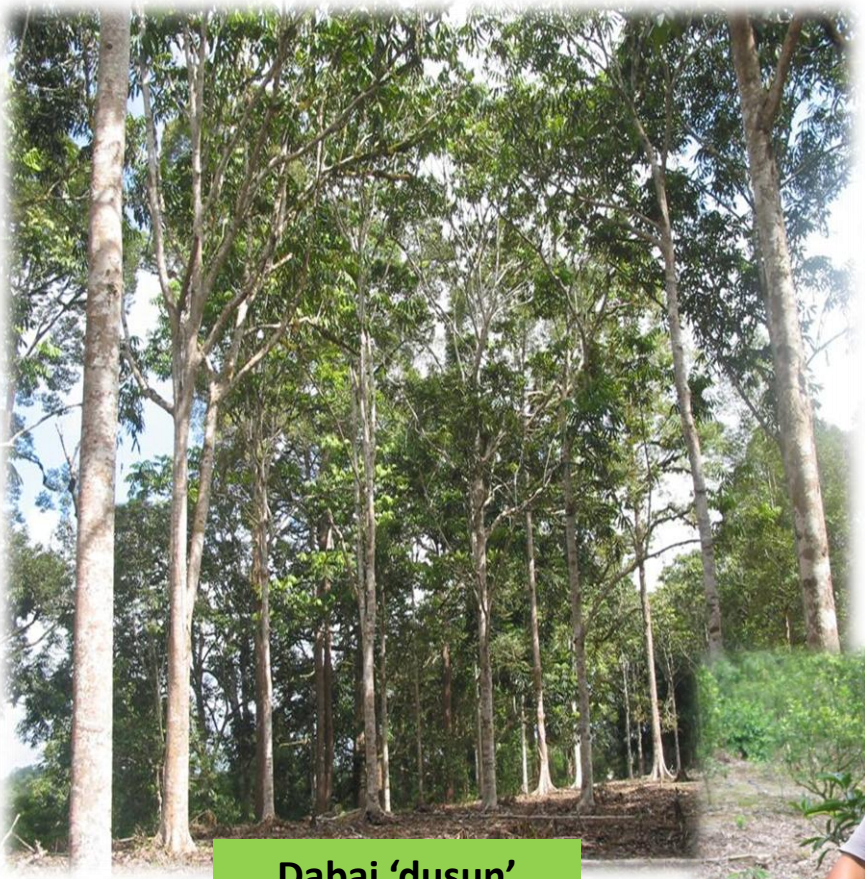
Physical Characteristics of Fruit		
PARAMETER	LAJA	LULONG
Individual fruit weight (g)	18.9	13.9
Fruit length (cm)	4.5	3.6
Flesh thickness (cm)	0.35	0.31
Seed weight (g)	7.7	5.0
Edible portion (%)	61.5	64.0

Nutritional Values of Fruit		
COMPONENT (%/100 gm)	LAJA	LULONG
Protein	6.8	5.5
Fat	44.3	33.9
Carbohydrate	37.2	45.6
Fibre	8.1	11.6
Ash	3.8	3.4

•In terms of size, the fruit of ‘Laja’ is bigger with individual fruit weight of 18.9 g .

• Lau *et al.* (2008) also reported that these dabai clones are rich in fat and also carbohydrate.

•Other dabai varieties such as ‘Song’, ‘Kapit’, ‘Intermediate’, ‘Egg Yolk’, ‘Tarat’, ‘Red Dabai’ and ‘Pulau Keladi’ (Brooke and Lau, 2013).



Dabai ‘dusun’

- **Dominated by smallholders, who grow the plant in mixed orchards called ‘dusun’.**

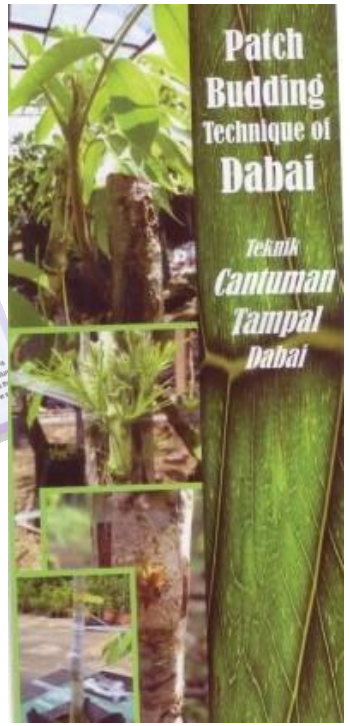
- **Managed the orchards on a small-scale ranging from several trees to several hectares.**

- **Recently, larger orchards of several hectares have emerged.**

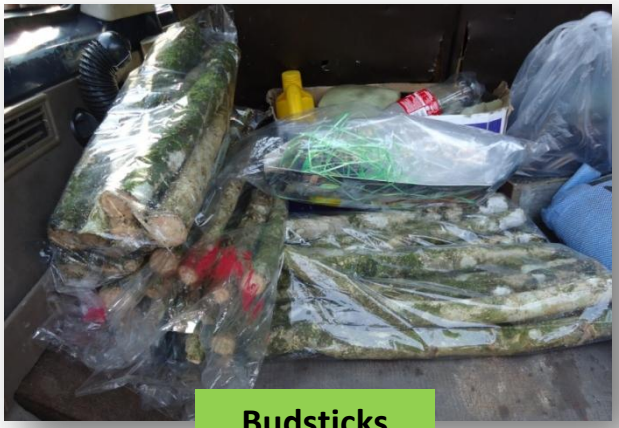
- **Initial fresh fruit yield of dabai trees is low at 10-20 kilogram/tree/season.**
- **Dabai price varies greatly depending on the season, quality and demand.**
- **During bumper season, the price of dabai could drop to RM 5 or less per kilogram during the peak period.**
- **A highly appreciated crop.**

Intervention: Technical support

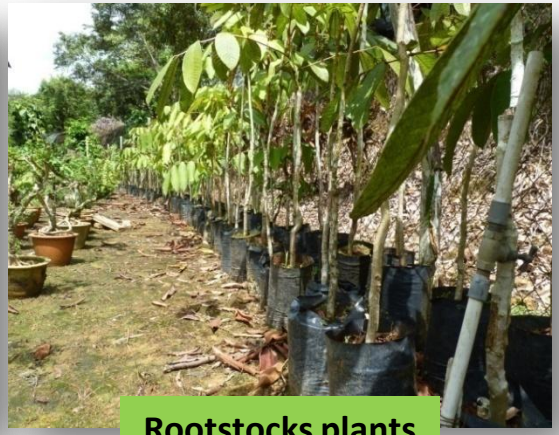
- **Seed propagation may result in fruits with variable traits and would give male trees which do not produce fruit.**
- **Seed propagation is not recommended, can be propagated by asexual methods.**
- **Private nursery operators and growers were given technical support and mother plants of selected dabai clones.**



- DOA Sarawak regularly monitored the production of grafted dabai
- 3 commercial nursery in Sarikei, Sibu and Sri Aman divisions were engaged and promoted as main producers of high quality dabai planting materials in the region.
- Three commercial growers in Sarawak were already identified to grow these quality planting materials.
- Generated more income and also made quality grafted dabai plants available to the masses.

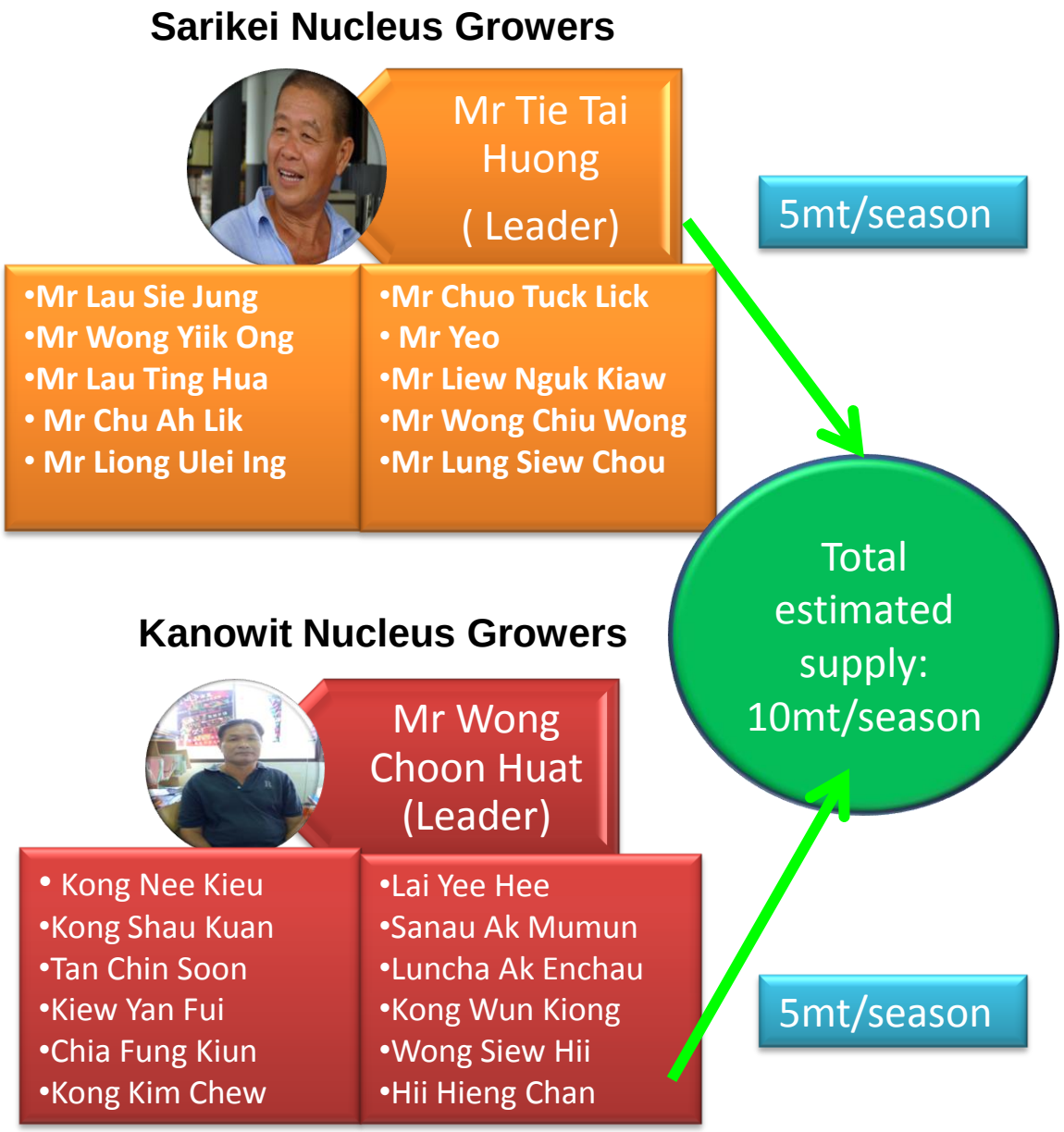


Budsticks



Rootstocks plants

- Field survey on productive trees in the central region was conducted in 2008.
- 5 clusters of 200 trees each could be organised to supply quality fruit for product development, promotion and marketing in new markets (Lau, 2009).
- Few nucleus dabai growers with selected seedlings in Sarikei and Kanowit divisions were identified.
- 24 smallholders with the estimated average production of 10 metric ton per season (T.H. Tie, personal communication, July 10, 2012).

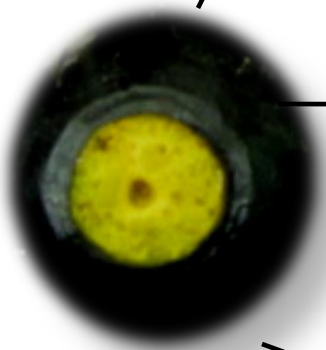


Nutritional Properties: Potential superfruit?

Proximate composition per 100g fresh edible portion	Dabai
Energy (kcal)	339
Moisture (g)	41.3
Protein (g)	3.8
Fat (g)	26.2
Carbohydrate (g)	22.1
Crude fibre (g)	4.3
Ash (g)	2.3
Phosphorus (mg)	65
Potassium (mg)	810
Calcium (mg)	200
Magnesium (mg)	106
Iron (mg)	1.3
Manganese (mg)	0.8
Copper (mg)	0.7
Zinc (mg)	0.47

(Wild Fruits & Vegetables in Sarawak, 2010)

Dabai fruit is highly nutritious and is rich in protein, fat, energy and carbohydrate (Voon and Kueh, 1999).

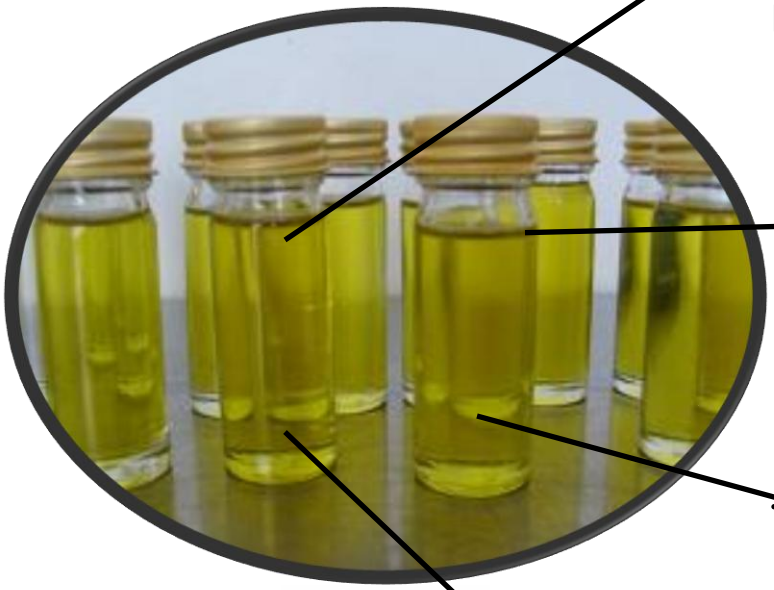


It is also high in phenolic compounds and vitamin E such as γ-tocopherol (Azrina *et al.*, 2010; Shakirin *et al.*, 2010).

The fruit also possesses high antioxidant capacity (Amin *et al*., 2007).

In recent years, due to the high nutritional quality, the fruit of dabai had been promoted as a specialty fruit by the DOA Sarawak (Leipzig, 1994; Lau, 2009).

Fatty acid composition (Pulp Oil)



Composition: 43.42% saturated fatty acid, 42.53% monounsaturated fatty acid and 14.05% polyunsaturated fatty acid (Azrina et al., 2010)

Pulp oil were comparable to palm oil, due to their near equal percentage of saturated, monounsaturated fatty acids and also polyunsaturated fatty acids (Azrina *et al.,* 2010).

May possess comparable nutrient content as the palm olein.

Substitutes for conventional oils that are used in the production of soap and shampoo (Azrina *et al.,* 2010).

Fatty acid composition (Kernel oil)

- Oleic acid (41.9%) was the main constituent of monounsaturated lipids in dabai kernel oil.
- The polyunsaturated fatty acid was in small amount, with linoleic acid of 14.05%.
- The major saturated fatty acid present in dabai kernel oil was palmitic acid (40.31%) with small amount of myristic acid, stearic acid and arachidic acid (Liew *et al.,* 2011).
- Dabai kernel oil has high tendency to be solid at room temperature (Azrina *et al*. 2010).
- Fatty acid composition of the kernel oil was similar to cocoa butter, suggesting the oil as a cocoa butter equivalent (CBE).

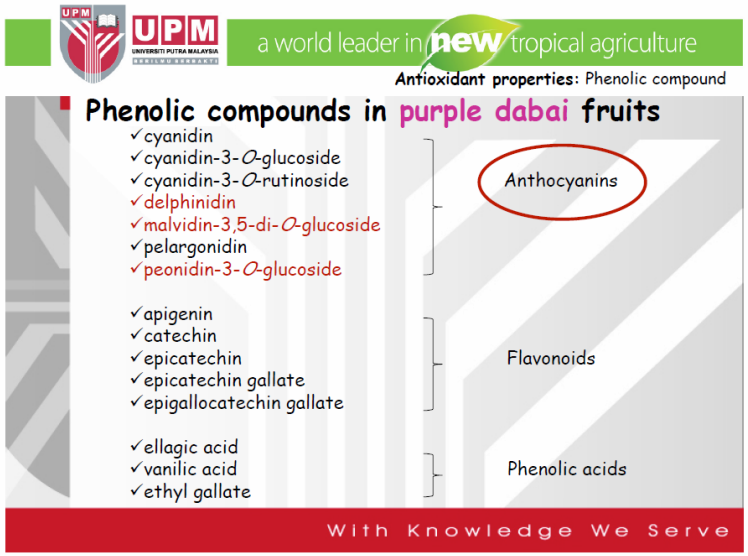
Composition per 100g sample	Dabai kernels
Moisture (%)	27.05
Fibre (g)	15.8
Fat (g)	26.20
Protein (g)	10.75
Carbohydrate (g)	47.24
Ash(g)	3.35
Energy (Kcal)	499.36

Nutrional, Physical and Sensory Analysis of Processed Dabai Kernel (Liew *et al*., 2011)

Antioxidant Properties

• In 2007, Amin *et. al*. carried out a preliminary work where the different parts of dabai fruit were analysed for antioxidant properties.

•Based on the β-carotene bleaching assay, the highest antioxidant activity was observed in the skin of dabai, with mean antioxidant activity of 89.31% O.I.



Canarium odontophyllum Miq: An underutilized fruit for Human Nutrition & Sustainable Diets (Amin I. and Chew L.Y., 2007)

•The total phenolic content were higher in the skin and whole fruit with 25.07 and 5.43 mg GAE/dried sample respectively, compared to the flesh (3.38 mg GAE/g dried sample) and kernel (2.14 mg GAE/g dried sample).

•The high antioxidant capacity of dabai could be due to the presence of phenolic compounds in the skin.

The high antioxidant capacity has led to dabai being investigated as a potential cholesterol lowering agent.

High total anthocyanin contents was determined in methanol and water extracts of defatted dabai parts (Khoo *et al.*, 2012).

Rabbits receiving defatted pulp of dabai showed the greatest cholesterol lowering effect- reduced plasma LDL-C, TC and thiobarbiturate reactive substance (TBARS) level as well as atherosclerotic plaques (Shakirin *et al.*, 2012).

Defatted pulp was found to be rich in phenolics, while the purplish defatted dabai peel has high amount of anthocyanin (Khoo *et al.*, 2012).

It was proven that dabai is a potential antioxidant source-can be exploited in nutraceutical and functional food industry.

The positive effect on hypercholesterolemic rabbits - 70 mg of polyphenolic compounds and the presence of high dietary fiber (Khoo *et al.*, 2012).

GI Certification of Dabai

- A potential superfruit which Sarawak can develop with competitive advantage.
- DOA to designate dabai as one of the priority crops in the region.
- Recently been granted Geographical Indication (GI) protection certification by the Malaysian Intellectual Property Corporation (MyIPO).
- The certification gives dabai the recognition necessary to the creation of a high quality product.

Dabai, terung asam get protection

BY HARUN JAU

KUCHING: Two more indigenous products have been granted the Geographical Indications (GI) protection by the Malaysian Intellectual Property Corporation (MyIPO).

The products are the Sarawak *Dabai* (effective from 9 March, this year) and the Sarawak *Terung Asam* (effective from 30 June).

The GI certificates for the two products were presented to Minister of Modernisation of Agriculture Datuk Patinggi Tan Sri Alfred Jabu when he officiated at the opening of Agriculture Research Officers' Meeting 2011 held at Four Points by Sheraton Kuching here yesterday.

Three local traditional rice varieties had earlier been granted the Geographical Indications protection by MyIPO.

They are the *Beras Bario* (effective from 22 February, 2008), *Beras Biris* and *Beras Bajong* (effective from 17, February 2009).

State Agriculture Department Director Lai Kui Fong said the department's research officers had been instrumental in registering local indigenous products for protections under the Geographical Indications, which is a form of product branding.

"GI protection will ensure authenticity, consistency and quality of the products. It will add value to the products and effectively increase farmers' income and subsequently creates greater demands for the products at home and abroad," he said.

According to Lai, the Research Division of the State Agriculture Department, being a generator of technology, has produced many publications over the years of seminars and conference proceedings, pamphlets, technical reports on crop technology ages, and the annual reports Research Division.

"Our research officers ha written bimonthly/monthl cles on crop research in a newspaper. Since this was s in 2007, a total of 90 article been published," he said.

(Front, from left) Deputy Chief Minister Datuk Patinggi Tan Sri Alfred Jabu, Di and Marketing) Datuk Mong Dagang, Assistant Minister of Agriculture (Far Modernisation of Agriculture Datu Dr Ngenang Janggu giving the thumbs up

MyIPO

Perbadanan Harta Intelek Malaysia
Intellectual Property Corporation of Malaysia

GEOGRAPHICAL INDICATIONS ACT 2000
GEOGRAPHICAL INDICATIONS REGULATIONS 2001

CERTIFICATE OF REGISTRATION
[Subregulation 29(3)]

SARAWAK DABAI

Geographical Indications No.	GI2010-00001
Class	3
Name of Registered Proprietor	Sarawak Information Technology and Resources Council (SITRC)
Registered From	9th day of March 2010
Expiry Date	9th day of March 2020
Goods	In respect of the following goods

Sarawak Dabai: Fresh fruit, frozen fruit and value added products

Quality, Reputation or Other Characteristic

Dabai (Canarium Odontophyllum Miq) is one of the popular indigenous fruit which is found naturally in Sarawak. It is easy to be found along of river banks in Sibu, Kapit and Limbang. Sarawak Dabai is naturally planted and grown by major communities in the orchard plots in Sarawak and free from any pest or diseases. Of this, Sarawak Dabai is regarded as an organic and green fruit.

Sarawak Dabai is a medium size tree growing to about 20m. The trees have tall straight trunk and large branches that only spread out at the top of the trees. It is also referred as 'Sibu Olive or 'Tropical Olive'. Immature fruits are white colour and later changed into slightly reddish and eventually changed into dark purple colour when ripe.

Sarawak Dabai is oval to ellipsoid in shape and they are harvested approximately after 120 days of flowering. The fruit is 3 -4cm long and 1.5-2.0cm wide. The flesh covering the hard, pointed seed is relatively thin, about 2-4mm. The good quality Sarawak Dabai is characterized by large size, weighing about 18g per fruit, thick and yellow-coloured aril, good nutty aroma and flavour and have find texture.

The fresh Sarawak Dabai must be immersed in warm water (80°C) for about 20 minutes in order to soften the fruit prior consumption. Frozen Sarawak Dabai can be preserved up to a year and it can be edible by cooking it in the boiling hot water for about 5 minutes.

Sarawak Dabai is full in nutrient which contains high antioxidant that is good for health. Several value-added products have been developed from Sarawak Dabai with the aim of increasing its usage and consumption by Malaysian.

(SITI EAISAH MOHAMAD)
For Registrar of Geographical Indications
MALAYSIA

Commercial Enterprises & Local Market

- Sold primarily in domestic markets- international market was not very much developed.
- Potential exists to develop it as a superfruit for wider domestic and regional markets.
- Emigrants from Sarawak in West Malaysia and other South East Asian countries would be a ready market for this fruit (Lau, 2009).
- Majority of the small-scale local manufacturers prefer to cater to niche markets.

Economic Potential-Value added products

- Frequently used as ingredients in cakes, cookies, sandwiches and pizza.
- Besides using the pulp and kernel for food products, the seeds can also make attractive keychains when polished and painted.
- The shell can be recycled to produce charcoal.


Dabai Layer cake


Dabai Biscuits


Keychain


Charcoal


Dabai Pizza

Dabai sauce

Dabai paste

Dabai mayonnaise


Dabai fried rice


Dabai Cracker

Mariam Cakes Sdn.Bhd.

Mariam Cake House outlets

Visit by Crown Prince of Perak, Raja Dr. Nazrin Shah Ibni Sultan Azlan Muhibbuddin Shah

Borneo To The World Sdn. Bhd.

Borneo To The World kiosk in Kuching International Airport

- DOA Sarawak continues to pursue industry development in its desire to improve the dabai supply chain and boost commercialisation.

- Favourable environment was created to encourage involvement of private sector in the supply chain operations of dabai fresh fruits and products.

Dabai Festival in Kapit (13th-14th November 2012)

Launching of Dabai Month by Deputy Chief Minister YB Datuk Patinggi Tan Sri (Dr.) Alfred Jabu (12th July 2012)

Launching of dabai as a signature fruit of Sarawak during MAHA International by Governor of Sarawak (November 2012)

Conclusion

- The high nutrient content and antioxidant quality made dabai a potential superfruit for commercialisation.
- Highly nutritious and is rich in protein, fat, energy and carbohydrate. Also high in antioxidant.
- Quite a substantial amount of the fruit is now available in many forms i.e. food products and non-food products
- It is envisaged that commercialisation activity of this special fruit will increase substantially in the next few years.
- It is hoped that dabai will be sold into international trade and will be ranked with other commercial fruits in the world market.

Acknowledgement

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THANK
YOU