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Seeds of Non-Dipterocarps

Biji Benih Pokok bukan Dipterokarpa

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Nor Asmah Hassan & Noraliza Alias

Seeds, for most plants are the normal source of offspring. Seeds provide stock of young plants and are indispensable in the rehabilitation of a forest. Seeds or fruits are also essential features to distinguish between the different species of trees.

The Dipterocarpaceae family is a major group which includes large trees called the dipterocarps. Other trees outside the group are known as the non-dipterocarps. Seeds of dipterocarps and non-dipterocarps can be differentiated by their shapes and sizes. Several non-dipterocarps such as *Gnetum gnemon* (belinjau), *Fagraea fragrans* (tembusu padang), *Swietenia macrophylla* (mahogany), *Dyera costulata* (jelutung) and *Pterocarpus indicus* (angsana) can be observed surrounding the Block B6 building of the FRIM Biotechnology Division. A few of the trees with interesting features are described further.

Edible and Useful

Belinjau and tembusu padang both produce clusters of small berry-like fruits. The belinjau fruit has little surrounding flesh with a large nut-like seed inside. Tembusu padang fruits are smooth and round with small pointed tips. Both fruits ripen from green to yellow, orange and finally to the matured red colour. Belinjau seeds are edible and cooked in sour vegetable soup. The ripe fruit can be pounded flat into raw chips, or emping in Malay, which are deep-fried and eaten as crackers. Tembusu padang fruits however are inedible and bitter tasting red berries. However, the latex produced under the skin is useful and traditionally used as adhesive.



Fruits of belinjau, with pointed tips (inset)

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Cover photo: Produce from Selabat mangrove forest



Fruits of tembusu padang with little surrounding flesh and large seed (inset)

Winged but Non-Dipterocarp

Mahogany and jelutung seeds are similar in terms of having hard fruit structure that protects the seeds and only cracks upon reaching maturity. Mahogany fruits however, are easily observed because their tips will always point towards the sky. The seeds also have thin, tail-like wing that rotates the whole structure when falling. The tail-like seeds may be wind dispersed by as far as 500 meters from the parent tree. Mahogany seeds are edible and traditionally sought for its medicinal values. Like mahogany, jelutung seeds are flat, expanded into wings at the two ends and dispersed by the wind. Jelutung fruits have a pair of large woody follicles that will split on one side to release numerous seeds. The split jelutung pod is shaped like a horn. Meanwhile, the angšana fruit contains several seeds which are condensed in the middle of a flattened winged structure. The structure is known as samara and adapted for dispersal by wind, and able to float on water. The fruit is internally divided by cross walls into four or five-seeded chambers.

The diversity of shapes and sizes of the non-dipterocarp seeds are evidence of the uniqueness of the tropical rainforest landscape. The distinctiveness is virtually preserved at FRIM, which was gazetted as The National Heritage Site in 2012.

ABOUT THE MAIN AUTHOR

Nadiah Salmi Nadzri is a research officer at the Seed Technology Laboratory, Forestry Biotechnology Division.



Chips from belinjau seeds



Mahogany seeds in hard fruit structure (top) and fruits pointing up to the sky (bottom)



The horn-like shape of the jelutung pod



Angšana samara with seed chambers (arrow)

Plant, Dipterocarp and Winged Seed

Pokok, Dipterokarpa dan Biji Benih Bersayap

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Nadiah Salmi Nadzri & Nashatul Zaimah Noor Azman

The Plant Kingdom contains all known plants in its highly diverse and complicated group. Plants are divided into groups based on plant body, vascular system and seed structures. The flowering and non-flowering are among plant groups that have well-differentiated structures.

The non-flowering plants (conifer, pine, redwood, cycad and ginkgo) have seeds which are not enclosed within the fruit, while seeds of flowering plant are embedded within the fruit. The seed is a small embryonic plant, usually accompanied by some stored food, nestled in a covering called the seed coat. Seed which is produced after fertilisation is the basis of future plants and a major food source for human and animals. The loss of biological diversity or plant extinction is a serious threat to the survival of living things.

Flowering plants have about 405 families and 14,559 genera. The Dipterocarpaceae family is a major group which includes large trees called the dipterocarps. Other trees outside the group are known as the non-dipterocarps. The dipterocarps are spread over tropical Asia, Africa and South America and characterised by their winged fruit.

Some dipterocarp species flower and fruit annually, while the majority develop flowers after long irregular intervals. The dipterocarp fruiting season better known as mass fruiting is a much awaited time of the year by many parties especially the foresters. When such season occurs, the forest canopy is transformed into a brilliant mosaic of yellow, brown, orange and even purple, all in varying shades of colour.

Seed wings of the dipterocarps develop from the calyx, which is a five-lobed green outer part of the flower. The number of wings on mature seeds is one of the characteristics used to identify species. Species without seed wings include *Neobalanocarpus hemii* (cengal), while winged seed species in numbers of two, three and five are *Hopea odorata* (merawan siput jantan), *Shorea parvifolia* (meranti sarang punai) and *Dryobalanops aromatica* (kapur) respectively.

Seed wings facilitate dispersal in finding favourable and less competitive conditions to germinate and grow. Maturation process reduces the moisture content and overall weight of the seed. Matured seed is lighter than the young seed and is carried away in long distances by the wind.



Neobalanocarpus hemii (cengal)



Hopea odorata (merawan siput jantan)



Shorea parvifolia (meranti sarang punai)



Dryobalanops aromatica (kapur)

ABOUT THE MAIN AUTHOR

Nor Asmah Hassan is a research officer at the Seed Technology Laboratory, Forestry Biotechnology Division. She holds a MSc (Botany) and BSc (Genetics) degrees from Universiti Kebangsaan Malaysia, Bangi. She joined FRIM in 2003 and is currently working on the development of synthetic seeds.

Conservation of Rare and Threatened Dipterocarpaceae in Peninsular Malaysia

Pemuliharaan Dipterocarpaceae Langka dan Terancam di Semenanjung Malaysia

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Syahida-Emiza Suhaimi & Wendy Yong Sze Yee

Members from the Dipterocarpaceae family form the bulk of the hardwood timber supply both for local and global use. Dipterocarp trees, in various forms such as logs, sawntimber, plywood, veneer, mouldings, chipboards, fibreboards, wooden frames, building joinery and carpentry, and wooden furniture are sources of high economic value timber.

The Peninsular Malaysia dipterocarps are grouped into 164 taxa comprising 155 species of which, 34 taxa are endemic. Members of the family are found at low altitudes of below 1800 m, in a wide range of habitats from the coast to the hills of the tropics. Unfortunately, Dipterocarpaceae is now listed as one of the most threatened plant families in Malaysia, mainly due to habitat degradation.

Based on conservation assessment by FRIM researchers, 92 threatened dipterocarp taxa were discovered from Peninsular Malaysia. The highest threat was attributed to the critically endangered 15 taxa, followed by the endangered 35 taxa and the vulnerable 42 taxa. Within these categories, which are collectively referred to as threatened, 22 are endemic to the peninsular. The alarming scenario led to the initiation of search and rescue projects to locate and conserve the remaining population of the threatened species.

FRIM conservation team worked closely with the forestry departments to identify the locations and populations of the threatened species. Studies on population, phenology and reproductive biology provided new findings and recommended conservation measures to the stakeholders. In the case of the dipterocarps, the forest areas are mainly under the jurisdiction and management of

the forestry departments, although some species were found on private lands.



Flowers of *Hopea subalata* (merawan kancing)

ISL Chua

Conservation status: Critically Endangered (CR).
Endemic to Peninsular Malaysia

Threats: At least 10 trees occur outside the Kanching FR boundary, occupying an area of about 0.17 ha. The land outside the boundary is classified as residential lot

Current status as a result of awareness: Compartments 2, 14 and the 0.17 ha area are now protected under Selangor State Park. Developer re-aligned and constructed the elevated Rawang Bypass in order to conserve the populations in Kanching FR

Over the years, tireless effort by the team concluded in some of the threatened species heading towards total protection via *in situ* conservation. FRIM initiated an *ex situ* collection through germplasm collection, as an initial step towards conserving the species in other locations. Wildings and seedlings of the threatened species are being maintained

and monitored at the Kepong Botanic Garden nursery. Some of the germplasm were donated and planted in private agencies and stakeholders' land for conservation awareness. These measures will hopefully increase the chances of survival among the threatened species populations in the wild.



Seedling of *Dipterocarpus sarawakensis* (keruing layang)

Conservation status: Critically Endangered (CR)

Threats: In Jerangau FR, populations located in production forest where harvesting is permitted.

Current status as a result of awareness: Compartment 31 Jerangau FR of 63 ha gazetted as Genetic Resource Area (GRA) is protected under HCVF. Seedlings from populations in Jerangau FR were collected for *ex-situ* conservation



Fruiting twig of *Dryobalanops beccarii* (kapur merah)

Conservation status: Endangered (EN)

Threats: The populations are situated at the boundary of Panti FR

Current status as a result of awareness: Compartment 6A & 6B of Panti FR, are now protected under HCVF



Inflorescences of *Vatica abdulrahmaniana* (resak abdulrahman)

Conservation status: Rare (RA). Endemic to Peninsular Malaysia

Threats: The populations are known only from Bukit Keledang in Kledang Saiong Forest Reserve

Current status as a result of awareness: Compartment 127 of Kledang Saiong FR, are now protected under HCVF. Seedlings from populations in Kledang Saiong FR have been collected for *ex-situ* conservation

LSL Chua

LSL Chua

Conservation status: Endangered (EN)

Threats: Location of the population in Gunung Arong FR closely adjacent to the main road

Current status as a result of awareness: Population in compartment 2 and 14 of Gunung Arong FR, are now protected under HCVF. Wildings from populations in Gunung Arong FR have been collected for *ex-situ* conservation



Leaves and fruits of *Cotylelobium melanoxydon* (resak tempurung)

Conservation status: Critically Endangered (EN)

Threats: The populations are situated at the boundary of Kledang Saiong Forest Reserve.

Current status as a result of awareness: Compartment 47 of Kledang Saiong FR, are now protected under HCVF.



Leafy twig and close up the stipule of *Parashorea globosa* (meranti pasir daun besar)

Conservation status: Critically Endangered (CR). Endemic to Peninsular Malaysia

Threats: Location of the population in Setul Forest Reserve (FR) closely adjacent to the main road. While population in Sungai Lalang FR lies in recreational forest, human activities and regular cleaning affect and regeneration and survival of the population

Current status as a result of awareness: Population in Setul FR are now protected under High Conservation Value Forest (HCVF). Matured fruits from populations in Sungai Lalang FR have been collected for *ex-situ* conservation to conserve the populations in Kanching FR



Flowers of *Vatica yeechongii* (resak)

ABOUT THE MAIN AUTHOR

Suhaida Mustafa is a research officer at the Forest Health and Conservation Programme under the Forest Biodiversity Division, FRIM. She conducts research on threatened dipterocarp species including population monitoring, reproductive biology and conservation of germplasms.

Tama Abu Scientific Expedition

Ekspedisi Saintifik Tama Abu

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& **Suhaida Mustafa**

The Heart of Borneo (HoB) is known for its unique, rich biodiversity and high endemic species. A series of scientific expeditions were carried out between 2008–2017 such as the Lanjak Entimau, the Long Banga and recently the Tama Abu Scientific Expedition. FRIM participated in the international expedition organised by the Forest Department Sarawak with an aim to document the variety and range of biodiversity residing in the HoB forest.

The HoB scientific expedition at Tama Abu Range, Baram involving 93 researchers from Malaysia and other countries was conducted from 14–26 August 2017. Studies conducted were related to various disciplines such as flora, fauna, hydrology, geology and eco-tourism. The Tama Abu Range is about 130 km from Miri town and the journey from the latter to the expedition site near Sungai Baleh took 10 hours. Travelling was literally on rugged logging road and accessible by four wheel drive vehicles. Selected logging forest practice in the area over 20 years ago adopts the heli-logging system.

The area lies mostly on sandstone substrate from sedimentary rock, composed of quartz sand, and sometimes silt and clay. Most of the trails were steep due to the mountainous terrain. Frequent occurrence of rain at the expedition site affected the tracks and logging roads which became hazardous and slippery. Daily specimen collections at different sites were usually conducted by scrambling up as well as frequently slipping down the steep slopes.

At 500–1200 m, Tama Abu is mostly covered by mixed dipterocarp forest dotted by tracts of kerangas forest. The lowland forest is a beauty of untouched nature with pristine vegetation and clear, unpolluted rivers. Among the findings was *Begonia fuscisetosa*, a floral species endemic to the lowland rainforest of Borneo. The plant is famed for its beauty and attractive foliage and has huge potential as an ornamental plant.

Aside from plants, an interesting find was a rare Bornean snake—the sumatran pit viper—*Parias sumatranus*. The bracket fungi or *Ganoderma* was among those observed growing on wood in addition to a variety of insects which made Tama Abu forest their home.



The Heart of Borneo is the main part of the island where forests remain intact. HoB is one of the largest transboundary rainforest area between the countries of Malaysia, Indonesia and Brunei. The HoB initiative is a conservation agreement between three governments to protect and conserve the rainforest biodiversity of Borneo.



Steep and eroding logging road leading to the base camp



Pinanga arundinacea, one of the palm species in the kerangas forest

The kerangas forest was found at higher elevation of 1200 m on acidic sandy soils. The summit has its own characteristic plant communities, such as mosses, palms, orchids and a few *Pinanga* species. Trees in the area are mostly stunted. Before reaching the summit, an abandoned wallow was observed, probably left behind by a Sumatran rhino or wild boar.

The specimens and observations of the expedition confirmed the high species diversity of the Tama Abu forest. Findings from the fruitful expedition will be disseminated via scientific papers and books to establish the baseline for future Heart of Borneo biodiversity management and conservation programmes.



Pristine and fresh water of the Sungai Baleh



Begonia fuscisetosa is endemic to Borneo



An abandoned wallow at the kerangas forest



Parias sumatranus, the sumatran pit viper

ABOUT THE MAIN AUTHOR

Syahida Emiza Suhaimi is a research officer at the Flora Biodiversity Programme, Forest Biodiversity Division, FRIM. She obtained her BSc in Forestry from Universiti Putra Malaysia and MSc in Plant Taxonomy from Universiti Malaya. She is a team member of the Flora of Malaysia project.

Pemuliharaan Kawasan Pesisiran Pantai Selabat

Rehabilitation of the Selabat Coastline

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Dr Nur Supardi Md Noor, Mohd Parid Mamat & Abang Ahmad Abang Morni

Pemuliharaan hutan dan biodiversiti negara adalah antara skop penyelidikan utama FRIM. Di samping menjaga kebajikan hutan, kepentingan penduduk sekeliling juga tidak diabaikan. FRIM mempunyai kepakaran menentukan keberkesanan serta impak sesebuah projek pembangunan terhadap sosio-ekonomi penduduk setempat dan limpahannya kepada pemegang taruh yang lain.

Projek pemuliharaan pantai di Kampung Pasir Puteh, Selabat merupakan sebuah projek yang memberi kesan positif kepada rakyat. Kawasan yang terletak kira-kira 25 km dari bandaraya Kuching ini pada asalnya merupakan pesisir pantai yang terhakis oleh ombak laut serta angin kencang, dan dicemari lumpur kuala sungai. Keadaan ini menyebabkan penduduk setempat kehilangan tanah dan mengalami kerugian harta benda.

Bagi mengatasi masalah hakisan, kawasan berlumpur seluas 20 hektar telah ditanam dengan pokok bakau kurap (*Rhizophora mucronata*) oleh Jabatan Hutan Sarawak (JHS). Manakala kawasan berpasir seluas 1.7 hektar ditanam dengan pokok ru laut (*Casuarina equisetifolia*). Usaha yang dimulakan pada tahun 2009 merupakan satu daripada kejayaan program penanaman pokok bakau dan spesies-spesies yang sesuai di pesisiran pantai negara kelolaan Kementerian Sumber Asli dan Alam Sekitar (NRE). Hakisan pantai dapat diatasi dengan pokok-pokok bakau yang ditanam pada jarak dua meter di antara satu sama lain yang kini hidup subur dan mengeluarkan benih. Kemasukan pokok api-api (*Avicennia*) turut mengubah kawasan berlumpur menjadi ekosistem hutan pesisiran pantai yang mirip kepada hutan paya bakau semula jadi. Kawasan ini menjadi kediaman ikan, pelbagai siput dan kerang, belangkas serta ketam yang saling bergantung hidup



Dirian pokok bakau kurap (*Rhizophora*) berumur lapan tahun di hutan paya bakau Selabat

dengan tumbuh-tumbuhan, serta menjadi sumber pendapatan baharu bagi penduduk tempatan.

Kawasan seluas 119 hektar di Selabat telah diwartakan sebagai *Selabat Mudflat Nature Reserve* oleh Kerajaan Negeri Sarawak melalui JHS. Pelan pengurusan dan pembangunan kawasan ini perlu sokongan penilaian ekonomi dalam bentuk kewangan. FRIM mengkaji nilai ekosistem hutan paya bakau bagi menguatkan hasrat kerajaan dan memberi kefahaman yang jelas kepada penduduk setempat terhadap pilihan penggunaan tanah serta pengurusan secara berkekalan.

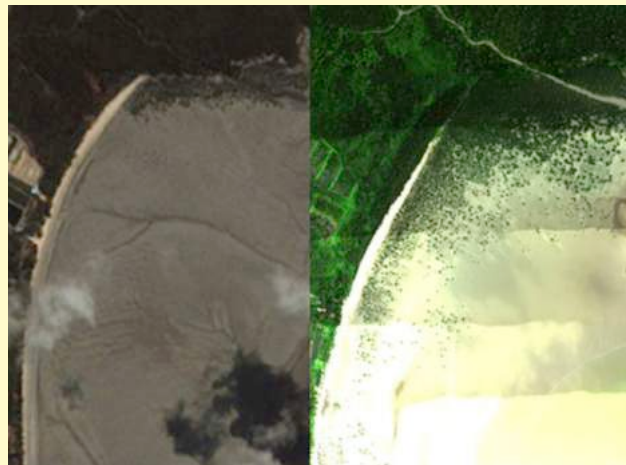
Kajian bersama FRIM dan JHS dibiayai oleh dana RMK-11 Jawatankuasa Teknikal R&D Bakau NRE. Penentuan impak faedah ekonomi pemuliharaan kawasan hutan paya bakau pesisiran pantai Selabat menggunakan penilaian komoditi berdasarkan harga pasaran dan bukan pasaran. Nilai yang diperolehi adalah seperti berikut:

Purata pendapatan bulanan isi rumah: RM3404

Pendapatan daripada sumber: RM560 (16%)

Nilai guna langsung sumber perikanan: RM250,320/bulan atau RM3,003,840/tahun

Nilai faedah pemuliharaan Selabat Mudflat Nature Reserve : RM39 juta (2016)



Imej satelit pada 2009 sebelum (kiri) dan pada 2016 selepas (kanan) kawasan penanaman
(Sumber: Jabatan Hutan Sarawak)



Pemandangan kawasan paya bakau Selabat pada 2009 iaitu sebelum (bawah) dan pada 2016 iaitu selepas (atas) penanaman dijalankan (Sumber: Jabatan Hutan Sarawak)

TENTANG PENULIS UTAMA

Mukrimah Abdullah adalah seorang pegawai penyelidik daripada Program Hutan Sosial, FRIM dan merupakan ketua bersama projek kajian penilaian impak sosio-ekonomi dan nilai faedah pemuliharaan Selabat Mudflat Nature Reserve. Bidang kepakaran beliau adalah ekonomi alam sekitar dan perhutanan sosial.

Pengeluaran Produk Herba Berkualiti di FRIM

Quality Herbal Product Manufacturing at FRIM

Dr Pin Kar Yong *pin@frim.gov.my*

Pusat Teknologi Herba FRIM (HTC) dibangunkan pada tahun 2005, dan dua tahun kemudian, memperoleh akuan Amalan Pengilangan Baik (Good Manufacturing Practice, GMP) bagi pengilangan produk tradisional berbentuk kapsul dan tablet daripada Bahagian Regulatori Farmasi Negara (NPRA), Kementerian Kesihatan Malaysia.

Pembangunan sebuah kilang bertaraf GMP menelan belanja mencecah jutaan ringgit dan di luar kemampuan kebanyakan pengusaha herba industri kecil dan sederhana. HTC memenuhi keperluan pengusaha terutamanya yang tidak mempunyai kemudahan pengilangan secara memberikan perkhidmatan memproses herba.

Sehingga kini, sejumlah 16 buah syarikat telah mendapatkan khidmat HTC sebagai pengilang kontrak untuk menghasilkan 25 jenis produk tradisional berbentuk kapsul. Berdasarkan harga jualan, anggaran nilai produk yang dihasilkan di HTC untuk syarikat-syarikat ini bagi tahun 2016–2017 adalah lebih kurang RM2.8 juta.

Sejak tahun 2015, HTC juga menawarkan perkhidmatan pendaftaran produk tradisional herba kerana ramai pengusaha menghadapi kesukaran urusan pendaftaran produk secara dalam talian dengan NPRA. Daripada 16 permohonan pendaftaran produk, 13 berjaya didaftarkan manakala tiga lagi dalam proses pendaftaran. Tempoh yang diambil NPRA untuk meluluskan sesebuah produk tersebut adalah sekitar lapan bulan.

Berbanding syarikat lain, HTC menjadi pilihan pengusaha herba untuk mendapatkan perkhidmatan memproses herba atas beberapa kelebihan seperti integriti sebagai sebuah agensi kerajaan yang menjaga hak intelek produk pelanggan dan memiliki kemudahan GMP yang diiktiraf NPRA. Pengusaha juga memperoleh

nilai tambah dalam bentuk khidmat nasihat, lokasi strategik yang mudah diakses dan caj perkhidmatan yang berpatutan.



Mesin yang digunakan dalam penghasilan ekstrak

HTC menganjurkan latihan teknikal teknologi pemprosesan herba sebagai usaha untuk berkongsi ilmu pengetahuan dengan pengusaha herba dan penuntut institusi pengajian tinggi (IPT). Para peserta amnya didedahkan kepada aspek-aspek GMP dan proses yang terlibat dalam pengilangan produk herba, manakala pengisian untuk pelajar IPT bermatlamat untuk melahirkan tenaga kerja untuk berkhidmat dalam industri herba. HTC telah melatih sejumlah lebih 100 pelajar Universiti Kuala Lumpur (UniKL) bermula pada tahun 2008. Maklumat lanjut tentang HTC boleh dirujuk dalam buku *Amalan Pengilangan Baik: Pengalaman Pusat Teknologi Herba FRIM*.



Pandangan dalaman HTC yang dibangunkan mengikut piawai GMP



Pencampuran ekstrak herba dengan bahan tambahan menggunakan mesin pengadun



Produk berjenama FRIMCo hasil usaha sama Koperasi FRIM Sdn Bhd dengan HTC



Kapsul dihasilkan mengikut spesifikasi yang diperlukan pelanggan

TENTANG PENULIS UTAMA

Dr Pin Kar Yong ialah pegawai penyelidik yang bertanggungjawab dalam aktiviti pengeluaran produk di Pusat Teknologi Herba, FRIM. Beliau terlibat dalam penyelidikan pemprosesan herba dan memberi khidmat perundingan dalam pengurusan kualiti produk—Good Manufacturing Practice (GMP). Beliau memperoleh PhD daripada Universiti Pertanian Malaysia pada tahun 2009 dalam bidang kejuruteraan kimia.



Bengkel Perisian Adobe CS: Teknologi Kreatif dan Inovatif

Adobe CS Workshop: Creative and Innovative Technology

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Peserta mempelajari penggunaan perisian Adobe CS

Industri kreatif merupakan salah satu sumber penting pertumbuhan ekonomi dan percambahan budaya di negara-negara maju. Dalam perspektif ekonomi dan sosiobudaya Malaysia, industri kreatif berpotensi menjana ekonomi berpendapatan tinggi serta memartabatkan budaya bangsa. Perkembangan teknologi komputer masa kini menyebabkan kegunaan serta keupayaan sesuatu paparan grafik berkembang pesat dalam pelbagai aspek kehidupan. Hasil gabungan teknologi komputer dan kepakaran manusia telah meningkatkan kualiti kerja serta menjadikan pengguna lebih kreatif dan produktif.

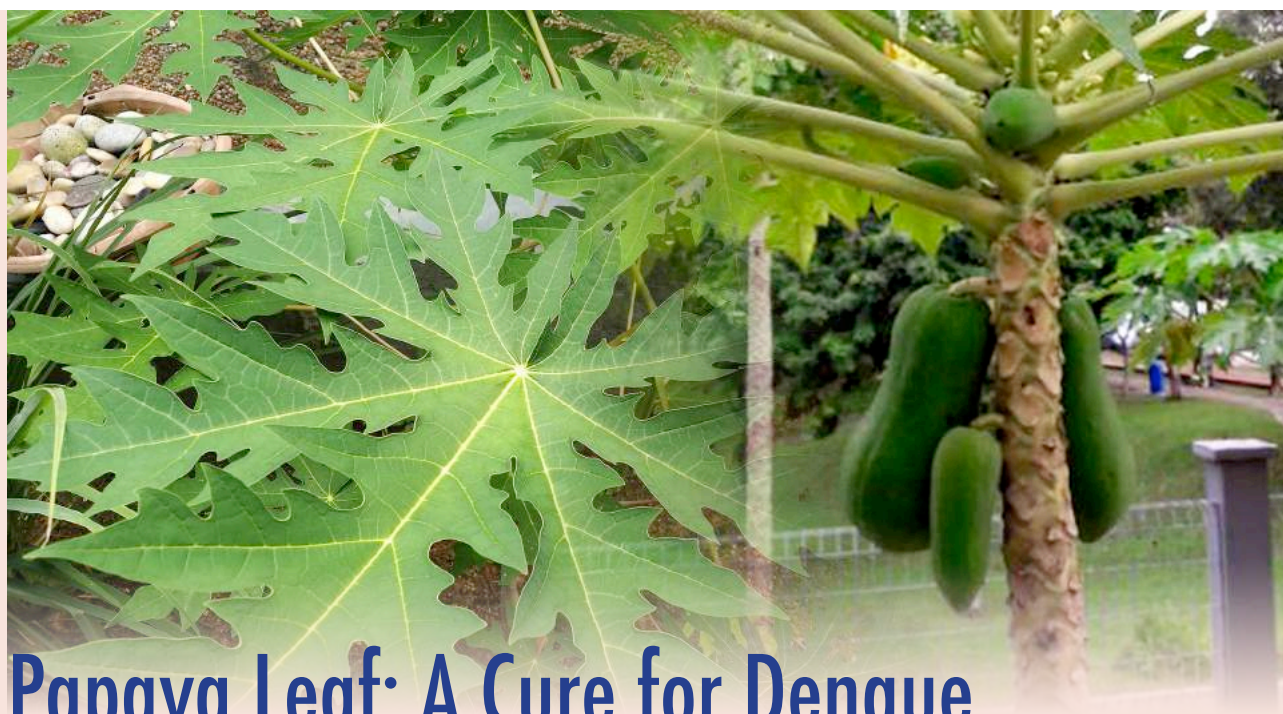
Perisian seperti Adobe CS mampu meminda imej pada skrin komputer dengan lebih mudah serta efektif berbanding di atas kertas. Kemajuan teknologi memainkan peranan penting dalam memajukan industri kreatif, namun tidak dapat digunakan sepenuhnya berikutan kekurangan pengetahuan tentang aplikasi kreatif. Kemahiran penggunaan Adobe CS masih berada di tahap minimum berbanding keupayaannya yang besar yang memerlukan daya kreativiti dan inovasi yang tinggi.

FRIM telah menganjurkan bengkel perisian kreatif Adobe CS sejak tahun 2009. Bengkel yang diadakan merupakan usaha bagi memperkenalkan kemudahan, kelebihan dan kecanggihan perisian digital dalam menghasilkan reka bentuk termasuk meminda dan mengubah suai sesebuah imej.

Pengguna dapat menggunakan perisian Adobe CS dalam pelbagai aspek kerja secara digital mahupun tradisi.

Pada tahun ini, FRIM dijemput menjadi tenaga pengajar dalam bengkel yang pertama kali dianjurkan agensi kerajaan seperti Perpustakaan Negara Malaysia (12–14 Julai), Lembaga Pemasaran Pertanian Pesekutuan (11–13 September), Majlis Perbandaran Subang Jaya (11–13 Oktober) dan Majlis Perbandaran Kajang (24–26 Oktober). Bengkel bertujuan melatih penjawat awam agar memperoleh kemahiran baharu, menjadi kreatif dan inovatif, serta berkemampuan menjalankan berbilang tugas. Peserta bengkel terdiri daripada pegawai kumpulan pengurusan dan profesional serta pelaksana 1, daripada pelbagai latar belakang seperti pengurusan sumber maklumat/ICT, penerbitan dan percetakan, promosi, perhubungan awam, perancang bandar, kejuruteraan dan landskap.

Kemahiran menggunakan perisian kreatif membolehkan peserta menjana pendapatan dalam bidang seperti multimedia, perfileman, penerbitan, percetakan, pengiklanan dan reka bentuk. Setelah menamatkan kursus, peserta disasarkan mampu menggunakan perisian kreatif seperti Adobe CS untuk menghasilkan karya atau produk yang mempunyai nilai estetika dan seni yang indah lagi menarik.



Papaya Leaf: A Cure for Dengue

Daun Betik: Penawar Denggi

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Dengue fever is a mosquito-borne tropical disease caused by the dengue virus. Dengue is transmitted by aedes mosquito, *Aedes aegypti*. Dengue has emerged as a human viral disease that affects the blood and a major concern in international public health research. Blood is a specialised body fluid. It has four main components: plasma, red blood cells, white blood cells, and platelets.

Symptoms of dengue include fever, headache, muscle and joint pains, and skin rash. In a small proportion of cases, the disease develops into life-threatening dengue hemorrhagic fever, resulting in bleeding, lowering of platelets and blood plasma leakage, or into a dengue shock syndrome that dangerously lowers blood pressure.

As there is no commercially available vaccine, prevention is sought by reducing the habitat of mosquitoes and limiting exposure to mosquito bites. Dengue fever requires hospitalisation where support care is provided, as there is no available modern anti-viral drug that can treat the disease.

Various treatments have been investigated by scientists. Recent studies have indicated that the juice or extract of papaya (*Carica papaya*) leaves can increase platelet

count and prevent hemorrhage, or bleeding in dengue. Papaya contains two important biologically active compounds, chymopapain and papain, which are widely used for digestive disorders. The leaves also contain flavonoids and other phenolic compounds.

Recent studies have reported membrane stabilising properties of papaya leaf extracts *in vitro* experiments. The papaya plant helps in dengue by treating thrombocytopenia (low platelet count). Platelets are colourless blood cells, also called thrombocytes which help blood clotting.

Papaya leaf extract inhibits haemolysis of red blood cells, or erythrocytes by stabilising the cell membrane. Thus the extract contains membrane stabilising properties that protects blood cells against destruction and prevents hemorrhage in patients with dengue infection.

However, in principle, for a drug to be formally accepted in biomedicine, adequate pre-clinical and clinical experiments have to be carried out. The active compound needs to be identified and tested in *in vivo* experiments, prior to the development of a papaya leaf drug for dengue.

ABOUT THE MAIN AUTHOR

Dr Vimala Subramaniam is a research officer at the FRIM Publications Branch. She is the recipient of various national and international awards for her findings in herbal research..

Projek Penyelidikan FRGS/FRIM/USM Menang Tempat Ketiga Inovasi Nanoteknologi Kebangsaan

13 Oktober 2017 Projek penyelidikan FRIM dengan kerjasama Pusat Pengajian Sains Kimia, Universiti Sains Malaysia (USM), Pulau Pinang memenangi tempat ketiga Pertandingan Projek Penyelidikan Inovasi Nanoteknologi Peringkat Kebangsaan (PIN) 2017. Projek yang dibiayai geran Skim Geran Penyelidikan Fundamental (FRGS), Kementerian Pendidikan Tinggi menerima pengiktirafan dalam kategori Sarjana melalui inovasi *Nanobiocide: a new solution for tropical wood*. Pertandingan diadakan pada 11 Oktober 2017 di Networking Lounge, Resource Centre, Technology Park Malaysia (TPM), Bukit Jalil, Kuala Lumpur, manakala majlis penyampaian hadiah pada 13 Oktober 2017 di booth NanoKEB 2017, Tent 2 @ NICE Ekspo, Technology Park Malaysia (TPM). Projek inovasi FRIM diketuai oleh Dr Mohamad Nasir Mat Arip, seorang pegawai penyelidik di Bahagian Keluaran Hutan.



Dr Mohamad Nasir (kanan sekali) bersama ahli projek

KP FRIM Terima Penghargaan NRE

25 September 2017 Ketua Pengarah FRIM, Dato' Dr Abd Latif Mohmod menerima sijil penghargaan khas yang disampaikan Menteri Sumber Asli dan Alam Sekitar (NRE), Dato Sri Dr Wan Junaidi Tuanku Jaafar. Menteri NRE menyampaikan sijil tersebut di majlis Perhimpunan Bulanan 1NRE yang diadakan di Jabatan Pengairan dan Saliran Malaysia (JPS),

Ampang. Sijil penghargaan adalah bagi penerimaan anugerah Brand Laureate Most Eminent Brand Icon Leadership 2017 bagi kategori 'Pemuliharaan Alam Sekitar' yang diterima Abd Latif pada 28 Ogos. Majlis dihadiri oleh Datin Sri Feona Wan Junaidi, isteri Menteri; Datuk Ir Hamim Samuri, Timbalan Menteri; staf NRE dan ketua-ketua serta wakil-wakil agensi kementerian.



KP FRIM (empat dari kanan) bersama Menteri NRE (lima dari kanan)