



## **PROGRAM BOOK**

### Virtual Symposium, 9-10 November 2021



# **ISODOTF2021 2<sup>nd</sup> INTERNATIONAL SYMPOSIUM** ON DURIAN AND OTHER TROPICAL FRUITS

**Recent Trends in Sustainable Agricultural Innovation Technology for Delivering Durian and Other Tropical Fruits to Global Market** 

# Virtual Symposium November 9<sup>th</sup> - 10<sup>th</sup>, 2021

Organized by



Indonesian Tropical Fruits Research Institute Indonesian Center for Horticultural Research and Development Indonesian Agency for Agricultural Research and Development **Ministry of Agriculture** 

**Co-Organized by** 



International Tropical Fruits Network (TFNet)



Indonesian Society of Horticulture (ISH/PERHORTI)

Supported by



Kasetsart University (Thailand)



Malaysian Agricultural Research and Development Institute (MARDI)



**Caraga State University** (Philippines)



Fruit and Vegetable Research



Institute (FAVRI/Vietnam)

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General Director of Indonesian Agency of Agricultural Research and Development	4
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### WELCOME REMARKS





Assalamu'alaikum Warahmatullahi Wabarakatuh, Salam sejahtera bagi kita semua

Ladies and gentlemen,

Allow me to express my gratitude and appreciation to IAARD and all of those who involved to make possible this symposium to be held. I respect all of the attendees who have attended here, especially to the co-organizers of the event, International Tropical Fruits Network (TFNet) and Indonesian Society for Horticulture (PERHORTI) which I am proud.

The Ministry of Agriculture has facilitated the development of tropical fruit through research institutions and universities to produce good quality, high yielding and marketable fruit. Tropical fruits are a source of vitamins and minerals for our body health and important need especially during the COVID-19 pandemic to increase the immunity. In addition, tropical fruits is a multipurpose commodity in the food and beverage industry, cosmetics, and other bioindustry. Tropical fruit is also one of the alternative commodities for food diversification.

During this pandemic, the agricultural sector increase by 2.19% and provided the largest contribution to Gross Domestic Product (GDP) of 15.46%. Over the past 4 years, fruits have continued to contribute to the largest export contribution to the horticultural sector. The demand for fruits from the global market during the pandemic has increased sharply. National fruit production in 2019 rose 4.8% from 2018, and export value added increased 73.40%.

Ministry of Agriculture has developed export-oriented horticultural areas, partnerships, triple exports program (Gratieks), and development of many fruit villages, like durian, banana, and dragon fruit villages in many provinces. The developing of Indonesian tropical fruits objectives are: increasing consumption/capita, self-sufficiency, and increasing exports. The development strategies can be carried out through: 1. Development of fruit varieties in accordance with market preferences. 2. Development of seed industry , 3. Development of cold chain systems in logistics activities. 5. Development of domestic and export markets, and 6. Encouraging the participation and contribution of the private sector.

The existence of government institutions, local governments, private companies, millennial farmers, and other community members is an integral part in developing fruit crops. Today we are here in order to accelerate the dissemination and socialization of research results and other important information from various countries to be used in the development of tropical fruits.

On behalf of the Minister of Agriculture of the Republic of Indonesia, I would like to congratulate all participants of the symposium. Hope it goes well until finish.

Wabillahi Taufik Walhidayah WASSALAMUALAIKUM WARAHMATULLAHI WABARAKATUH

Dr. H. SYAHRUL YASIN LIMPO , S.H., M.Si., M.H. Minister of Agriculture, Indonesia

### WELCOME SPEECH





Assalamu'alaikum Warahmatullahi Wabarakatuh, Salam sejahtera bagi kita semua

Ladies and gentlemen,

This event is one of the dissemination agendas of Indonesian Agency for Agricultural Research and Development (IAARD) to accelerate and extend the agricultural innovation to users around the world. During its 47 years of work, IAARD has produced various technologies that need to be disseminated to stakeholders. Technical guidance on good agriculture practices must be socialized to farmers in order to produce high quality, quantity and continuity of fruits. In this opportunity, I would like to express my gratitude to the Indonesian Center for Horticulture Research and Development, Co-organizers (TFNet and PERHORTI), FAO representative, invited speakers, and all presenters for participations in this Symposium. I believe this symposium will be useful for policy makers, bioindustry and contribute to increase productivity and quality of tropical fruit.

This agenda is part of the International Year of Fruits and Vegetables (IYFV 2021), which is a campaign that can inspire individuals, farmers, the private sectors, and governments to consume and increasing activity in fruits agribusiness. As a tropical fruits producing country Indonesia must participate and take part in this activity.

Innovation is an urgent need to win the global competition as a producer and exporter of tropoical fruits in international market. This is in line with the target of Indonesian Ministry of Agriculture to achieve self-sufficiency and incline exports in order to increase the country's foreign exchange. The theme of the activity is: "Recent trends in sustainable agricultural innovation technology for delivering durian and other tropical fruits to global markets" in accordance with the current strategic plan to support the establishment of fruit agribusiness systems.

The demand for research and development in tropical fruits is increasing in line with changes in Indonesia strategic environment. The acceleration of fruits development can be made if the implementation of R&D changes from business as usual towards research oriented to solve the problems quickly by using the local resources. The fruit sub-sector must be developed based on sustainable innovation using national resources in order to reach category as producer and exporter in the global market. IAARD must tight-up networking with local governments, national and international institutions.

Wabillahi Taufik Walhidayah WASSALAMUALAIKUM WARAHMATULLAHI WABARAKATUH

Dr. Ir. FADJRY DJUFRY, M.Si. General Director of Indonesian Agency of Agricultural Research and Development Ministry of Agriculture, Indonesia

## About ISODOTF2021

Recently, high demand of durian fruit is increase significantly as well as others tropical fruits. Hence, all information relates to cultural practices and plant production, plant genetic resource and breeding, post-harvest technology, pests and diseases management and agricultural economics and supply chain management as well need to be gathered for high productivity and quality purposes. It expected that effective, efficient and sustainable technology could lead high profitability for tropical fruits agribusiness.

Indonesian Agency for Agricultural Research and Development (IAARD) through Indonesian Center for Horticultural Research and Development (ICHORD) and supported by Indonesian Tropical Fruits Research Institute (ITFRI) has produced several prominent technologies on tropical fruits. All of those technologies were created to give added value on horticultural product and adjusted based on agribusiness activity steps i.e. preparing production facilities, production processes, post-harvest handling and marketing.

Competition in global market is getting tougher, hence, fruits innovation technology is inevitable need whether on-farm and off-farm. Agribusinessmen in the competitor country have already been developed innovation to win market competition. Meanwhile, in other tropical countries agribusinessmen have difficulties to access innovative technology to increase product competitiveness.

Indonesian Tropical Fruits Research Institute (ITFRI) was established since 1984 has also contributed in the development of Indonesian horticultural technology as well as produce new superior variety on commodity of durian, mango, mangosteen, banana, salak and papaya. The technologies and varieties have mostly adopted by stakeholder. Nevertheless, both are still need to be more widely disseminated in order to give more benefits to the user. However, another tropical fruits producer countries have also developed those technology rapidly. Hence, mutual collaboration is worth to be done. Further, those technologies adoption could be modified based on local wisdom that available in the society. One of the ways to share and earn cultivation technology input and marketing of tropical fruits in international linked is through conducting international symposium among producer countries on durian and other tropical fruits.

#### AIM

This symposium aimed to Incorporate best practices on technology development and product innovation for durian and others tropical fruits and as an area for sharing information on recent advance in sustainable agricultural innovation technology in aspect of cultivations, trade, and industry for delivering durian and others potential tropical fruits to global market.

#### THEME

Recent Trends in Sustainable Agricultural Innovation Technology for Delivering Tropical Fruits to Global Market

#### SUBJECT

- 1. Cultural Practices and Plant Production
- 2. Plant Genetic Resources and Breeding
- 3. Postharvest Technology
- 4. Plant Pests and Diseases Management
- 5. Agricultural Social Economics

#### PARTICIPANTS

The Symposium is expected could be joined by researcher, academia, decision makers, NGO, international organization, civil society, private sectors, agricultural extension workers, farmers, and students from across the world.

### **SYMPOSIUM Guidelines**

#### **For Participants**

#### For Plenary Session

1. The conference will be held online using the ZOOM meeting platform. If your computer/laptop doesn't have the Zoom application installed, install it first by clicking the meeting link provided. You may also download the latest Zoom Client for Meetings through this following link https://zoom.us/download#client\_4meeting. The link will direct you to download zoom and install it. (Konferensi akan diselenggarakan secara daring/online melalui aplikasi rapat Zoom. Jika komputer/laptop Anda belum terinstal aplikasi Zoom, silakan menekan link rapat yang sudah disiapkan. Anda juga bisa mengunduh Zoom versi terbaru melalui link https://zoom.us/download#client 4meeting. Browser akan secara langsung mengarahkan Anda mengunduh aplikasi zoom. Silakan tekan download dan instal).

2. If it is already installed, open the zoom application, then select Join a Meeting. The Participants must enter the main ZOOM room starting at 08:30 A.M. [Jakarta time, GMT+7]

(Jika aplikasi zoom sudah terinstal di perangkat lunak Anda, silakan buka aplikasi zoom, lalu pilih Join a Meeting. Peserta wajib memasuki ruang rapat utama ZOOM pada pukul 08:30 WIB. [Jakarta time, GMT+7]).

3. Enter the meeting code provided (generally consists of 11 digits). (Silakan masukan kode rapat yang sudah disediakan (umumnya memiliki 11 angka)

4. For a presenter participant, enter your name in the format of Your Presenter Code \_Participant's Full Name (e.g. CP01 Theerawut Chutinanthakun). For a non-presenter participant, enter your Chosen name in the format of Your Parallel Session Room Code (CP/PB/PD/PH/AS)\_Participant's Full Name (e.g. CP\_Eko Darma Husada). Make sure your full name match with the name registered on the registration form. If the name does not match, the committee may not allow the participant to enter the meeting.

(Untuk peserta presenter, tuliskan nama lengkap dengan format: kode presenter\_nama lengkap peserta (e.g. CP01\_Theerawut Chutinanthakun). Untuk peserta non-presenter, tuliskan nama lengkap dengan format: kode ruang sesi paralel\_nama lengkap peserta (cth.. CP\_Eko Darma Husada). Pastikan nama lengkap yang digunakan sesuai dengan nama yang sudah didaftarkan pada formulir registrasi. Jika nama yang Anda cantumkan tidak sesuai, panitia tidak akan mengizinkan Anda memasuki ruang rapat zoom).

5. After clicking join, you will be asked for the meeting password. Enter the meeting password received in the email from the committee. Then click Join Meeting.

(Setelah menekan tombol join, silakan masukkan kata sandi rapat yang sudah diinformasikan panitia melalui surat elektronik. Lalu tekan Join Meeting).

6. Wait for the host to put you into the Zoom meeting room. (Silakan menunggu host mengizinkan Anda memasuki ruang rapat zoom).

7. After entering the Zoom room meeting, make sure the speakers are muted, unless permitted by the host. Use the chat menu at the bottom to interact using text with the host.

(Setelah Anda masuk ke dalam ruang rapat zoom, pastikan mikrofon dalam keadaan off, kecuali diizinkan oleh host. Silakan menggunakan menu chat untuk berkomunikasi dengan host).

#### For Parallel Session

1. Parallel session will begin according to time schedule on program, make sure all participants not coming late. After opening by MC, breakout room will assigned.

(Sesi paralel akan dilaksanakan sesuai waktu yang tertera pada tabel program, mohon seluruh partisipan untuk hadir tepat waktu. Setelah opening selesai, ruang breakout akan langsung dibuka).

2. The host will help the participants to enter the breakout room according to the participant's parallel session room code. Therefore, make sure you use the parallel session code correctly.

(Host akan membantu peserta memasuki ruang breakout sesuai dengan kode ruang sesi pararel peserta. Pastikan Anda sudah mencantumkan kode ruang sesi pararel dengan benar).

3. Participants can also enter the breakout room independently by selecting the breakout room according to the participant's parallel session room code that provided by the host.

(Peserta dapat juga memasuki ruang breakout secara mandiri dengan cara memilih ruang breakout sesuai kode ruang sesi pararel yang disiapkan host di ruang utama zoom).

4. If Participants still have difficulty entering the breakout room, the participants can ask directly to the host via the chat feature in the main Zoom room.

(Jika peserta masih mengalami kesulitan memasuki ruang breakout, silakan jangan ragu berkomunikasi langsung dengan host melalui chat yang terdapat pada ruang utama zoom).

5. The parallel session will be guided by a moderator. Make sure you have sent the virtual presentation file to the committee.

(Sesi pararel akan dipandu oleh seorang moderator. Pastikan Anda sudah mengirimkan file presentasi virtual ke panitia).

6. Virtual presentations can be delivered using an MS-PowerPoint, presentation video, or PowerPoint with voice-over.

(Presentasi virtual dapat disampaikan menggunakan MS-PowerPoint, video presentasi, atau MS-PowerPoint dengan suara).

7. The time allocated for a presentation is 15 minutes, with a further 5 minutes allowed for discussion at the end of session.

(Setiap peserta disediakan waktu 15 menit untuk presentasi dan 5 menit untuk sesi tanya-jawab pada akhir sesi).

8. For discussion, Q&A form will be shared on ZOOM chat. Participant can filling up their question on form that will be shared to start discussion with presenter at the end of each session.

(Untuk diskusi, form Q&A akan dishare oleh panitia pada chat room di ZOOM. Partisipan dapat mengisi pertanyaanya pada form yang tersedia. Form akan ditayangkan setelah seluruh presentasi selesai dan memulai sesi diskusi).

9. After the parallel session is over, the participants can re-enter the main ZOOM room at the closing ceremony.

(Setelah sesi pararel berakhir, peserta dapat kembali bergabung ke dalam ruang zoom utama pada acara penutupan).

10. Do not forget to fill in the attendance list at the plenary and parallel sessions that have been prepared by the committee as a condition for obtaining a certificate.

(Jangan lupa mengisi daftar hadir yang disiapkan panitia saat sesi pleno dan sesi pararel sebagai persyaratan untuk mendapatkan sertifikat).

### The PROGRAMS

	DAY 1. NOVEMBER, 9 <sup>th</sup> , 2021			
TIME (AM/PM)	AGENDA			
08.00 - 08.30	GUESTS AND PARTICIPANTS ENTER THE ROOM MEETING https://us02web.zoom.us/j/2013720594 Meeting ID : 201 372 0594 Passcode : 9101121			
08.30 - 08.45	<ul> <li>OPENING CEREMONY</li> <li>1. Opening by MC (Riry Prihatini, M.Sc.)</li> <li>2. National Anthem "Indonesia Raya"</li> </ul>			
08.45 - 09.00	WELCOME SPEECH Dr. Ir. Fadjry Djufry, M.Si. Director General of Indonesian Agency of Agriculture Research and Development/IAARD			
09.00 - 09.15	<b>OPENING REMARKS</b> Dr. H. Syahrul Yasin Limpo, S.H., M.Si., M.H. Minister of Agriculture, Republic of Indonesia.			
09.15 - 09.30	1. Photo Session 2. Video IYFV2021			
09.30 - 09.45	Break			
Moderator : Di	PLENARY SESSION r. Muhammad Prama Yufdy (ICHORD)			
09.45 - 10.05	Jesper Karlsson (Food Agriculture Organization) "FAOs contribution to sustainable tropical fruit development"			
10.05 - 10.25	Lindsay Gasik (Traveler Blogger Durian, USA) "The Western Perspective on Durian"			
10.25 - 10.45	Jingtair Siriphanich, Ph.D (Kasetsart University, Thailand) "Postharvest Research on Durian : Progresses and Potentials"			
10.45 - 11.05	Lim Chin Khee (Durian Consultant Malaysia) "Best farm practices for durian cultivation in Malaysia"			
11.05 - 11.50	Discussion			
11.50 - 12.50	Break			
	PARALLEL SESSION 1			
12.50 - 01.00	GUESTS AND PARTICIPANTS ENTER THE PARALLEL ROOM MEETING [CP/PB/PD/PH/AS]			
TIME (AM/PM)	TITLE/AUTHOR			
Room 1 Moderator Notulen	: Cultural Practices and Plant Production [CP] : Prof. Dr. Slamet Susanto (ISH/PERHORTI) : Nini Marta, M.P. (ITFRI)			
01.00 - 01.15	<b>Effect of pollen of hybrid durian on fruit setting of Monthong durian in different temperatures</b> <i>Apiradee Korpphaiboon, Natrapee Sukjitpaiboonphol, Sirikarn Petsiri, and Theerawut Chutinanthakun*</i>			
01.15 - 01.30	<b>Enhancing fruit development of durian using different methods of nutrient supplements</b> <i>Theerawut Chutinanthakun *, Apiradee Korpphaiboon, Natrapee Sukjitpaiboonphol, and Sirikarn Petsiri</i>			
01.30 - 01.45	IoT-Enabled Irrigation System - An integrated solution for durian farm Ahmad Taufik Jamil			
01.45 - 02.00	Existing Technology and Analysis of Durians Farming in Lae Parira Dairi, North Sumatra			
02.00 - 02.15	Growth, Productivity and Phosphorus Uptake of Abelmoschus esculentus (L.) Moench on the Treatment of Sago dregs with Local Microorganisms as Organic Fertilizer on Marginal Land Rachmawati Hasid*, Abdul Madiki, Sarawa M., Tresjia Corina Rakian, Makmur Jaya Arma, Andi Nurmas, Robiatul Adawiyah, and Sarmin Sabarda			
02.15 - 02.30	Discussion			
Room 2	: Plant Genetic Resources and Breeding [PB]			
Moderator	: Dr. Agus Sutanto (ITFRI)			
Notulen	: Dr. Sukartini (ITFRI)			
01.00 - 01.15	Phylogenetic Study of The Durio Flower Characters from Kalimantan			

	Doni Irsan Naufal, Kusuma Dewi Sri Yulita, and Priyanti*
01.15 - 01.30	Conservation, Distribution of Eleven Durian Species and Hybrid Detection Applying Molecular
	Markers
	Muhammad Imam Surya*, Yayan Wahyu Candra Kusuma, Kusumadewi Sri Yulita, N. Sri Hartati, and
	Enny Sudarmonowati
01.30 - 01.45	Isolation and Characterization of Polymorphic DNA Fragments in Mangosteen
01100 01110	Ellina Mansyah*. Agus Sutanto, Panca Jarot Santoso, Riry Prihatini, Makful, and Sukartini
01.45 - 02.00	Induction of Polyploidy with Colchicine in Serif Saga Agrihorti Watermelon
01110 02100	Rahayu IS Sutoyo PKD Hayati* and Kuswandi
02.00 - 02.15	Genetic Diversity of Durian Hybrids Based on Mornhological Characters
02.00 02.10	Ni Luh Putu Indrivani <sup>*</sup> Farihul Ihsan Fitriana Nasution and Panca Jarot Santoso
02.15 - 02.30	Discussion
Room 3	Plant Pest and Diseases Management [PD]
Moderator	· Affondi Dh D (ITFRI)
Notulon	· Antanui, I n.D. (III KI) · Jumiunidang M Si (ITEDI)
	Control of stom concer discose coursed by Necentalidium dimidiatum in drogen fruit with several
01.00-01.15	Control of stelli cancer disease caused by <i>Neocylandium dimidiatum</i> in dragon fruit with several botonical posticidas
	Piska* Jumiunidana and Mizu Istianto
01.15 01.20	A Deview of Litilization of Essential Oil Vanar for Deste and Discoses Control on Ervits
01.15 - 01.50	A NEVIEW OF UTILIZATION OF ESSENTIAL OF VAPOR FOR FESTS AND DISEASES CONTOFOR OF FURS
01.30 01.45	Milli Islamo, Deni Emilia, Riska, and Ella Octivina Diant Depositio Nometodos, Associated with Cariga nangua L in Vegyelearte Special Province
01.30 - 01.43	Indonesia
	siwi indarti* and Tarvono
01.45 - 02.00	Inhibitory Canacity of Cinnamon Oil ( <i>Cinnamomum hurmannii</i> ) in Controlling The Fungus
01.45 02.00	Thielavionsis naradova which Causes Pointed Fnd Rot of Salak Fruit (Salacca zalacca) In Vitro
	Wilda Dhiya Pratiwi* Sulhaswardi and Riska
02.00 - 02.15	Insect Pests on Durio zibethinus Murray at Areas Affected by Drought and Salinity in Mekong Delta
02.00 02.15	and Biological Characteristics of Allocarsidara Malayensis Crawford (Homontera: Psyllidae)
	Le Ouoc Dien* and Huynh Thanh Loc
02.15 - 02.30	Discussion
Room 4	: Postharvest Technology [PH]
Moderator	: Nofiarli, M.P. (ITFRI)
Notulen	: Yosi Zendra Joni, Ph.D. (ITFRI)
01.00 - 01.15	Domestication of underutilized indigenous plant Garcinia latissima Mig. through fruit jam
	production
	Aulia Hasan Widjaya, Fitri Fatma Wardani, Ria Cahyaningsih, and Reza Ramdan Rivai*
01.15 - 01.30	Maturity Assessment of Cavendish (Musa paradisiaca L.) Bananas Using the Thermal Image
	Method
	Sri Waluyo, Nanda Febrianingrum, Soesiladi Esti Widodo*, and Zulferiyenni
01.30 - 01.45	Detection of Fruit Maturity of Cavendish Banana by Thermal Image Processing Technique
	Soesiladi Esti Widodo*, Sri Waluyo, Zulferiyenni, and Reza Latansya
01.45 - 02.00	Musang King durian: Volatile organic compound ester compositions and their changes during long
	term frozen storage
	Misran Azizah* and Tan Xue Yi
02.00 - 02.15	Synergy of ethylene absorbent materials and natural fiber reinforcement in carboxy
	methylcellulose-based spray coating to resistance durian fruit dehiscence (Durio zibethinus Murr.)
	var. MonThong
02.15 02.20	Piyapong Sonkaew*, Thanatcha Chiaa, and Voraphat Luckanatinvong
02.15 - 02.50	Discussion
Koom 5 Madawatan	: Agricultural Social Economics [AS]
Notulon	: Apri Layia Sayeku, Ph.D. (ICHOKD) . Twi Dudiyanti M.Si (ITEDI)
<b>Notulen</b>	: 1Fl Budiyanu, M.Sl. (11FKI)
01.00 - 01.15	Arini P Hanifa* Riswita Syamsuri Herniwati Eka T Yuniarsih
01.15 - 01.30	The Enhancement Strategies for Manga Evnorts in The International Market
01.15 - 01.50	Puspitasari* Warvat Hardiyanto Rikza Alfya Anyarah Cahyaty
01.30 - 01.45	The notential economic impact of tropical fruit seedlings distribution program in Indonesia: the
01.30 - 01.43	case of mango in Pasuruan Regency
	Adhitya Marendra Kiloes* and Puspitasari

	TETENGER BUMI 58UB, Information Technology to help Durian and Nusantara fruit planting			
	Tibvani Tibvani*. Graita Sukma Febriansvah Triwildan Azmi, Achmad Afif Ubavdillah and Wafia Nur			
	Muhammad Arwani			
02.00 - 02.15	Difference of Intensive Cultivation On Mango Farming: Implications For The Smallholders In			
02.00 02.15	Indonesia			
	Agus Hadiarto* Anil Kumar Anal Avishek Datta Made Iana Mejaya and Rizka Amalia Nugrahapsari			
02.15 - 02.30	Discussion			
02.10 02.00	CUESTS AND PARTICIPANTS ENTER THE MAIN BOOM MEETING			
0230 - 0245	Reak			
02.45 03.00	CLOSINC OF DAV 1			
02.45 - 03.00				
	DAY 2. NOVEMBER, 10 <sup>th</sup> , 2021			
TIME				
(AM/PM)	AGENDA			
08.00 - 08.30	GUESTS AND PARTICIPANTS ENTER THE ROOM MEETING			
	https://us02web.zoom.us/j/2013720594			
	Meeting ID : 201 372 0594			
	Passcode : 9101121			
	PLENARY SESSION			
Moderator: M	r. Yacob Ahmad (TFNet)			
08.30 - 08.50	Dr. Nguyen Quoc Hung			
	"Current durian industry in Vietnam"			
08.50 - 09.10	Panusak Saipanich			
	"Current durian industry in Thailand"			
09.10 - 09.30	Rowena P. Varela, Ph.D.			
	"Current durian industry in Philippines"			
09.30 - 09.50	Dr. Johari Bin Sarip			
	"Current durian industry in Malaysia"			
09.50 - 10.10	Dr. Panca Jarot Santoso			
10.10 10.20	"Current durian industry in Indonesia"			
10.10 - 10.30	Discussion			
10.10 - 10.30	Break			
PARALLEL SESSION 2				
	PARALLEL SESSION 2			
TIME (AM/PM)	PARALLEL SESSION 2 TITLE/AUTHOR			
TIME (AM/PM) Room 1	PARALLEL SESSION 2 TITLE/AUTHOR : Cultural Practices and Plant Production [CP]			
TIME (AM/PM) Room 1 Moderator	PARALLEL SESSION 2 TITLE/AUTHOR : Cultural Practices and Plant Production [CP] : Sri Yuliati, M.Si. (ITFRI)			
TIME (AM/PM) Room 1 Moderator Notulen	PARALLEL SESSION 2 TITLE/AUTHOR : Cultural Practices and Plant Production [CP] : Sri Yuliati, M.Si. (ITFRI) : Titin Purnama, M.P. (ITFRI)			
TIME (AM/PM) Room 1 Moderator Notulen 10.45 – 11.00	PARALLEL SESSION 2 TITLE/AUTHOR : Cultural Practices and Plant Production [CP] : Sri Yuliati, M.Si. (ITFRI) : Titin Purnama, M.P. (ITFRI) Canopy Arrangement for High-Density-Planting System to Increase High Quality Durian			
TIME (AM/PM) Room 1 Moderator Notulen 10.45 – 11.00	PARALLEL SESSION 2         TITLE/AUTHOR         : Cultural Practices and Plant Production [CP]         : Sri Yuliati, M.Si. (ITFRI)         : Sri Yuliati, M.Si. (ITFRI)         : Titin Purnama, M.P. (ITFRI)         Canopy Arrangement for High-Density-Planting System to Increase High Quality Durian         Production Efficiency			
TIME (AM/PM)           Room 1           Moderator           Notulen           10.45 - 11.00	PARALLEL SESSION 2         TITLE/AUTHOR         : Cultural Practices and Plant Production [CP]         : Sri Yuliati, M.Si. (ITFRI)         : Titin Purnama, M.P. (ITFRI)         Canopy Arrangement for High-Density-Planting System to Increase High Quality Durian         Production Efficiency         Siriporn Vorakuldumrongchai Buppha Simma*, Orawintinee Chusri Chompu Chantee, Sasima			
TIME (AM/PM)           Room 1           Moderator           Notulen           10.45 - 11.00	PARALLEL SESSION 2         TITLE/AUTHOR         : Cultural Practices and Plant Production [CP]         : Sri Yuliati, M.Si. (ITFRI)         : Titin Purnama, M.P. (ITFRI)         Canopy Arrangement for High-Density-Planting System to Increase High Quality Durian         Production Efficiency       Siriporn Vorakuldumrongchai Buppha Simma*, Orawintinee Chusri Chompu Chantee, Sasima         Muangkaew, and Usa Sitthilit       Canopy Arrangement for High-Density-Planting System to Increase High Quality Durian			
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11.00 - 11.15	Shoot and Root Responses of Drought Stressed Oil Palm in Nursery Phase
11.15 - 11.30	Searching for the Best Durian Variaties in Indonesia
11.15 - 11.50	Mohamad Reza Tirtawinata*
11.30 - 11.45	Discussion
11.45 - 12.00	-
Room 3	: Plant Pest and Diseases Management [PD]
Moderator	: Dr. R. Heru Praptana, S.P. (ITFRI)
Notulen	: Mega Andini, S.P. (ITFRI)
10.45 - 11.00	Determination of Bactrocera carambolae and Bactrocera tau in The Mekong Delta of Vietnam Based
	on Polymorphism of mtDNA
	Le Quoc Dien*, Bui Ngoc Kim Ngan, and Tran Nhan Dung
11.00 - 11.15	Distribution of Spodoptera frugiperda J.E Smith (Lepidoptera: Noctuidae) and Its Natural Enemies
	in West Sumatera
44.4.5 44.20	Wilna Sari*, Novri Nelly, Hidrayani, and Yaherwandi
11.15 - 11.30	New report of <i>Bactrocera umbrosa</i> Fabricius (Diptera: Tephritidae) as a secondary pest of Durian
	Fruit Durio zibethinus (Murr.)
11.20 11.45	Suputa*
11.30 - 11.45	Implementation of Area-wide Management for Fruit Fly on Mango in Indonesia
	Ajjanai ', Henari, Deni Emilia, Ellina Mansyan, Slejano De Faveri, Vijay Seguran Shanmugam, ana Patar Jonkson
11.45 12.00	Discussion
11.45 - 12.00	Postbarvest Technology [PH]
Moderator	· Prof. I Made Sunartha Utama (Udavana University)
Notulen	: Yuni Fitri Cahvaningsih, M.Si. (ITFRI)
10.45 - 11.00	Mathematical Modeling of degradation Quality on Snake Fruit (Salacca edulis) Quality during
	Storage in Modified Atmosphere Packaging
	Ajeng Septina Arlikah*, Salman Zaki Al Ghifari, Nabila Mumtaz Prasetyo, and Wahyudi Budi Sediawan
11.00 - 11.15	Preharvest methyl jasmonate treatment on mature durian fruit (Durio zibethinus Murray) var.
	MonThong to alleviate chilling injury symptom during low temperature storage
	Piyapong Sonkaew*, Thanatcha Chida, and Voraphat Luckanatinvong
11.15 - 11.30	Acceptance of Functional Beverages Made from Bignay Fruit and Aloe-Gel on Different Storage
	Luh Suriati*, I Gede Pasek Mangku, Luh Kade Datrini, Hanilyn A. Hidalgo, and Josephine Red
11.30 - 11.45	Different Harvesting Time on Quality of Reddish-fleshly Rambai (Baccaurea motleyana Muell.
	Arg.)
11.45 10.00	Nur Annisa Ramadhanty, Roedhy Poerwanto, and Deden Derajat Matra*
11.45 - 12.00	
Koom 5 Madamatan	: Agricultural Social Economics [AS] : Denother Chandraholon (TENot)
Notulon	: Doroiny Chandrabalan (IFNel) : Voci Zondro Joni Dh D. (ITEDI)
10.45 11.00	: 1081 Zellul'a Jolil, Fli.D. (11FRI)
10.45 - 11.00	System and Determinant of Market Channel Choice
	Rizka Amalia Nugrahansari <sup>*</sup> , Sara Ratna Oanti, and Ida Widi Arsanti
11.00 - 11.15	Mangosteen Agribusiness Development In Production Area: An Approach to Build Farmer Group
	Association As Future Social Capital In Rural Area
	Dini Rochdiani*, Sulistyodewi Nur Wiyono, Sara Ratna Qanti
11.15 - 11.30	Private nurseries as the main source of seedlings for mango farmers in West Java, Indonesia
	Sara Ratna Qanti*, Rizka Amalia, Puspitasari, Henri Perkasa, Idha Widi Arsanti, Hardiyanto, Thomas
	Reardon, and Randy Stringer
11.30 - 11.45	Discussion
11.45 - 12.00	-
12.00 - 12.50	Break
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12.50 - 01.00	GUESTS AND PARTICIPANTS ENTER THE PARALLEL ROOM MEETING [CP/PB/PD/PH/AS]
TIME (AM/PM)	TITLE/AUTHOR

Room 1	: Cultural Practices and Plant Production [CP]
Moderator	: Dr. Rozeita Laboh (MARDI)
Notulen	: Nini Marta, M.P. (ITFRI)
	Growth, Productivity and Phosphorus Uptake of Abelmoschus esculentus (L.) Moench on the
01.00 01.15	Treatment of Sago dregs with Local Microorganisms as Organic Fertilizer on Marginal Land
01.00 - 01.15	Rachmawati Hasid*, Abdul Madiki, Sarawa M., Tresjia Corina Rakian, Makmur Jaya Arma, Andi
	Nurmas, Robiatul Adawiyah, and Sarmin Sabarda
	Increasing the Flowering and Fruiting of Citrus reticulata Blanco by Application of Potassium
01.15 - 01.30	Nitrat and Agrodyke
	Sakhidin*
01 20 01 45	Effect of Bud Shoot on The Successful of Budding and Vegetative Growth of Several Citrus Species
01.30 - 01.43	Agus Sugiyatno*, Titistyas Gusti Aji, and Hardiyanto
01.45 - 02.00	Discussion
Room 2	: Plant Genetic Resources and Breeding [PB]
Moderator	: Dr. Sukartini (ITFRI)
Notulen	: Yuni Fitri Cahyaningsih, M.Si. (ITFRI)
	Morphological Diversity and Quality of Avocado Fruit (Persea americana Mill) from Silih Nara
01.00 - 01.15	District, Central Aceh Regency
	Rd. Selvy Handayani*, Mahdalena , Safrizal, Muhamad yusuf, and Ismadi
01.15 01.20	Fruit Development and Quality of Abiu (Pouteria caimito Radlk.) in Bogor Region
01.13 - 01.50	Slamet Susanto, Muhamad Ramdan, Dhika Prita Hapsari*, and Deden Derajat Matra
	Formation of embryogenic mutant callus in melon (Cucumis melo L.) through gamma-ray
01.30 - 01.45	irradiation for NaCl tolerance
	Nurningsi Anhufi*, Darda Efendi, and Rossa Yunita
01.45 - 02.00	Discussion
Room 4	: Postharvest Technology [PH]
Moderator	: Riska, Ph.D. (ITFRI)
Notulen	: Leni Marlina, M.Si. (ITFRI)
	Morphological and Phytochemical Characterization of Lobi-lobi Fruit (Flacourtia inermis) at each
01.00 - 01.15	Maturity Stage
	Muhammad Nasichul Umam, Roedhy Poerwanto, and Deden Derajat Matra*
	Ethanol vapour reduced the deterioration rate of mangosteen fruit quality during storage at chilling
01.15 - 01.30	temperature
	I Made Supartha Utama*, Ni Luh Yulianti, and I Gusti Ayu Prapti Pundari
	Nutritional compositions of new durian varieties developed in Thailand (Breeding)
01 30 01 45	Yuraporn Sahasakul*, Amornrat Aursalung, Nattira On-nom, Piya Temviriyanukul, Suntaree
01.30 - 01.43	Suwonsichon, Siriporn Vorakuldumrongchai, Orwintinee Chusri, Ratchanee Chatbanyong, and Uthaiwan
	Suttisansanee
01.45 - 02.00	Discussion
	GUESTS AND PARTICIPANTS ENTER THE MAIN ROOM MEETING
02.00 - 02.15	Break
	PANNEL DISCUSSION
	Topics : How to Bring Durian and other Tropical Fruits to Global Market: Challenge and Opportunity
	Moderator : Dr. Catur Hermanto
	Notulen : Deni Emilda, M.Sc.
	Panelists:
	1. 1. Jesper Karlsson, FAO
02.15 - 03.15	2. Dr. Muhammad Prama Yufdy, ICHORD
	3. Yacob Ahmad, TFNet
	4. Prof. I Made Utama, Udayana University
	5. Dr. Panca Jarot Santoso, ITFRI
	6. Panusak Saipanich, President of TDA
	7. Dr. Nguyen Quoc Hung, FAVRI
	CLOSING CEREMONY
	CLOSINC DEMADES
	CLOSHIG REMARKS Dr. Ir. Muhammad Taufia Ratula. M Si
03.15 – END	Director of Indonesian Center for Horticultural Research and Development (ICHOPD)
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### The ABSTRACTS



#### TRENDS AND SUSTAINABILITY ISSUES IN GLOBAL TROPICAL FRUIT VALUE CHAINS

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Production and export of tropical fruits have experienced remarkable growth in recent decades. This is also true for the so called minor tropical fruits including durian. While data is provisional, exports of durian is thought to have increased from below 300,000 tonnes in 2011 to over 700,000 tonnes in 2019. Rising demand from China has been the main driver of this trend. Thailand accounts for most exports of durian and Indonesia, which is the biggest producer, cater for its own large domestic market. Minor tropical fruits can contribute to food security and other development objectives in many ways. Most minor tropical fruits are consumed locally and contribute to household incomes and nutritious diets there. Both strengthening of domestic markets and increased exports can offer more income opportunities for smallholder producers and workers. Logistical hurdles and seasonally are challenges for increased trade of these perishable crops. The COVID-19 pandemic and social, environmental, and economic sustainability issues have also highlighted the need to address risks in tropical fruit value chains. It is difficult to draw conclusions about the effects of the COVID-19 pandemic on the minor tropical fruit sector, but we did see a decrease in trade during 2020. In the case of bananas and major tropical fruits, some countries saw a decrease in production capacity. Disease mitigation measures at farms in some countries may have helped to reduce disruptions. The banana sector was also hampered by plant diseases and natural disasters during the year. Lockdown measures led to a reduced demand of for example avocados and pineapples from the hospitality sector. Transportation also suffered from restrictions and a lack of containers. Nevertheless, in general the sector did well from an economical and logistical perspective. Avocado exports reached a historical peak. To ensure continued success, the tropical fruit sector must increase its adaptation capacity to climate change impacts. An increased incidence of extreme weather events has already destroyed orchards and plantations in some countries. Increasing temperatures may also contribute to the spread of pests and plant diseases. At the same time, the agricultural sector is a significant driver of climate change and other environmental problems. There is clearly room for exploring production systems that protect biodiversity, sequester carbon, and increase resilience to shocks. Moreover, low incomes, poor working conditions, unequal sharing of profit and other socio-economic challenges are not rare in the agricultural sector, including in tropical fruit value chains. Many companies are taking steps to address sustainability challenges and conform to higher expectations from consumers and stricter government regulations. To support their efforts, and increase coordination between stakeholders, FAO hosts the secretariat of the World Banana Forum and leads a project for responsible tropical fruit value chains. The latter focuses on the avocado and pineapple sectors and helps businesses to strengthen their capacity to deal with sustainability risks and become more resilient to shocks.



#### BEST FARM PRACTICES FOR DURIAN CULTIVATION IN MALAYSIA

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#### POSTHARVEST RESEARCH ON DURIAN: PROGRESSES AND POTENTIALS

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#### Abstract

Biological knowledge of the Monthong fruit has been predominantly acquired, making it the most successful cultivar in the fresh durian market. Still, new problems are encountered both in the field and in the market, such as abnormal ripening patterns and seed borer. Limited procedure to minimize these difficulties has been achieved. In addition, as customers become more familiar with durian, they demand for new tastes and experiences. However, knowledge on other cultivars is very limited to support their supply chains. Fully mature fruit is better quality than less mature ones, but they do not last as long. With modern trade and logistic, can this problem be overcome? Could dehiscence be controlled, while allowing normal pulp development? In doing so, maturity at harvest should be precise. A tool with high accuracy is needed. Acoustic, ultrasonic, dielectric, NIR, and microwave technology have been studiednone have yet been proved to be practical. A combination of technologies must be employed, and AI should play a critical role. Currently durian is either beginning to ripen or induced to ripen prior to shipping by using ethephon and arrives at the market is at the ripe stage with a short shelf life. A procedure to ripen durian with ethylene gas while delaying the process with other compound is being developed to extend its marketability. Fresh cut durian is a promising alternative, which saves transport cost by two-third. However, the main concern is microbial contaminant. Research has shown that this can be controlled bv carboxymethylcellulose and other substances. An import/export protocol should be developed for cross-country shipment of durian in this form. Durian is recognized as a most delicious fruit, but with an offensive odor. Many perceive it as an unhealthy fruit full of calories. However, recent researches have shown that durian contains a good deal of health beneficial substances that should be vigorously investigated further. With the fore-mentioned

Keywords: Durian, postharvest, potential fruit





#### THE WESTERN PERSPECTIVE ON DURIAN

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#### Abstract

Western countries are a new market for durian and the needs and desires of Western durian consumers are not yet well understood by durian suppliers in South East Asia. American Lindsay Gasik will share her perspective on durian and its future in the West, while sharing her own story in learning to love durian, her travels through 14 countries hunting durian varieties and exploring durian farms, and what she's learned along the way about the intersection of durian and culture that should shape the way that durian is presented to new markets.





#### CURRENT DURIAN INDUSTRY IN VIETNAM

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#### Abstract

In Vietnam, durian is grown in many regions from the Central to the Mekong Delta, majorly concentrated in provinces of Binh Phuoc, Tay Ninh, Dong Nai and Ba Ria - Vung Tau (in the South East), Tien Giang, Ben Tre and Vinh Long (in the Mekong Delta), and Gia Lai, Dak Lak, Dak Nong and Lam Dong (in the Central Highlands). According to the General Statistic Office (2020), durian cultivation covered 70,012 ha in total, of which the area under harvest was 37,215 ha, yielding the total volume production of 559,019 tons/year. The average yield was 15.02 tons/ha. Due to having been propagated from seeds, durian trees in Vietnam produce fruit of diverse characteristics, yield and quality. The area under commercial durian production in the last 10 years have been dominated by three major cultivars, namely Ri6, Dona and Chin Hoa. The main harvest season is from May to June in the Mekong Delta, and from July to August in the Central Highlands. Nonetheless, with the diverse ecological conditions in sub-regions and application of off-season production techniques, durian harvest season in Vietnam has been significantly extended. In Vietnam, durian can be either cultivated in monocropped orchards or intercropped with other plants, such as avocado, coffee, black pepper, mangosteen, tea, and cacao, etc. The common planting spacing varies from 6 - 9 m between plants and rows of plants. In the Mekong Delta, a mature durian tree available for bearing commercial fruits is usually applied with the fertilization rate of 1,600 g N + 1,600 g P2O5 + 1,600 g K2O with supplements of organic fertilizers. The use of Paclobutrazol in combination with plastic covering the bed to create drought in the rainy season are widely applied to induce off-season flowers. In the context of increasing saline intrusion, application of climate-smart cultivation techniques, specifically water-saving irrigation technologies (drip irrigation, sprinkler irrigation) have been highly recommended in durian production

Keywords: durian, off-season, yield, quality, market, Mekong Delta





#### CURRENT DURIAN INDUSTRY IN THAILAND

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#### Abstract

Durian is one of Thailand's most important fruit trees, with growing areas concentrated in the East and South provinces. It generates the most revenue for Thailand's fruit exports. Despite the COVID-19 pandemic, Thailand's fresh durian export value in 2020 reached an all-time high of USD 2.073 billion, a 41.5% increase, with a 75.9% global market share. China currently accounts for 70% of all durian exports on the global market, and this figure is expected to rise. Durian prices have also recently risen dramatically. As a result, other durianproducing countries have expressed interest in competing in China's durian market, posing a greater future challenge to Thai durian exports. Thai durian exporters intend to implement proactive marketing strategies in order to maintain their market share while also exploring potential new markets such as India. On the production part, intensive farming techniques (cross pollination and fruit thinning) have been used to increase yield. Off-season flowering techniques to manipulate harvesting time with foliar paclobutrazol application have been widely used in durian growing provinces. Durian production management was centered on climate, nutrient, disease, pest and good agricultural practices (GAP), with the goal of improving the safety and quality of durian products to meet the consumers demand for higher standards. Thai Durian Association or TDA was established in 2020 to not only maintain Thailand's position as the world leader in the durian industry, but also to collaborate with other stakeholders to revolutionize and grow the global durian industry's unity. TDA is now collaborating with the Agricultural Research and Development Agency to assist and encourage durian research in Thailand. TDA is also looking forward to working with additional partners throughout the world.

Keywords: Durian, export, management.





#### **DURIAN PRODUCTION IN THE PHILIPPINES**

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#### Abstract

Durian (Durio zibethinus L.) is among the fruits considered native to the Philippines. It naturally thrives in the rainforests in Mindanao. Durian grows almost abundantly in Mindanao, particularly in Davao, Cotabato, Sulu and Agusan. As more people become accustomed to eating Durian, many Durian plantations have been developed through the years. Durian production has an increasing trend with an annual growth of 13.9 and 2.07 for 2017-2018 and 2018-2019, respectively. The biggest hectarage of Durian in the country is in Davao Region. In 2019, the production in the Davao Region was 60,248MT. In fact, Davao Region is considered as the 'durian republic' in the Philippines. The other regions with substantial production of Durian are SoCCSKSarGen, Caraga Region, and Sulu. There are 10 cultivars recommended for commercial planting in the country. The most common varieties are two local selections (DES 806 and DES 916) and four selections developed from introduced cultivars (Chanee, Monthong, Umali and CA 3266). There are new selections which are not yet registered. Arancillo is among the traditional varieties which bear small fruits with good eating quality. The most common pests and diseases of Durian are Phytopthora palmivora, and a complex of fruit borers. The most prevalent fruit borers are Tonica lagaropis Meyrick and Conogethes punctiferalis (Guenee). The pests and diseases are managed through the implementation of integrated pest management, particularly by integrating the understanding on the agroecology of the crop. Production of durian fruits is seasonal, as trees usually flower in April to June and fruit harvesting happens in July to November. Postharvest handling is still traditional for many regions but in Davao Region, some fruit processing activities are already done to preserve the surplus fruits. The markets of Durian fruits are mainly domestic, however, new markets abroad have been opened recently. The Durian production in the Philippines is still rather small-scale compared to Malaysia and Thailand. Nonetheless, the Department of Agriculture is supporting the expansion of Durian production to supply the increasing markets in Manila and in the United States and Japan.

Keywords: durian production trend, durian cultivars, durian pests and diseases, fruit seasonality, market demand





#### CURRENT DURIAN INDUSTRY IN MALAYSIA

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#### Abstract

Durian (Durio zibethinus) is one of the nine types of premium fruits in Malaysia along with pineapple (Ananas comosus), jackfruit (Artocarpus heterophyllus), watermelon (Citrullus lanatus), mango (Mangifera indica), banana (Musa sp.), mangosteen (Garcinia mangostana), papaya (Carica papaya) and starfruit (Averrhoa carambola). While D. zibethinus is the main species, there are also several wild species namely D. lowianus, D. graveolens, D. oxleyanus, D. kutejensis, and D. dulcis were obtained in Malaysia especially in Sabah and Sarawak. From being merely operated on a small scale decades ago, now durian has emerged as one of the Malaysian new source of wealth. With acreage of 70,286 ha, it accounted for 47% of the total fruit cultivation in Malaysia and produced 377,251 MT of fruits in 2019. This volume contributes to 105% of self-sufficiency rate of Malaysian durian. Six percent out of the total production were exported mainly to China and Singapore. Malaysia has secured an export market access for frozen whole durian to China in 2018, which has seen a tremendous growth of Malaysian durian industry. Since 1933, there are 215 clones of durian have been registered by Department of Agriculture Malaysia (DOA) with designation numbers of D1 to D215. Musang King (D197) is one of the premium clones in Malaysia which has now accounted for 36% of total commercial durian trees in Malaysia. Another premium registered clone is MDUR 88 (D190). Unlike Musang King which is derived from farmer's selection, MDUR 88 was developed by Malaysian Agricultural Research and Development Institute (MARDI) through a proper breeding program. In addition, there are ten popular registered clones including D188, D189, D2, D24, D99, D145, D160, D168, D175 and D200. These clones can be characterized using Distinctness, Uniformity and Stability (DUS) test developed by The International Union for the Protection of New Varieties of Plants (UPOV). To ensure sustainability and viability of Malaysian durian industry, technologies generated from R&D need to be efficiently transferred including incorporate them in durio-tourism industry.





#### CURRENT STATUS OF INDONESIN DURIAN INDUSTRY

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#### Abstract

Indonesia is home of more than 21 species of durio, which 9 of those are produce edible fruits. Common durian (D. zibethinus) is still the most popular and could be found through of the country. Since 2016, Indonesia has become the largest fresh fruit durian producer in the world, however, less than 1% volume of the total world exports could be fulfilled by Indonesia. Durian fruits in the market are generally still dominated by local varieties without specific names and are only known by regional names including un uniform in quality as well. The developed commercial varieties were dominated by introduced durian such as Monthong, Chanee, and Musangking. The native varieties are widely planted include Matahari, Simemang, Namlung Petaling and ST Klamunod. Seedlings through clonal propagation, budding and grafting were used by all the new growers. A new method has emerged to produce large and extra large digged seedling called 'dongkelan'. The durian cultivation pattern in Indonesia is currently entering a transition period from traditional to more intensive cultivation with the emergence of large-scale orchards ranged 10s - 100shectares by applying more advanced cultivation technologies. The aspects of harvesting, post-harvesting and marketing have not developed much due to only a few new orchards that have produced fruit which sold out through direct selling.

Keywords: durian, industry, Indonesia

#### **CULTURAL PRACTICES AND PLANT PRODUCTION (CP)**

#### [CP01][ABS-4] Effect of pollen of hybrid durian on fruit setting of Monthong durian in different temperatures

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#### Abstract

The study on the effect of the pollen of hybrid varieties on fruit setting of Monthong durian in different temperatures was conducted with two experiments at the Chanthaburi Horticultural Research Center, Thailand. The first experiment was on the in vitro germination of pollen from nine hybrid varieties Chanthaburi 1-9 at different temperatures. Chanthaburi-3 and Chanthaburi-6 were found to have a effective germination rates at 10 to 35 degree celsius temperature range. Consequently, Chanthaburi-3 and Chanthaburi-6 were chosen to study its pollen effect on Monthong fruit setting at different temperatures from 10 to 35 degree celsius. It was found that the percentages of fruit set from pollen of Chanthaburi-3 were higher at 25 and 35 degree celsius. On the contrary, the percentages of fruit set from pollen of Chanthaburi-3 nor Chanthaburi-6 showed higher at 15, 20 and 30 degree celsius. Neither Chanthaburi-3 nor Chanthaburi-6 could germinate at 10 degree celsius. The benefit of these studies will be applied to design imminent planting area of Durian to increase fruit setting under climate changes.

Keywords: durian, pollen germination, fruit set, climate changes

#### [CP02][ABS-5]

#### Enhancing fruit development of durian using different methods of nutrient supplements

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#### Abstract

The study on fruit develop enhancement of ^Manthong^ durian was conduct at the Chanthaburi Horticultural Research Center, Thailand. The different method of nutrient supplements to decreasing losses was the main objective of this study. The combination of 20-20-20 + humid acid + carbohydrate extract was use in various technique. The direct injection at secondary branch and paste polymer gel which soaking with combined nutrient 1 and 3 pieces per branch were compared with the traditional or foliar spraying technique. It was found that fruit quality of all treatments were in the standard grade for export. However, the cost of directly injection showed the lowest, followed by 1 piece of polymer gel which about 52.4% and 48.7% compared to traditional. While, cost of 3 pieces of polymer gel per branch was higher than traditional about 19.3%. Nevertheless, pasted with polymer gel was not convenient to apply with the several steps since soaking, transporting through pasting at the branches. So, the directly injection is the alternative method with not only decreasing cost but also could enhance fruit development of directly fruiting branches to provide a good quality for exporting of durian.

Keywords: durian, fruit enhancement, injection, polymer gel, nutrient application

#### [CP03][ABS-10] IoT-Enabled Irrigation System - An integrated solution for durian farm

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#### Abstract

Durian trees require abundant water but not too much. Enough water should be given and timely. Too little water may retard growth of the trees whereas too much water may kill the trees. A precise irrigation system is necessary to water the durian tree. An Internet of thing (IOT)-enabled irrigation system is created, installed, and tested. The system main components are soil moisture sensor. It will measure soil moisture and send data to IFTTT (If This Then That) cloud through network. IFTTT (if this than that) is the integration platform to integrate to other main component to control water valve and water pump through smart plug. If the threshold is reached it will open the water valve and activate sprinkler to water the durian trees and activate the water pump to refill water tank. The system is tested in a 5.72 acres durian farm with 179 newly plant durian trees. The user is able to monitor the system through mobile phone each time the system is working. The system is working well and do not require the user to present every day at the farm and able to control from remote. In conclusion, the innovation of using IOT-enabled irrigation system for durian farm is something new to our durian farmer and able to ensure to water the durian tree according to their needs. It is also potential to be used to apply liquid fertilizer to durian tree and making easy to manage the durian farm.

Keywords: irrigation system durian farm IOT

#### [CP04][ABS-43]

#### Existing Technology and Analysis of Durians Farming in Lae Parira Dairi, North Sumatra

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#### Abstract

The purpose of this study are to determine the existing technology of Durian cultivation and to understand the financial feasibility analysis in Dairi Regency in order to enhance the improvement of the technology needed. Methods used in this research are survey and observation method. Based on the assessment results, it was found that Durian farming which planted on planted on sloping land (50%) with no terraces, no tillage, no fertilizer, no insecticides and fungicides, without the effort of harvets at once with the treatment. Soil analysis results obtained low P levels, high K, pH moderate (5-6), organic C is low. Durian farming is a byproduct of farming because of its easy care, pest and disease attack rate of durian area. B/C ratio of Durian about 2,1. The increment of revenue can be achieved by improving the productivity within the improvement of farming technologies. Technology improvement in Durian cultivation that needed are, seed quality improvement, reducement, and the used of integrated pest and disease control. To anticipate price fluctuations, farmers need a storage technology that is a group warehouse to keep the Durian when the market price is very cheap. Institutional education needs to be strengthened for the socialization of Durian cultivation technology and innovation to the farmers. Multiplication durian for seedling by vegetative methods. Fruit processing training needs to be done to extend the shelf life of durian products.

Keywords: durian farmers and farming systems technology

#### [CP05][ABS-51]

#### Growth, Productivity and Phosphorus Uptake of Abelmoschus esculentus (L.) Moench on the Treatment of Sago dregs with Local Microorganisms as Organic Fertilizer on Marginal Land

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#### Abstract

Sago dregs have the potential to be used as raw material for composting, can be used as organic fertilizer to help overcome the problem of low soil fertility, limited soil microorganisms and soil physical properties that capability very low to support for plant growth, especially on marginal land. Objective research to study the capability of sago dregs with local microorganisms as organic fertilizer on support of increasing of green okra plants growth on marginal land. This research was conducted in Land II of the Field Laboratory of the Agriculture Faculty Halu Oleo University, from January 2019 to May 2019. The study was carried out using a randomized block design (RBD), by treatment of sago dregs with mixed local microorganisms consisting of 6 (six) treatments, namely: without fertilizer (K0), using sago dregs with mixed local microorganisms 5 t ha-1 (K1), 10 t ha-1 (K2), 15 t ha-1 (K3), 20 t ha-1 (K4) and 25 t ha-1 (K5). Each treatment was repeated 3 times, so that in total there were 18 experimental units. The results showed that the application of sago dregs with local microorganisms could increase plant height, number of leaves, leaf area, stem diameter, dry stover weight, number and weight of fruit, and Phosphor uptake.

Keywords: Local microorganism, okra plant, Phosphor uptake, sago dregs.

#### [CP06][ABS-31] Canopy Arrangement for High-Density-Planting System to Increase High Quality Durian Production Efficiency

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#### Abstract

Chanthaburi Horticultural Research Center has responsible to develop new plantation system for durian in order to serve the demand of high quality products. Research on canopy arrangement for high-density-planting system was conducted at the Eastern Economic Fruits Development Center, Khlung District, Chanthaburi Province, Thailand, during 2016-2020. The new canopy arrangement should be suitable for the usage of machinery to reduce labors, improve yield and quality of durians and lead to high income. Durians, Monthong cultivar, were planted at 7x4 m spacing (57 plants/rai). Height and canopy width were controlled at 6 m and 4 m, respectively. Five styles of canopy arrangement comprised of 1) pyramid shape, natural branch position 2) pyramid shape, spiral staircase branch position 3) square shape, natural branch position 4) square shape, spiral staircase branch position and 5) slender spindle shape. Differenced were compared using T-test. The results showed that slender spindle shape provided the highest floral number (3,399 flowers/tree), fruits number (21 fruits/tree) and yield (82.5 kg/tree). Meanwhile there were no different in production cost (532 THB/tree or 30,334 THB/rai). Therefore, the slender spindle shape gave the highest net return at 319,785 THB/rai.

Keywords: Durian, Canopy styling, Canopy arrangement, Pruning

#### [CP07][ABS-41] Effect of Microclimate Modification in Durian Orchard on Physiological Responses and Plant Productivity

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#### Abstract

High temperature and low humidity are factors effecting the rate of plant development. These two factors that increase an exponential climb in vapor pressure deficit (VPD). Despite this, few studies have isolated the physiological response of plant functioning to high VPD, thus limiting our understanding and ability to predict future impacts on fruits production. The micro sprayed irrigation was applied at 15 minutes interval for four time a days. It was showed significant decreased in air temperature and increased in air humidity after modified microclimate. Leaf stomatal conductance showed higher in modified microclimate by 600 micromol H2O/m2/s where it was about 500 micromol H2O/m/s for control leaf. The microclimate modification could increase net photosynthesis from 15.36 to 18.26 micromol CO2/m/s but remained constant in control by about 15.5 micromol CO2/m/s. Leaf transpiration in modified microclimate leaf and control leaf by about 52.3 and 38.1 micromol H2O/m2/s, respectively. The net photosynthesis showed positive correlation with transpiration, whereas transpiration showed negative relation with air humidity. Microclimate modification could reduce 10 percent of fruit drop, enhanced fruit growth, development (weight and size) and yield. The study could supports the use of sprinklers as a cooling system to maintain physiological activities under extreme heat stress conditions in durian orchard.

**Keywords:** Microclimate- Vapor pressure- Photosynthesis- Transpiration- Stomatal conductance

#### [CP08][ABS-8] Stimulation lateral bud growth of salacca (Salacca zalacca) using diesel fuel and Benzyl Amino Purine (BAP)

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#### Abstract

The supply of seedling is important in development of salacca (Salacca zalacca) farming in Indonesia. However, limitation on the sucker number or lateral bud will affect the seedling availability. The study aimed to determine the effect of diesel fuel and Benzyl Amino Purine (BAP) to stimulate the lateral bud growth in seedling phase. The study was conducted at Aripan, experimental station of Indonesia Tropical Fruit Research Institute (ITFRI) from January to October 2018. The research was arranged in Randomized Block Design with seven treatments and five replications which salacca cultivar Madu was used as source of material. The experiment showed that removal spear leaf and drip of 0.1 ml diesel fuel into the stem base was given the best treatment to stimulate lateral bud for material of air layering propagation. This treatment resulted that the lateral buds and leaves number as many as 4.24 and 2.42 respectively. This research is useful to seedling propagate by air layering in seedling phase.

Keywords: Salak (Salacca zalacca), diesel fuel, Benzyl Amino Purine (BAP), lateral bud
# [CP09][ABS-24] The Relationship Study of Leaf Potassium Content to Fruit Quality and Nutrient Content of Mangosteen

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## Abstract

Potassium (K) plays an important role in fruit quality. The decrease and increase of potassium will impact fruit quality. This study aimed to determine the ideal status of leaf potassium content concerning fruit quality and Calcium (Ca) and Magnesium (Mg) aryl nutrients of the mangosteen fruit. This study has been carried out in 5 production centers in West Sumatra, West Java, and Bali. The research method used is purposive sampling. For each location, ten plants were determined and taken as samples. Leaf samples were taken from fully developed leaves in 4 cardinal directions in the middle of the canopy. The fruits samples were taken on index 2 of physiologically ripe fruit. The results showed that the ideal potassium leaf content for obtaining fruit quality and nutrient content of Ca and Mg aryl fruit was 1 - 1.6%. A higher potassium leaf content than 1.6% will decrease Mangosteen fruits quality and aryl nutrient content.

Keywords: Fruit Quality, Potassium, Calsium, Magnesium, Mangosteen

# [CP10][ABS-21] Status and management of excessive application phosphorus fertilizer under durian orchard soils in the Eastern Thailand

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### Abstract

Durian growers believed that P is direct a contribution for crop flowering and fruiting, therefore it has been applied profligately, being particularly overused, even though, it reaches excess range especially in durian orchard soils in Eastern Thailand. The purpose of this study was to investigate the status and management of P in order to enhance efficiency fertilizer used. The soil samples (topsoil and subsoil) and durian leaf samples were collected from 6 orchards depended on soil suitability (high, moderate and low suitability) for analysis. The leaf samples were collected for 5 times cover growing season (leaf flushing 1, leaf flushing 2, flowering, young fruit and mature fruit). The result indicated that available P (Bray II) of soil was an average 245 and 172 mg/kg for top soil and sub soil, respectively in which 75% of top soil and 45% of sub soil were classified as a very high range depended on FAO standard. Moreover, 8% of soil samples accumulated P higher than 500 mg/kg. Most of P content of leaf tissue were varied in a range of critical value (0.15-0.25%), which the highest concentration was found on flowering and young fruit stage (0.24-0.26%). The antagonism between P and Zn was found in 1 of the 2 orchards on the high soil suitability ( $r = -0.507^{**}$ )-P and Cu were found on 4 orchards of moderate and low soil suitability ( $r = -0.423^{**}$ , -0.330\*, -0.851\*\* and -0.352\*). The farmers were normally applied 630-1200 g P2O5 /tree/year, whereas yield removal was only 190 g P2O5 /tree/year. Therefore, P fertilizer could be decreased by 10-30% or more if there was a very high available P in the soil according to 50% P recovery.

Keywords: overused P fertilizer, soil and plant analysis

# [CP11][ABS-60] Increasing the Flowering and Fruiting of Citrus reticulata Blanco by Application of Potassium Nitrat and Agrodyke

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## Abstract

The appropriate treatment is needed to strengthen the flowering induction of citrus especially at wet season. Potassium nitrat is reported as an effective dormancy breaking agent so its application can enhance the flowering of many fruit crops. Agrodyke is known as an organic fertilizer that contains macro and micro nutrients. The research aimed to obtain the best dose of potassium nitrat and agrodyke to support the flowering and fruiting of citrus. This study used Completely Randomized Design with two factors arranged factorially. The first factor was dose of potassium nitrat (0, 25, and 50 g/plant), the second factor was dose of agrodyke (0, 20, and 40 g/plant). There are nine combination treatments, each repeated four times so there are 36 citrus trees planted at planterbag, Observed variables consists of flowering and fruiting components. The result of research shows that application of 50 g/plant potassium nitrat and 40 g/plant agrodyke gave the fastest flowering (50 days after application of treatment). Application of the same treatment gave the highest number of flower and fruit, fruitset but the lowest fruit drop.

Keywords: Citrus reticulata Blanco, flowering induction, potassium nitrat, agrodyke

# [CP12][ABS-67] Effect of Bud Shoot on The Successful of Budding and Vegetative Growth of Several Citrus Species

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## Abstract

The main factor affecting the success of budding in citrus is the position of the bud shoot to be taken. The aim of this research was to obtain the best position of bud shoot for increasing the success of budding on citrus propagation. The research was carried out in Tlekung Experimental Installation, Indonesian Citrus and Subtropical Fruit Research Institute with the altitude of 950 m asl from April to July 2018. Factorial Randomized Block Design was used in this research that was consisted of 2 factors, these were Factor I: position of bud shoot: top (36-50 cm from bottom), middle (16-35 cm from bottom), and bottom (0-15 cm from bottom)- whereas for factor 2 was citrus species (mandarin cv. Madura, tangerine cv. Pontianak, pummelo cv. Giri Matang, lime, and orange cv. Punten). The results showed that there was no significant interaction between the position of bud shoot and species on all variables. Regardless of interaction, the percentage successful of budding subjected to the position of bud shoot was high that ranging from 89,63% to 93,33%- whereas for species could reach 100 % (orange cv. Punten). Time of bud break of siam cv. Pontianak was relatively longer than that of other species (39.87 days). Moreover, pummelo cv. Giri Matang showed wider shoot diameter (4,96 mm) on 10 weeks after planting.

Keywords: budding, bud shoot, citrus, species

# PLANT GENETIC RESOURCES AND BREEDING (PB)

# [PB01][ABS-7] Phylogenetic Study of The Durio Flower Characters from Kalimantan

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#### Abstract

The flower morphological characters of Durio from Kalimantan are used to determine its relationship and distribution. This study used herbarium specimens stored in the Herbarium Bogoriense as many as 52 collection numbers. A total of 47 floral morphological characters were observed and scored using a multistate character. Information on the location of specimen collection listed on the label is searched for the coordinates using Google Maps. The scoring data were analyzed using the PAUP 4.0 Maximum Parsimony method, which started with the heuristic search 1000 times. The heuristic search results were bootstrap analyzed 1000 times. The coordinates are entered into the ArcGIS 10.5 program to create a distribution map. A total of 15 Durio species in Kalimantan have been identified. The morphological characters of Durio flowers in Kalimantan vary in shape, color, and bud sizeflower stalk- pistil- stamens- petals- calyx- and epicalyx. The Durio phylogenetic tree in Kalimantan has a homoplasy index of 0.5286, a consistency index of 0.4714, a retention index of 0.4188, and a step length of 210. The highest bootstrap of 66% is found in Durio acutifolius and D. griffthii. Durio species are spread throughout Kalimantan with 11 species spread in East Kalimantan Province, two species in South Kalimantan Province, seven species in West Kalimantan Province, three species in North Kalimantan Province, and six species in Central Kalimantan Province. The flower morphological used to identify, reconstruct phylogenetic trees, and distribute Durio in Kalimantan.

Keywords: Durio acutifolius- Durio griffithii- Phylogenetics- Kalimantan

## [PB02][ABS-9]

# Conservation, Distribution of Eleven Durian Species and Hybrid Detection Applying Molecular Markers

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#### Abstract

As part of the center of origin of durian which makes it rich in biodiversity, Indonesia is a home of a large number of Durio species. Therefore, before several species are extinct, conservation and sustainable utilization of precious germplasm of durian for its development of varieties with superior traits is of important. Among edible Durio species, only one commercial durian is available in the current era. It indicates that research on wild durian as compared to Durio zibethinus including the hybrids need to be intensified. Ex situ conservation efforts have been conducted by collecting 11 species of Durio with a total number of accessions more than 130 maintained in 12 botanic gardens in Indonesia. The distribution of these Durio species as well as the efforts to identify the fingerprint of several Durio species and their hybrids are also discussed for potential uses in the future. Of molecular markers utilized for genetic analysis of durian, several primers of Random Amplified Polymorphic DNA (RAPD) are potential for detecting the variation of the species and the hybrids between D. graveolens x D. zibethinus and D. kutejensis x D. zibethinus. The efforts and the results would contribute conservation the species and its utilization for the development of commercial durian varieties from wild durian in the future.

Keywords: ex situ conservation, distribution, fingerprint, RAPD, Durio species, Indonesia

# [PB03][ABS-12] Isolation and Characterization of Polymorphic DNA Fragments in Mangosteen

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## Abstract

Mangosteen is known as apomictic plant with narrow genetic diversity. Genetic differences in mangosteen have been identified through variation in DNA banding patterns based on analysis of RAPD, ISSR, SSR, SCAR, etc. To determine the mechanism of genetic differences occured between mangosteen plants can be done through isolation and characterization of DNA fragments found, both polymorphic and monomorphic. The objectives of this research are: 1). To isolating and characterizing polymorphic and monomorphic DNA fragments in mangosteen germplasm, 2). To obtaining sequence data information that distinguishes the mangosteen individuals. The research steps are DNA extraction, isolation of DNA fragments, cloning, sequencing. To determine the DNA fragments resulting from PCR amplification, the sequences data was performed on the NCBI GenBank database using the BLAST analysis (http://blast.ncbi.nlm.nih.gov/Blast.cgi). A total of 69 DNA fragments from RAPD analysis were isolated and sequenced from 51 mangosteen samples. The results of the homology analysis through BLAST analysis showed that most of the sequences analyzed consisted of transposons and microsatellite which noted as noncoding regions. BLAST analysis indicated that one amplification product associated with the calcium/calmodulin-dependent protein kinase II delta (CAMK2D) enzyme. This enzyme is for the regulation of calcium ions and xyloglucan galactosyltransferase for cell wall physiological mechanisms. The DNA fragment derived from Tembilahan, non Gamboge disorder variety, amplified by primer RAPD4 ((AAGAGCCCGT) and 1500 bp in size. The results of this study can be used to study the mechanism of genetic variation in mangosteen.

Keywords: Isolation, characterization, polymorphic DNA fragments, mangosteen

# [PB04][ABS-22] Induction of Polyploidy with Colchicine in Serif Saga Agrihorti Watermelon

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## Abstract

Seedless watermelon (*Citrullus lanatus* (Thunb.) Matsum. & Nakai) is more preferred by consumers than watermelon with seeds. *Seedless watermelon* is a triploid plant obtained from crossing a tetraploid with a diploid plant. This study aimed to obtain the best immersion duration and concentration of colchicine on the growth and ploidy level of Serif Saga Agrihorti watermelon cultivars and to obtain tetraploid plants. This research was carried out in February-April 2021 in Batang Anai District, Padang Pariaman Regency. Serif Saga Agrihorti watermelon seeds were soaked in colchicine solution with concentrations of 0.2%, 0.4% and 0.6% and soaking time of 24 and 36 hours. Results showed that enormous mutations were observed in colchicine immersion treatment with a concentration of 0.4% for 24 hours, *i.e.* 1.92% in stomata length, 0.96% in stomata width, and 0.96% in plant length. This study obtained two tetraploid plants, *i.e.* 0.2% 24 Jam-4 and 0.4% 24 Jam-27.

Key Word: colchicine, immersion, polyploidy, seedless, triploid

# [PB05][ABS-14] Genetic Diversity of Durian Hybrids Based on Morphological Characters

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## Abstract

Improvement of durian varieties according to the desired ideotype can be done through crossing. The aim of this research was to study the genetic diversity of durian hybrids based on morphological characters. The research was conducted at Aripan Experimental Station of Indonesian Tropical Fruit Research Institute (ITFRI) from January 2019 to May 2021. The materials used were 12 durian hybrids from crossing of intra species and inter species. The observed characters were fruit weight, fruit stalk length, aril thickness, number of pulp unit per carpel, fruit rind thickness, edible portion, seed number per fruit, average seed weight, fruit shape, aril colour, taste, and aril texture. The results showed that durian hybrids 93(11) and 72A(12) had many superior characters. The genetic diversity of durian hybrids were range from low to moderate. Almost all of characters had moderate diversity except edible portion had low diversity. At a similarity coefficient of 0.47%, hybrid durians were devided into 6 clusters

Keywords: durian, hybrid, diversity, clustering

# [PB06][ABS-13] Genetic Relatedness of Duku (Lansium domesticum) by RAPD markers

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## Abstract

Duku is a tropical fruit usually found in Indonesia and Malaysia. Duku Kalikajar is famous for the good taste and small seeds. Duku Kalikajar is originated from Purbalingga Regency Central Java. Besides Duku Kalikajar, there are also other duku cultivars in the area around Purbalingga, Banyumas and Banjarnegara Regencies. Among duku cultivars, Duku Kalikajar has the highest price and demand. This study aims to examine the genetic profile and genetic relationship between several duku cultivars in Purbalingga, Banyumas, and Banjarnegara Regencies based on RAPD markers. As many as 11 samples were taken from three regencies and their DNA was extracted using CTAB method with little modification. The observed variable was band resulted from PCR amplification using RAPD marker. Genetic relationship was obtained using MEGA ver 6.06 with UPGMA method. Genetic diversity between duku cultivars Purbalingga, Banyumas, and Banjarnegara Regencies was 0.5 according to Jaccard^s similarity coefficient. Eleven accessions of Duku accessions were grouped into three clusters, with two main clusters and one basal cluster. All groups showed scattered grouping pattern, which alleged to the existence of high interspecies crossing level between local the Duku accessions sampled from District of Purbalingga, Banyumas, and Banjarnegara.

Keywords: duku, genetic variation, genetic relationship, and RAPD.

# [PB07][ABS-33] Shoot and Root Responses of Drought Stressed Oil Palm in Nursery Phase

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# Abstract

Drought has a major impact on oil palm on vegetative growth and productivity. Therefore, drought tolerance and water-use efficient oil palm planting material are needed to overcome this problem. FTSW method describes the soil and plant moisture condition based on the amount of water transpired by plants. This research was arranged in a Randomized Block Design with two factors (three FTSW levels and three oil palm varieties) and aimed to determine plant response to drought stress. The results showed that drought stress reduced plant performance in terms of the number of leaves, root volume, and wet and dry weights of shoots and roots. DxP Simalungun variety showed better performance than DxP PPKS 540 and DxP Langkat under drought stress conditions.

Keywords: Oil Palm, Drought, Transpiration, Shoot, Root

# [PB08][ABS-45] Searching for the Best Durian Varieties in Indonesia

## Mohamad Reza Tirtawinata

## Yayasan Durian Nusantara

## Abstract

Indonesia has a rich diversity in durian germplasm that has yet to be discovered and utilised. Yayasan Durian Nusantara (YDN) is a foundation that seeks the best durian varieties in Indonesia by the means of: gathering information of the best durians around the country, exploring the centers of durian natural habitats, organizing durian contest in regencies/provinces, and joining Whatsapp Group Communities on Durians. Durians are naturally adapted to where the mother tree (PIT) is founded, so the priority is to propagate the PIT and start an orchard for commercial production at the nearest suitable site. YDN, the PIT owner/farmer, the local government, and the Ministry of Agriculture join efforts to explore, discover, conserve, propagate, develop orchards, and commercialise the best selected durians for a better future.

Keywords: Explore, discover, utilise, best durian varieties

# [PB09][ABS-50] Morphological Diversity and Quality of Avocado Fruit (Persea americana Mill) from Silih Nara District, Central Aceh Regency

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#### Abstract

Avocado is a very popular fruit in Indonesia due to its delicious taste and many health benefits. The province of Aceh has many types of avocado plants with various superior properties. The problem that occurs today is that not many people have analyzed the diversity of avocados. Limited information on the quality of avocados originating from Aceh can lead to weak protection of genetic resources and plant development. The purpose of this research was to obtain the criteria for the quality and diversity of avocados from Silih Nara District, Central Aceh Regency. This research uses descriptive analysis method. The description of the avocado is based on the description from the International Plant Genetic Resources Institute (IPGRI). The results showed that based on the export quality standard, there were 6 accessions of avocado fruit that were included in the quality standard I, which are SN01, SN05, SN11, SN12, SN14 and SN15. Based on the value of Total Dissolved Solids (TDS), there are 6 accessions of avocado that fall into the average category, which are SN01, SN02, SN03, SN06, SN13 and SN14. The superior avocado plant from Silih Nara District, Central Aceh Regency has a low level of similarity. At the 60% similarity level, the plants were divided into 9 groups. There were 6 accessions from avocado plants that had no similarities with other accessions, which are SN12, SN05, SN06, SN07, and SN11 accessions.

Keywords: accession, edible portion, NTSys, similarity

# [PB10][ABS-57] Fruit Development and Quality of Abiu (Pouteria caimito Radlk.) in Bogor Region

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## **IPB** University

## Abstract

Abiu plant is an introduced plant of tropical Amazon and has been developing in several years in Indonesia. This research aims to identify the fruit character of abiu plants in two locations in Bogor region. The research was conducted at Desa Balumbang Jaya, Kecamatan West Bogor and Desa Mekarsari, Kecamatan Cileungsi, Bogor district, West Java. Fruit quality analysis was conducted at Post-harvest Laboratory, Department of Agronomy and Horticulture IPB. The study was conducted in February to August 2018. Sampling was done randomly as many as 15 plants location-1. The results showed that the variables related to the length, width, and weight of fruit in Balumbang Jaya are better than Mekarsari. While the variables related to morphology and quality of fruit were not significantly different between them. Environmental conditions especially rainfall and temperature may cause difference in several fruit characters.

Keywords: Fruit quality, Identification, Morphology, Sapotaceae

# [PB11][ABS-69] Formation of Embryogenic Mutant Callus in Melon (Cucumis melo L.) through Gamma-Ray Irradiation for NaCl Tolerance

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## Abstract

The demand for melons in Indonesia has increased year after year. This increase is not supported by the fact that melon production continues to drop. There is still a lack of fertile land for cultivating melons, thus the planting area is expanded to subobtimal lands, such as saline land. Somaclonal variation was increased using mutation breeding techniques to produce salinity tolerant melon. This research aimed to find an LD50, LC50, and create a putative mutant callus tolerant to salinity by NaCl as the selection agent. This research used was embryogenic callus cultured on MS medium with 1 mg/l 2.4-D. The radiosensitivity doses consists of 0, 10, 30, 50, 70, 90, 110, 130, 150, 170, 190, 210, and 230 Gy. Then, selection of NaCl with concentrations 0, 50, 100, 150, 200, and 250 mM. This study obtained the LD50 of embryogenic callus at 126.5 Gy and the LC50 at 137.5 mM. Changes in callus color from yellowish-white to brown and callus weight tended to decrease as the irradiation dose increasing. The callus that did not change color to brown is assumed to be a putative mutant callus that is resistant to NaCl.

Keywords: gamma-ray irradiation, Cucumis melo, salinity, in-vitro selection.

# PLANT PESTS AND DISEASES MANAGEMENT (PD)

# [PD01][ABS-3] Control of stem canker disease caused by Neocytalidium dimidiatum in dragon fruit with several botanical pesticides

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### Abstract

Productivity of dragon fruit in Indonesia has collapsed since 2012. One of the major factors is the occurrences of Stem Canker disease caused by Neocytalidium dimidiatum. To find an eco-friendly technique to control the disease, in this study the antifungal activity of several botanical pesticides was tested against the growth of N. dimidatum under in vitro condition on potato dextrose agar (PDA) and field trial. The aimed of this research was to obtain an effective botanical pesticide in controlling stem canker on dragon fruit. The experiment in invitro was arranged in Randomized block design with 21 treatments (four kinds of pesticides consist of five concentrations of each, and mock) and three replications, each replication consists of four units. The botanical pesticides are Cinnamon (Cinnamomum burmanii) oil, nano-lemongrass, nano-clove and liquid smokes. The field experiment was arranged in two designeProductivity of dragon fruit in Indonesia has collapsed since 2012. One of the major factors is the occurrences of Stem Canker disease caused by Neocytalidium dimidiatum. To find an eco-friendly technique to control the disease, in this study the antifungal activity of several botanid with one best in-vitro botanical pesticide (Cinnamon oil) and chemical fungicide (with rotation). The results showed that C. burmanii oils is an effective botanical pesticide to suppress the radial growth, fungal dry weight and number of N. dimidiatum conidia, with the minimum inhibitory concentration (MIC) by 2 ml (v/v). The inhibitory activities of this oil at concentration of 2 ml/ L (v/v) against fungal radial growth, dry weight and number of conidia were 100% when compared to other pesticide with different concentrations and control. In field trial, Percentage of stem canker disease on dragon fruit applied with cinnamon oils was 68.37%, higher than dragon fruit applied with chemical fungicides, while there were no different between disease severity index of both of treatments.

Keywords: Dragonfruit, stem canker, botanical pesticide

# [PD02][ABS-6] A Review of Utilization of Essential Oil Vapor for Pests and Diseases Control on Fruits

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## Abstract

Agricultural products including fruits, are indispensable to meet human food needs. For this reason, it is necessary to make maximum efforts to increase agricultural production. One of the obstacles to increase the production of agricultural commodities is the incidence of pests and diseases. Control technologies that are environmentally friendly and safe for consumers are needed to suppress the negative impacts of chemical pesticides. Utilization of plant essential oils is one of the environmentally friendly technologies that need to be optimized as the foundation for future plant pests and diseases control technology. The results of previous studies have gathered information that essential oils have potential as agents for controlling plant pests and diseases is reviewed. This review focuses on the potential of volatile oil vapor as a fumigant to control pests and diseases in storage and in the field. The result of this review shows that the application of essential oil vapor has opportunity to be applied as an alternative future technology that is safe for the environment and consumers.

Keywords: vapor- essential oil- control- pests- diseases- environmentally friendly

# [PD03][ABS-16] Plant Parasitic Nematodes Associated with Carica papaya L in Yogyakarta Special Province, Indonesia

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## Abstract

Plant-parasitic nematode is one of the biotic limiting factors in agricultural cultivation. So far, parasitic nematode associated with papaya cultivation in Indonesia has not been studied. A survey in papaya orchard at Agrotechnology Innovation Centre, Universitas Gadjah Mada, Yogyakarta was conducted during August - September, 2021. Samples of rhizosphere soil and root were collected from two papaya cultivars (Merah Delima and California). Nematodes were extracted using White head tray technique modification, and identified at genus level. Results were found six genera of plant parasitic nematodes infected Carica papaya, namely Criconemoides, Helicotylenchus, Hoplolaimus, Meloidogyne, Pratylenchus, and Xiphenema. The population density was measured and the highest population was root knot nematode Meloidogyne sp (386,7/ 5g root on Merah delima cultivar) and fallowed by spiral nematode Helicotylenchus sp (56,7/100 g of soil surrounding California cultivar). This information may allow a further investigation to prevent plant damaged become more severe.

Keywords: nematode, parasitic, papaya

## [PD04][ABS-42]

# Inhibitory Capacity of Cinnamon Oil (*Cinnamomum burmannii*) in Controlling The Fungus *Thielaviopsis paradoxa* which Causes Pointed End Rot of Salak Fruit (*Salacca zalacca*) In Vitro

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### Abstract

Pointed end rot disease is the major problem in salak production caused by the fungus Thielaviopsis paradoxa. The pointed end rot of the salak pondoh results in changes in aroma, taste, and texture. Unpleasant aroma, soft texture, and unattractive appearance can reduce the selling value of the product and even market rejection. This study aimed to determine the effectiveness of several concentrations of cinnamon essential oil to control the pointed end rot of salak caused by the fungus T. paradoxa. This research was carried out at the Pest and Disease Laboratory of the Indonesian Tropical Fruit Research Institute, which was arranged in a non-factorial Completely Randomized Design (CRD) with five treatments and fivez replications, each replication consisting of four Petri plates. The treatments were five levels of essential oil concentration added to the PDA media, namely 0%, 0.05%, 0.1%, 0.15% and 0.20%. The results showed that the inhibitory activity of cinnamon essential oil measured by colony diameter reached 100% from the addition of 0.1, 0.15, and 0.20% to the media, which was significantly different without the addition of essential oil (K0). The number of spores were not produced in media containing essential oils ranging from 0.05, 01, 0.15, and 0.20% and the values were significantly different with control (K0), which reached 22.72 x106 spores/ml. The addition of 0.1%, 0.15%, and 0.20% cinnamon oil to PDA media effectively inhibited the growth of the fungus T. paradoxa, which causes pointed tip rot on salak in vitro.

Keywords: Cinnamomum burmannii, Salacca zalacca, Thielaviopsis paradoxa

## [PD05][ABS-53]

# Insect Pests on *Durio zibethinus* Murray at Areas Affected by Drought and Salinity in Mekong Delta and Biological Characteristics of *Allocarsidara malayensis* Crawford (HOMOPTERA: PSYLLIDAE)

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## Abstract

The Mekong Delta is heavily affected by the impact of climate change (increasing temperature, salinity intrusion (due to drought and saltwater intrusion is 4,459 ha in 2020) favorable pests and diseases thrive, affecting the livelihoods of durian farmers. Based on farmer survey and field observations from January 2020 to May 2021 on 60 orchards of Tien Giang, Vinh Long, Tra Vinh and Soc Trang, 12 insect pests were recorded. The most common ones were Allocarssidara malayensis Crawford, Conogethes punctiferalis Guenee, Batocera rufomaculata, Planococcus lilacinus Cockerell, Pseudococcus sp., Crypticerya jacobsoni Guenee, Euproctis subnotata Walker, Xylossandrus sp., Hypocryphalus sp., Panonychus citri Mcgregor, Scirtothrips sp, and Adoxopphyes privatana. Among these eight insect pests, only Allocarssidara malayensis, Batocera rufomaculata, Planococcus lilacinus and Xylossandrus sp. caused severe damage to. Through the research, morphobiological characteristics of Allocarssidara malayensis Crawford in the condition of the lab (temperature is 28 to 30, RH is 75 to 85) also have been described thoroughly.

**Keywords:** Allocarssidara malayensis, Bactocera rufomaculata, Planococcus lilacinus, Xylossandrus sp, insect, Mekong Delta of Vietnam.

# [PD06][ABS-54] Determination of *Bactrocera carambolae* and *Bactrocera tau* in The Mekong Delta of Vietnam Based on Polymorphism of mtDNA

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#### Abstract

The precise identification's procedure of fruit flies species is important for the management of fruit fly pests to enhance quarantine services on fruit and vegetable. In this study, we collected 15 samples from guava and bitter gourd fruits in 3 provinces belong to the Mekong Delta region. From that, a nucleotide sequences of 700 bp of the cytochrome oxidase subunit II (COII) gene of mitochondria DNA (mtDNA 13 and mtDNA 20) was amplified by PCR with the mtD13 and mtD20 primer pairs using DNA of 15 specimens from fruit flies samples. Based on the results, sequences of a 700 bp portion of the cytochrome oxidase subunit II of the 15 specimens from collected fruit flies, the results showed that they belong to the genus Bactrocera (12 guava fruit fly samples belong to the subgenus Bactrocera and 3 bitter gourd samples belong to the subgenus Zeugodacus (or Dacus)) with phylogenetic tree supported by high bootstrap value as (97.54-98.02%). Two genera had been identified by 2 haplotype with 11 different mutations on the DNA sequences. Genus Bactrocera has three different species named B. dorsalis, B. correcta and B. carambolae with the homogenus sequences come up to 98.02%. In genus Zeugodacus, DNA sequences of the two species named Bactrocera curcubitae and B. tau was high heterologous with each other (99-100%) with 15 different mutations on their DNA sequences. The DNA sequences of the species belong to the genus Zeugodacus have high homologus (98.91-99.39%).

Keywords: fruit fly, Bactrocera carambolae, Bactrocera tau, mtDNA

# [PD07][ABS-58] Distribution of *Spodoptera frugiperda* J.E Smith (LEPIDOPTERA: NOCTUIDAE) and its Natural Enemies in West Sumatera

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## Abstract

Spodoptera frugiperda or Fall Armyworm (FAW) is an invasive pest that was first discovered attacking maize plants in West Pasaman Regency, West Sumatra Province in March 2019. FAW attacks have spread widely to almost all regions in Indonesia with varying attack intensities. There are no reports of FAW natural enemies that can be used as biological control agents. This study aims to determine the distribution of FAW and the types of natural enemies, mainly parasitoids associated with FAW and their potential as biological control agents. The research was conducted in a survey at the centrals of corn plants in 4 Regency in West Sumatra. Samples were taken in the lowlands area (West Pasaman and Padang Pariaman Regencies) and highlands area (Tanah Datar and Limapuluh Kota Regencies). Each Regency was selected 3 districts and each district was selected 2 villages. Each village was taken one observation area. The sampling technique was carried out using a Purposive Random Sampling method based on the symptoms of the attacked plant. FAW larvae were taken and placed in a plastic box and maintained until it becomes an adult. The emerging parasitoids were identified based on morphology that referred to several kinds of literature. The level of parasitization of each parasitoid was calculated from the number of larvae that were reared and the number of parasitoids that emerged. The results showed that FAW has spread to all regencies in West Sumatra. The natural enemies that attack the larvae were the parasitoid group. The parasitoids found were of the order Hymenoptera, species Microplitis sp. and Chelonus sp. from the family Braconidae. Parasitoid Charops sp. from the family Ichneumonidae and two other types from the family Ichneumonidae. The highest parasitization of FAW larvae was shown by parasitoid Chelonus sp. (11,47%) and Microplitis sp.(5,91%) in Kinali district, West Pasaman regency

Keywords: fall armyworm- Hymenoptera- parasitoid- parasitization

# [PD08][ABS-66] New Report of *Bactrocera umbrosa* Fabricius (Diptera: Tephritidae) as a Secondary Pest of Durian Fruit *Durio zibethinus* (Murr.)

Suputa

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## Abstract

Bactrocera umbrosa is an unique fruit fly based on their host (stenofagous insect). The fruit flies have not been recorded attack for other genus of Artocarpus fruits in the world until this study is conducted. Around a hundred local varieties of durian fruits were observed from East Java. All fruit samples borred by insects or mammals as well as cracked fruit were observed and the fruit fly larvae were collected. The larvae were brought and reared in the laboratory condition, and the adult of fruit flies were identified as Bactrocera umbrosa. Because of the fruit flies were only able to attack the durian fruits that have been previously damaged either by other pests or natural cracking fruits, so Bactrocera umbrosa is considered as a secondary pest of durian fruit rather than a primary one.

Keywords: Bactrocera umbrosa, durian, host, new report.

# [PD08][ABS-71] Implementation of Area-Wide Management for Fruit Fly on Mango in Indonesia

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### Abstract

Fruit fly is a prominent barrier for Indonesian mango production and quality as well as mango production countries in the world. The fruit fly attacked on Indonesian mango was ranged between 14.8 - 70% which lost value was estimated 0.246 - 1.163million USD per year. Commonly farmers rely on insecticide which un-prover ways in implementation. Area-Wide Management for fruit fly on mango is a combination of suitable techniques, environmentally friendly and supporting sustainable agricultural production. It offers chance in suppress fruit fly population. Research with objective to know the impact of implementation of AWM techniques toward population fluctuation, suppressing fruit fly population under economic threshold (less than 1 fruit flies per trap per day/FTD) and percentage of infested fruit. The research was conducted in Gedong gincu mango central production in Cirebon and Indramayu district, West Java from July 2019 to December 2020. The result showed that Implementation of AWM techniques continuously and responsive was significantly suppress adult fruit fly population under economic threshold after six months of application. Population fluctuation of fruit fly was influenced by mango phenological stages and the availability of alternate host in the villages. However, implementation of AWM techniques continuously and responsive was possible to control population fluctuation of fruit fly in treated area always less than 1 FTD.

Keywords: Mango, Area-Wide management, fruit fly.

# **POSTHARVEST TECHNOLOGY (PH)**

# [PH01][ABS-17] Domestication of Underutilized Indigenous Plant *Garcinia latissima* Miq. through Fruit Jam Production

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#### Abstract

Garcinia latissima Miq. belongs to Clusiaceae and is locally known as dolomagota or manggis papua. The fruits of this species contain numerous beneficial phytochemical compounds, such as flavonoids, tannins, saponins, and alkaloids. Antimicrobial activity is found to be presented in the extract of this indigenous fruit and inhibits the development of certain pathogens. Although its potential usage for food or medicinal products, people have not fully recognized to further optimally utilize the fruits from this species. The lack of scientific information about this plant and a relatively short period of fruit freshness are likely to be the main factors contributing to the less utilization of the fruits. Hence, this present study aims to develop the post-harvest technology of this underutilized indigenous plant by producing a fruit jam as a simple and well-accepted product. We revealed that the fresh fruit of G. latissima had a comparable vitamin C as opposed to the widely common fruits. Furthermore, the fruit jam contained 21.8 mg/ 100 g vitamin C, 0.24% protein, 0.26% fat, 10.7% water content, and 0.10% ash. Organoleptic analysis exhibited that the fruit jam derived from 1 kg fruit pulp + 1 kg sugar + 2 g maizena (cornstarch) was the most acceptable mixed formula from the panelists.

Keywords: domestication, fruit jam, Garcinia latissima, manggis papua, post-harvest

## [PH02][ABS-18]

# Maturity Assessment of Cavendish (*Musa paradisiaca* L.) Bananas Using the Thermal Image Method

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### Abstract

Banana (Musa paradisiaca L.) is a climacteric fruit with a short shelf life and rapid decline in fruit quality. The stage of banana ripeness is an important factor that affects the quality of the fruit. It is necessary to determine the appropriate level of maturity at the time of harvesting. Determination of the harvest time of bananas based on the physical fruit, such as diameter size and days after anthesis, was deemed inappropriate. This study was conducted to determine the effect of differences in the diameter of bananas on the level of maturity of bananas detected by the thermal image method. The treatment was applied to ^Cavendish^ bananas with small (<38), medium (38-42), and large (43-48) diameters with a skimmed scale at stage I. This scale is the standard size of Cavendish bananas for export commodities. The results showed that the thermal image could detect the level of maturity of bananas, where an increase in fruit size was followed by an increase in temperature- small diameter size had a temperature of 28.85 C, a medium diameter of 28.88 C, and a large diameter of 29.15 C. The increase in fruit temperature also correlated with physical quality (weight, hardness, brix), chemical quality (free acid and sucrose), but did not correlate with starch content. Diameter size was in line with increasing fruit weight, brix value, free acid and sucrose content, as well as decreasing fruit hardness value.

Keywords: Cavendish banana, diameter, thermal image

# [PH03][ABS-19] Detection of Fruit Maturity of Cavendish Banana by Thermal Image Processing Technique

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## Abstract

The level of fruit maturity for determining harvest time is an important factor that affects fruit qualities during ripening of Cavendish banana. The quality resulting from that process can affect the level of consumer acceptance. During growth, fruit undergoes metabolism which produces energy and emit some kinds of infrared radiation. The thermal image processing technique was tried to detect fruit temperature at various levels of maturity of the fruits. Five bunches of Cavendish bananas, with 8 hands each, from the top to the eighth hand were used for the experiment. Four fingers of each hand were analyzed for their thermal images, physical and chemical qualities, and SEM (scanning electron microscopy). Bunches were used as replications in the analysis. The standard method of determining the level of fruit ripeness was carried out to find the correlation with the thermal image. The results showed that the hands at the higher position of the bunch (the more mature hands) had higher temperatures than those at the lower position (the less mature hands). Ripe Cavendish bananas (7th day) had a higher temperature than unripe bananas (1st day). The results showed that the thermal image could distinguish the maturity levels of the hands of Cavendish banana and highly correlated with physical (fruit weight, diameter, firmness) and chemical qualities (glucose, sucrose, starch contents), but had no correlation with SEM, Brix, and free acid contents. Thus, the thermal image had the potential to be developed as a non-destructive method to distinguish the maturity and ripeness of Cavendish bananas.

Keywords: Cavendish banana, harvest, maturity, thermal image, SEM

# [PH04][ABS-20] Musang King Durian: Volatile Organic Compound Ester Compositions and Their Changes during Long Term Frozen Storage

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## Abstract

Durian (Durio zibethinus Murray) is one of the most valuable tropical fruit crops in Southeast Asia, contributing tremendously to the fruit industry's economic viability. It is widely cultivated in Malaysia, Thailand, Brunei, and Malaysia is the second-highest producer after Thailand. The durian market has extended from the local to international, with China is the top importing country for frozen durian from Malaysia, while Singapore is the major importer of fresh durian from Malaysia. The high appreciation for durian might be due to the creamy texture, strong aroma, and sweet taste. Despite being rich in flavour, durian fruit emits a robust aroma due to volatile organic compounds (VOCs). Ester-containing compounds were found to occur at very high levels in the pulp of Musang King durian (more than 80%) especially ethyl 2-methyl butanoate, ethyl propionate, propyl 2-methyl butanoate and ethyl 4methyl pentanoate. The changes of the volatile compositions of Musang King especially ester-containing compounds during long term frozen storage were investigated. Durian arils were blast frozen for four h at -40 C and were vacuum packaged and stored for one year storage at -20 C. After one year of storage, the VOCs generally showed a downward trend during frozen storage. Ester-containing VOC, especially ethyl 2-methyl butanoate, was continuously reduced as storage duration extended. The result proved that frozen storage was reliable to maintain the quality of Musang King durian. However, subsequent frozen storage towards one year may cause the flavour quality to deteriorate even though the pulp is still edible.

Keywords: durian, Musang King, volatile, ester

## [PH05][ABS-34]

# Synergy of Ethylene Absorbent Materials and Natural Fiber Reinforcement in Carboxy Methylcellulose-Based Spray Coating to Resistance Durian Fruit Dehiscence (*Durio zibethinus* Murr.) var. ^MonThong^

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#### Abstract

Durian (Durio zibethinus) is a climacteric tropical fruit, having respiration and emitting ethylene production peaks. The fresh mature durian fruit dehiscence after harvesting is a major postharvest problem of fully ripe- cracking or breaking at along the suture in the middle of each locule, reduced the consumption quality and commodity value of the fruit. The ethylene production of mature fruit was the main factor and important cause of fruit cracking or dehiscence more than moisture loss. Generally, most coating materials to protecting fresh fruit dehiscence was not only able to reduce weight loss but also create high CO2 gas inner of them led to anaerobic respiration and low O2 gas as modified atmosphere. interfering ethylene production. In this study, the synergy of ethylene absorbent- microporous active carbon, natural zeolite and natural fiber (CAM plant and C4 plant reinforcement in carboxymethyl cellulose-based (CMC) spray coating was examined in order to reduce weight loss, absorb ethylene gas and sulfur odor, and lowly accumulate of CO2 inside the mature durian fruit- about 140 days after anthesis, pulp organic dried matter about 39%. All treatments were kept at 30 - 32 C and relative humidity 80 - 85 % for 9 days. The results showed that coating methods had a speed rate of 6 fruits per minute and coating materials were dried after by less than 2 hours. The ethylene production, sulfur-compound, percent of weight loss of the coated treatment were lower than control. Meanwhile, pulp firmness (hardness) of coated treatment had higher than control. Moreover, all coated treatments were not found fruit dehiscence and decay on those condition.

Keywords: Durian, fruit dehiscence, ethylene, coating, activated carbon, fiber reinforcement

## [PH06][ABS-70]

# Mathematical Modeling of degradation Quality on Snake Fruit (Salacca edulis) Quality during Storage in Modified Atmosphere Packaging

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## Department of Chemical Engineering, Universitas Gadjah Mada, Yogyakarta, Indonesia \*Email : ajeng.septina.a@mail.ugm.ac.id Abstract

Snake fruit is one of the commodities with abundant production and has great potential to be processed into derivative products with higher selling value. Yogyakarta contributed 411,998 quintals of snake fruit production from the total production of snake fruit in Indonesia which reached 9,557,632.3 quintals in 2019. With its existence that is almost available every year, it is very possible to make snake fruit as an export commodity that can benefit Indonesia. However, a short shelf life can cause the fruit to rot quickly. The aim of this study was to investigate the effect of modified atmosphere packaging (MAP) during storage to quality of snake fruit such as moisture, weight loss, and carbohydrate. Snake fruit were packed into 2 different MAP: 21 and 10% concentration of oxygen. Later, the carbohydrate content of snake fruit was obtained from fresh to rotten using the Lane-Eynon method. In this study, a mathematical model will be discussed and made to determine the decrease in the quality of snake fruit, in this case the degradation of carbohydrates.

## [PH07][ABS-52]

# Preharvest Methyl Jasmonate Treatment on Mature Durian Fruit (*Durio zibethinus* Murray) var. ^MonThong^ to Alleviate Chilling Injury Symptom during Low Temperature Storage

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## Abstract

Durian (Durio zibethinus Murray.) is a climacteric tropical fruit and sensitive to low temperature. Mature fresh durian fruit (MD) will illustrate the chilling injury symptoms- offflavor and odor of fresh pulp, soaking core, and marketable valueless when storage below 15 C. In order to alleviate chilling injury symptoms of those at low-temperature storage. Preharvest spraying treatment of the methyl jasmonate (MeJA) to mature durian fruit- 110 days after anthesis (DAA), by 7 and 14 days on the tree before harvest were exanimated. After harvested, MD were treated with ethylene 26% and were kept at 5 - 7 C for 21 days. The chilling injury symptoms on rind and aril of durian were investigated throughout storage period. All parameters- Chilling index (CI), polyphenol oxidase activity (PPO), malondialdehyde content (MDA), total phenolic content (TPC), and soluble protein content (SPC) in the durian rind were investigated. Edible quality of durian aril was evaluated by using color properties (L\* a\* b\* C\* and hue angle), sensory evaluation with a 5-point hedonic scale (flavor-like, taste-like, and overall-like), and texture profile analysis (TPA). In the durian rind, the CI and PPO of control were higher than the MeJA treatment while, MDA, TPC, and SPC were not different. In the aril, sensory evaluation (flavor-like, taste-like, and overall-like), pulp color (L\* a\* b\* C\* and hue), and TPA (hardness) of control and MeJA treatment were not different. TPA analysis of durian pulp, the hardness between control and MeJA treatment were not different. The adhesive force of aril of control was higher than MeJA treatment while the springiness index of control was lower than the MeJA treatment. MeJA treatment illustrated the effective means to suppress chilling injury in postharvest storage of durian whole fruit at low temperatures and prolonged the shelf life. Furthermore, fresh mature durian fruit were intended to kept in low temperature by less chilling injury symptom than cont

Keywords: Durian, methyl jasmonate, chilling injury, low temperature storage

# [PH08][ABS-59] Acceptance of Functional Beverages Made from Bignay Fruit and Aloe-Gel on Different Storage

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## Abstract

The functional beverage made from natural ingredients is in great demand and a trend recently because contributes to health. The shift in food consumption pattern to accommodate an array of bioactive compounds in foods with minimum calorie intake has resulted in the development of many novel beverages. One of the potential products is the aloe-bignay beverage which is made from aloe-gel (Aloe barbadensis Miller.) and bignay (Antidesma bunius). Aloe-gel in addition to low calories also contains 75 functional compounds, and bignay is known as an antioxidant, antibacterial, and antidiabetic properties. Bignay common variety was a good source of antioxidants particularly the flesh at fully ripe stage. The aloebignay formula determines its characteristics and shelf life. This study aims to determine the effect of aloe-gel and bignay proportion on acceptability of aloe-bignay beverage. This study used a completely randomized design three replications. The ratio between aloe-gel and bignay (75:25%- 50:50%, 25:75%), on storage temperature of (4-8)C- (9-13)C, and (27-28)C used to observe the total dissolved solids, pH, organoleptic test of color, taste, flavor, viscosity and overall acceptability. The results showed that the proportion of aloe-gel and bignay fruit affected the acceptability of the Aloe-bignay beverage. The best aloe-bignay beverage formula is a 50:50 % ratio on storage temperature of (4-8) C.

Keywords: aloe vera- bignay- functional beverage- shelf-life- storage.

# [PH09][ABS-64] Different Harvesting Time on Quality of Reddish-fleshly Rambai (*Baccaurea motleyana* Muell. Arg.)

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## Abstract

Rambai is one of the underutilized Indonesian fruit. Bark of the Rambai tree is used as antibacterial in traditional medicine and has a potential anticancer ingredient. The fruit is an aril and contains vitamin C, vitamin B, and phosphor. Harvesting time influences the physical appearance and nutrition of the fruit. This study was aimed to determine the effect of different harvesting times on the physical and biochemical parameters on the red-fleshed rambai fruit. The samples were collected from Taman Buah Unggul Mekarsari, Cileungsi, Bogor, West Java. The sweetness of the fruits was measured by the ratio of total soluble solids (TSS)/ total titrated acid (TTA), while glucose, fructose, and sucrose were measured using the enzymatic methods. The sweetness of the fruits increased from 13 WAA (week after anthesis) to 19 WAA. However, all other parameters, including fruit firmness, TTA, and TSS/TTA ratio do not differ significantly, according to the Tukey test. Glucose was found to be the dominant sugar in the red-fleshed rambai fruit.

Keywords: fruit quality, glucose, ripening, underutilized fruit, rambai

# [PH10][ABS-65] Morphological and Phytochemical Characterization of Lobi-lobi Fruit (Flacourtia inermis) at each Maturity Stage

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## Abstract

Lobi-lobi is an Indonesian underutilized fruit that is rarely cultivated. Nevertheless, lobi-lobi contains beneficial nutrients, such as high phenolics and anthocyanins. This study aimed to determine the morphological and phytochemical characteristics of lobi-lobi at various stages of maturity based on changes in rind color. Our study used lobi-lobi fruits from six different stages of maturity based on fruit rind color. Morphological characterization included fruit diameter, total fruit weight, seed weight, aril weight, edible portion, and fruit firmness. Phytochemical characterization included total dissolved solids (TDS), total titrated acid (TTA), sugar content (glucose, fructose, and sucrose), and secondary metabolite profiling by Gas Chromatography-Mass Spectrometry (GC-MS). The results showed that lobi-lobi had a high TTA content at each stage of maturity. The glucose content of lobi-lobi was higher than that of either fructose or sucrose. The GC-MS analysis showed 34 total compounds spread across the six stages of lobi-lobi maturity. Specific metabolites were identified at maturity stages 1, 4, 5, and 6. Malic acid was identified as the dominant organic acid in lobi-lobi fruits.

Keywords: gas chromatography, glucose, lobi-lobi, phytochemical, ripening

# [PH11][ABS-68] Ethanol Vapour Reduced The Deterioration Rate of Mangosteen Fruit Quality during Storage at Chilling Temperature.

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### Abstract

Indonesia is one of mangosteen fruit production countries and every year tries to increase the volume of the export. The lacks of postharvest technology in maintaining quality and shelf life of the fruit is one of obstacles. This study aimed to examine the effect of ethanol favours exposed to the fruit and storage temperatures on the quality and shelf life. The volumes of ethanol, namely 0, 2 and 4 mL traped in the 10 g carageen was placed in small sachets. The sachets were then put in the basal of styrofoam trays on which five fruits were placed and wraped with LDPE plastic streching film. The fruit exposed with ethanol vapour were stored at chilling temperature of 10+1oC and at room temperature of 28+1oC. The controlled fruit without treatment were also prepared for comparison. The result showed that the treatment ethanol vapour significantly reduced the intensity of damage, colour change of the rind and aril, the change rate of Vitamin C, total soluble solid and total acidity of the airl, and fruit texture during storage compared to control. Those reductions were significantly higher when the fruit stored at chilling temperature compared to the room temperature. Ethanol vapour released from 4 mL liquid ethanol entraped in the carageen and stored at chilling temperature was the best treatment of which the quality of the aril and the intact fruit can be maintained properly by up to 20 days measuremet.

Keywords: Mangosteen, ethanol vapor, slow release, postharvest quality.

# [PH12][ABS-36]

# Nutritional Compositions of New Durian Varieties Developed in Thailand

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## Abstract

Thailand has many varieties of durian that are commercially available. However, nowadays the problems of unevenness in quality characteristics and similar harvesting time of durian result in excessive product, leading to low prices. Therefore, durian breeding development to get an early or late harvesting time varieties could lead to higher income for durian farmers. This research, thus, aims to investigate the nutritive compositions (energy, protein, fat, carbohydrate, fiber, sugar, ash, vitamin C, and minerals) of new developed varieties of durian (Chanthaburi 1-10) in comparison to 5 commercially available varieties (Monthong, Chanee, Kanyaw, Puangmanee and Kradomtong). These new developed varieties of durians were developed from the mother and father of the commercial varieties. The results suggested that the nutritive compositions of the new developed varieties were corresponded to the mother and father varieties. Each variety had its unique nutritional properties, and some even exert their original varieties. This knowledge gained from this research would benefit consumers to choose their favorite durian based on their nutrition compositions.

Keywords: Durian, variety, nutritional composition
#### AGRICULTURAL SOCIAL ECONOMICS (AS)

#### [AS01][ABS-15] Consumer Characteristics and Their Preferences Toward Local Durians in South Sulawesi

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#### Abstract

The study was aimed to analyze the durian consumer characteristics and the idiotype of South Sulawesi's local durians based on consumer preferences towards biophysical traits of durian. A survey was conducted using an online questionnaire from 100 respondents in Makassar and neighbouring regencies based on random sampling. The result showed that respondents were characterized by 57% female and 43% male- the age group was dominated by 41-50 years old (38%), and 47% of respondent occupations were civil servants. Local durians were preferred (94%) to imported ones (6%). The most popular local durians in South Sulawesi was from Palopo-Luwu regencies (81%). Most respondents preferred deep-sweet taste (70%) with wet-soft texture (47%), thick flesh (66%) in dark yellow colour (54%) and tiny seed (39%). The most preferred aroma was medium strength (51%), medium size of durian (67%) with oval shape (53%), green-brownish skin colour (46%), short thorns (45%). The top five biophysical characteristics in choosing durian were taste, aroma, and the flesh's texture, thickness, and colours. The gathered data and information are beneficial for researchers, breeders, and farmers in conserving the local germplasm of durians and selecting the specific traits for improved varieties.

Keywords: consumer, preference, local, durian

#### [AS02][ABS-23] The Enhancement Strategies for Mango Exports in The International Market

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#### Abstract

Indonesia is the 5th largest mango producer in the world, with production reaching 2.6 million tons, but the volume exported is only 2500 tons or 0.1% of the total mango production. Constraints for Indonesian mangoes in entering the export market include not being able to meet export quality and continuity, the reason being that most of the mango production in Indonesia is cultivated conventionally with technology and management that have not been specifically planned to produce quality fruit. Therefore, mango agribusiness needs to be encouraged to become an industry-based business. The application of industrial principles in the development of mangoes for export is very much needed because in industrial principles, product quality standards are applied as a reference for determining the price and quality of marketed products. The purpose of this study was to identify internal, external and strategic factors in increasing the production of export quality mangoes. Identification of internal and external factors is done through Focus Group Discussion (FGD), and strategy determination is done by SWOT analysis. The results of the Internal Factor Evaluation (IFE) calculation show that the attributes of weakness are the dominant factors in the internal factors, and the most dominant weakness factor is that at least mangoes are produced that meet the export criteria. Opportunity becomes the dominant factor in external factors, and the opportunity factor which becomes the most dominant attribute is the increasing world demand for mangoes. Based on the SWOT analysis, nine strategies were found in increasing export quality mangoes, including the strategy of optimizing the mango area through intensification of mango cultivation with government support through input assistance programs, capital, export promotion, and technology on farm to off farm, so that Indonesian mangoes are expected to meet export market in the form of fresh and processed mangoes.

Keywords: mango, SWOT, export

#### [AS03][ABS-49] The Potential Economic Impact of Tropical Fruit Seedlings Distribution Program in Indonesia: The Case of Mango in Situbondo Regency

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#### Abstract

The use of quality seeds of improved fruit varieties is one of the essential factors of productivity leverage. Through the Ministry of Agriculture, the Republic of Indonesia has undertaken various agricultural development programs to increase the use of quality seeds. One of the programs is by distributing high-yielding improved tropical fruit varieties for free to the community in various regions in Indonesia. This policy is implemented to support mango as one of the potential tropical fruit commodities that can bring benefits, especially for smallholders in many production centres. This paper analyses the economic potential of the distribution of mango planting materials in Indonesia. Situbondo Regency, one of the mango production centres in Indonesia, is taken as the object of this current study. It is estimated that in the next 3-5 years after the distribution of the seedlings, there will be approximately 100 tons of additional mango production in this regency. Based on the calculation of the costbenefit calculation, seedling distribution in this production centre can provide a total additional profit of around IDR 2.7 billion/year for smallholders. Garifta Merah, the primary mango variety seedlings distributed in this regency, can also support the effort to increase the export volume since this variety has a high potential to be exported. Furthermore, the sensitivity analysis performed shows that even if the principles of good agricultural practices of mango are not applied, as long as the seedlings were planted, the potential positive economic impact can still be achieved in the future.

Keywords: mango, seedlings, cost benefit analysis

#### [AS04][ABS-55] TETENGER BUMI 58UB, Information Technology to help Durian and Nusantara fruit planting

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Research Group : Enterpreneurship of Information Technology Faculty of Computer Science, Universitas Brawijaya

#### Abstract

The poverty rate in Pait Village is high. Based on data on the number of poor families released by the Pait Village Government, more than 65% of families in Pait Village are poor families. Pait Village's economy is generally dominated by the agriculture and livestock sectors. Based on the above problems, it is necessary to plant durian and Nusantara fruit plants to help improve the economy of the Pait Village residents. This activity is named TETENGER BUMI 58UB as a form of dedication from Brawijaya University to the community to participate in improving the living standards of the Pait village community. The fruits of the archipelago planted include 58 Bawor Durian, 68 Bido Durian and orange, 60 Avocado (Alligator + BS4), 20 Petai, 7 jackfruit, 7 mangosteen fruit, 10 pieces of Matoa, 3 Peer Aloma, 1 Red Peeled Guava, 5 Jamaican Guava, 3 pieces of Cempedak, 7 star fruit, 7 pieces of Kedondong, 4 pieces of Gedong Ginchu Mango, 5 pieces Srikoyo, 3 Grapefruit, 10 genitu/Bapel dan 10 pieces of red guava. Information technology used for fundraising and promoting this fruit planting is Digital payment, Facebook, Instagram, Youtube etc

**Keywords:** TETENGER BUMI 58UB, Information Technology, Durian fruit planting, Nusantara fruit Planting

#### [AS05][ABS-56] Difference Of Intensive Cultivation On Mango Farming: Implications For The Smallholders In Indonesia

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#### Abstract

Mango was known as 'The Best Loved Tropical Fruit' having prospect as a costly and high demand commodity in global market. However, detailed information on profitability of the mango farming remained limited. This study focused on socio-economic performance of mango farming and objective of this study was to develop the efficiency of mango farming. The study was conducted in Cirebon, Indonesia using 93 farmers as samples managing mango farming. Results of the study showed that mango farming were classified into three group of cultivation method, namely non-intensive, semi-intensive and intensive cultivation. The average total cost of non-intensive, semi-intensive and intensive cultivation were US-303.3, 743.6 and 1,853.8, respectively. Gross market price of those groups were US- 1,380.0, 2,470.3 and 5,366.3, respectively. Net profit of those groups were US- 1,076.7, 1,726.8 and 3,512.5, respectively. This study found out that difference of cultivation method affected the net profit. Farmers may decide method based on affordable finance to reach the highest profit. The mango farming using intensive cultivation method (cost of production more than USD 1,200) require all input to maximize net profit, whereas that of using non-intensive (USD less than USD 350) and semi-intensive (USD 351-1,200) cultivation method need partial input.

Keywords: intensive cultivation, mango, smallholders farmer

#### [AS06][ABS-61]

#### Improving Mango Farmers Participation in Modern Retail Channels in Indonesia: The Production System and Determinant of Market Channel Choice

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#### Abstract

The change in the pattern of public consumption from food consumption to consumption of high-value fruits and vegetables has stimulated the development of modern markets. Therefore, a strategy is needed to increase farmer participation in the modern market. This paper aims to (1) identify the performance of mango cultivation at the on-farm level, (2) analyze the mango marketing system, and (3) analyze the determinants to increase farmers^ participation in the modern market. Primary data from interviews with 204 mango farmers in Cirebon and Majalengka, West Java were used in this study. Descriptive analysis and logistic regression models were used to answer the research questions. The result shows the existence of market modernization or market transition in mango sector. This is indicated by (1) replacement of the role of rural brokers by urban-based wholesalers, (2) the use of spraver trader services, (3) increasing inter-island sales and supermarkets. The effort to increase mango market integration and competitiveness should be focused on penetration into modern markets and inter-island trade than increased exports. The leverage point for increasing mango productivity and quality is the use of spray equipment, spray machines, fruit fly traps, and harvesting tools. Government intervention should be focused on assisting farmers who manage their own farm (not using the services of sprayer traders). While for farmers who use the services of sprayer traders, the intervention can be carried out through training that may improve the ability of sprayer trader in farming management, harvesting, and post-harvest handling.

Keywords: mango, modern market, production system

#### [AS07][ABS-62]

#### Mangosteen Agribusiness Development In Production Area: An Approach to Build Farmer Group Association As Future Social Capital In Rural Area

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#### Abstract

Indonesian mangosteen has its superiority in the international market. However, the differences in the cultivation techniques and the production technologies result in inconsistency in the quality and quantity produced. In the past two years, farmers also have been experiencing delayed harvest season of mangosteen due to extreme weather changes in Indonesia. To map out the problems in mangosteen production, we apply a conceptual model through soft system methodology, as part of the systems thinking models. This study used primary data that were collected through intensive Focus Group Discussion from two mangosteen production areas in West Java, Indonesia. The conceptual models that are suggested based on this study are as follows: 1) improvement in the production system, 2) collaboration from shareholders, university, and government to increase production, 3) reformation related to the function of farmers group, and 4) initiation to construct the foundation of mangosteen business association. The findings from this study can be used to assist the policymaker to define a roadmap for the future rural resource development based on the leading commodity.

Keywords: business development, farmer group, system thinking, mangosteen

#### [AS08][ABS-63] Private Nurseries as The Main Source of Seedlings for Mango Farmers in West Java, Indonesia

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#### Abstract

Mango is an important fruit in Indonesia. In volume, it is the top fruit after banana, and a government priority fruit. Mango production grew slowly before the 1990s and developed faster afterward. Mango sector is undergoing rapid technological change, variety diversification, and commercialization, with the emergence of many small and medium farmers. However, little is known about this process, especially on how mango farmers procure their mango trees. This paper narrows this gap by investigating the patterns of farmers^ sourcing of mango seedlings. The descriptive statistics approach is used to explore how marginal, small, and medium mango farmers source their mango trees by comparing over own-production versus other seedlings providers. This study use panel data from 172 mango farmers in West Java-Indonesia that were collected through surveys in 2011 and 2017. The study shows that: 1) apart from own-production, farmers also source the mango seedlings from government nurseries (direct and indirectly), private nurseries, and seedlings traders- 2) overall, private nurseries are the source of seedlings for 65% of the farmers.

Keywords: mango, seedling procurement, private nurseries

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### INDONESIAN TROPICAL FRUITS RESEARCH INSTITUTE

Indonesian Tropical Fruits Research Institute is a government's research institute on tropical fruits under Indonesian Ministry of Agriculture, Indonesian Agency for Agricultural Research and Development, Indonesian Center for Horticulture Research and Development.

#### Vision

Become a world-class institution on agricultural research and development that produces and develops agricultural technology innovations to realize superior sustainable agricultural industry based on local resources.

#### Mission

- 1. To produce, develop and disseminate technological innovations, systems, models, and policy recommendations on tropical fruit research which based on local resources to support realization of sustainable superior agricultural industry.
- 2. To improve the quality of agricultural research and development resources and efficiency and effectiveness of their utilization
- 3. To develop a national and international network in science and technology (scientific recognition).

#### Main tasks and functions

ITFRI has the main task to carry out tropical fruits research with its functions as follow:

- 1. Implementation of program, work plan and budgeting.
- 2. Implementation of genetic, breeding, and nursery of tropical fruits research.
- 3. Implementation of exploration, conservation, characterization, and utilization of tropical fruit germplasm research.
- 4. Implementation of agronomy, morphology, physiology, ecology, entomology, and phytopathology of tropical fruit research.
- 5. Implementation of technological components and agribusiness of tropical fruits research.
- 6. Implementation of post-harvest and fresh handling of tropical fruits research.
- 7. Providing technical services on tropical fruit research.
- 8. Preparation of cooperation, information, documentation, dissemination, and utilization of tropical fruit plant research outputs.
- 9. Management of human resources, financial, household, and facilities.

#### Human resources

ITFRI supported by 151 human resources which consisting of 52 researchers, 36 technicians, 1 librarian, 1 archivist and 61 administrators.

#### Facilities

As a research institution, ITFRI is equipped with various facilities, which include office buildings, laboratories, experimental stations, green houses, guest houses, meeting rooms (auditorium), and others.

ITFRI is supported by 5 laboratories, namely Laboratory of Germplasms and Tissue Culture, Laboratory of Chemical and Post-Harvest, Laboratory of Plant Protection, Laboratory of Molecular and Laboratory of Mass Seedling Production at Solok, West Sumatera and 2 laboratories at Subang, West Java.

In addition, ITFRI is also supported by six experimental stations, namely Aripan and Sumani experimental stations (at Solok, West Sumatra), Wera experimental station (at Subang, West Java), Cukur Gondang, Kraton, and Pandean experimental stations (at Pasuruan, East Java).

# International Tropical Fruits Network (TFNet)

International Tropical Fruits Network (TFNet) is an international organization and global network originally established under the auspices of the Food and Agriculture Organization (FAO) of the United Nations in 2000 with the aim of promoting sustainable development of the tropical fruit industry in relation to production, consumption and trade.

## Members

TFNet is an expanding network with members from the government, non-government and international organizations, research institutes, the academe, the private sector, and smallholder farmers. Membership is classified into country members, associate members, and ordinary members. As of August 2019, the TFNet country members are:

The Republic of Fiji
 The People's Republic of China
 The Syrian Arab Republic
 Federal Republic of Nigeria
 Republic of Indonesia
 People's Republic of Bangladesh



## **Benefits for Members**

- Sharing information, expertise and technologies.
- Discounted participation in international conferences, symposiums, and seminars.
- Participation in human resource development programs.
- Participation in collaborative projects or studies.

## **Capabilities**

The capability of TFNet builds on:

- A proven track record in terms of organizing capacity building projects and events, supporting R&D, and developing projects through consultancies.
- A strong network of co-operation with national and international organizations, institutions, private companies, and individual experts. This network is only available to TFNet.
- A permanent core of highly motivated staff

## Services and Activities of TFNet

- Organizing workshops/symposiums in member countries to address related issues on tropical fruits.
- Establishing collaborative projects of interest with other regional and global networks.
- Providing capacity building activities in member countries to improve knowledge and skills.
- Consultancies.
- Organizing technical study visits.
- Knowledge dissemination activities.

## GOALS

GOAL 1: CREATING A TROPICAL FRUIT INFORMATION HUB



GOAL 2: ESTABLISHING JOINT COLLABORATIONS



GOAL 3: ASSISTING INT'L TRADE EXPANSION



GOAL 4: PROMOTING TECHNOLOGY TRANSFER



#### CONTACT US

International Tropical Fruits Network (TFNet)

Block C8, MARDI HQ, Serdang, Selangor Malaysia 43300 Tel: 603-89416589 Fax: 603-89416591 Email: info@itfnet.org Website: www.itfnet.org

## Perhimpunan Hortikultura Indonesia (PERHORTI)

Perhimpunan Hortikultura Indonesia (PERHORTI) is a scientific professional organization that plays an active role and provides real contribution in increasing Indonesia's global competitiveness in horticulture through human resource development, dissemination and transfer of science and technology as well as facilitating stakeholder networking.

## Members

PERHORTI members are individuals and organizations, companies, and institutions that can contribute positively to the development of Indonesian horticulture. Individual members include academics, researchers, growers, national and local government officials, and other horticultural profesionals.

## **Benefit of Members**

- Opportunities to share information, expertise and technologies in horticulture
- Participation in national and international seminars, conferences and symposiums organized by Perhorti
- Participation in human resource development program
- Participation in collaborative project and studies
- Publication of research findings in Jurnal Hortikultura Indonesia

## Capabilities

- Facilitating the development of partnerships among stakeholders for horticultural development
- Networking with government and local government, practitioners, academician and researchers
- Managing Jurnal Hortikultura Indonesia

## **Services and Activities**

- Organizing national and international seminars and symposium in collaboration with other institutions
- Establishing of collaborative projects with regional and national network
- Providing capacity building activities for Perhorti members to improve their knowledge and skills
- Consultancies
- Organizing scientific tours in horticulture

# Goals



Email: sekretariat.perhorti@gmail.com Website: perhorti.id



# PT HIJAU SURYA BIOTECHINDO

LOCATED IN KISARAN, PROV. SUMATERA UTARA, INDONESIA

Hijau Surya is a plant tissue culture company specializes in producing young banana plants, potato, and tropical ornamental plants.

Our experienced team grows the tissue culture plants in our state-of-art laboratory and greenhouse under strict hygienic conditions.

**Company Facilities :** 

## Lab

- 10.000 sterility level culture rooms equipped with air shower and energy-efficient LED lights
- Transfer Room equipped with up to 60 laminar air flow cabinets
- Highly-trained personnels

## Greenhouse

- Soiless growing media
- Motorized shading net
- Semi-automatic sprinkler
- Air circulation fans
- Movable benches
- Buffer room



**Still In Research :** Ginger, orchids & various tropical ornamental plants.



😝 Hijau Surya

hijausurya

hijausurya



## **PUPUK TEPAT UNTUK HASIL MAKSIMAL**



## Manfaat

- Meningkatkan produksi dan kualitas hasil panen
- 2. Mudah dan praktis diaplikasikan
- 3. Kelarutan yang baik di tanah maupun di dalam air

# Keunggulan

Kombinasi terbaik untuk kebun durian, dengan formula hara-hara seimbang. Tepat diaplikasikan untuk berbagai fase pertumbuhan tanaman dari produsen terbaik & terpercaya.



PUPUK DAN OBAT-OBATAN PERTANIAN



Fruits and vegetables, your dietary essentials.



# INTERNATIONAL YEAR OF FRUITS AND VEGETABLES 2 \(\circ) 2 1

#IYFV2021



## **Indonesian Tropical Fruits Research Institute**

Indonesian Center for Horticultural Research and Development Indonesian Agency for Agricultural Research and Development Ministry of Agriculture

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## **CONNECT WITH US**





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