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Exploring the potential of *Etlingera elatior* (torch ginger) as ornamental, medicinal plant, and food products

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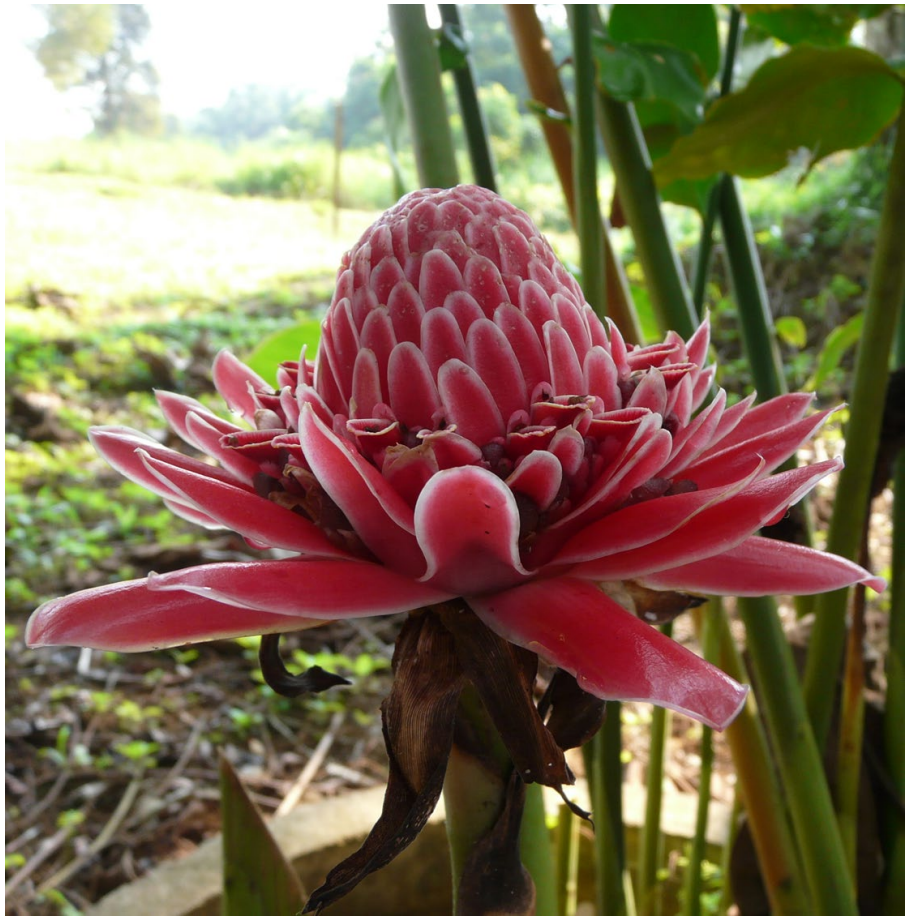
Outlines



- Introduction
- Economic Potential
- Products Development
- Challenges and Future Perspectives
- Conclusion

Introduction

- *Etlingera elatior* (torch ginger) is a plant in the Zingiberaceae family that is widely cultivated in Southeast Asia for **ornamental purposes** or consumed as **food**.

- This plant is known as torch ginger due to the striking resemblance of the **inflorescence** to a **flaming torch**.

- The vernacular names for torch ginger are *Bunga Kantan* (Malaysia), *Bunga Kecombrang* (Indonesia), *Kaa Laa* (Thailand) and *Rosa-De-Porcelana* (Brazil).

Introduction

- Zingiberaceae family is **resilient** to **climate change** with high adaptability towards different growing conditions.
- Majority of the *Etlingera* species **lack ornamental value** due to their **short vase-life span**.
- Torch ginger is one of the most known species of *Etlingera*.

Inflorescence

- Butterflies, Amegilla bees, stingless bees (*Tetragonula iridipennis*), and sunbirds (*Nectarinia asiatica* and *N. zeylonica)* have all been spotted pollinating this species. (Aswani et al., 2013).

Traditional Uses

- In Malaysia and Southern Thailand, the young inflorescences are used as **herbs and food ingredients**. The extract from the stem is used to **reduce swelling**, while **decoctions** of the leaves are used to **clean wounds**. Post-partum women also use the **leaves for bathing** to remove **body odor** and wound cleaning.

- In Malaysia and Indonesia, the fruits are also used to **treat earaches, diarrhea, coughs, mouth sores, and increase human appetite** (Ismail et al., 2019; Sabilu et al., 2017).

- In Indonesia, the pseudostems were blended and filtered to get the liquid and served to treat the **typhoid fever patient**.

Culinary

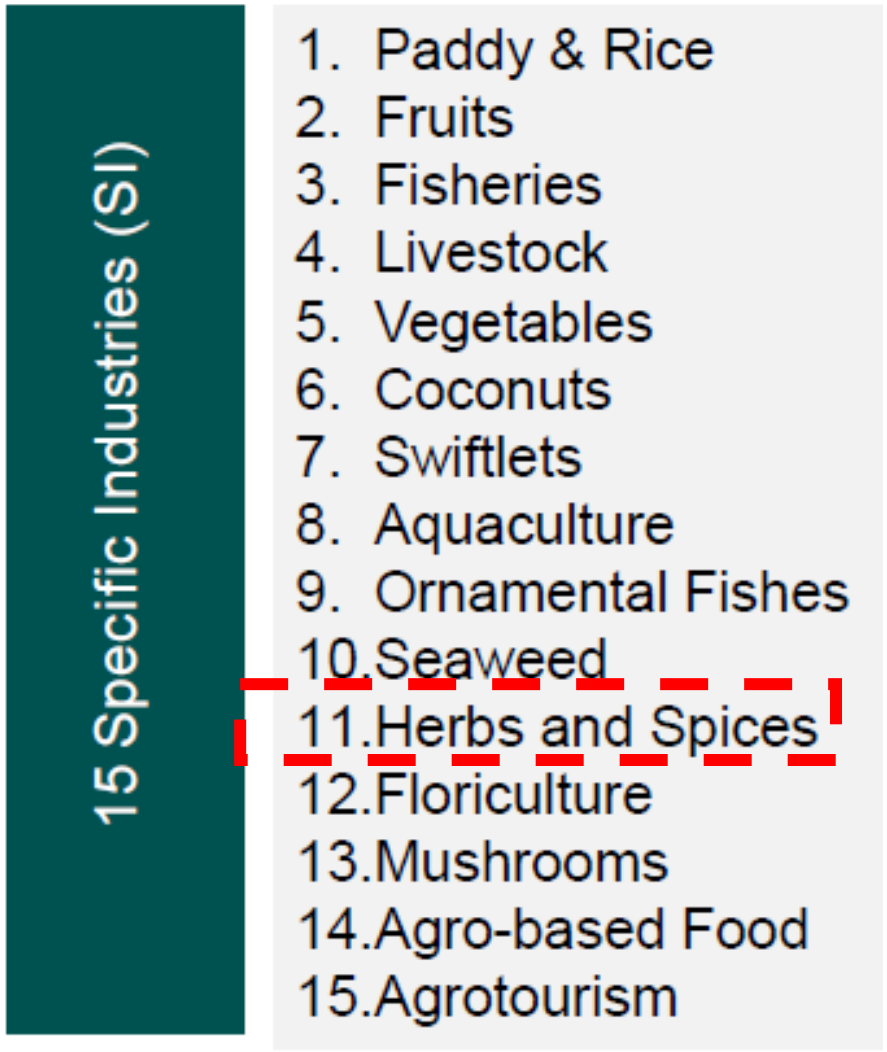
- Young inflorescences and half-ripe fruiting shoots are widely used as an ingredient in traditional Malaysian cuisines such as Penang *laksa, nasi ulam, nasi kerabu* and mixed vegetables.
- In North Sumatra, the flower buds and the ripe seed pods containing tiny black seeds are used for **cooking fish dishes**.

Nasi Kerabu, Malaysia

Chili Sauce (*Sambel Kecombrang*) Bali, Indonesia

ECONOMIC POTENTIAL

Malaysia National Agrofood Policy 2011-2020



- One of the 11 potential herbs to be commercialized.

- Production of herbal plants in Malaysia for 2018 has reached a good value of MYR 69 million (USD 17 million).

(Department of Agriculture, 2018).

Economic Importance

	2014	2016	2018
Production (metric tons)	905.07	1281.44	1,787.13
Planting area (ha)	178.31	250.34	356.18

- The average yield of this plant was reported at 6.06 mt/ha, with an overall production value of MYR 9.83 million (USD 2.4 million).

(Department of Agriculture, 2018).

Ornamental

- The varying shades of white, pink, and red colors of the bracts and flowers make this species an attractive ornamental plant.

Different bract color of torch ginger. A: dark pink (KAN024); B: pink (KAN035); C: pale pink (KAN031) (Ismail et al., 2021)

Ornamental value

Etlingera elatior ‘Bloody mary'

Bamboo Land, 2021

Etlingera elatior ‘James Red'

Bamboo Land, 2021

Ornamental

Etlingera elatior ‘Light pink'

Bamboo Land, 2021

Etlingera elatior 'Thai White'

Bamboo Land, 2021

Ornamental value

Aloha Tropicals, 2021

Bamboo Land, 2021

Development of New Cultivars through Breeding Programme

- In response to the floriculturist demand, **extensive research being conducted**, leading to more variation in the range of **colours, shapes, yield, and extending vase-life.**

- Attempt to create a **hybrid** was performed to broaden its **genetic variation**, but it remains a challenging process.

Yields

- Cultivars show good yields:
    - Tropicas: 150-200 flower stems/clump/year
    - Thai White: 100-120 flower stems/clump/year
    - Ironstone: 50 flower stems/clump/year
    - IAC 41: 33.25 flower stems/clump/year
    - IAC Camburi: 41.20 flower stems/clump/year

Medicinal Values of Torch Ginger

- **Flavonoids, terpenoids, saponins, and tannins** are essential compounds successfully isolated from torch ginger inflorescences.

- Extracted **essential oil** from leaves, roots and rhizomes of torch ginger.

- **Anthocyanin** (flavonoid) in the inflorescence can inhibit the **ovarian cancer lines** through **cytotoxic activity**.

- The ethanolic extract of torch ginger inflorescence has a vigorous **antioxidant activity** and could be used as a **treatment for lead poisoning**.

- Flower extracts were also proved to repress **Human breast carcinoma tumor cell** lines of MCF-7 and MDA-MB-231.

Nutritional properties

- There is always a demand for marketable and **high nutritional products** in the food and health supplement sectors.

- The **inflorescence** contains a **high level of protein, crude lipid, and fiber**, with the contents on dry weight basis is 12.6%, 18.2%, and 17.6%, respectively.

- The inflorescence contains **essential minerals** like potassium, calcium, magnesium, phosphorus, iron, zinc, sodium, and boron.

PRODUCT DEVELOPMENT

Agro-Industry- Food products

Torch ginger **puree**

Chilli sauce mixed with torch ginger and anchovies

Dried torch ginger for **cooking and garnishing**

Agro-Industry- Home essentials

Bhumi Sekitar, 2021

Product Development- FL1 cream

cosmetics

MDPI

Article

Efficiency of Skin Whitening Cream Containing *Etlingera elatior* Flower and Leaf Extracts in Volunteers

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Flower and leaf extracts for natural whitening ingredient

- **Natural antioxidant compounds**, along with having anti-aging, anti-microbial, anti-inflammatory, and tyrosinase-inhibiting actions.

- These compounds in cosmetic products tend to be **safer, biodegradable,** more **environmentally friendly.**

- Previous study- aqueous extracts consists of **isoquercetin, catechin, and gallic acid**, which are capable of inhibiting **tyrosinase activity,** leading to a **skin lightening effect** useful in **cosmetic applications**.

Table 1. The formulations of FL1 cream containing *Etlingera elatior* flower and leaf extracts.

Phase	Trade Name	INCI Name	%
A (Oil Phase)	Nikkomulese LH	Glycerin (and) Hydrogenated lecithin (and) Hydroxypropyl methylcellulose stearoxy Ether (and) Squalane (and) Sodium methyl stearoyl taurate	4.00
	DC 350	Dimethicone	3.00
	Squalane	Squalane	5.00
	Cetyl alcohol	Cetyl alcohol	0.30
	Stearyl alcohol	Stearyl alcohol	0.30
B (Water Phase)	Na_2EDTA	Disodium EDTA	0.10
	Glycerin	Glycerin	3.00
	Butylene glycol	Butylene glycol	4.00
	Carbopol ultrez 21 polymer	Acrylates/C10-30 alkyl acrylate crosspolymer	0.50
	1Flower/1leaf extract	*Etlingera elatior*	1.00
	DI water	Aqua	q.s. 100
C	NaOH (18% w/v)	Sodium hydroxide (for adjusting pH to 5.5)	0.30
D	Spectrastat BHL	Caprylhydroxamic acid (and) 1,2-hexanediol (and) butylene glycol	2.00

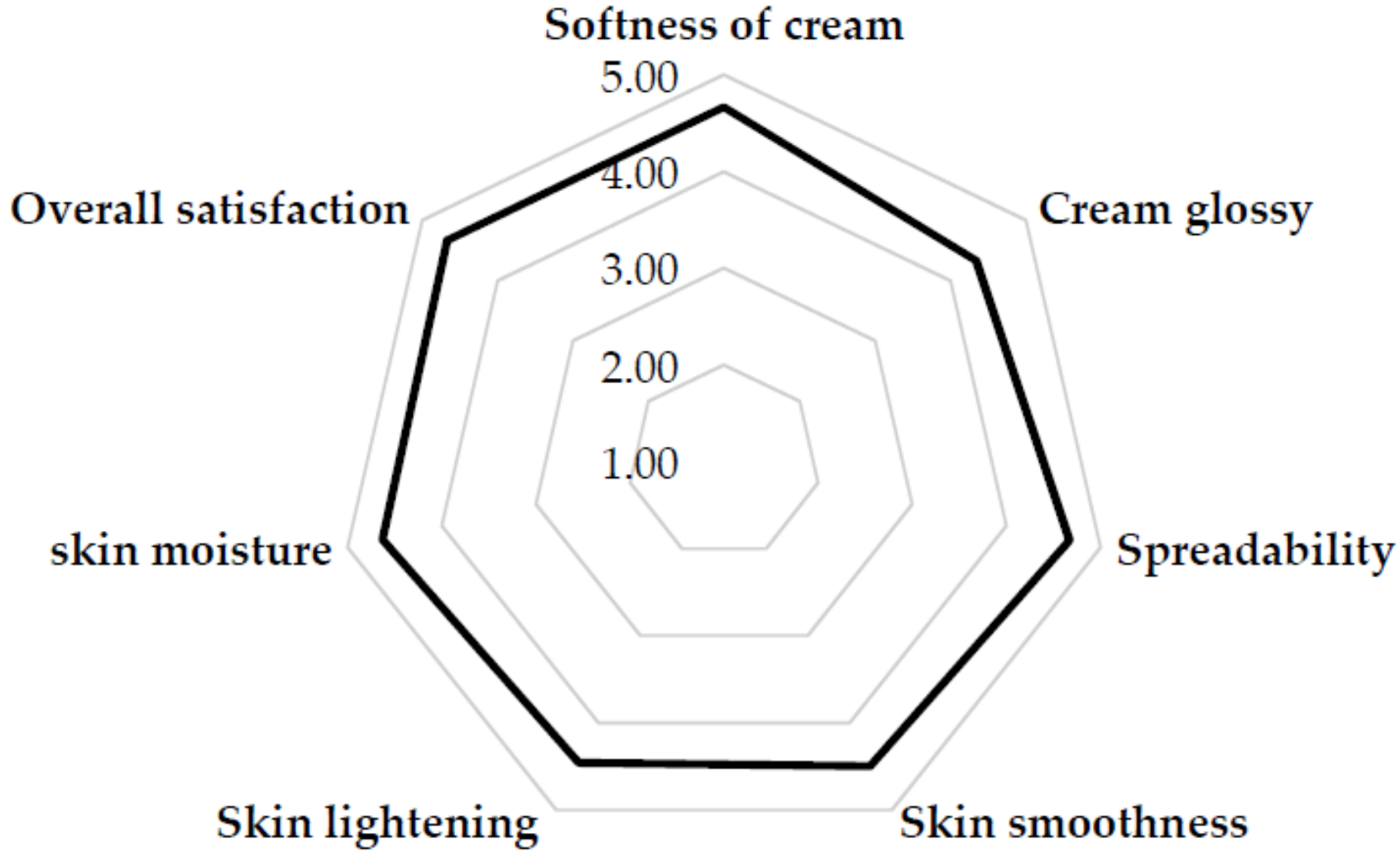

Figure 4. The satisfaction of the volunteers with the FL1 cream.

Product Development- Green Synthesis of Gold Nanoparticles

molecules

MDPI

Article

Etlingera elatior-Mediated Synthesis of Gold Nanoparticles and Their Application as Electrochemical Current Enhancer

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Product Development- Green Synthesis of Gold Nanoparticles (AuNPs)

- The use of plant materials for the synthesis of AuNPs.
- Reducing agents- used as a simple green synthesis of AuNPs by using an **aqueous extract** of **torch ginger.**
- Gold nanoparticles used in **drug delivery** in **biological** and **medical applications, plant genetics** and **sensory probes**.

Challenges and Future Perspectives

Breeding Attempt and Challenges

- Due to the **inflorescence structure**, the crossing process and its analysis is challenging to perform.

- The difficulty of crossing is proven **with low fruit set** due to the position of the **individual flowers in inflorescence**, **identifying crossed** and **pollinated flowers**.

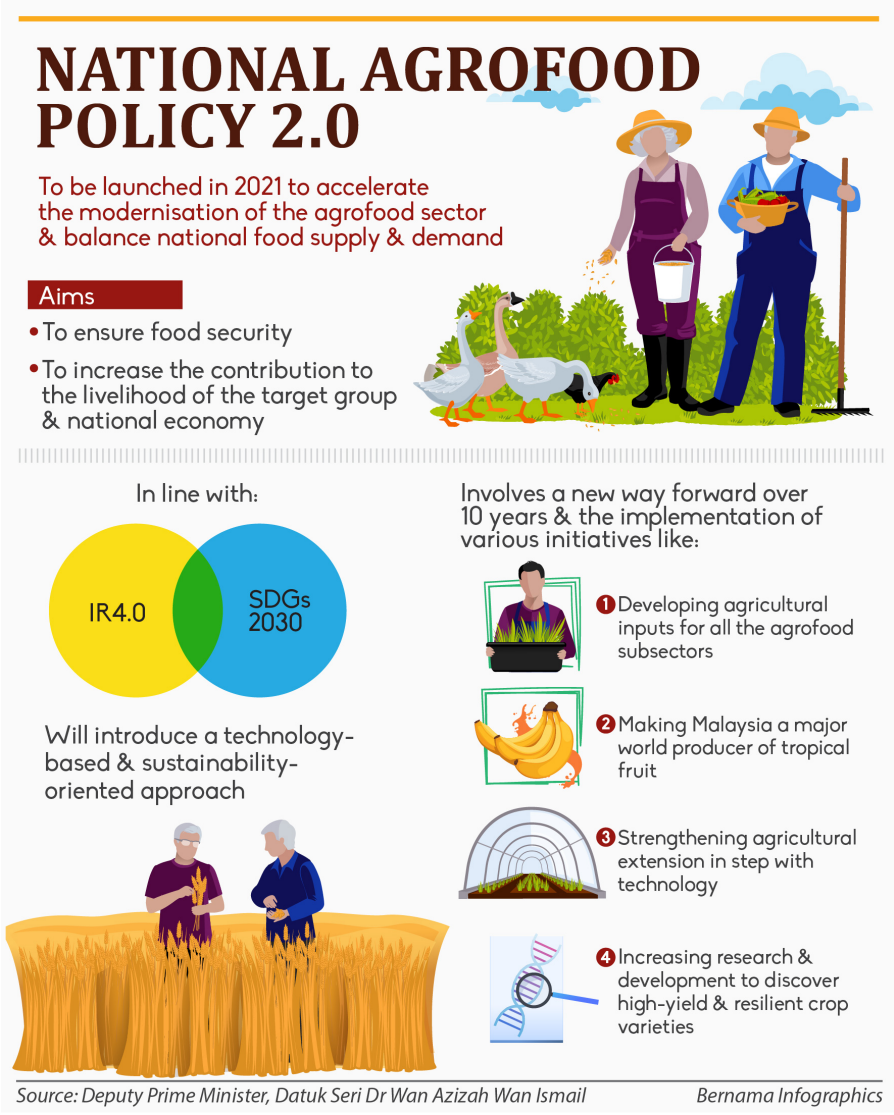
- More effective means of identifying individual flowers which have been pollinated is needed

Future Perspectives

- The export value of **Malaysia's floriculture industry** stands at US$ 119 million (RM 500 million) in 2017, which created 50,000 jobs opportunities. Moreover, Malaysia is ranked **8th in the world** as an **exporter of floriculture products**.

- Thus, the **expansion of the industry** will increase the national income and strengthen the nation's economy.

National Agrofood Policy 2021-2030



Farmers

Harian Metro, 2021

Kosmo, 2020

Harian Metro, 2020

Harian Metro, 2020

What can we do? Germplasm collection

- In Malaysia, torch ginger is mostly cultivated by small scale farmers with **land race varieties**.

- The **national germplasm** and **national database portal** for collections need to be constructed to select traits that can be used in the future to generate more **new cultivars**.

What can we do? Genetic Improvement

- Biotechnological techniques that can be manipulated are **somaclonal variation** through **plant tissue culture, genetic engineering**, and *in vitro* mutation. It would be worth exploring the **possibility of improvising** and producing **new food products** based on the nutritional value of the plant.

- Modern households move towards modern **interior decorations**. The successful inducing **dwarfism** of torch ginger was the starting point to produce cultivar suitable for indoor plants.

What can we do?

- Accelerating modern technology application
- Optimizing farm size for productivity
- Establish an efficient agrofood value chain
- Strengthening specific industry for herbs and medicinal plants
- Enhancing value added in food industry and agro related activities
- Clinical test for toxicology assessment and mutagenicity analysis. Cosmetic and nutraceutical products.

Conclusion

- It is a plant with a lot of benefits.

- Torch ginger can be planted into industrial scale as abundance of potentials make this plant as a perfect candidate for the plant of the future.

Publications

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Journal of Agricultural Science
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Commercial Potentials and Agronomic Status of *Etlingera elatior*, a Promising Horticulture Plant from Zingiberaceae Family

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In vitro propagation of *Etlingera elatior* (Jack) (torch ginger)

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In vitro mutagenesis of *Etlingera elatior* (Jack) and early detection of mutation using RAPD markers

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Thank You

- Team Members

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