Crops Improvement of Tropical Fruits in Bogor Agricultural University

Center for Tropical Fruit Studies & Department of Agronomy & Horticulture
BOGOR AGRICULTURAL UNIVERSITY
Mandate

Improve Tropical Fruits Competitiveness through Breeding Program, Technology Development, Marketing and Clustering
Facilities

Laboratories:
✓ Tissue Culture
✓ Molecular Biology
✓ Post Harvest
✓ Plant Physiology
✓ Pest and Disease
Facilities

Field Station
✓ Kebun Tajur I (4 ha)
✓ Kebun Tajur II (3.5 ha)
✓ Kebun Pasir Kuda (1.8 ha)
Strategy and Approach

- Ideotype of products referred to stakeholders preferences
- Long term program
- Transparency in planning and implementation of the program
- Guided by Roadmap Technology
Crop Improvement

Tropical Fruit Genetic Studies

1. Mangosteen genetic variability, first elucidated in 2002
2. Mangosteen origin, source of variability
3. Spine characters inheritance of pineapples
4. Papaya gender expression molecular marker
Mangosteen apomixis & polyembryonic seed
Crop Improvement

Mangosteen varieties

Mangosteen Wanayasa
Mangosteen Puspahiang
Mangosteen Malinau
### Morphological Characters

<table>
<thead>
<tr>
<th>No.</th>
<th>Characters</th>
<th>No.</th>
<th>Characters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flowering time</td>
<td>8</td>
<td>Anthers arrangement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Presence of anthers at female flowers</td>
</tr>
<tr>
<td>2</td>
<td>Colour of the sap</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Colour of Sepal (Corola)</td>
<td>10</td>
<td>Fruit shape</td>
</tr>
<tr>
<td>4</td>
<td>Stigma position</td>
<td>11</td>
<td>Textur of the fruit peel surface</td>
</tr>
<tr>
<td>5</td>
<td>Textur of stigma surface</td>
<td>12</td>
<td>Colour of mature fruits</td>
</tr>
<tr>
<td>6</td>
<td>Ratio <em>stigma lobes</em></td>
<td>13</td>
<td>Aroma of the aril</td>
</tr>
<tr>
<td>7</td>
<td>Diameter of stigma</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Richards, 1990*
Garcinia selebica  
\[ \times \]  
Garcinia malaccensis

\[ \downarrow \]

Garcinia mangostana

- 81 morphological characters
- 11 primers
- 180 tapes

Lasih, 2011
Crop Improvement

Germplasm Collection

TUNAS AK R 1000 (6)

Pepaya Mini

Pepaya Besar
Crop Improvement

Small size papayas

ARUM BOGOR

IPB 3

Soft,
Easy to be eaten using spoon
Crop Improvement

Medium-big size papayas

Released and disseminated with Sukabumi Regency
Crop Improvement

High nutrient value banana

- Sweet
- Tasty
- High carotene contents (88.3 mcg/100 g)
- Low glycemic indexes (52%)
- High economic value

Disseminated with Bogor Regency, and Central Java Province Local Government
Crop Improvement

Diseases tolerance banana

Fusarium Wilt

Blood Diseases Bacterial Wilt
Crop Improvement

High value local variety

Delika Subang
Mahkota Bogor

Released and Developed with Bogor Regency
Crop Improvement

New hybrid varieties

V4
No PPVT: **25/PVHP/2007**

V 49
No PPVT: **26/PVHP/2007**
Crop Improvement

New type pineapple

Golden Pineapple

The new Ideotype
Crop Improvement

New hybrid of melon

Bright Meta
Snow White Meta
Golden Meta
Crop Improvement

New hybrid of melon

IPB-MH301 (Sunrise Meta)
IPB-MH302 (Orange Meta)
IPB-MH303 (Mentor Meta)
IPB-MH304 (Equator Meta)
Crop Improvement

Propagation materials production
1. Mother plantlet propagation of pineapple and banana
2. Development of tissue culture protocol for seedling production of pineapple and banana
3. Production and dissemination of seed papaya
4. Production of mangosteen seedlings
Research Results on Technological Development

Seed Propagation:

- In-vitro propagation of pineapple with high *multiplication rate* and low genetics variability
- Embryo somatic culture of papaya for sex expression trapping
- Regeneration of mangosteen
Research Results on Technological Development

Propagation materials production
Research Results on Technological Development

Field Production Technology:

- Utilization of microorganism for rooting improvement in mangosteen.
- Harvesting pattern mapping of mangosteen throughout Sumatra and Java for marketing purposes.
- Bio-control agents for panama disease in banana.
- Identification of parasitoid for Desmicoccus brevives as viral vector on pineapple
- Improvement of mangosteen orchard
- Control of Gumosis (Yellow Latex)
Field Production Technology Development

Application of *A. rhizogenes* for rooting improvement of mangosteen

- Control
- ATCC15834
- TISTR 509
- 07-2001
- R1000
- A4
Yellow latex is the main problem in mangosteen agribusiness, because it becomes a factor that reduces the fruit quality.
The ducts are found in the exocarp, mesocarp, endocarp, aril of the fruit, flower, stem and leaf.
Ultrastructural observation showed that the ducts were surrounded by specific epithelial cells, which were living cells containing dense cytoplasm with plastid, mitochondria and golgi apparatus organelles.
The ducts are branched, canal-like type

There are continuous secretory ducts from fruit stalk to the fruit.
The qualitative test indicated that the yellow latex collected from stem bark, outer part of fruit, young fruit pericarp, mature aril and young aril contained terpenoid, flavonoid and tannin, but not alkaloid, saponin and steroid.
Yellow latex become a problem when the epithelial cells of the duct rupture, and the latex spilled into the aryl.

We found that the rupture of epithelial cells due to low Ca in the soil. The Ca needed to form calsium-pectat in the cell wall of epithelial cells. Spraying CaCl2 directly to the fruits decreased the yellow latex incident at the aryls.
Field Production Technology Development

IPM for Mealybug Wilt Diseases

Model for fertilizer application dosage

$y = -3 \times 10^{-5}x^2 + 0.0347x + 64.795$
$r = 0.94^*$

$y = -101.06x^2 + 188.96x + 8.6117$
$r = 0.91^*$
Research Results on Technological Development

Field Production Technology:

- Fruit size manipulation on papaya and pineapple
- Seedling treatment for hermaphrodite expression on papaya
- GAP Implementation on farmers through establishment SOP of Papaya, Pineapple, Banana, Mangosteen, Melon, Salacafriet, Citrus (in cooperation with Ministry of Agriculture)
Culture Technology Development

- Higher productivity (45-80 kg/tree)
- Export quality up to 40%, from 10%
- Increasing environment awareness among farmers
Improvement of mangosteen orchard system will be adopted nationwide.
Fruit for Catchment Area Rehabilitation

Fruit very suitable to use in catchment area which is provide economic benefit to villagers and maintain buffering capacity as environments benefit to community.
Research Results on Technological Development

Post-harvest technology

- Pineapple for specific purpose (bromelain)
- Utilization banana flour as high nutrition of instant baby food.
- Papain studies of papaya
- Starch contents studies of several banana cultivar.
- Establishment National Standard of Indonesia (SNI) for Pineapple, Banana, Citrus, and Passion Fruit (Cooperated with Ministry of Agriculture).
Research Results on Technological Development
Fruit processing
Services

- Trainings
- Business Consultation
- Research Collaboration
- Community Development
Partnership

- Business
- Government
- Farmer
- R&D Institution
Publication and Promotion
Publication and Promotion

Promotion and database:
- Website: [http://www.pkbt.ipb.ac.id](http://www.pkbt.ipb.ac.id)
- Booklet, brochure, poster
- Newspaper: Agrina, GATRA, Trubus
- TV: acara asal usul, empat mata
Terima Kasih

http://www.pkbt.ipb.ac.id; email : ipbfruit@indo.net.id