Conserved and novel mechanisms underlie oil palm (*Elaeis guineensis* Jacq.) fruit abscission: A model for studying fruit abscission in the palm family (*Arecaceae*).

**Fruit abscission is a domestication trait**

*Elaeis guineensis* (African Oil Palm) as a model

Unsynchronized fruit ripening and abscission of palm fruit cause economical losses

MRI 3D Imaging of palm fruit reveals H₂O abundant AZ
Cell wall striations appear and plasmodesmata increase in size during development of the AZ layer cells.

30 DAP

120 DAP

Cell wall striations appear particularly at tip of AZ cells

120 DAP

What are cellular features of a functional AZ (ripe fruit)?

• Vascular bundles remain undifferentiated in AZ
• Phenolic cells
• Nuclear alignment (AZ organizes into cell layers)
• Intracellular pectins accumulate during development throughout AZ layers

What cellular features change during separation?

• AZ toluidine blue color change after separation suggests cation changes in cation environment (e.g., H+, Ca²⁺)
• Intracellular pectins decrease

Nuclei remain intact and aligned in the AZ

Primary AZ of oil palm is rich in unmethylated homogalacturonan (HG, pectin backbone)

Are there changes in the methylation status of HG in the AZ?
**Figure 4.1. Schematic of abscission zone evolution during development until after separation 180 DAP (right)**

- Ethylene
  - Plasmodesmata expansion and amount decrease
  - Angular nuclear shape alteration

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**The polygalacturonase gene *EqPG4* has spatial and temporal expression related to AZ cell separation**

**In situ hybridization**
- *EqPG4* transcript

**Epifluorescence (signification)**
- Polarized light

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**Which genes are expressed in the AZ during abscission:**
- Transcriptome (RNA seq)

**Objectives:** Identify AZ specific gene expression and analyze transcriptional basis of oil palm fruit abscission

- AZ
  - AZ30: Non functional AZ
  - AZ150: Functional AZ
  - F150: No separation (No AZ)

+ ethylene
- 3h, 6h, 9 h
There are two species of oil palm: *E. guineensis* and *E. oleifera* separated by approximately 15-20 Myr.

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Ethylene induces AZ specific expression during abscission

Ethylene induces AZ specific expression during abscission

The search for non-shedding oil palm

- Collected in Taisha 2006 (Philippe Amblard and Claude Louis, PalmElit/CIRAD)
- Planted at Colé by DANEC and Murrin Corp.
Is *E. oleifera* non-shedding (no abscission)?

Field phenotyping

**Field notes**
- Confirm pollination
- **NS** – not shedding
- **Sh** – shedding
- **Sh (low)** – a little shedding
- **IM** – Immature fruit
- **NF** – no fruit
- **IC** – incomplete pollination
- **D** - dead

**Other Notes (e.g.)**
- Only one fruit
- Signs of shedding

In vitro phenotyping

Before

After

**E. oleifera** Taisha that do not abscise fruit and have different AZ anatomy

Is non-shedding a character in wild populations?

How has the abscission behavior evolved in the Palm Family?

Palm diversity in Ecuador

- 32 genera
- 136 species of palms
- 20% of all palm species known to the Americas.

http://www.palmbase.org

*Elaeis oleifera* collections (AAU Herbarium)
Thank you very much