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Unravelling Synergistic Effects of Palm Bunch Ash and Glutathione on Plant Growth

Participant: Koh Yi Sze
University: Monash University Malaysia
Faculty: School of Engineering
Supervisors: Dr Patrick Tang, Dr Goh Bey Hing

Introduction: Palm bunch ash (PBA)

Fresh Fruit Bunch (FFB)

- Palm oil cultivated from mesocarps of the oil palm fruits

Empty Fruit Bunch (EFB)

- 22% of FFB, major waste
- Mostly incinerated to be disposed

Palm Bunch Ash (PBA)

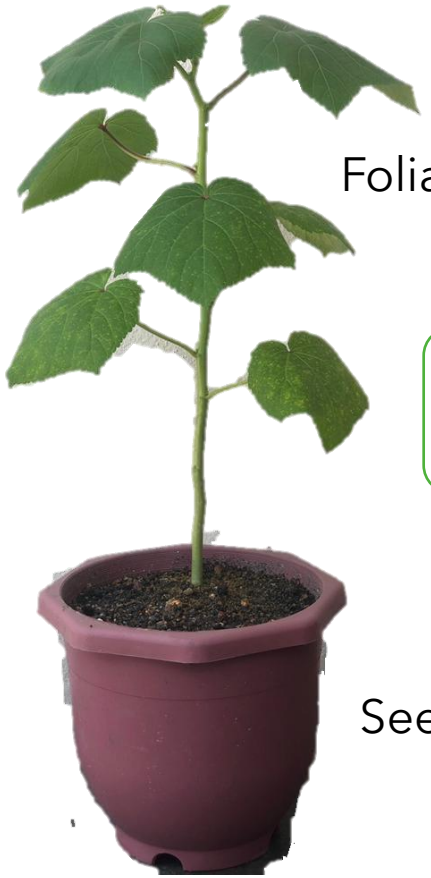
- > pH 7 & rich in potassium
- Reduces soil acidity and acts as a potash fertiliser [1]

Introduction: Glutathione (GSH)

GSH is a tripeptide, found abundantly in most plant tissue

Roles: Antioxidant, regulates enzymatic & photosynthetic activities

Induced by abiotic stresses; Inhibited by extreme stresses.



Foliar spray

Exogenous applied GSH

Seed soaking

Mitigate oxidative stress and damage to plants

Improved growth and yield of various plants [2]

Problem Statement

- Plants are susceptible to environmental stresses.
- Individual application of PBA and GSH improve growth of plants.
- However, there is yet to be a research on the effects of the **combined application** of PBA and GSH on plant growth

Objective

- **To assess the effects of PBA, GSH and their combined application** on okra plant growth through:
  - Examination of growth parameters like **plant height**, **stem girth**, **number of leaves per plant** and **leaf area**.

Experimental Design

4 groups , 4 replicate pots & 6 seeds each:

A. Control group

- Water-soaked & planted in black soil (3 kg) only

B. PBA group

- Water-soaked & planted in PBA-soil (200 g: 3 kg) mix

C. GSH group

- GSH-soaked (100 mg/L) & planted in black soil (3 kg) only

D. PBA-GSH (Combination) group

- GSH-soaked (100 mg/L) & planted in PBA-soil (200 g: 3 kg) mix

Experimental Procedures

1) Seed Soaking

- 60 seeds in GSH
- 60 seeds in water

2) PBA: Soil Mixing

- 200g PBA: 3 kg black soil for 8 pots

3) Planting

- 6 seeds in each pot accordingly
- Watered daily

4) pH & NPK Soil Test

- Soil samples added with reagents
- Compared against colour charts

Results & Discussion

Soil Test, Plant Height, Stem Girth, Number of Leaves per Plant, Leaf Area

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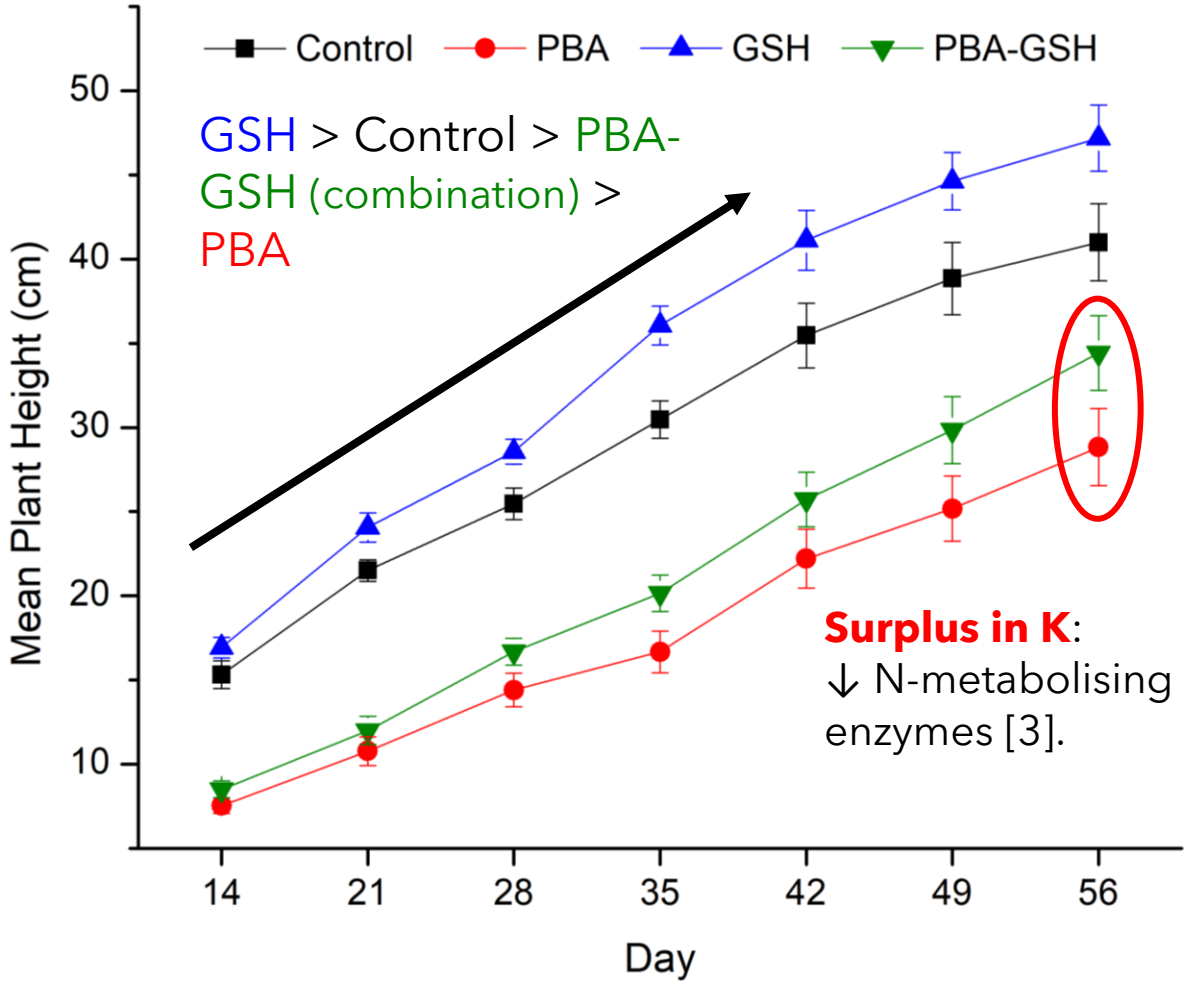
Soil Test

For NPK level: 0 = depleted, 1 = deficient, 2 = adequate, 3 = sufficient, and 4 = surplus.

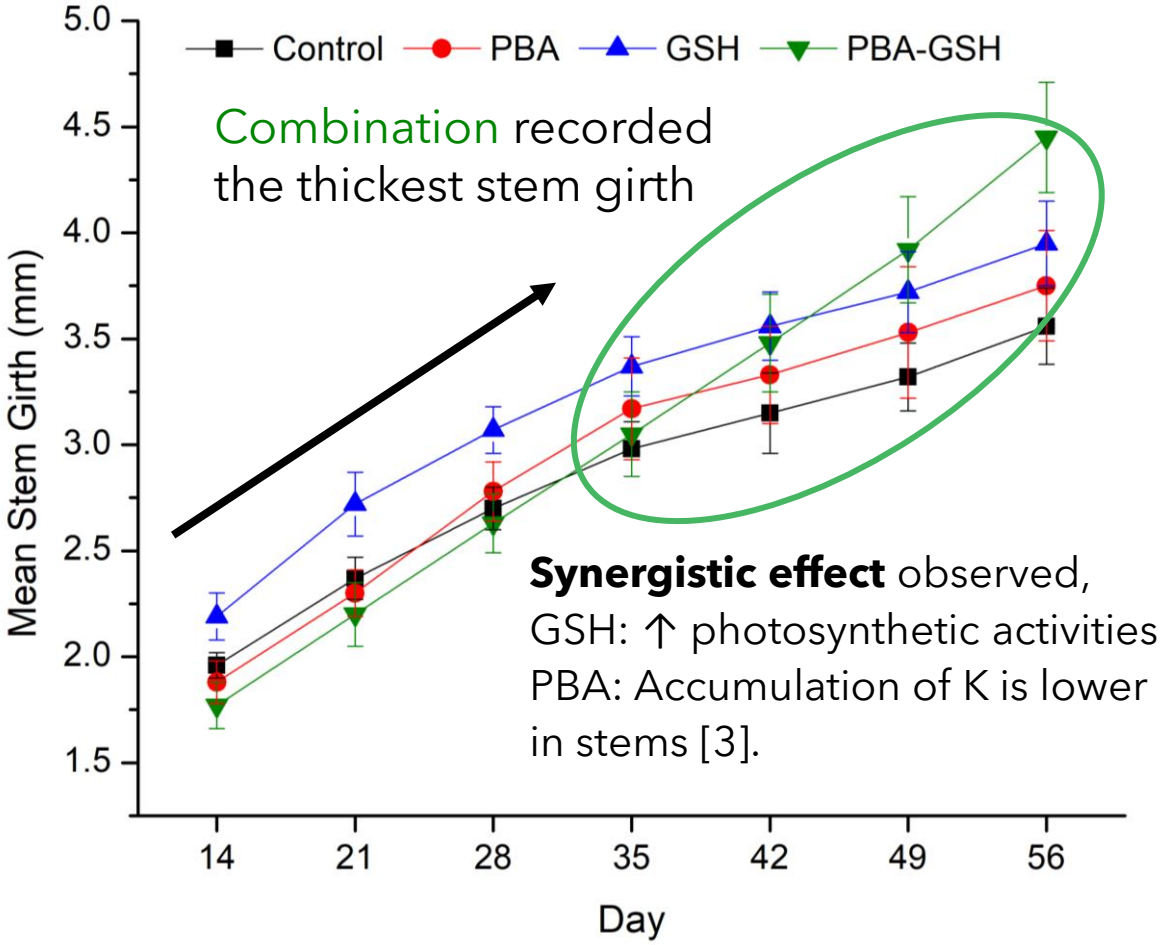
Soil Sample	Day 0			Day 42			
	Black soil	**PBA**	**PBA-soil mix**	Control group (**Black soil**)	PBA group (**PBA-soil mix**)	GSH group (**Black soil**)	PBA-GSH group (**PBA-soil mix**)
pH	6.5	> 7.5	7	6.5	7	6.5	7
Nitrogen, N	N2	N0	N2	**N2**	**N2**	**N2**	**N2**
Phosphorus, P	P3	P3	P3	**P3**	**P3**	**P3**	**P3**
Potassium, K	K2	K4	K4	K2	**K4**	K2	**K4**

- No change in properties; pH: 6.5 – black soil, 7 – PBA-soil mix.
- Nitrogen level **adequate;** Phosphorus level **sufficient** in all soils
- Potassium level **surplus** for PBA-soil mix

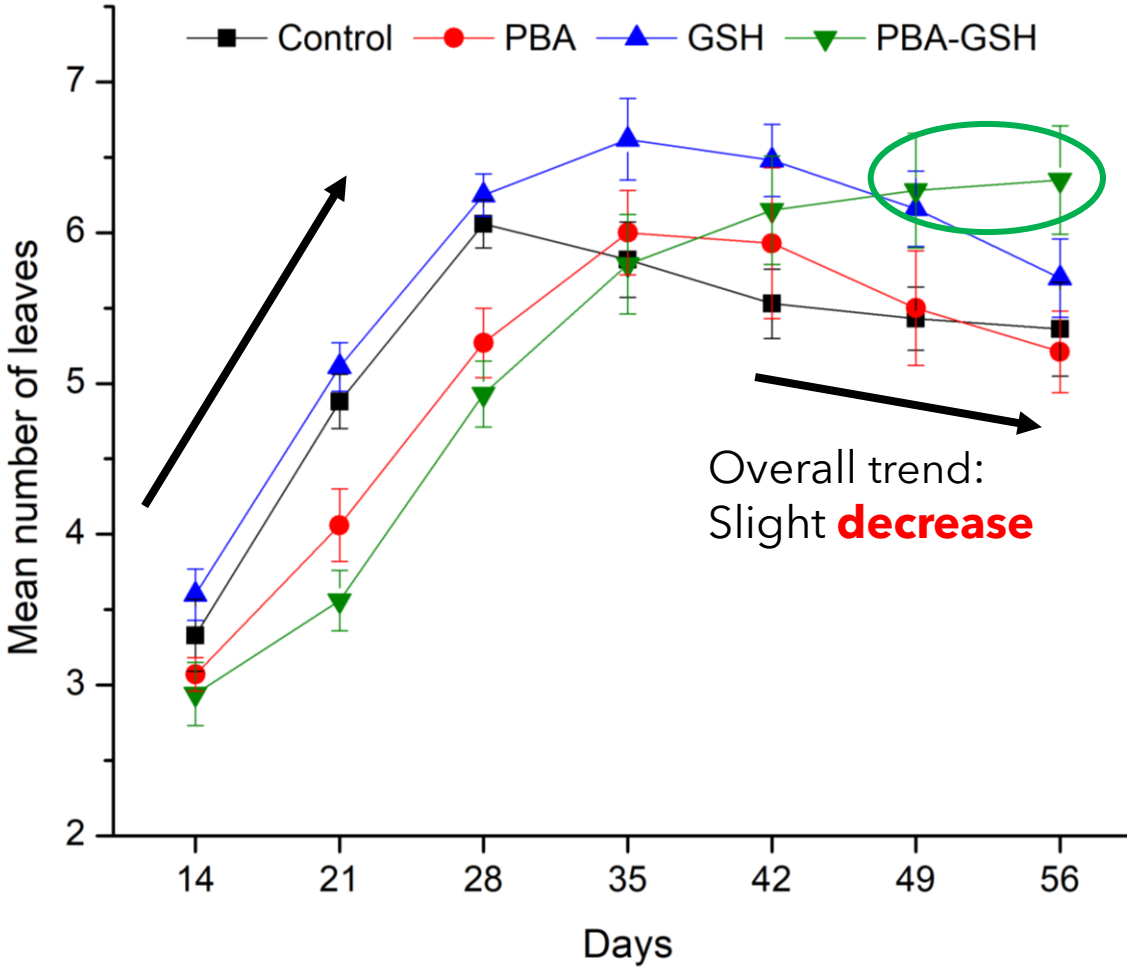
Plant Height



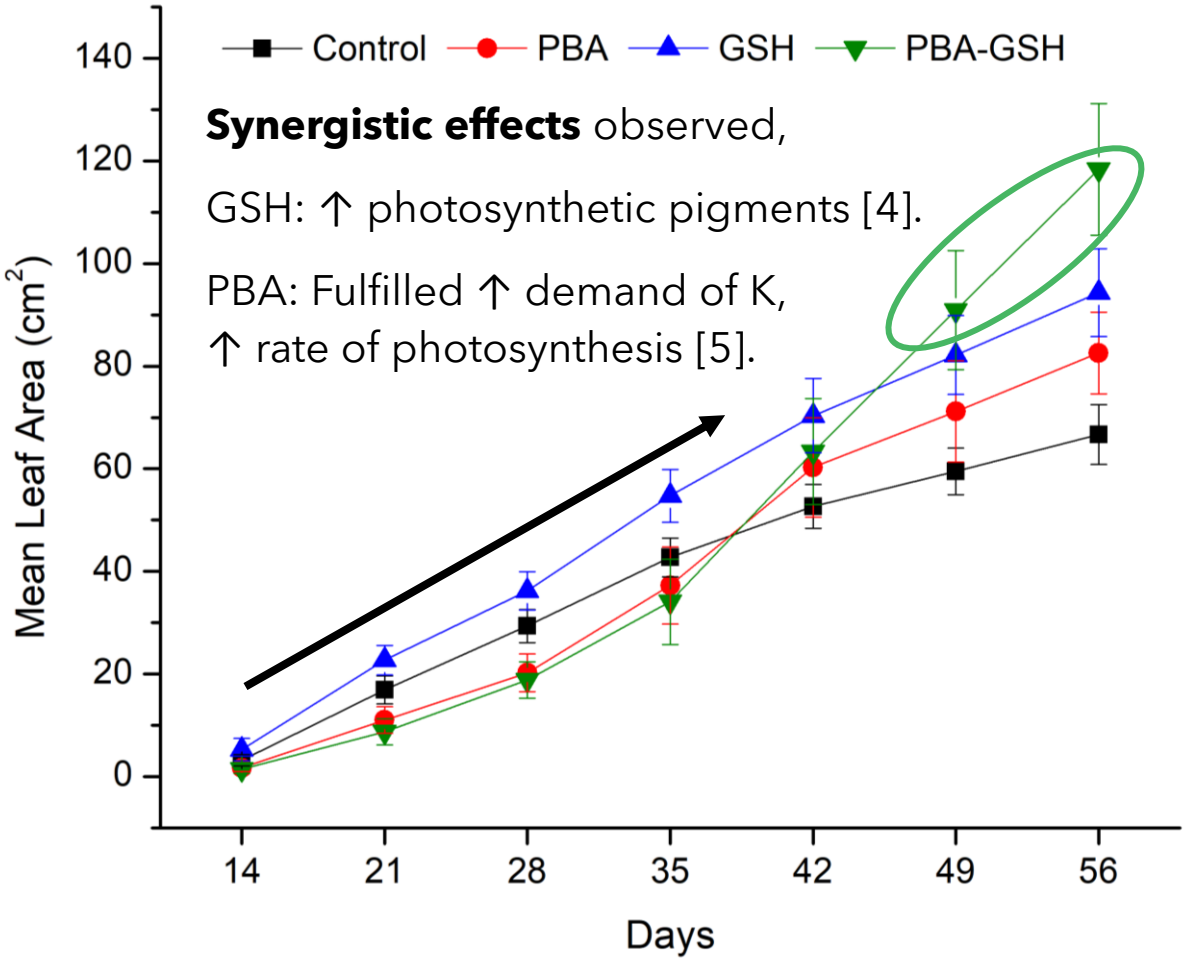
Stem Girth



No. of leaves



Leaf surface area



Visual Assessment

Control: White Spots, Chlorosis, Wilting

Powdery mildew: Fungus that favours high humidity [6].

PBA: Curling & shrunken leaves, White flies and eggs

Vectors of okra enation leaf curl disease (OECD) [7];

GSH: Bigger leaves with a few yellow leaves

PBA-GSH: Bigger leaves with darker green

Increased photosynthetic pigments and improved resistance to diseases; Indicates presence of more chlorophyll [5];

Conclusion

- **Synergistic effects of combination PBA-GSH group** were evident in later stages:
  - **PBA** fulfilled the increasing nutrient demand
  - **GSH** enhanced enzymatic and photosynthetic activities

- **Future Works:**
  - **Lab analysis** of 1) Black soil and PBA composition; 2) Enzymatic and photosynthetic activities of plants
  - **Encapsulation work** to produce controlled release for PBA and GSH

Thank You

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