Effects of Foliar Application of Varying Levels of Paclobutrazol on Morphological Responses of NSIC SP 30 Sweet Potato Variety (*Ipomoea batatas* L.) under Waterlogged Conditions

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1 Introduction & Aim

The Philippines is highly prone to natural hazards such as typhoons, floods, landslides, earthquakes, tsunamis, and volcanic eruptions. In Region VIII (Eastern Visayas), particularly Samar and Leyte, frequent typhoons cause severe flooding that destroys livelihoods, especially crops. Climate change further worsens waterlogging due to intense rainfall, leading to soil hypoxia (low oxygen levels). Root development is a key indicator of plant resistance to hypoxia, yet little is known about how sweet potatoes respond to such conditions. Overall, drought and flooding remain major factors limiting global crop productivity (Engel et al., 2008; Nguyen et al., 2020).

Paclobutrazol (PBZ) protects plants from various stresses including drought, temperature extremes, UV-B radiation, pollution, and fungal infections by boosting antioxidant defenses that neutralize harmful reactive oxygen species (Watson and Himelick, 2004). In Eastern Visayas, flooding from heavy rainfall threatens sweet potato production. PBZ has been shown to reduce oxidative damage by enhancing antioxidant activity, though its current use is mainly recommended for mango, tomato, and avocado. The study aims to evaluate the effect of paclobutrazol (PBZ) on the vegetative growth and morphological characteristics of sweet potato grown under waterlogged conditions.

2 Methodology

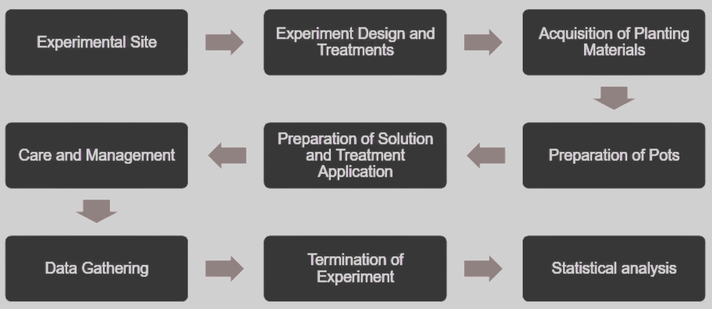


Figure 1. Schematic representation of activities conducted.

Figure 2. Actual preparation of the study. Starting from top-left, moving right, row by row: Preparation of soil mixture for potting; arrangement of pots and trays for planting setup; Paclobutrazol solution Permagro used for foliar application; sweet potato transplants established in pots; growth observation of established sweet potato in pots; preparation of PBZ foliar spray solutions in the laboratory; experimental setup of sweet potato under greenhouse conditions; leaf morphological response showing PBZ treated plants; and measurement of oven-dried sweet potato biomass using a digital scale for data collection.

Experimental Treatments

- Treatment 0 - Control (0 mg active ingredient PBZ per plant)
- Treatment 1 - 25 ppm PBZ
- Treatment 2 - 50 ppm PBZ
- Treatment 3 - 75 ppm PBZ
- Treatment 4 - 100 ppm PBZ

Experimental Layout

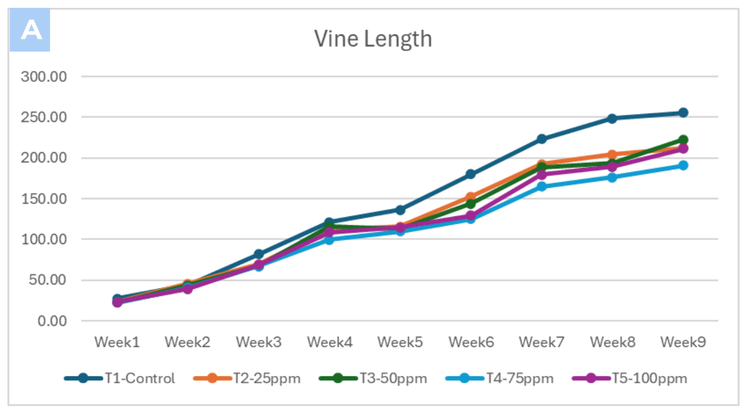
- The experiment was laid out in a randomized complete block design (RCBD) with three replications and three samples.

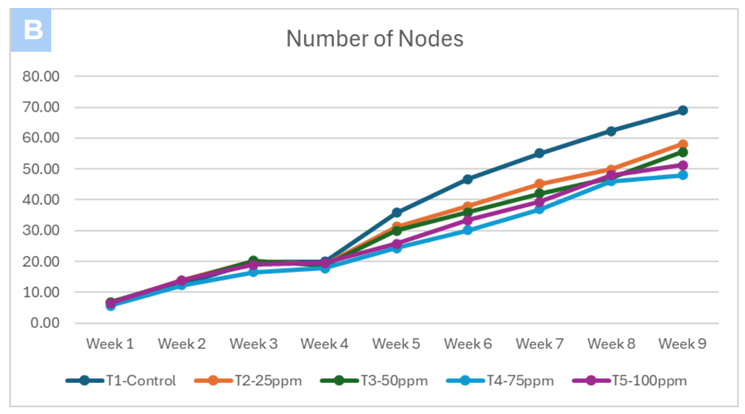
Data Gathered

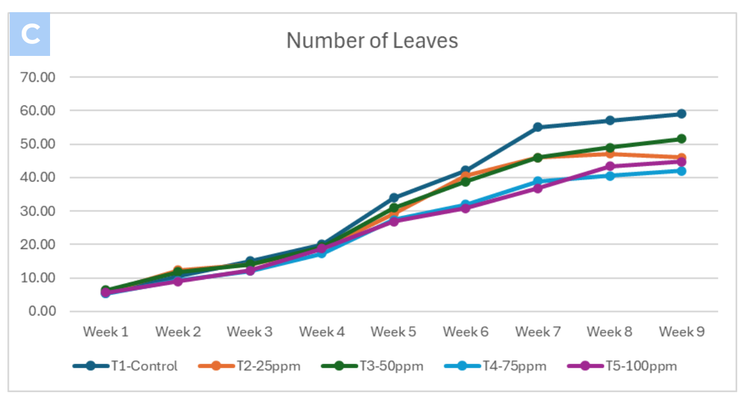
- **The growth parameters** measured in sweet potato plants included vine length (cm), number of nodes, number of leaves, number of lateral branches, vine diameter (cm), internode length (cm), and petiole length (cm). **The harvest parameters** recorded were fresh weight (shoot and root), fresh weight (shoot), fresh weight (root), root length, root diameter, oven-dried weight (shoot), and oven-dried weight (root).

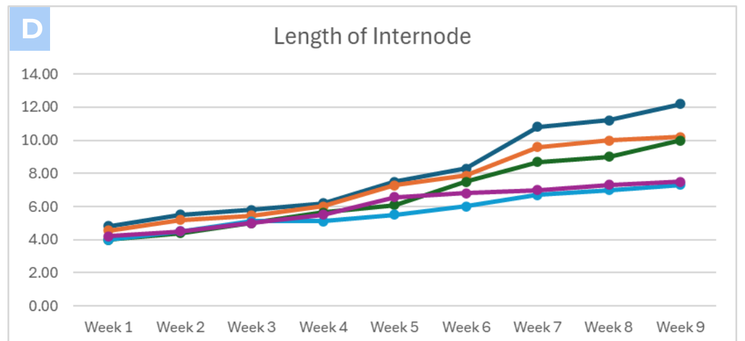
3 Findings

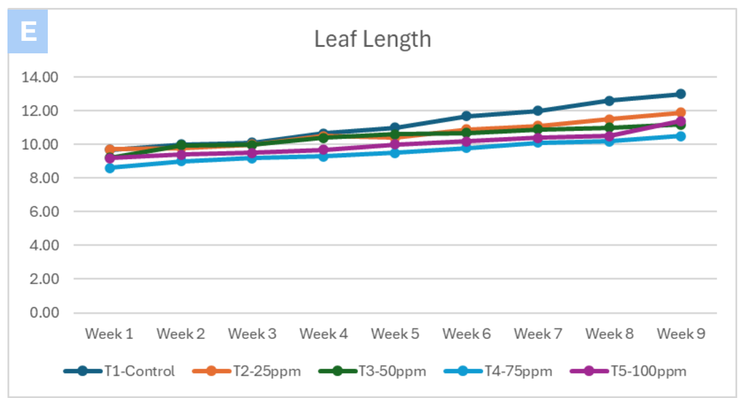
Figures A-I: Vine lenght, number of nodes, number of leaves, length of internode, leaf length, leaf width, fresh weight and dry weight, rooth length (cm), and root diameter (mm), of sweet potato NSIC SP 30 variety (cm) as influenced by varying levels of paclobutrazol (PBZ) across nine weekly measurements (W1-W9).

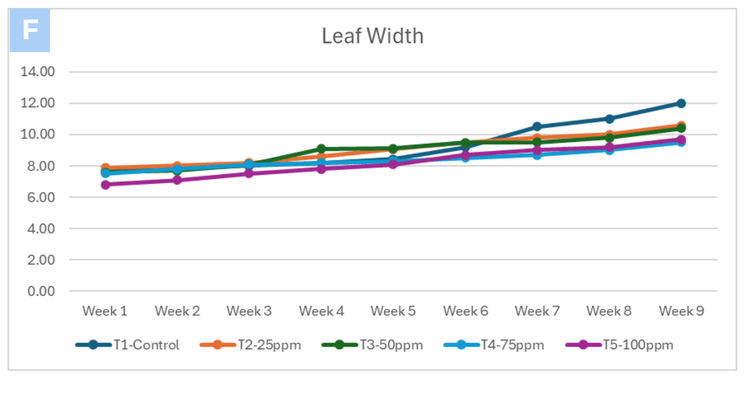


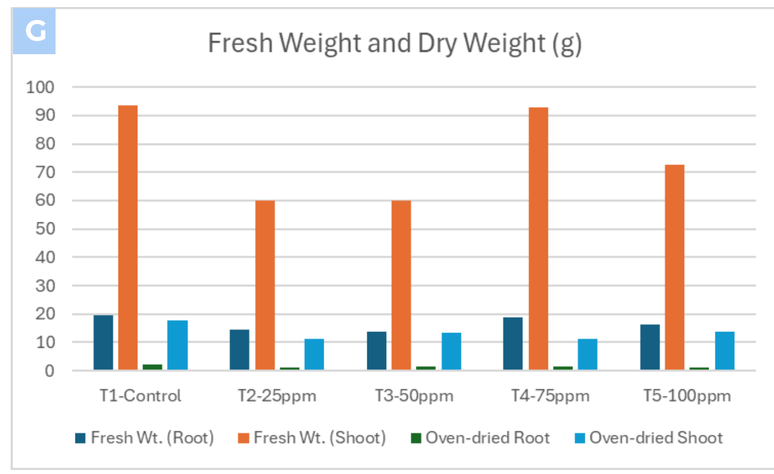


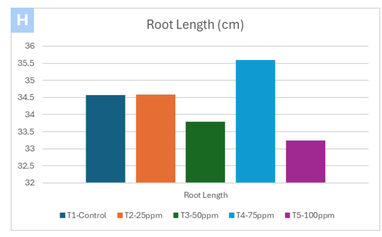












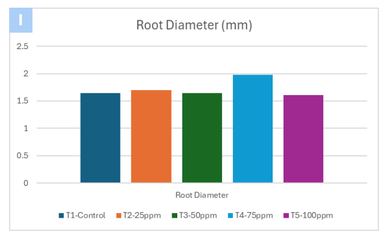


Figure 3. The root length and diameter at 9 weeks after application.

4 Conclusions

- A general trend observed across most vegetative parameters was that the control group consistently exhibited the highest growth, while higher concentrations of PBZ (75 ppm, 100 ppm) generally led to reduced growth, especially in the later weeks of the experiment. This confirms the expected dwarfing effect of PBZ.
- The analysis of fresh biomass parameters at harvest showed that the 75 ppm PBZ concentration performed comparably to the control in terms of overall fresh weight, fresh root weight, and fresh shoot weight.
- This indicates that despite the significant vegetative dwarfing, PBZ at this optimal concentration was able to maintain the total fresh biomass production including storage root development which is a crucial aspect for agricultural yield.

5 Recommendations

- The use of 75 ppm PBZ is recommended for farmers aiming to prioritize storage development over vegetative growth particularly in waterlogged or stress-prone environments.
- For optimal root development and avoid excessive suppression of shoot growth, PBZ should be applied during early vegetative growth at 14-21 days after transplanting.
- Similar study should evaluate different sweet potato varieties to determine varietal responses to PBZ under waterlogged conditions. This will help identify cultivars best suited for maintaining storage root development and growth regulation in flood-prone areas.
- Antioxidant properties should also be analyzed to evaluate the potential of sweet potato to combat stress.

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