

GROWTH PERFORMANCE OF *Trema orientalis* L. (Blume) Ulm. SEEDLINGS IN RESPONSE TO MINERAL NUTRIENT OMISSION

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ABSTRACT

The Philippine forest land is among the top threatened biodiversity areas in the world and one of the major causes is deforestation. In reforestation, pioneer tree species are planted first to copy the natural flow of forest succession. Studies on early successional tree species are limited, especially on determining the growth performance as affected by nutrient deficiency. The study was conducted under screen house condition at the Terrestrial Ecosystems Division (TED), Institute of Tropical Ecology and Environmental Management (ITEEM), Visayas State University, Visca, Baybay City, Leyte. This study aimed at evaluating the effect of nutrient omission on morphological and physiological growth of *Trema orientalis* L. (Blume) Ulm. The experimental design was randomized complete block design, with 7 treatments [control (no fertilizer), -N, -P, -K, -Ca, -Mg, and NPKCaMg] and 3 replications with 35 seedlings in each replication which constituted a total of 735 seedlings. The root collar increment, plant height increment, number of leaves, leaf area, dry biomass and root shoot ratio were evaluated.

After six months of fertilizer application, results showed that there was an increasing influence ($p \leq 0.01$) to the root collar diameter increment, plant height increment, number of leaves and leaf area specially in -Ca treatment. The biomass production and root-shoot ratio was significantly affected ($p \leq 0.01$) in control and -N treatments. Stunted growth and reduced leaf were exhibited in seedlings planted at -N and control treatments. Therefore, fertilizer application significantly enhanced the growth ($p \leq 0.01$) of the seedlings. Likewise, nutrient element omission significantly influenced ($p \leq 0.01$) the growth performance and biomass production of *Trema orientalis* L. at seedling stage.

INTRODUCTION

- Reforestation provides environmental and economic benefits as well as enrichment of biodiversity. It also improves chemical properties of soil and provides higher net income because of the availability of resources (Neidel et al., 2012).
- In a disturbed and damaged ecosystem, the early successional tree species together with other pioneer plants are the first to grow because they can adjust to poor soil conditions and adverse environmental situations (Natividad, 2016).
- Each species of plant has an ideal nutrient uptake ratio together with the exact amount of water, light, and heat allocation needed for plants to effectively use the nutrients (Uchida, 2000).
- Assessing the growth performance of early tree species is important with respect to assisting experts to better formulate a strategy to contribute in the restoration efforts of degraded terrestrial ecosystems.

OBJECTIVES

- To evaluate the morphological performance of *Trema orientalis* seedlings as affected by nutrient element omission under screen house conditions; and
- To determine the influence of nutrient element omission on the physiological performance of *Trema orientalis* seedlings.

MATERIALS & METHODS

- Location of the Study Site
- Potting medium
- Nutrient Solution
- Initial Measurement and Measurement A After Six Months of Fertilizer Application
- Morphological Measurements
 - Root Collar, Shoot Height, Number of Leaves and Leaf Area
- Physiological Measurements
 - Dry Biomass and Root Shoot Ratio
- Data Encoding and Statistical Analysis

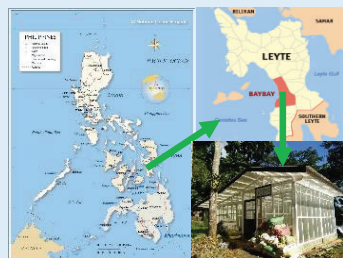


Fig 1. Location of the Study Site



Fig 2. (a) Experimental Set-up, (b) Preparation of Potting Medium and Transplanting

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RESULTS

A. MORPHOLOGICAL PARAMETERS



TREATMENT	ROOT COLLAR INCREMENT (MM)	SHOOT HEIGHT INCREMENT (CM)
Control	0.92 ± 0.03 ^a	8.54 ± .29 ^a
-N	1.65 ± 0.06 ^b	7.38 ± .18 ^b
-P	2.65 ± 0.06 ^c	25.50 ± .63 ^c
-K	2.49 ± 0.05 ^c	26.03 ± .66 ^c
-Ca	2.76 ± 0.09 ^c	34.34 ± .70 ^c
-Mg	2.43 ± 0.05 ^c	26.61 ± .58 ^c
Complete	2.36 ± 0.03 ^c	22.25 ± .45 ^c

(a)

(b)

Fig 3. (a) Growth performance of the seedlings and (b) root collar and height increment after six months of fertilizer application. Values with different superscript letters (a-d) within columns are statistically significant at $p \leq 0.05$ Root Collar Increment $n=120$, Shoot Height Increment $n=120$

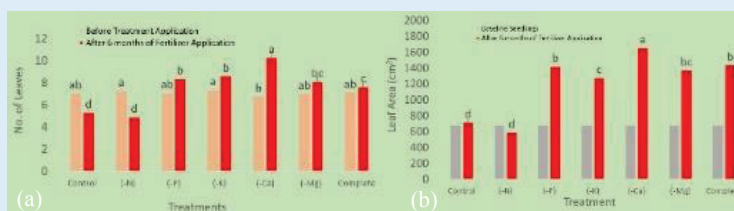


Fig 4. (a) Number of leaves and (b) leaf area before and after six months of treatment application. Values with different letter (a-d) designation with the same color are significantly different at $p \leq 0.05$ Number of leaves $n=120$, Leaf area $n=15$

B. PHYSIOLOGICAL PARAMETERS

TREATMENT	ROOTS	STEM	LEAVES	TOTAL
Control	0.23 ± 11 ^a	0.13 ± 13 ^a	0.13 ± 10 ^a	0.52 ± 30 ^a
-N	0.26 ± 11 ^a	0.11 ± 13 ^a	0.11 ± 10 ^a	0.43 ± 30 ^a
-P	1.00 ± 11 ^b	0.61 ± 13 ^b	0.72 ± 10 ^b	2.34 ± 30 ^b
-K	1.18 ± 11 ^b	1.00 ± 13 ^b	1.10 ± 10 ^b	3.28 ± 30 ^b
-Ca	1.16 ± 11 ^b	0.84 ± 13 ^b	0.97 ± 10 ^b	2.98 ± 30 ^b
-Mg	1.06 ± 11 ^b	0.77 ± 13 ^b	0.95 ± 10 ^b	2.77 ± 30 ^b
Complete	1.04 ± 11 ^b	0.67 ± 13 ^b	0.95 ± 10 ^b	2.66 ± 30 ^b

(a)

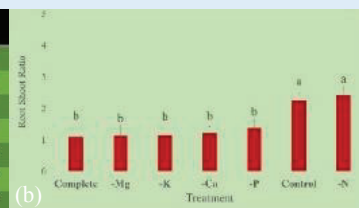


Fig 5. (a) Dry biomass of roots, stem, leaves and (b) root shoot ratio after six months of fertilizer application. Values with different superscript letters (a-c) within columns are statistically significant at $p \leq 0.05$ $n=105$

DISCUSSION & CONCLUSION

- Assessment on the morphological and physiological performance of *Trema orientalis* revealed that nutrient omission affects growth performance.
- There was a significant difference ($p \leq 0.05$) in root collar and shoot height after six months of fertilizer application. -Ca treatment had the highest increase in both root collar (2.76mm ± 0.09) and shoot height (34.34cm ± .70) while the control (no nutrient) treatment had the least root collar (0.92mm ± 0.03) and shoot height (8.54cm ± .29) increment.
- Omission of Calcium resulted to the significant increase in leaf quantity (10.24 ± 0.33) as well as the leaf area (1651.35cm² ± 66.67) after six months.
- In terms of biomass, -N treatment had the significant lesser production in roots (0.26 g ± 0.11), stem (0.11 g ± 0.13) and leaves (0.11 g ± 0.10).
- Root shoot ratio was significantly higher in -N treatment (2.42% ± 0.26) and control (2.26% ± 0.26).
- The consistent low biomass production in -N treatment strongly indicates that nitrogen is a primary nutrient needed for better growth performance of *Trema orientalis* six months from germination.
- Therefore, fertilizer application significantly enhanced the growth ($p \leq 0.01$) of the seedlings. Likewise, nutrient element omission significantly influenced ($p \leq 0.01$) the growth performance and biomass production of *Trema orientalis* L. at seedling stage.

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