



# Chonradsadornumrung School

## Evaluating the Defense Mechanisms of Selected Plants in Khlong Tamru Chonburi, Thailand, against Biotic and Abiotic Stressors in Soil and Water



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### Abstract

This current environmental science research aims to evaluate the defense mechanisms of selected plants present in the brackish river of Khlong Tamru, Chonburi, Thailand. Using the standard equipment from Extech, the researchers characterized various water and soil physico-chemical factors such as water temperature, TDS, dissolved oxygen, electrical conductivity, salinity, transparency, water pH, air temperature, soil temperature, soil pH, NPK concentration, and relative humidity. Then, the leaves of three selected plants were gathered for the phytochemical screening. Based on the experimentations, results and gathered data, the researchers concluded that there are significant differences ( $p < 0.05$ ) in water temperature, dissolved oxygen, TDS, electrical conductivity, transparency, salinity, soil temperature (5cm depth), soil pH, and relative humidity except for soil temperature at 10 cm depth ( $p > 0.05$ ). Moreover, Nipa Palm (*Nypa fruticans*), Red Mangrove (*Rhizophora mangle*) and Spurred Mangrove (*Ceriops tagal*) contains various secondary compounds as their defense mechanism against biotic and abiotic stressors in soil and water. For the improvement of the study, further research will be conducted to evaluate antimicrobial activities of the experimental plants against their biotic stressors.

**Keywords:** Brackish, Biotic stressors, Abiotic stressors, Secondary Compounds

### Research Questions

1. Is there a significant difference in soil and water parameters measured in the brackish river of Khlong Tamru, Chonburi, Thailand?
2. What secondary compounds do selected plants produce as their defense mechanism against biotic and abiotic stressors in soil and water?

### Hypotheses

**Alternative:** There is a significant difference in the physico-chemical parameters of the brackish river of Khlong Tamru, Chonburi, Thailand and the selected plants possess secondary compounds as their defense mechanism against biotic and abiotic stressors in soil and water.

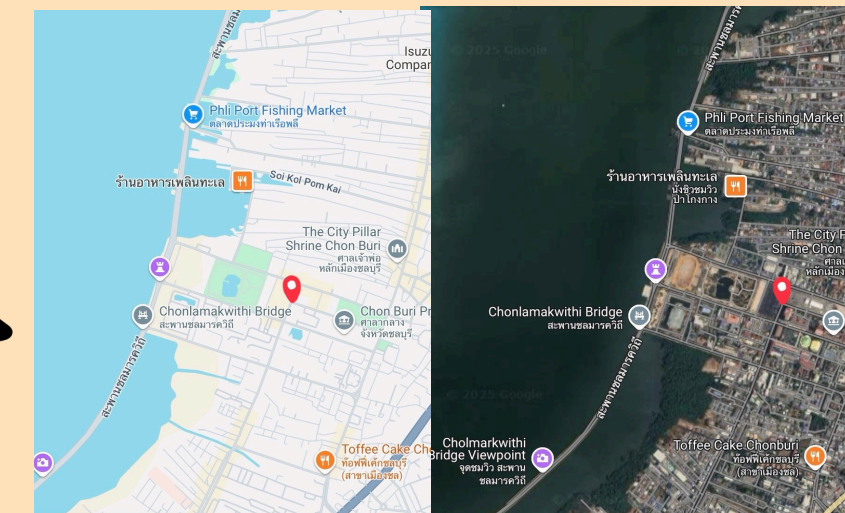
**Null:** There is no significant difference in the physico-chemical parameters of the brackish river of Khlong Tamru, Chonburi, Thailand and the selected plants do not possess secondary compounds as their defense mechanism against biotic and abiotic stressors in soil and water.

### Introduction

In the past, Khlong Tamru district in Chonburi, Thailand, was merely a modest town with a diverse range of plants growing along its brackish river, which is connected to the Gulf of Thailand. Currently, it is undergoing rapid changes because it is included in the Eastern Economic Corridor (EEC), which aims to boost a region's economic activities. As a result, various infrastructures have been constructed, including factories, bridges, and buildings. Brackish water from Khlong Tamru river is beneficial to the various forms of life that are existing in the area. Plants like Nipa Palm, Spurred mangrove, and Red Mangrove are common halophytes that benefits from the river. These plants produce various substances like secondary metabolites that protect them from microbial pathogens and abiotic stresses in their environment (Schafer et al., 2009). These compounds are also responsible for plants biological activities that are also beneficial to human beings. The production of these valuable compounds is linked to the nutrients that plants absorb from the soil and the water. Previous research emphasized that reasonable proportion of nutrition (NPK) factors directly promote the absorption and assimilation of plants, thereby affecting their growth and development (Yildirim et al., 2011). Other factors, like dissolved oxygen (DO) in the water can respond to facilitate the availability of essential nutrients such as NPK, low DO levels can impact the roots' function and stunted growth of the plants (Raven, Evert, & Eichhorn, 2005). The intensity of anthropogenic activities near the river may have had an immense impact on the survival of plants especially, in terms of their nutrient absorption which has great impact on their growth and development. Given the rapid changes occurring in Khlong Tamru, Chonburi, Thailand that could affect the diversity of life particularly the plants, it is imperative to evaluate the soil and water quality of this place. The situations above prompted the researchers to conduct environmental research entitled "Evaluating the Defense Mechanisms of Selected Plants in Khlong Tamru, Chonburi, Thailand, against Biotic and Abiotic Stressors in Soil and Water". The current study sought to characterize the physical and chemical features of the river and soil. Most importantly, the defense mechanisms of selected plants in Khlong Tamru, Chonburi, Thailand, against various biotic and abiotic stresses in soil and water were assessed.

### Research Methodology

#### A. Study Site



#### B. Survey and Preparation of Materials



#### C. Water quality testing



#### D. Collection of plants



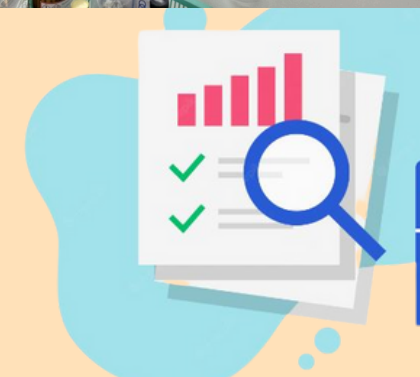
#### E. Ethanolic extraction



#### F. Phytochemical screening



#### G. Analysis of data



### Results

The figures below show the data encoded on Globe web page from December 2024 to January 2025

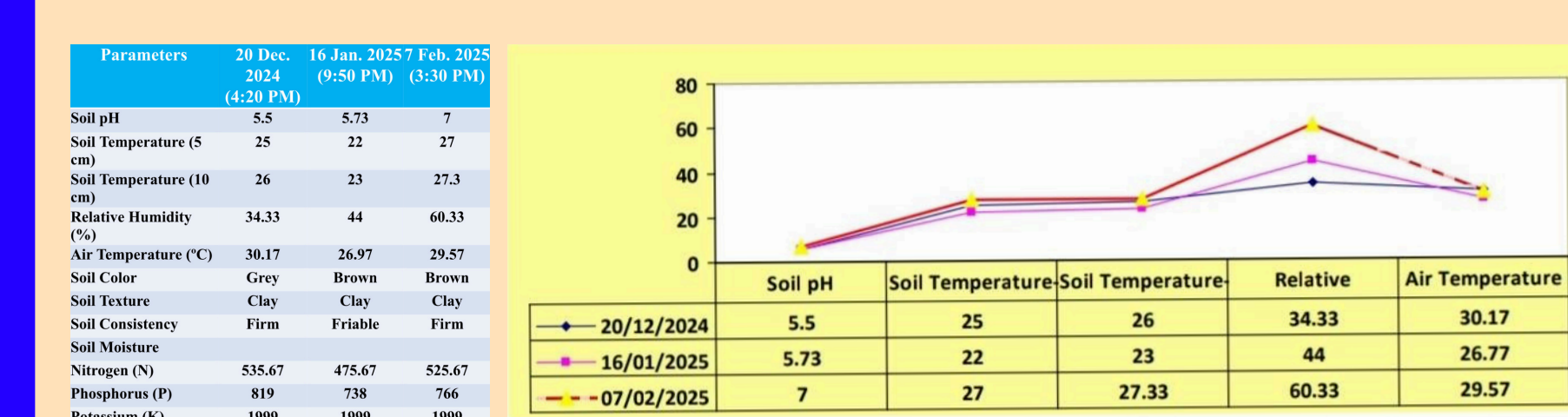


Table 1. Average results of soil characterization measured in the brackish river of Khlong Tamru, Chonburi, Thailand.

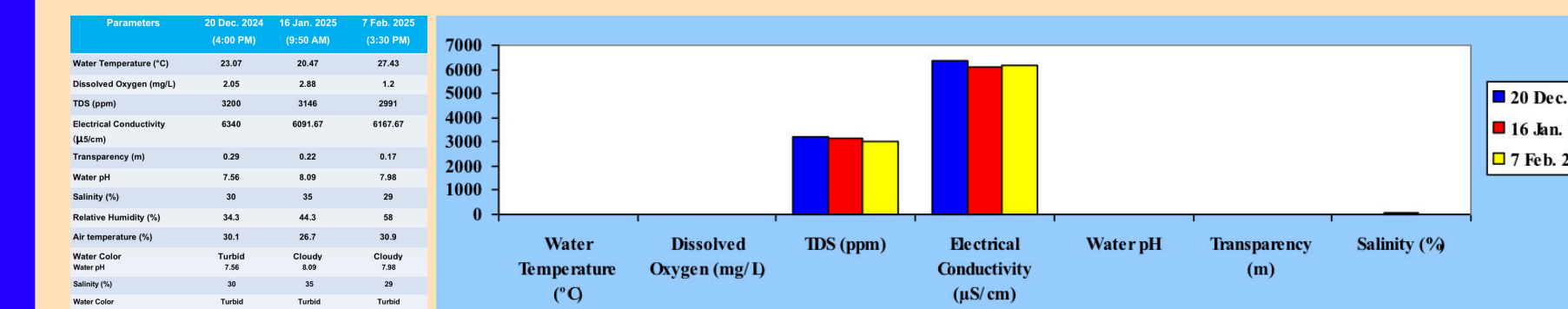


Table 2. Average results of water characterization measured in the brackish river of Khlong Tamru, Chonburi, Thailand.

Secondary Compounds	Nipa Palm	Red Mangrove	Spurred Mangrove
Alkaloids	+	+	+
Saponins	+	+	+
Tannins	+	+	+
Phenolic Compounds	+	+	+
Flavonoids	+	+	+
Leucoanthocyanins	+	+	+

Table 3. Results of Phytochemical Screening

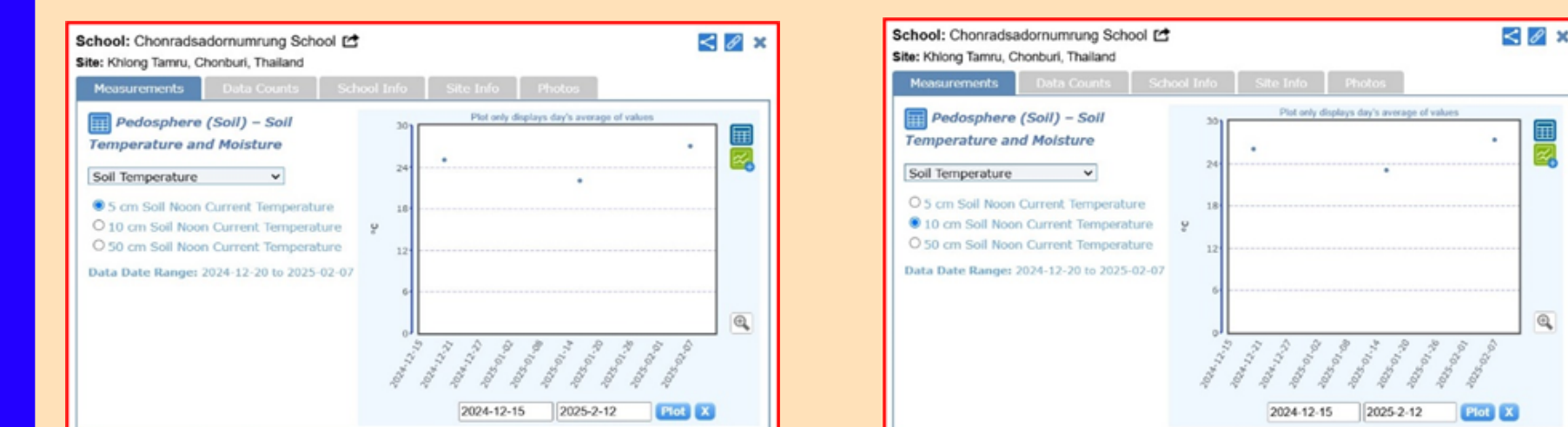


Figure 1. Globe Data Entry for soil temperature (5 cm).

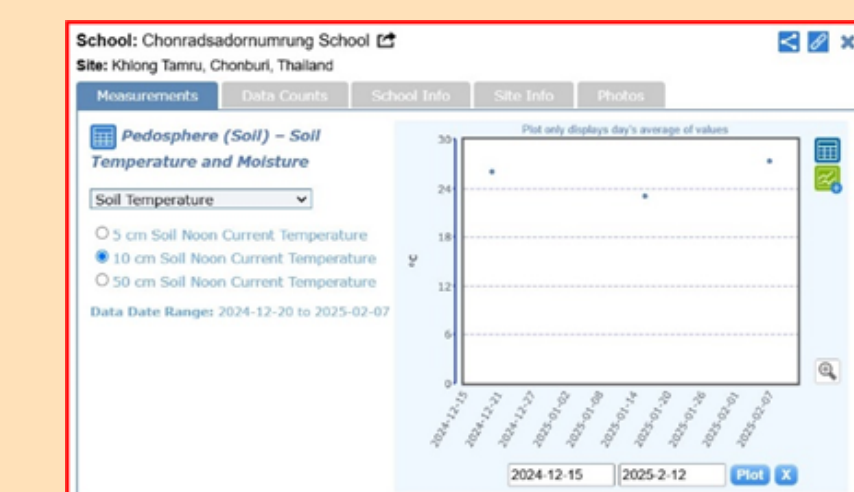


Figure 2. Globe Data Entry for soil temperature (10 cm).

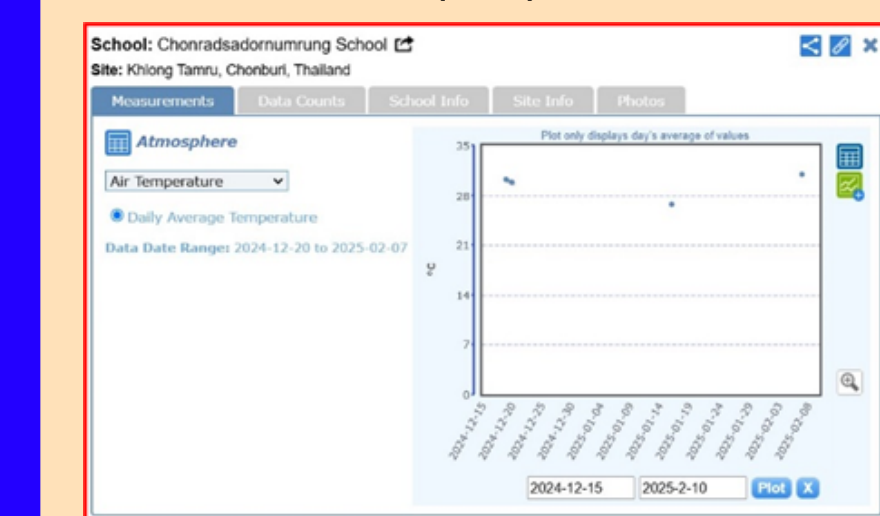


Figure 3. Globe Data Entry for air temperature.

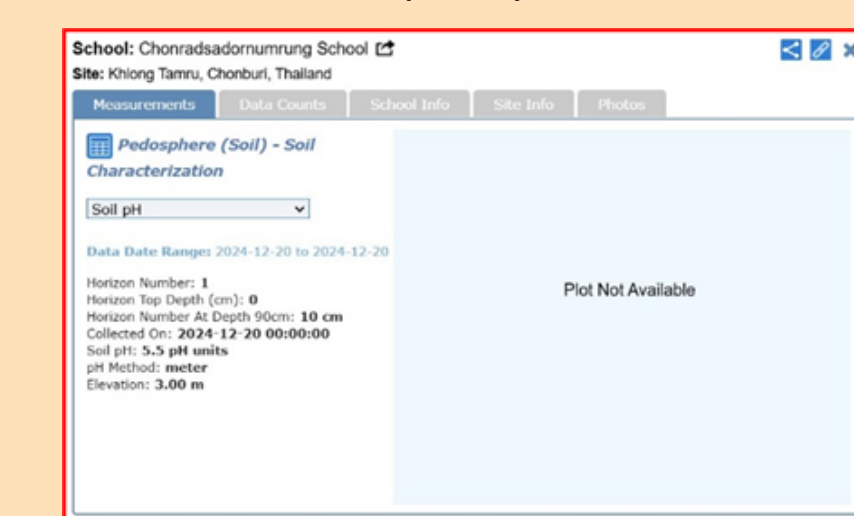


Figure 4. Globe Data Entry for soil pH.

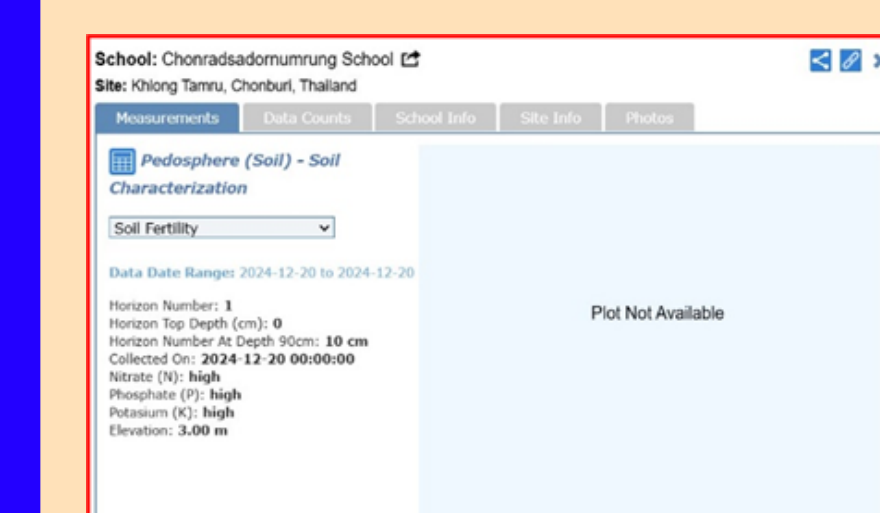


Figure 5. Globe Data Entry for soil fertility.

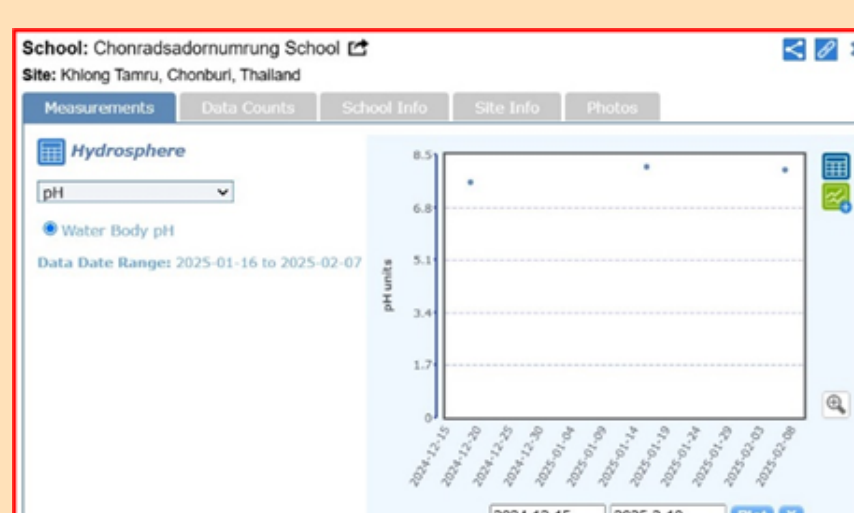


Figure 6. Globe Data Entry for water pH.

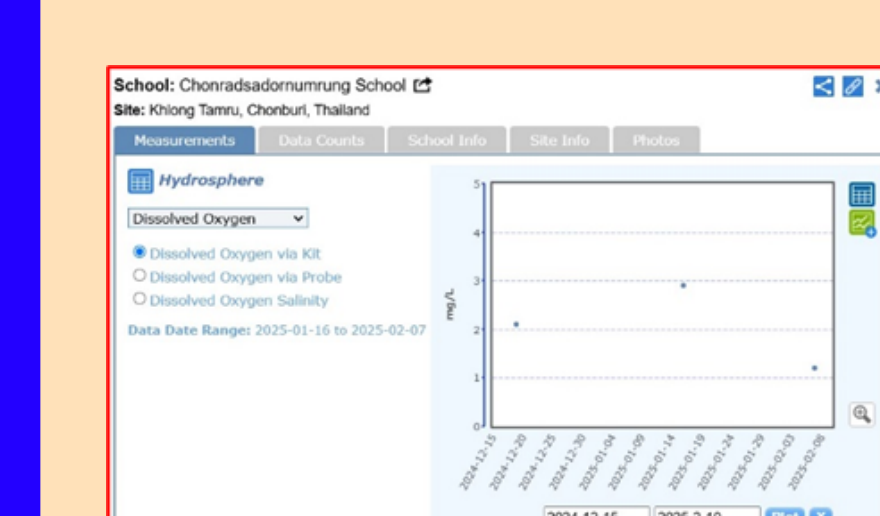


Figure 7. Globe Data Entry for dissolved oxygen.

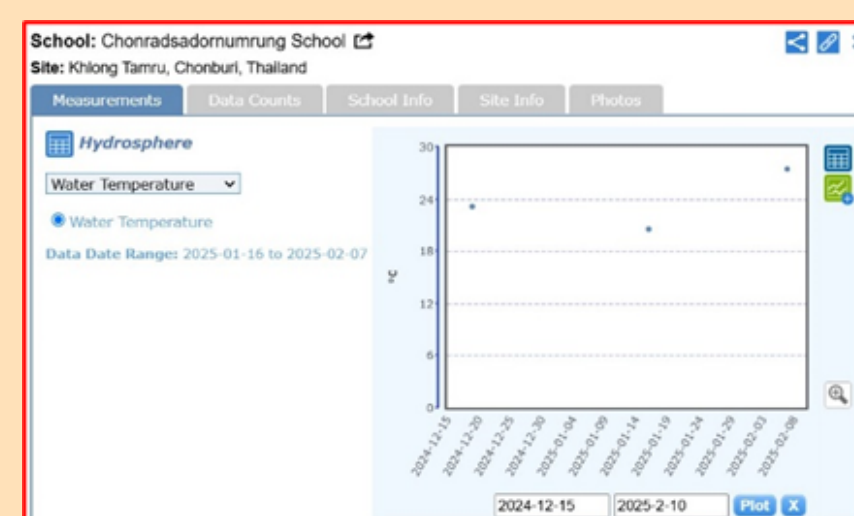


Figure 8. Globe Data Entry for water temperature.

### Conclusion

Based on the experimentations, results and gathered data, the researchers concluded that there are significant differences ( $p < 0.05$ ) in water temperature, dissolved oxygen, TDS, electrical conductivity, transparency, salinity, soil temperature (5cm depth), soil pH, and relative humidity except for soil temperature at 10 cm depth ( $p > 0.05$ ). Moreover, Nipa Palm (*Nypa fruticans*), Red Mangrove (*Rhizophora mangle*) and Spurred Mangrove (*Ceriops tagal*) contains various secondary compounds as their defense mechanism against biotic and abiotic stressors in soil and water.

### Recommendations

For the improvement of the study, further research will be conducted to evaluate antimicrobial activities of the experimental plants against their biotic stressors. Additionally, more plants growing in the brackish water of Khlong Tamru will be studied for their secondary compounds and biological activities.

### Acknowledgment

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