Prepared by : A study and comparison of soil quality in rice cultivation at the seedling, heading, and golden heading stages in Na Muen Si Subdistrict, Na Yong District, Trang Province.

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Abstract

This study comparing soil quality during rice cultivation at the seedling, heading, and heading stages in Na Mueang Si Subdistrict, Na Yong District, Trang Province, aimed to: 1) study soil quality during the seedling, heading, and heading stages, and 2) compare soil quality during the seedling, heading, and heading stages. The objective was to understand the soil conditions that directly affect rice growth and yield. Analysis of key variables revealed that the physical environment of the soil was suitable for cultivation, with a stable pH of 6.0-7.0, which is an optimal level for nutrient release. Furthermore, the soil had the ability to retain temperature at 26-28°C, even with external temperature fluctuations reaching 32.1°C during the heading stage. A comparison of nutrient levels at each stage showed that in the seedling stage... The soil had sufficient initial nutrients for growth. However, during the heading stage, nitrogen (N) levels increased significantly, reaching a maximum of 66.7°C, supporting panicle and flower formation. Finally, during the golden heading stage, the levels decreased. Phosphorus (P) and potassium (K) levels peaked at 106.7 and 30.0°C, respectively, consistent with the rice plant's need for nutrient translocation to accumulate nutrients for increased grain weight and quality. In summary, soil quality showed positive changes, with increases in major nutrients correlated with growth stages, effectively meeting the rice plant's needs at each developmental stage.

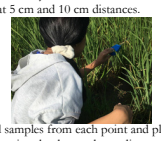
INTRODUCTION

Rice production is a vital economic foundation and way of life for the people in Na Muen Si Subdistrict, Na Yong District, Trang Province. However, successful cultivation depends primarily on soil quality, especially pH, moisture content, and the availability of essential nutrients (N, P, K), which must be adequate and suitable for the rice plants at each stage of growth. "The main reason for this study is that current soil conditions in different rice paddies may vary in degradation or fertility depending on farmers' management practices and fertilizer use. Furthermore, rice plants have different nutrient requirements at different stages of growth. Therefore, studying only one period is insufficient to reflect the true potential of the soil. Thus, the researchers recognized the importance of "studying and comparing soil quality" at three key stages: seedling stage, heading stage, and golden heading stage, to understand the detailed physical and chemical changes in the soil. The data obtained will be extremely beneficial in helping farmers plan fertilizer application according to the rice's needs at each stage, reduce redundant production costs, and improve agricultural management in Na Muen Si Subdistrict for greater accuracy and sustainability.

Research Methods

1. Select rice paddy plots in Na Muen Si Subdistrict, covering several sub-areas for soil quality comparison.

2. Use a spoon or small spatula to scoop soil from the surface level of approximately 0–15 cm and measure the soil temperature at 5 cm and 10 cm distances.



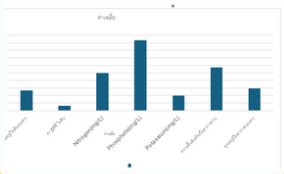
3. Collect soil samples from each point and place them in sample bags, noting the date and coordinates of each point.

4. Mix soil samples from multiple points in the same plot to obtain an average sample per plot.

5. Carefully store the samples, preventing contamination, until pH, acidity/alkalinity, and NPK (nutrient content) measurements are taken.

Results

Air temperature tends to decrease steadily throughout the rice growth period, with the highest average air temperature of 32.1 degrees Celsius during the seedling stage and dropping to a low of 28.2 degrees Celsius during the heading stage. Soil with water had a significantly higher nitrogen content (50 mg/L compared to 13.3 mg/L), reflecting improved nutrient dissolution and plant uptake. Phosphate levels were similar on average, while dry soil potassium was slightly higher. Simultaneously, relative humidity in the air in waterlogged areas was higher (57.6% > 54.6%), but air temperatures were similar, indicating that the main difference was in soil conditions rather than weather. Overall, waterlogged soil was more suitable for plant growth because it was cooler, wetter, and had more readily available essential nutrients.



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Discussion

During the seedling stage, the soil temperature was found to be 27.8°C, which is within the optimal range for germination and root development of rice plants. The soil pH was 6, indicating slightly acidic soil conditions conducive to nutrient absorption. Nitrogen, phosphorus, and potassium values were 32.3, 93.3, and 13.3 mg/L, respectively, reflecting sufficient phosphorus for root development but relatively low potassium levels. Soil moisture content was 3.9, and relative humidity was 66.7%, while air temperature was 32.1°C, showing that the overall environment was suitable for rice seedling establishment.

Flowering Stage

During the flowering stage, the soil temperature increased to 29.7°C, and the soil pH increased to pH 7, which is neutral. This affected changes in nutrient dissolution and absorption, especially nitrogen, which increased to a maximum of 66.7 mg/L, consistent with the increased nitrogen demand during panicle formation. Phosphorus and potassium levels were 80 and 20 mg/L, respectively. Soil moisture content was 4, and relative humidity decreased slightly to 64.6 percent, while air temperature dropped to 29.5 degrees Celsius. This reflects that the environment at this stage is conducive to the reproduction and development of rice flowers.

Golden Heading Stage

During the golden heading stage, the soil temperature was 29.8 degrees Celsius, and the soil pH decreased to 6, which is within the optimal range for nutrient absorption for starch accumulation in rice grains. Nitrogen, phosphorus, and potassium levels were 50, 106.7, and 30 mg/L, respectively, with phosphorus and potassium being the highest at this stage. This reflects the role of these nutrients in developing grain quality and panicle completeness. Soil moisture content increased to 4.8, and relative humidity was 65.7 percent, while air temperature decreased to 28.2 degrees Celsius, which is an environment suitable for rice grain maturation

Conclusions

A study of the environmental conditions and soil properties used for rice cultivation at the seedling, flowering, and heading stages revealed the following: Soil temperature averaged 26.33°C at 5 cm depth and 26.66°C at 10 cm depth, while dry pH averaged 28°C at 5 cm depth and 27.33°C at 10 cm depth. Next was soil pH, with an average of 6 in wet soil and 7 in dry soil. Nutrient levels (nitrogen (N), phosphorus (P), and potassium (K)) averaged 50, 93.3, and 20 mg/L in wet soil, respectively, and 13.3, 93.3, and 30 mg/L in dry soil, respectively. Finally, relative humidity in wet soil averaged 57.6%, while in dry soil it averaged 54.6%. The average soil-air temperature with water was 29.1 degrees Celsius, and the average air temperature was 29.2 degrees Celsius. The results of this study can be used as baseline data to assess the suitable environmental conditions for rice cultivation.

Research Question

Does the soil quality differ during the seedling, heading, and golden heading stages of rice cultivation?