ALLEVIATION OF SOIL MOISTURE STRESS IN BANANA CULTIVATION

Mohd. Kamil Yusoff[1], Mohd Razi Ismail[2], Marziah Mahmood[3] and Zulkifli Hj. Shamsuddin[4]

Departments of [1]Environmental Sciences, [2]Agronomy and Horticulture, [3]Biochemistry and Microbiology, and [4]Soil Science Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia

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Introduction

Water stress affects all aspects of plant growth (Mohd Razi and Mohd Kamil, 1996). In recent years, there has been a resurgence of interests in the effects of water stress on basic physiological process in the plant (Acevedo et al. 1971). Water stress inhibits cell elongation, causes stomatal closure and reduces transpiration and carbon dioxide assimilation. Those sequence directly or indirectly will affect the crop performance and productivity.

Materials and Methods

The experiment was conducted to study the effect of alleviation of water stress by investigating the influence of sewage effluent and different surface covers on banana plants cultivated on ex-mining land, physiological impacts with respect to soil water deficits and the role of banana in controlling the soil erosion process (comparison with legume cover). The experiment was carried out in a glass house except for the soil erosion study. The treatment was based on Randomised Complete Block Design (RCBD) with replications. The effect of the treatment was based on the changes in the physical and biochemical growth parameters. The growth parameters observed include leaf quantity, stomatal conductance, width and length of banana leaf, the plant height, diameter of banana stem, CWSI, IR, RH, DB, DT, VPD, SOL, and biomass.

Results and Discussion

Sewage study: Statistical result shows that the treatments affect the stomatal conductance and width of the leaf, plant height, diameter of the stem, DT, CWSI and dry weight of biomass and induced significant effects on banana growth ($P<0.01$). The other parameters were not significantly affected, suggesting that all the treatments experienced the same environmental conditions. Surface covers: Statistical analysis indicated that black plastic (T2) was the most effective form of mulching. Mulching with T2 showed a significant different towards stomatal conductance ($p<0.01$) and stem diameter ($p<0.05$). Increase in thickness of leaf was also observed. This result also indicated that T2 was capable of preventing water evaporation from the soil. Soil erosion study: The result shows that banana plant is capable of controlling the soil erosion at the initial stage. Surface coverage of the plot planted with banana changed with time. Towards the matured stage, plot planted with *Calapogonium mucunoides* shows that surface coverage appeared to be 90% and thus minimise the soil erosion effectively. Water deficit study: Plants subjected to limited availability of water showed marked decrease in plant vegetative growth and physiological process. Stem girth and leaf elongations were markedly reduced after 7th day of withholding water. Regardless of large depletion of soil moisture content, there was a small reduction in leaf water status measured as relative water content. Stomatal conductance was sensitive to the depletion of soil moisture content. There was no correlation between initial reduction in stomatal conductance between the reduction in relative water content. Proline concentration in banana leaf tissue increased with the onset of water stress. The study also showed that stomatal conductance of banana plant was affected by the changes in Vapour Pressure Deficit, in both irrigation and water stressed plants.

Conclusions

The results suggested that sewage effluent has a high potential in improving soil fertility. The overall results of the study suggested that sewage at higher concentration was able to minimise the water stress through soil modification as well as providing nutrient. Soil surface covered with black plastic was able to minimise the water stress through minimisation of evaporation loss and thus improves soil moisture status. The study also revealed that the physiological process of banana plant significantly depends on water availability. Due to the plant adjustment with respect to water stress, the plant has a potential for controlling soil erosion especially during the initial stage.

References

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