

Microbial Inoculants to Increase the Biomass and Nutrient Uptake of Tithonia Cultivated as Hedgerow Plants to Control Erosion in Ultisols

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Abstract : Ultisols require greater amounts of fertilizer application compared to other soils and susceptible to erosion. Unfortunately, the price of synthetic fertilizers has increased over time during the years, making them unaffordable for most Indonesian farmers. While terrace technique to control erosion very costly. Over the last century, efforts to reduce reliance on synthetic agro-chemicals fertilizers and erosion control have recently focused on Tithonia diversifolia as a fertilizer alternative, and as hedgerow plant to control erosion. Generally known by its common name of tree marigold or Mexican sunflower, this plant has attracted considerable attention for its prolific production of green biomass, rich in nitrogen, phosphorous and potassium (NPK). In pot experiments has founded some microbial such as Mycorrhizal, Azotobacter, Azospirillum, phosphate solubilizing bacterial (PSB) and fungi (PSF) are expected to play an important role in biomass production and high nutrient uptake of this plant. This issue of importance was pursued further in the following investigation in field condition. The aim of this study was to determine the type of microbial combination suitable for Tithonia cultivation as hedgerow plants in Ultisols which have higher biomass production and nutrient content, and decline soil erosion. The field experiment was conducted with 6 treatments in a randomized block design (RBD) using 3 replications. The treatments were: Tithonia rhizosphere without microbial inoculated (A); Inokulanted by Mycorrhizal + Azotobacter + Azospirillum (B); Mycorrhizal + PSF (C); Mycorrhizal + PSB(D); Mycorrhizal + PSB + PSF(E);and without hedgerow Tithonia (F).The microbial substrates were inoculated into the Tithonia rhizosphere in the nursery. The young Tithonia plants were then planted as hedgerow on Ultisols in the experimental field for 8 months, and pruned once every 2 months. Soil erosion were collected every rainy time. The differences between treatments were statistically significant by HSD test at the 95% level of probability. The result showed that treatment C (mycorrhizal + PSB) was the most effective, and followed by treatment D (mycorrhizal + PSF) in producing higher Tithonia biomass about 8 t dry matter 2000 m⁻² ha⁻¹ y⁻¹ and declined soil erosion 71-75%.

Keywords : hedgerow tithonia, microbial inoculants, organic fertilizer, soil erosion control

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