

Addition of two *Trichoderma* species with organic fertilizer paste - A boon for crop yield of *Abelmoschus esculentus* L. cv. MI 5

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Sustainable agriculture is a farming technique that minimizes environmental impacts while providing a tenable yield. The use of organic amendments as an alternative to inorganic treatments has more significant potential to establish a self-sustaining, less expensive, and environmentally friendly agricultural system. The amalgamation of organic fertilizer with bio-controlling microorganisms is more beneficial than individual application in cropping land to enhance crop productivity. The present study was aimed to examine the influence of an organic fertilizer paste enriched with *Trichoderma* spp. to enhance the growth performances and yield of *Abelmoschus esculentus* L. cv. MI 5. The organic fertilizer paste was prepared by aerobic digestion of air-dried and powdered immature twigs of the following plants; *Annona glabra*, *Clidemia hirta*, *Chromolaena odorata*, and *Pongamia pinnata* (2.0 kg each) in distilled water (42.0 L) for a month. Bio-controlling agents *Trichoderma harzianum* (KT852821.1) and *Trichoderma virens* (KP985643.1) were formulated in solid carrier material (compost, straw, clay, and cow urine; 2:1:1:1) separately. The pot trial consisted of six treatments of liquid organic fertilizer enriched with *Trichoderma* spp. (T10H, T10V, T20H, T20V, T25H, and T25V, where 10, 20, and 25 denote 10%, 20%, and 25% of *C. odorata*, *A. glabra*, *C. hirta*, and *P. pinnata* extract combined with H as *T. harzianum* and V as *T. virens*) with 15 replicates in a completely randomized block design. One-week-old *A. esculentus* L. cv. MI 5 seedlings were soil treated for 3 months (1st week - 5 mL, 2nd week - 10 mL, 3rd week - 15 mL, 4th week - 20 mL, and 100 mL). The positive and negative controls were commercial fertilizer (Maxicrop) and tap water, respectively. Shoot growth performances, root growth performances, average fresh weights, and average dry weights, and the amount of harvest of *A. esculentus* L. cv. MI 5 were measured after 3 months of the plantation. One-way ANOVA statistical method, along with Tukey's multiple comparison tests were used to identify the significant differences ($P \leq 0.05$) in growth parameters among treatments using MINITAB (Version 17). T10H treatment (10 % diluted *C. odorata*, *A. glabra*, *C. hirta*, and *P. pinnata* extract only incorporated with *T. harzianum*) recorded significantly ($P \leq 0.05$), the highest average plant shoot height (163.6 ± 5.40 cm), number of leaves (39 ± 2), stem circumference (5 ± 0.19 cm), average leaf area (309.56 ± 1.2 cm²), root length (38 ± 2.20 cm), the girth of the root (5.24 ± 0.32 cm), number of lateral roots (59 ± 2.08), fresh weight of the entire plant (146.13 ± 16.79 g/plant), fresh weight of the root (35.53 ± 5.82 g/plant), average dry weight of the whole plant (17.61 ± 1.79 g/plant), dry weight of the shoot biomass (13.1 ± 1.42 g/plant), dry weight of the root biomass (4.19 ± 0.09 g/plant), the average number of pods per plant (30 ± 0.24), and average fresh weight of pods (39.83 ± 2.14 g). Therefore, T10H treatment can be successfully used as the best organic fertilizer paste enriched with *T. harzianum* to enhance the growth and yield of *Abelmoschus esculentus* L. cv. MI 5.

Key words: *Abelmoschus esculentus*, Growth performance, Organic fertilizer paste, *Trichoderma* spp. Crop yield

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