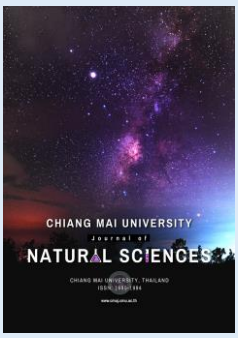

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Research article

Tropical Wetland Earthworm Vermifluid Promotes Mitotic Activities and Root Growth in *Allium cepa* at low concentrations

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Abstract It is well established that earthworms and their products promote plant growth and improve crop yield, but more information about their mechanisms of action, especially at cellular level, is required. This study assessed the enzyme and bacterial activities of vermifluid secreted by a tropical wetland earthworm, Alma millsoni. The effects of the vermifluid on the mitotic activities and root growth of Allium cepa (onions) were evaluated. Vermifluid enzyme and bacterial activities were assessed using standard procedures. Mitotic activities were evaluated using the Allium assay squash technique. Root lengths in onions grown in graduated dilutions of vermifluid were measured using a metre rule. Phosphatase had the highest activity (39.00 ± 3.70 units/ml/min) in the vermifluid, followed by urease (4.90 ± 0.18 units/ml/min), protease (3.20 ± 0.28 units/ml/min), amylase (1.40 ± 0.09 units/ml/min) and lipase (0.001 ± 0.00 units/ml/min). The total microbial count (TBC) and total fungi count (TFC) in the vermifluid were 6.0×10^4 CFU/ml and 2.4×10^5 CFU/ml, respectively. Results also indicated that the lower the vermifluid concentrations, the higher the number of dividing cells and mitotic index in onion roots. Onion roots grown in 10% vermifluid had the highest significant ($P < 0.05$) root growth of 2.65 ± 0.30 cm, 4.01 ± 0.61 cm, and 4.54 ± 0.62 cm, at 12-hour, 24-hour, and 72-hour exposure period, respectively. The inverse relationships between onion mitotic activities, root growth and vermifluid concentrations imply that the growth-promoting enzymes and other products in vermifluid stimulate cellular root growth better in small concentrations.

Keywords: *Alma millsoni*, earthworm fluid, enzymes, microbial activities, mitosis, phosphatase.

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