

Effects of *Tinospora tuberculata* leaf methanol extract on seedling growth of rice and associated weed species in hydroponic culture

ABSTRACT

The study was conducted to evaluate the responses of rice and rice weed seedlings (barnyardgrass and weedy rice) at the three-leaf stage to *Tinospora tuberculata* leaf methanol extract (3.12, 6.25 and 12.5 g L⁻¹) under hydroponic culture. It shows that the leaf methanol extract had various degrees effects depending on target plant species and each tested index (biomass, root length, shoot length, transpiration volume, chlorophyll *a*, chlorophyll *b* and carotenoid contents). The effective concentration of the leaf extract capable of reducing 50% of rice growth was higher than those of target weed species. Moreover, the root length was more tolerant to leaf methanol extract in comparison to the other plant parameters measured. A greater reduction was observed in chlorophyll *a* content compared to chlorophyll *b* and carotenoid. The results revealed that the reduction of transpiration volume closely coincided with the magnitude of growth inhibition of tested plants. Ultra-fast liquid chromatography analysis revealed 11 of 32 peaks in chemical profile, including benzoic acid, caffeic acid, chlorogenic acid, isoorientin, isovitexin, orientin, p-anisic acid, syringic acid, trans-cinnamic acid, trans-ferulic acid, and vitexin have the same retention time with those peaks of the extract. The amount of compounds was present in the range of between 4 817 and 115.5 mg kg⁻¹ dry weight (DW). The concentration-response bioassay of all 11 individual compounds and their equimolar mixture against the seeds of barnyardgrass revealed their contribution in the allelopahic activity of *T. tuberculata* leaf extract. The examined compounds and their combination exhibited various degrees of growth inhibitory effects on the early growth of barnyardgrass. Therefore, the specific number, concentration, combination and inhibitory activity of bioactive compounds leads to allelopathy activity of *T. tuberculata* leaves which could be employable directly as a natural herbicide and its growth inhibitor compounds can be used as a template for producing new herbicides.

Keyword: Allelochemicals; Identification and quantification; Natural herbicide; UFLC; Weed control