

**Effects of organic soil amendments on photosynthetic traits of black pepper
(*Piper nigrum* L.) in an alluvial soil**

ABSTRACT

Black pepper in Sarawak, Malaysia, is mainly cultivated using the conventional method involving heavy usage of chemical compound fertilizers. Organic soil amendments can reduce the required amounts of chemical fertilizers. So, the objectives of this study were to compare selected properties of soils as well as the physiological performances of mature vines following the application of fermented juices, biochar, and compost. There were five treatments; each replicated five times in a randomized complete block design. Treatments were as follows: (i) FNPk–NPK 15 : 15 : 15 compound fertilizer; (ii) FPJ (fermented plant juice); (iii) FPJBC (FPJ, biochar, and compost); (iv) FFJ (fermented fruit juice); and (v) FFJBC (FFJ, biochar, and compost). The results revealed that combined fermented juices, biochar, and compost positively improved soil bulk density, soil porosity, TOC, C/N ratio, available P, exchangeable K, and exchangeable Ca. The fermented juices incorporated with biochar and compost had favourable effects on the leaf chlorophyll concentration, Normalized Difference Vegetation Index (NDVI), and gas exchange rates such as photosynthesis, stomatal conductance, and transpiration. Pepper leaf chlorophyll, NDVI, and photosynthesis rate were negatively correlated with soil total N. These results suggested that introducing organic soil amendments such as fermented juices, biochar, and compost improved soil physiochemical properties and black pepper physiological traits.
