

Piper caninum extract and Brevibacillus agri mixture suppresses rice leaf spot pathogen; Nigrospora oryzae and improves the production of red rice (*Oryza sativa* L)

ABSTRACT

Under the guise of enhancing productivity, using pesticides and artificial fertilizers in agriculture affects both the environment and living things. High chemical residues in food and the environment disrupt the health of consumers. One of the solutions that can bring about a reduction in the use of pesticides and chemicals is switching to organic fertilizers. The application of biopesticides originating from biological sources such as plant extracts and the use of microbes is gaining global acceptance. Therefore, this study aimed to obtain the best biopesticides and biostimulants that could suppress the leaf spot pathogen, *Nigrospora oryzae*, and increase the growth and yield of Bali red rice. The study contained four treatments, namely untreated control (F0), *Piper caninum* leaf extract (F1), *Brevibacillus agri* (F2), and fermented *P. caninum* leaf extract plus *B. agri* (F3). The treatments were arranged in a randomized complete block design, and each treatment was replicated three times. The parameters measured were the number of tillers per plant, number of leaflets per plant, chlorophyll content, number of grains per panicle, grain weight, and grain yield. Furthermore, antimicrobial and antioxidants were assayed using SEM. GC-MS. At the end of the experiment, the disease index of the leaf spot was measured. The results showed that F3 significantly suppressed leaf spots caused by *N. oryzae* compared to other treatments, including untreated control in red rice. Additionally, the F3 significantly increased the number of productive tillers, number of grains per panicle, and grain yield compared to all other treatments. The F3 enhanced the crop yield at 6.19 tons/ha, an increase of 50% compared to the untreated control. The SEM.GC-MS results showed the presence of 2.3 butanediol, tetradecanoic acid, butanoic acid, ethyl ester, benzene propanal, 3-(1,1-dimethylethyl)- α -methyl, α -N-Normethadol in treated plants with *P. caninum* plus *B. agri*.