Journal of Applied Biosciences 117: 11669-11683

ISSN 1997-5902

Bioassay and Pilot Mass Production of Entomopathogenic Fungus, *Beauveria bassiana* for the Control of Coffee Berry Borer (*Hypothenemus hampei*: *Scolytidae*), Ferrari.

Yonas Chekol Belay*[1] and Tesfaye Alemu Tenkegna*[1]
[1]Department of Microbial, Cellular and Molecular Biology
College of Natural and Computational Sciences, Addis Ababa University (AAU)
*Corresponding author: yocbelay@gmail.com ; tesfayealemu932@gmail.com

Original submitted in on 19th May 2017. Published online at www.m.elewa.org on 30th September 2017 https://dx.doi.org/10.4314/jab.v117i1.4

ABSTRACT

Objective: The aim of this study is to evaluate the potential of entomopathogenic fungus (*Beauveria bassiana*) on coffee berry borer based on bioassay test and pilot mass production of conidia using diphasic fermentation.

Methodology and Results: The spore germination test is usually done before bioassay tests. The spore concentration was adjusted to $1x10^7$ spore/ml from the stock suspension using a Haemocytometer. The conidial viability was assessed. Ten coffee berry borers per treatment were dipped into 100 ml sterile beaker that contained 10 ml of *Beauveria* isolates spore suspension with $1x10^7$ spore ml^{-1} from the plate using sterile paintbrush. Spore production was determined by randomly selecting three beetles within each treatment for which, there was spore production. Mass production of *Beauveria* conidial on sorghum was done. Thirteen *Beauveria bassiana* isolates were screened for the biocontrol agent against of coffee berry borer. Four parameters (spore germination percent, 100% insect mortality, average survival time (LT_{50}), and spore production on the dead insect) were used for screening. 0nly 3 isolates scored $\geq$ 93% spore germination, all isolates showed 100% mortality, six isolates showed shorter time of LT_{50} mortality approximately $\leq$ 84 hrs (3.5) days and 4 isolates produced more than $1x10^7$ average mean spore production per beetle. There were significant differences on spore germination due to spore production of the isolates. Three isolates B7A, G2A and C3C merited for conidial mass production cultured on cooked sorghum using diphasic liquid-solid fermentation to produce spore powder. The mean spore concentration g^{-1} of spore, weight of harvested spore $kg^{-1}$of substrate, spore production kg^{-1} of substrate and the average mean spore germination potential (%) during conidia mass production using the 3 isolates were $4.80 x10^{10}$, 8.26 ± 0.42, $4.01x10^{11} \pm 2.00 x 10^{11}$ and 89.33 ± 5.01, respectively. There was a significance difference by the isolates on spore concentration and spore production by the isolates.

Conclusion and applications of results: These isolates that showed 100% mortality on coffee berry borers and also killed them within $\leq$ 3.5 days of LT_{50} indicated that *Beauveria bassiana* could control the insect pest. Production of spore per cadaver of coffee berry borer almost meets the demand of spore concentration required per hectare of coffee farm ($1x10^7$). The isolates of *B. bassiana* which are efficient in all criteria are considered to be good candidate on selecting biopesticides agents. Moisture content of the

harvested spore is expected to be lower to maintain the viability and improved shelf life. The use of high quality standards for spores increases the likelihood of success when applied in the field. The shorter mean mortality time and high germination potential for the spores are the main criteria of microbial biopesticides. A possible reason for having shorter time of mortality and higher spore production was that adequate viable spores could be there and therefore more promptly infected the beetles caused more rapid mortality during field application.

Key words: *Beauveria bassiana*, Bioassay, Coffee Berry borer, Mass production, Spore concentration