BO2 - Biodiversity Inventory, Collection and Preservation (in-situ and ex-situ):Prokaryotes and Leaf Blight Pathogenic Fungi on Oil Palm

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Abstract

Chitinase and β-glucanase have a role as a biological control agent of oil palm pathogenic fungi, such as *Curvularia affinis* and *Colletotrichum gloeosporioides*. The pathogens caused antrachnose, leaf blight, and rotting on oil palm leaves. There are two bacterial isolates selected as chitinase and β-glucanase producer which isolated from soil of oil palm plantation in Jambi. *Bacillus thuringiensis* SAHA 12.08 produced optimum chitinase at 60-h incubation. The chitinase was precipitated by 30% ammonium sulphate and the activity increased 2.35 fold. *Bacillus subtilis* SAHA 32.6 produced optimum β-glucanase at 12-h incubation. The β-glucanase was precipitated by 60 % ammonium sulphate and could increase 1.43 fold its activity. Both precipitated chitinase of *B. thuringiensis* SAHA 12.08 and β-glucanase of *B. subtilis* SAHA 32.6 could inhibit the growth of *C. affinis* and *C. gloeosporioides* by using in vitro test. The isolates and also the enzymes showed potential to apply as biocontrol agents for fungal pathogens on oil palm plants.

Growth Curve and Enzyme Activity of Bacterial Isolates

Fig. 1 Growth curve and enzyme activity of (A) *Bacillus thuringiensis* SAHA 12.08 and (B) *Bacillus subtilis* SAHA 32.6

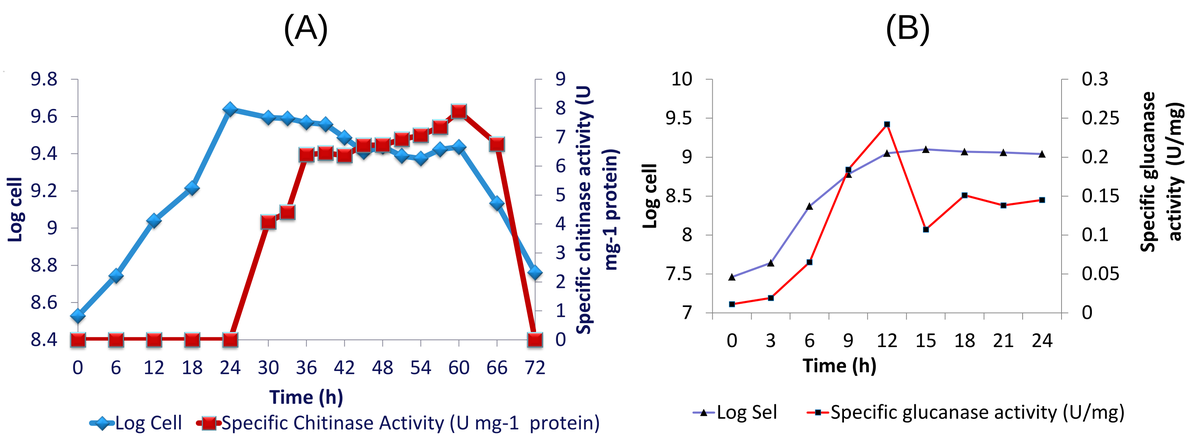


Table 1 Chitinase partially purification of *B. thuringiensis* SAHA 12.08

Steps	Total Protein (mg)	Total Activity (U)	Specific (U/mg protein)	Purification (fold)
Crude extract	19.68	142.6	7.24	1
30% ammonium sulphate precipitation	0.0842	1.44	17.061	2.35

Table 2 β-glucanase partially purification of *B. subtilis* SAHA 32.6

Steps	Total Protein (mg)	Total Activity (U)	Specific Act. (U/mg protein)	Purification (fold)
Crude extract	12.48	4.48	0.36	1
60% ammonium sulphate precipitation	0.114	0.06	0.51	1.31

Antagonistic Activity

Fig. 2 Leaf blight disease on oil palm leaves (A) caused by *Curvularia affinis* and *Colletotrichum gloeosporioides* (B)

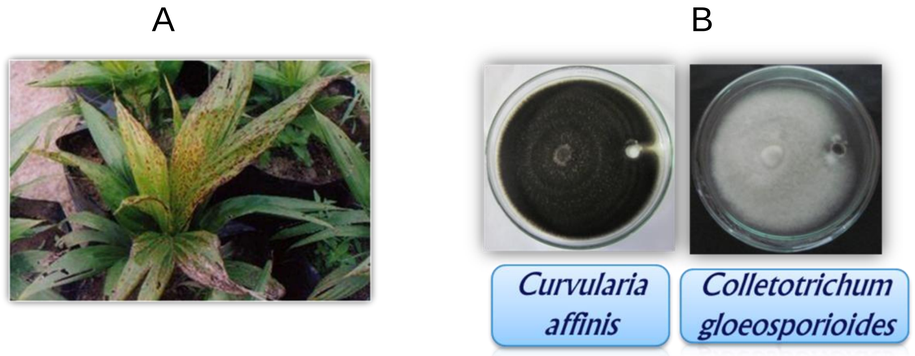
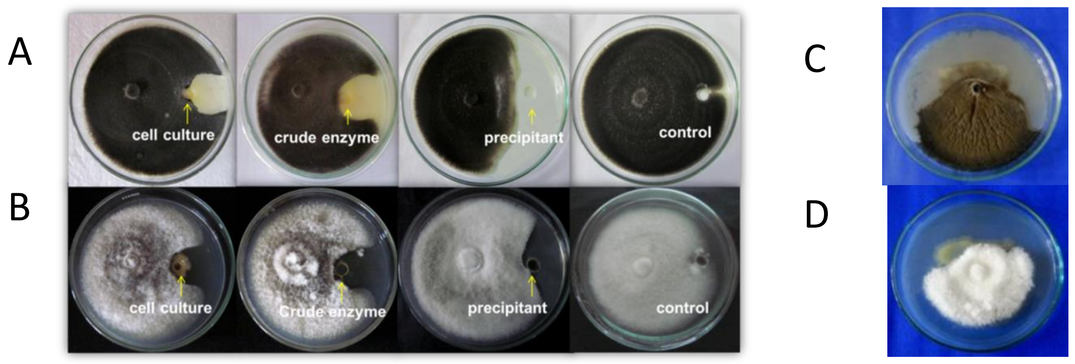


Fig. 3 The antagonistic activity of chitinolytic *B. thuringiensis* SAHA 12.08 against *C. affinis* (A) and *C. gloeosporioides* (B) after 7 days incubation on PDA medium. Aquadest used as negative control. Precipitated enzyme by using 30% ammonium sulphate.

The antagonistic activity of glucanolytic *B. subtilis* SAHA 32.6 against *C. affinis* (C) and *C. gloeosporioides* (D) after 7 days incubation on PDA medium.



Effectiveness of *B. thuringiensis* SAHA 12.08 against Leaf Blight Disease (Detached Leaf Assay)

Crude enzyme has inhibitory against *C. affinis* better than 60-h cell culture. *C. gloeosporioides* 60-h cell culture capable of inhibiting better than the crude enzyme. This chitinase could inhibit *C. affinis* than *C. gloeosporioides* through in vitro and detached leaf assay and has potential application as biocontrol agents for *C. affinis* and *C. gloeosporioides*.

Fig. 4 Effectiveness of *B. thuringiensis* SAHA 12.08 against leaf-blight disease using oil palm leaves

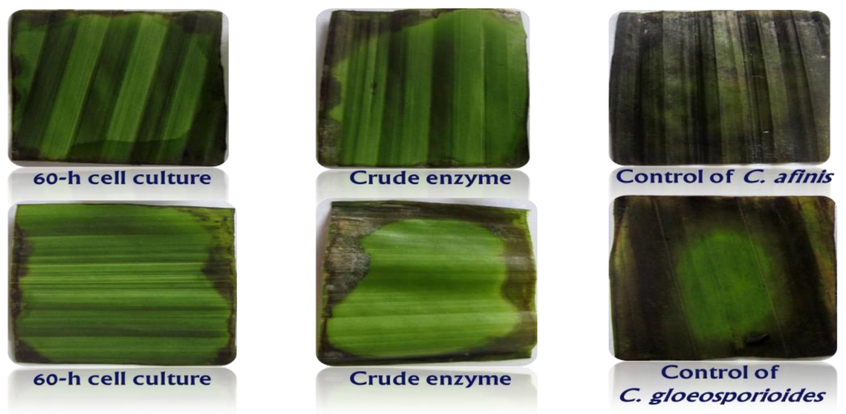


Fig. 5 Leaf structure of oil palm after treatment with (a) *C. affinis* , (b) *C. affinis* + *B. thuringiensis*, (c) negative control (without treatment): 1) upper epidermis, 2) bundle sheath, 3) mesophyll, 4) lower epidermis

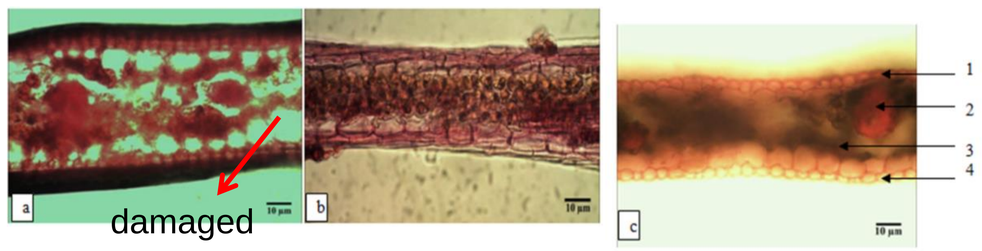


Fig. 6 Leaf structure of oil palm after treatment with (a) *C. gloeosporioides*, (b) *C. gloeosporioides + B. thuringiensis,* (c) negative control (without treatment): 1) epidermis, 2) mesophyll, 3) bundle sheath