

Produksi bioinsektisida ulat grayak (*spodoptera sp.*) berbasis sistein jahe merah (*zingiber officinale*) = Producing army worm (*spodoptera sp.*) bioinsecticide based on sistein of red ginger (*zingiber officinale*) var *rubrum*

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Abstrak

Ulat grayak *Spodoptera sp.* merupakan salah satu hama yang sangat merusak. Berbagai insektisida kimia telah diciptakan untuk mengontrol serangga tersebut salah satunya bekerja dengan menghambat Asetilkolinesterase AChE pada sistem saraf. Akan tetapi, insektisida kimiawi tersebut menyebabkan efek samping terhadap mamalia yang memiliki situs katalitik sejenis serta terakumulasi pada hewan air. Kita perlu menciptakan insektisida yang ramah lingkungan, ramah pengguna, secara spesifik mengontrol ulat grayak, dan terdegradasi secara alamiah dalam tubuh hewan air. Penelitian ini menginvestigasi aktifitas protease sistein jahe merah *Zingiber officinale* var. *Rubrum* dalam kaitannya menghambat kerja Asetilkolinesterase ulat grayak. Jahe merah terkenal dengan kekuatan kandungan enzim proteasenya, yaitu zingibain. Jenis protease zingibain cocok dengan situs katalitik pada ulat grayak sehingga jahe merah potensial dijadikan bahan baku bioinsektisida ulat grayak yang memenuhi kriteria di atas. Jahe merah segar dicuci kemudian diekstraksi dengan dua variasi yakni menggunakan pelarut etanol 95 dan tanpa pelarut. Aktifitas enzim yang diperoleh menggunakan pelarut jauh lebih kecil dibandingkan dengan ekstrak yang diperoleh tanpa menggunakan pelarut sehingga tidak dilanjutkan ke tahap uji efikasi. Perolehan ekstrak tanpa menggunakan pelarut disentrifugasi pada 4600 rpm dan difilter. Filtrat kemudian dicampur dengan buffer natrium fosfat ber-pH 7 dengan rasio 1:1. Campurannya kemudian disentrifugasi kembali pada 4600 rpm selama 30 menit dan ambil supernatannya. Supernatan hasil ekstrak tersebut digunakan untuk mencelup daun pakan ulat grayak berinstar 4. Efeknya terlihat dengan kematian ulat grayak pada konsentrasi larutan 25 dan 50 sedangkan pada larutan berkonsentrasi 100 hanya tampak perlambatan tumbuh kembang ulat. Ekstrak crude jahe merah tidak cukup efektif mematikan ulat grayak walaupun aktifitas enzimatisnya mencapai 169 PU. Ekstrak tersebut perlu diteliti lebih lanjut untuk dapat diproduksi sebagai bioinsektisida komersial.

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Armyworm *Spodoptera sp.* is highly polyphagous defoliator on various horticulture and grain plants. Various chemical insecticides have been created to control armyworms. One of those insecticides inhibits Acetylcholinesterase AChE in nervous system. Nevertheless, it causes side effect to mammals since their serine catalytic residue in their nervous system are inhibited and accumulated in under water living organism. There is a need to create an eco friendly, user friendly, and specific insecticide which only affect armyworm's nervous system, and degraded safely in the body of under water living organism. This research investigates cysteine protease's enzyme activity of red ginger *Zingiber officinale* var. *Rubrum* to block armyworm's AChE. Red ginger is known for its powerful proteolytic enzyme content, called zingibain. Its catalytic site also matches with residue site in armyworm's body so that red ginger's proteolytic enzyme can be used as bioinsecticide raw material which meets the criterias above. Fresh red ginger rhizomes were washed and extracted with 95 ethanol and without any organic solvents. Ethanol

extracted has lower enzymatic activity than non solvent extract so that only non solvent extract was continued to efficacy test. Non solvent was then deposited in low temperature and centrifuged at 4600 rpm to get rid of its starch content. It was filtrated through filtration paper to remove large contaminants. The filtrate was poured into 0.1 M Potassium Phosphate buffer pH 7 with ratio 1:1. The liquid was then centrifuged again at 4600 rpm for 30 minutes before collecting the supernatant. Fresh leaves were then dipped into crude ginger protease extract and fed to fourth instar armyworms. Leaves dipped into non diluted extract were barely eaten by armyworm while the 50 and 25 dilution was half eaten and most eaten. The crude red ginger extract was not strong enough to kill them although the research showed its enzymatic activity reaches up to 169 PU. It still needs improvement to be produced as commercial bioinsecticide.