EXPRESSION OF SOYBEAN β-1,3-ENDOGLUCANASE CDNA AND EFFECT ON DISEASE TOLERANCE IN TRANSGENIC CABBAGE PLANTS

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ABSTRACT

Cabbage (*Brassica oleracea* cv. *capitata* L.) is one of the main and important upland vegetables in Indonesia. However, growing cabbage is facing so many problems, especially fungal disease where there is no resistance gene found. Therefore, the development of cabbage resistant to fungal disease through the use of unconventional method is utmost important. *Agrobacterium*-mediated transformation of soybean β-1,3-endoglucanase cDNA, a fungal disease resistance gene, into cabbage genome has been done and got seven cabbage transformant. The expression of soybean β-1,3-endoglucanase cDNA in cabbage transformant was checked by dot blot hybridization of total RNA of recombinant planlet using amplified β-1,3-endoglucanase cDNA fragment as a probe. Disease tolerant of the recombinant cabbage was analyzed by inoculating the recombinant planlets using *Fusarium* sp. Analysis of soybean β-1,3-endoglucanase cDNA expression demonstrated that four out of seven recombinant cabbage planlets were able to express transformed gene, and three of them showed a complete resistance to *Fusarium* sp infection. However one of them showed a partial resistance as demonstrated by appearance of necrotic area that was smaller than untransformed cabbage.

Keywords: Cabbage plant (*Brassica oleracea* cv. *capitata* L.), soybean β-1,3-endoglucanase cDNA, expression, disease tolerant

INTRODUCTION

Cabbage (*Brassica oleracea* cv. *capitata* L.**)** is one of the main and important upland vegetable in Indonesia, as it has a high economic value. In addition to fill the domestic market, cabbage is also used as an export commodity. Recently, cabbage become one of the most exported fresh vegetables in Indonesia, along with tomato, potato, red pepper, broccoli, and shallots (Permadi, 1993). The production of cabbage was inhibited by the spread of pest and plant diseases that attack to the plant. So far controlling the cabbage diseases still uses a conventional methods, such as pesticide and cross hybridizations to generate resistant hybrids. Conventional crossbreeding is time consuming and allows unwanted character of the parents to be expressed. One of alternative ways to solve the problem is the development of recombination cabbage by introducing an anti-fungi gene β-1,3-endoglucanase into cabbage genome, so that a fungi-tolerant cabbage will be produced (Permadi, 1993; Djatnika, 1993).

The use of soybean β-1,3-endoglucanase to cope fungi attack is based on the ability of the enzyme to catalyses the hydrolysis of β-1,3-glucan, the major component of the cell wall of the most fungi. In addition, the hydrolysis produces an elicitor that is a carbohydrate, which in turn induces the production of antifungal compound, phytoalexins. This small molecular weight compound that is produced by plant as a respond of infection is an important mechanism in plant self-defense (Keen, 1981; Keen and Yoshikawa, 1983; Yoshikawa *et al*., 1995; Boudart *et al*., 2003).

In effort to improve the quality of cabbage crop, especially for the resistance to the disease that is caused by pathogenic fungi, is expected can be reached by introducing cDNA of soybean β-1,3-endoglucanase into cabbage genome (*B. oleracea* var. *capitata* L.) via *Agrobacterium tumefaciens. Agrobacterium*-mediated transformation of soybean β-1,3-