

**EKSPRESI GEN *PHYTOENE SYNTHASE* DAN
LYCOPENE β - *CYCLASE* DALAM JALUR BIOSINTESIS KAROTEN
PADA LIMA TAHAP PERKEMBANGAN BIJI BERAS HITAM
(*Oryza sativa* L. 'Cempo Ireng')**

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INTISARI

Beras merupakan makanan pokok sebagian besar masyarakat Indonesia. Terdapat beragam warna beras yang dipengaruhi oleh pigmen warna pada bagian aleuron biji padi, salah satunya ialah beras hitam. Beras hitam Cempo Ireng dikenal berasal dari Yogyakarta. Beras hitam dapat memberi manfaat kesehatan bagi tubuh karena mengandung banyak senyawa antioksidan seperti antosianin dan karoten. Phytoene synthase (PSY) dan lycopene β - cyclase (LCYb) merupakan enzim yang berperan dalam jalur biosintesis karoten pada tumbuhan. Penelitian ini bertujuan untuk mengamati biosintesis karoten secara molekuler menggunakan ekspresi gen *PSY* dan *LCYb* pada tahap bunting, *anthesis*, *milk stage*, *dough stage*, dan *mature stage* biji padi hitam Cempo Ireng. Pengamatan tahap perkembangan dilakukan dengan mengamati biji padi yang diambil pada beberapa hari perkembangan, yaitu pada 0 *Day after Flowering* (DAF), 3 DAF, 8 DAF, 10 DAF, 12 DAF, 15 DAF, 17 DAF, dan 22 DAF di bawah mikroskop *stereo* dengan perbesaran 40 \times dan didokumentasikan. Pengamatan secara molekuler dilakukan dengan mengisolasi RNA biji padi pada kelima tahap perkembangan biji menggunakan *RNeasy Plant Mini Kit*. RNA yang telah terisolasi diuji kemurnian dan konsentrasinya menggunakan spektrofotometer nanodrop. *Coplementary DNA* (cDNA) disintesis dari RNA menggunakan *GoScript™ Reverse Transcription System Kit*. Hasil ekspresi dari gen *PSY* dan *LCYb* diuji dengan menggunakan *quantitative PCR* (qPCR). Hasil yang didapatkan menunjukkan bahwa biji padi hitam Cempo Ireng mengekspresikan gen *PSY* dan *LCYb* pada kelima tahap perkembangan biji. *PSY* diekspresikan paling tinggi pada tahap perkembangan *dough stage* yaitu sebanyak 135,92 kali lebih tinggi (*up regulated*) terhadap tahap bunting dan *LCYb* diekspresikan paling tinggi pada tahap *milk stage* yaitu sebanyak 10,26 kali lebih tinggi (*up regulated*) terhadap tahap bunting.

Kata kunci: beras hitam Cempo Ireng, biosintesis β - karoten, lycopene β - cyclase (LCYb), phytoene synthase (PSY)

**GENE EXPRESSION OF PHYTOENE SYNTHASE AND
LYCOPENE β - CYCLASE IN CAROTENE BIOSINTESIS OF FIVE
DEVELOPMENT STAGES OF BLACK RICE SEEDS
(*Oryza sativa* L. 'Cempo Ireng')**

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ABSTRACT

Rice has been being the main staple food of Indonesian. There are various colors of rice influenced by pigments contained in the aleurone parts of rice seeds, one of them is black rice Cempo Ireng. Black rice Cempo Ireng is one of the local cultivar pigmented rice located in Yogyakarta. In addition to be consumed as a calorie source food, black rice can also provide health benefits to the body because it contains many antioxidant compounds such as anthocyanin and carotenoids. Phytoene synthase (PSY) and lycopene β - cyclase (LCYb) are enzymes that play a role in the biosynthetic pathway of carotenoids in plants. This study aimed to observe the carotenoids biosynthesis through molecular approach by gene expression of PSY and LCYb at pre - anthesis stage, anthesis, milky stage, dough stage, and mature stage of Cempo Ireng black rice seed. The development stages were carried out by observing rice seeds taken on several development days at the seed age: 0 Day after Flowering (DAF), 3 DAF, 8 DAF, 10 DAF, 12 DAF, 15 DAF, 17 DAF, 22 DAF utilize the 40 \times magnification of stereo microscope. Molecular approach was conducted by isolating the Cempo ireng RNA in the five stages of seed development using RNeasy Plant Mini Kit. The purity of isolated RNA was tested using a nanodrop spectrophotometer. Complementary DNA (cDNA) is synthesized using the GoScript™ Reverse Transcription System Kit. The results of gen expression of PSY and LCYb synthesized enzyme were tested using quantitative Real Time PCR (qPCR). The result showed that the black rice Cempo Ireng seed expressed the coding gene PSY and LCYb at all five stages of seed development. The highest expression of PSY is at the dough stage of development stage, quantify of 135.92 times higher (up regulated) relatives to the pre - anthesis stage and the highest expression of LCYb is at the milk stage which is 10.26 times higher relatives to pre - anthesis stage.

Keywords: *black rice Cempo Ireng, β - carotene biosynthesis, phytoene synthase gene (PSY), lycopene β - cyclase gene (LCYb)*