

EKSPRESI GEN *EgPAP3* TERKAIT PENYERAPAN FOSFAT PADA KELAPA SAWIT (*Elaeis guineensis* Jacq.) PROGENI ‘Dumpy’ DAN ‘Yangambi’

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INTISARI

Pemuliaan kelapa sawit terutama pada varietas Tenera dengan progeni 'Dumpy' dan 'Yangambi' dilakukan karena menghasilkan minyak tinggi. Namun, masih banyak permasalahan lahan terbatas dan indikasi kekahatan nutrisi di lahan seperti kekurangan fosfat. Fosfat merupakan unsur hara makro yang penting bagi perkembangan pertumbuhan awal kelapa sawit. Respon kelaparan fosfat membuat tumbuhan mengaktifkan ekspresi gen yang terlibat dalam serapan dan pengangkutan fosfat salah satunya *PAP*. *EgPAP3* merupakan gen yang mengkodekan *purple acid phosphatase*. Oleh karena itu, penelitian ini bertujuan untuk mengetahui tingkat ekspresi gen *EgPAP3* pada akar kelapa sawit progeni 'Yangambi' dan 'Dumpy' pada tiga perlakuan fosfat, yaitu kelaparan P (0% fosfat), defisiensi P (4,67% fosfat), dan optimum P (14,01% fosfat) dikodekan P1, P2, dan P3. Hasil isolasi RNA memiliki konsentrasi diatas 50 ng/ μ L sehingga dapat digunakan dalam analisis ekspresi gen. Ekspresi gen target dieksplorasi dengan metode RT-qPCR. Pendekatan analisis ekspresi gen relatif menggunakan metode $2^{-\Delta\Delta C_t}$. Ekspresi gen *EgPAP3* mengalami peningkatan dalam menghadapi kelaparan fosfat diikuti perubahan karakter pada kelapa sawit 'Yangambi' dan 'Dumpy' terutama difokuskan pada struktur akar yaitu pemanjangan, adanya akar lateral, serta peningkatan jumlah akar sekunder dan biomassa akar yang merupakan upaya peningkatan efisiensi penyerapan fosfat. Diharapkan penelitian ini dapat memberikan wawasan baru mengenai potensi peningkatan penyerapan fosfat pada kelapa sawit, yang dapat meningkatkan produktivitas kebun kelapa sawit milik rakyat.

KATA KUNCI: *EgPAP3*, ekspresi gen, kelapa sawit, RT-qPCR

EXPRESSIONS OF THE *EgPAP3* GENE RELATED TO PHOSPHATE UPTAKE IN OIL PALM (*Elaeis guineensis* Jacq.) PROGENY ‘Dumpy’ AND ‘Yangambi’

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ABSTRACT

Oil palm breeding, particularly of the Tenera variety with its progenies ‘Yangambi’ and ‘Dumpy’ has been conducted due to its high oil yield. However, challenges remain regarding limited land availability and nutrient deficiencies, especially phosphate deficiency. Phosphate is a macronutrient essential for the early growth and development of oil palm. Under phosphate starvation, plants activate the expression of genes involved in phosphate uptake and transport, one of which is *Purple Acid Phosphatase (PAP)* gene family. *EgPAP3* is a gene that encodes purple acid phosphatase. Therefore, this study aimed to determine the level of *EgPAP3* gene expression in the roots of oil palm genotypes ‘Yangambi’ and ‘Dumpy’ in three phosphate treatments, namely P starvation (0% phosphate), P deficiency (4.67% phosphate) and optimum P (14.01% phosphate) encoded P1, P2, and P3. The isolated RNA had concentrations above 50 ng/ μ L, which were suitable for gene expression analysis. Gene expression genes was analyzed using the RT-qPCR method, and relative gene expression levels were calculated using the $2^{-\Delta\Delta Ct}$ approach. *EgPAP3* gene expression increased under phosphate starvation and was accompanied by morphological changes in both ‘Yangambi’ and ‘Dumpy’, particularly in root structure, including root elongation, the emergence of lateral roots, and an increase in the number of secondary roots and root biomass as adaptive strategies to enhance phosphate absorption efficiency. This research provide new insights into the potential improvement of phosphate uptake in oil palm, which may contribute to increasing the productivity of smallholder oil palm plantations.

KEYWORDS: *EgPAP3*, gene expression, oil palm tree, RT-qPCR