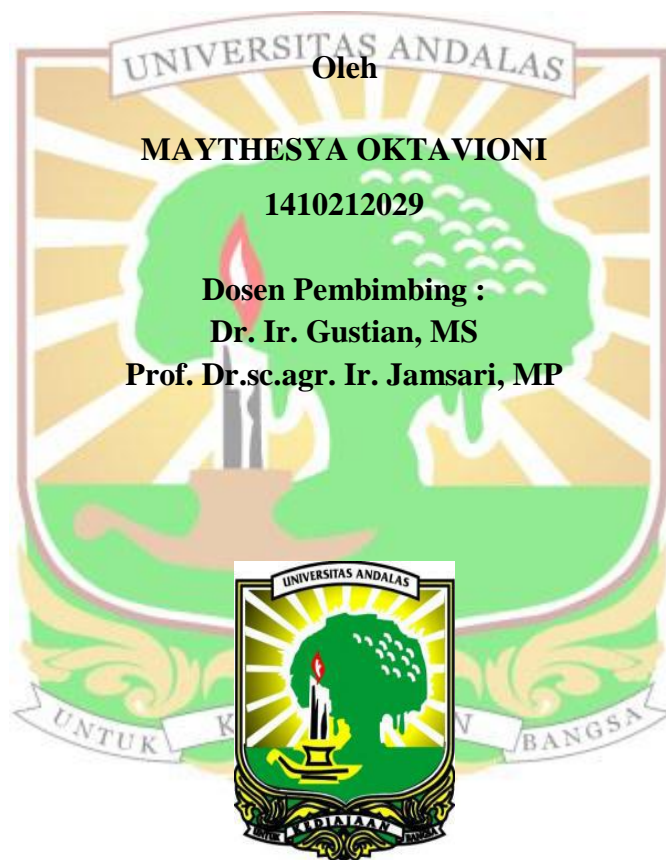


**ISOLASI DAN KARAKTERISASI PROMOTOR DISTAL GEN
NPR1 DARI TANAMAN CABAI (*Capsicum annuum* L.)**

SKRIPSI



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ABSTRAK

Protein *NPR1* adalah regulator utama dari sistem ketahanan tanaman terhadap patogen berupa bakteri, jamur, virus, dan nematoda. Sistem ketahanan ini dikenal dengan *Systemic Acquired Resistance* (SAR). Ekspresi gen *NPR1* diinduksi oleh patogen dan senyawa asam salisilat (AS). Promotor distal adalah sekuen regulator penting yang mengandung elemen *cis-acting*, *enhancer*, dan *silencer* yang berperan dalam inisiasi transkripsi gen. Elemen *cis-acting* yang sering ditemukan pada promotor gen yang diinduksi oleh patogen dan AS berupa elemen *W-box*, *RAVIAAT*, dan *ASF1*. Penelitian ini bertujuan untuk memberikan informasi terkait struktur dan peran promotor distal gen *NPR1* sebagai referensi dalam interaksi *elemen cis-acting* dengan faktor transkripsi dan optimalisasi promotor, serta perakitan tanaman transgenik yang tahan *geminivirus*. Sekuen promotor distal gen *NPR1* (*PD_CbNPR1*) diisolasi dari DNA genom cabai genotipe *Berangkai* menggunakan primer spesifik. Elemen-elemen *cis-acting* dikarakterisasi dengan *PLACE a Database of Plant Cis-acting Regulatory DNA Elements*. Sekuen *PD_CbNPR1* yang berhasil diisolasi berukuran 5.950 bp yang berada pada posisi 4.051-10.000 bp dari ATG. Elemen-elemen *cis-acting* yang ditemukan pada promotor distal *PD_CbNPR1* berupa *W-box*, *WLE1*, *RAVIAAT*, *TATA-box*, *CAAT-box*, *GARE*, dan *GT1*, selain ini juga ditemukan adanya elemen *enhancer* dan *silencer*. Empat elemen *enhancer* yang ditemukan pada *PD_CbNPR1* adalah *CCAAT-box*. Sedangkan elemen *silencer* yang ditemukan berjumlah satu buah dengan urutan konsensus GAGAAATT. Agar fungsi dan peran masing-masing elemen *PD_CbNPR1* (*cis-acting*, *enhancer*, dan *silencer*) dalam regulasi ekspresi gen *NPR1* dapat diketahui, penelitian lanjutan berupa analisis *in-vitro* dengan cara konstruksi dan analisis fungsional promotor perlu dilakukan.

Kata kunci : *CCAAT-box*, gen *NPR1*, promotor distal, *RAVIAAT*, *W-box*

ISOLATION AND CHARACTERIZATION THE DISTAL PROMOTER OF NPR1 GENE FROM CHILI PEPPER (*Capsicum annuum* L.)

ABSTRACT

NPR1 protein is one of key regulator of plant defense system against pathogen such as bacteria, fungi, viruses, and nematodes. This defense system is known as Systemic Acquired Resistance (SAR). The NPR1 gene expression is induced by pathogens and salicylic acid (SA). Distal promoter is the important regulatory sequence contains cis-acting elements, enhancer, and silencer that play important role in initiation of gene transcription. Cis-acting elements that are often found on promoter sequence that induced by pathogens and SA are W-box, RAV1AAT, and ASF1. This study aimed to isolate and characterize the distal promoter of NPR1 gene (*PD_CbNPR1*) from chili pepper (*Capsicum annuum* L.) genotype *Berangkai*. This research provide information related to the structure of NPR1 gene distal promoter which is active during interaction between cis-acting elements and transcription factors. The ability to optimize the promoter region will be very important in development of transgenic plants that is resistant to geminivirus. The promoter sequence of *PD_CbNPR1* was isolated from genomic DNA of chili pepper genotype *Berangkai* using specific primers. The cis-acting elements was characterized by PLACE. The isolated promoter distal of *PD_CbNPR1* sequence exhibited a 5,950 bp in size located at 4,051 to 10,000 from the ATG start point. The cis-acting elements that found in *PD_CbNPR1* are *W-box*, *WLE1*, *RAV1AAT*, *TATA-box*, *CAAT-box*, *GARE*, dan *GT1*. The enhancer and silencer elements also successfully found which are characterized as *CCAAT-box* and *GAGAAATT* respectively. However, further functional analysis is needed to elucidate their role in the NPR1 gene regulation.

Keywords: CCAAT-box, distal promoter, NPR1, RAV1AAT, W-box