

GENETIC VARIABILITY AND PHENETIC RELATIONSHIPS OF NUTMEG (*Myristica fragrans* Houtt.) FROM WEST JAVA BASED ON MORPHOLOGICAL AND PCR-ISSR MARKERS

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ABSTRACT

Nutmeg (*Myristica fragrans* Houtt.) is one of Indonesia's primary spice commodities. It belongs to the family Myristicaceae, originated from the Banda Islands, and is widely cultivated worldwide. Although extensive research has been conducted on the potential use of Nutmeg, no research has been carried out specifically on genetic variability of Nutmeg from West Java. Using morphological and molecular approaches this scientific investigation was carried out to explore the genetic variability and phenetic relationships of Nutmeg cultivars from West Java and to determine the characters that affect the phenetic relationships patterns of Nutmeg. Morphological character observation and species identification were carried out in the field in May 2022, while molecular character observation such as DNA isolation and PCR-ISSR analysis were carried out at the laboratory between June to September 2022. Variability and phenetic relationships based on morphological and molecular characters were analyzed based on the *Unweighted Pair Group Method with Arithmetic Mean* and *Principal Component Analysis* methods using the *Multi Variate Statistical Package* software. A total of 34 morphological characters were observed both qualitative and quantitative. The result showed that there are three Nutmeg fruit shape variations i.e. round, oval, and thick round. The dendrogram based on morphological characters using the *Gower General Similarity Coefficient* formed two main clusters with a similarity index between 0.45-0.88. While the dendrogram based on molecular markers using the *Jaccard's Coefficient* has a similarity index between 0.43-0.90 and formed also 2 main clusters but with different compositions of group members. The results of *Principal Component Analysis* showed that the main morphological characters that influence the relationships patterns were leaf shape, fruit shape, and fruit size index. Among the studied primers, the ISSR 3 showed the highest *Polymorphism Information Content* value (0.28) and the ISSR 7 provided the lowest value (0.27), with a similarity index of 0.43. Also, the findings showed that the geography of an area does not associate with genetic variability. In the future, the study results can be used to develop identification program of prospective cross-parents for assembling superior cultivars.

Keywords: Numerical taxonomy, polymorphism DNA, ISSR, classification

VARIABILITAS GENETIK DAN HUBUNGAN PHENETIK PALA (*Myristica fragrans* Houtt.) DARI JAWA BARAT BERDASARKAN PENANDA MORFOLOGIS DAN PCR-ISSR

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INTISARI

Pala (*Myristica fragrans* Houtt.) merupakan salah satu komoditas rempah unggulan Indonesia. Pala termasuk anggota Myristicaceae, berasal dari Kepulauan Banda, dan banyak dibudidayakan di seluruh dunia. Meskipun telah banyak dilakukan penelitian tentang potensi penggunaan Pala namun belum ada penelitian yang dilakukan secara khusus tentang variabilitas genetik Pala dari Jawa Barat. Dengan menggunakan pendekatan morfologi dan molekuler, penelitian ini dilakukan untuk mempelajari variabilitas genetik dan kekerabatan fenetik Pala dari Jawa Barat serta mengetahui karakter yang mempengaruhi pola kekerabatan fenetik Pala. Pengamatan karakter morfologi dan identifikasi spesies dilakukan di lapang pada Mei 2022, sedangkan pengamatan karakter molekuler seperti isolasi DNA dan analisis PCR-ISSR dilakukan di laboratorium antara Juni hingga September 2022. Variabilitas dan hubungan fenetik berdasarkan karakter morfologi dan molekuler dianalisis berdasarkan metode *Unweighted Pair Group Method with Arithmetic Mean* dan *Principal Component Analysis* menggunakan perangkat lunak *Multi Variate Statistical Package*. Sebanyak 34 karakter morfologi diamati baik secara kualitatif maupun kuantitatif. Hasil penelitian menunjukkan tiga variasi bentuk buah Pala yaitu bulat, lonjong, dan bulat tebal. Dendrogram berdasarkan karakter morfologi menggunakan *Gower General Similarity Coefficient* membentuk dua klaster utama dengan indeks kesamaan antara 0,45-0,88. Sedangkan dendrogram menggunakan penanda ISSR dengan *Jaccard's Coefficient* memiliki indeks kemiripan antara 0,43-0,90 dan juga membentuk 2 klaster utama, namun dengan komposisi anggota grup yang berbeda. Hasil *Principal Component Analysis* menunjukkan bahwa karakter morfologi utama yang mempengaruhi pola kekerabatan adalah bentuk daun, bentuk buah, dan indeks ukuran buah. Dari primer yang diteliti, ISSR 3 menunjukkan nilai *Polymorphism Information Content* tertinggi (0,28) dan ISSR 7 memberikan nilai terendah (0,27) dengan indeks kesamaan 0,43. Hasil penelitian menunjukkan bahwa letak geografi suatu daerah tidak mempengaruhi variabilitas genetik Pala. Kedepannya hasil penelitian dapat digunakan sebagai panduan identifikasi calon induk persilangan untuk perakitan varietas unggul.

Kata kunci: Taksonomi numerik, polimorfisme DNA, ISSR, klasifikasi