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DEVELOPMENT AND ENVIRONMENTAL
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"TOWARD HARMONIZATION BETWEEN DEVELOPMENT AND ENVIRONMENTAL CONSERVATION IN BIOLOGICAL PRODUCTION"

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Genetics Diversity Analysis of Durian Landraces in Serang Regency base on Morphological and Isozymes Characters

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Abstract

Serang regency was known has high diversity of Durian (*Durio zibethinus* Murr.) landraces. In order to elucidate the genetics variability of the diversity, eighteen landraces from four locations were subjected to morphological studies and isoenzymes analysis. The obtained data were analyzed for genetics relationship among landraces base on morphological and isoenzymes characters and compatibility between morphological and isoenzymes characters. Base on fourteen morphological characters there were 54 % of dissimilarity level indicates medium morphological variability. Isoenzymes analysis by using 7 proteins resulted 39 bands, and genetics variability of evaluated trees was 93 % of dissimilarity level. The concurrence analysis on morphological and isoenzymes analysis result, showed the very weak Rohlf correlation value ($r=0,074$). This result was indicated that grouping of durian landraces should be using joint of morphological and isozyme analysis. Joint morphological-isozyme cluster analysis showed that genetics variability among evaluated trees were 60 % of dissimilarity level, and at 53 % level dissimilarity, the durian landraces in Serang Regency should be classified into three groups i.e., 1) Seureuh, Sawah, Pedes, Tolaksana, Potret, Rampayak, Onder, Belu, (2) Balingbing, TM, Paok, Maslay, Emas, Puso, Liter, and 3) Montong, Chanee, and Camat.

Keywords: Durian (*Durio zibethinus* Murr.), isozyme analysis, genetics diversity.

INTRODUCTION

Southeast Asia was believed as center of origin of durian (*Durio zibethinus* Murr.), and Borneo Island stated as distribution center (Morton, 1987), subsequently from Borneo Island durians were distributed to other region of Southeast Asia, including Java Island, and domesticated and selected in throughout Southeast Asia. As center of Indonesia has very high variability in durian, and very useful for breeding development, so far Ministry of Agriculture of Indonesia has released 37 cultivated variety of durian.

Serang regency located in north coast of West Java reported as production center of durian, with very high variability in term of morphological character as well as fruit characters. In Serang regency has acknowledged several durian landraces Potret, Kadu, Sawah and Maslay with specific advantage as taste, flavors, flesh color and flesh thickness. In addition the genetics variability of durian landraces are shown from other morphological characters, as tree architecture, leave shape, leave size and fruit shape.

Genetics variability is a source for crop improvement, and information on genetics diversity and its distribution on the population are very important for breeding program (Thormann and Osborn, 1992; Lee M. 1995). Unfortunately genetics variability of durian in Indonesia, in general, and particularly in Serang regency are not well identified yet, since exploration and recording of durian germplasm still lack behind, subsequently nomenclature and clustering of durian mostly using fruit characters that vulnerable to environmental and climatic change. In order to develop date base on genetics variability on durian landraces in Serang regency, exploration and identification of potential landraces has been conducted. The collected information will be useful for breeding program of durian as genetic

sources for trait improvement and also necessary for conservation of durian germplasm in Serang regency.

The potential of molecular techniques (RFLP, RAPD, microsatellites, AFLP) and protein markers (represented particularly by isoenzymes and seed storage proteins) for cultivar identification and phylogenetic studies has not been completely explored. The usefulness of a particular category of molecular / biochemical markers is limited by several attributes including e.g. level of polymorphism, environmental stability, the number of loci, molecular basis of the polymorphism and the ease and cost of analysis. In this context, the advantages of isozymes include the simplicity and low cost of analysis, the simple molecular basis of their polymorphism and reasonable genome coverage (10–50 loci per species) – (Gepts 1995).

Application of isozymes has been performed by Idris (1993) on five clones of Malaysian Durian by using *alkaline phosphatase*, *acid phosphatase*, and *peroxidase*. Moreover Suketi (1994) revealed that isozymes were able to differentiate durian clones chanee, monthong and sitokong. Both of them indicated that not all of the clone can be differentiated by using one enzyme system; therefore it is necessary to identify morphological characters as genetic markers to reveal durian germplasm.

MATERIAL AND METHODS

Plant Materials

Plant materials that subjected to the analysis are eighteen potential landraces from four sub-districts in Serang regency. List of the landraces presented in Table 1. The landraces analyzed as single trees and morphological observation conducted in-situ.

Table 1. List of landraces analyzed in the study, along with their sub-district origin

Number	Local Name	Sub-district of Origin
1	Seureuh	Padarincang
2	Pedes	Padarincang
3	Sawah	Padarincang
4	Balingbing	Padarincang
5	Paok	Padarincang
6	Monthong	Pabuaran
7	Maslay	Pabuaran
8	Chanee	Pabuaran
9	Tolaksana	Baros
10	Emas	Baros
11	Onder	Baros
12	Belu	Baros
13	Potret	Baros
14	Teem	Ciomas
15	Puso	Ciomas
16	Liter	Ciomas
17	Camat	Ciomas
18	Rampayak	Ciomas

Morphological observation

Morphological observation conducted in-situ, base on Tropical Fruit Descriptor (IBPGR, 1980), Leaflet Shape (LFS), Leaflet Base Shape (LBS), Leaf Midrib (LMr), Upper Surface Color (USC), Lower Surface Color (LSC), Surface Between Veins (SBV), Leaf Blade Margin (LBM), Leaf Blade Length (LBL), Leaf Blade Width (LBW), Petiole Length (PtL), Trunk Diameter (TrD), Trunk Height (TrH), Canopy Diameter (CaD), Canopy Diameter (CaD), and Canopy Shape (CaS) - (IBPGR, 1980).

Morphological characters classified into descriptive data, which divided into several categories, score 1 for presence and 0 for absence.

Isozymes Analysis

Isozymes analysis was conducted following procedure of Wendel and Weeden (1989). Seven isozymes were using to elucidate genetics variability of eighteen durian landraces, consist of *peroksidase* (PER), *esterase* (EST), *acid phosphatase* (ACP), *alcohol dehydrogenase* (ADH), *aspartate aminotransferase* (AAT), *malate dehydrogenase* (MDH), and *super oxide dismutase* (SOD).

Data analysis

The obtained data were subjected for cluster analysis by using computer program NTSYS-pc (*Numerical Taxonomy and Multivariate Analysis System*) version 2.0 (Rohlf, 1998). Coefficient of similarity among *landraces* measured base on Dice coefficient (Nei and Lie, 1979), by using un-weighted pair group method of arithmetic average (UPGMA) function *similarity qualitative* (SIMQUAL). Comparison analysis between morphological markers and isozymes markers was conducted by using MXCOMP function of NTSYS-pc version 2.0 (Rohlf, 1998), and level of similarity determined by *goodness of fit*; very good ($r \geq 0.9$), good ($0.8 \leq r < 0.9$), weak ($0.7 \leq r < 0.8$), very weak ($r < 0.7$) Rohlf (1993).

RESULTS

Morphological Markers

Morphological identification and analysis on eighteen durian landraces of Serang Regency indicated that high variability was showed by following characters Leaflet Shape (LfS), Leaflet Base Shape (LBS), Leaf Midrib (LMr), Surface between Veins (SBV), Leaf Blade Length (LBL), Leaf Blade Width (LBW), Petiole Length (PtL), trunk diameter (TrD), Trunk Height (TrH), Canopy Diameter (CaD) and Canopy Shape (CaS), however Leaflet Base Shape (LBS), Upper Surface Color (USC), Lower Surface Color (LSC) and Leaf Blade Margin (LBM) showed low variability among the landraces (Table 1).

Association among leaf characters was found on Leaflet Shape (LfS) class 1 and 4 associated with Leaf Midrib (LMr) class 1 (obvious), except for Belu, Potret, Puso, Liter, dan Rampayak that showed Leaf Midrib (LMr) class 2 (obscure). Subsequently Leaflet Shape (LfS) class 2 and 3 associated with Leaf Blade Margin (LBM) class 1 (*cuspidate*) and Leaflet Base Shape (LBS) class 1 (*acute*) (Tabel 2.)

A dendogram base on scored data of observed morphological characters revealed that the durian landraces separated into range 54% to 12% coefficient of dissimilarity. Closest relationship was found between Montong and Chanee at 12% of coefficient of dissimilarity as expressed in similarity of Leaf Blade Margin (LBM), Leaflet Base Shape (LBS), Leaf Midrib (LMr), Upper Surface Color (USC), Lower Surface Color (LSC). Those result indicated that these durian originated from common ancestor in Thailand (Figure 1).

At 50% coefficient of similarity the landraces were separated into three groups; first group consist of Seureuh, Pedes, Tolaksana, Potret, Rampayak, Onder, Liter and Belu; second group consist of Sawah, Puso, Maslay, Emas, TM, Balingbing, and Paok; and third group consist of Montong, Chanee, and Camat. The grouping result not associated with origin of the tree (Figure 1).

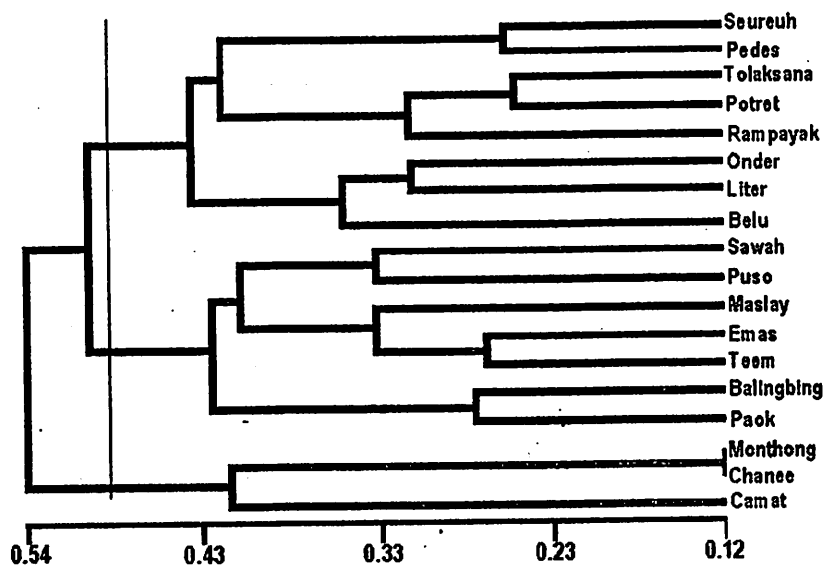


Figure 1. A dendrogram base on scored data of observed morphological characters of durian landraces at three sub-district of Serang Regency

Isozyme Markers

Isozymes analysis on eighteen durian landraces in Serang regency, showed that from seven isozymes, six enzymes system produce polymorphic band consist of *Peroksidase* (PER), *Esterase* (EST), *Acid Phosphatase* (ACP), *Alcohol Dehydrogenase* (ADH), *Aspartate Aminotransferase* (AAT), and *Malate Dehydrogenase* (MDH), however *Super Oxide Dismutase* (SOD) produce null allele. Number of the band of each enzyme system ranged from three (ADH, AAT) to eleven (PER) at average of 6.5.

A dendrogram base on scored data of observed morphological characters revealed that the durian landraces separated into range 54% to 17% coefficient of dissimilarity. Closest relationship was found between Seureuh with Pedes and Emas with Puso at 17% coefficient of dissimilarity (Figure 2).

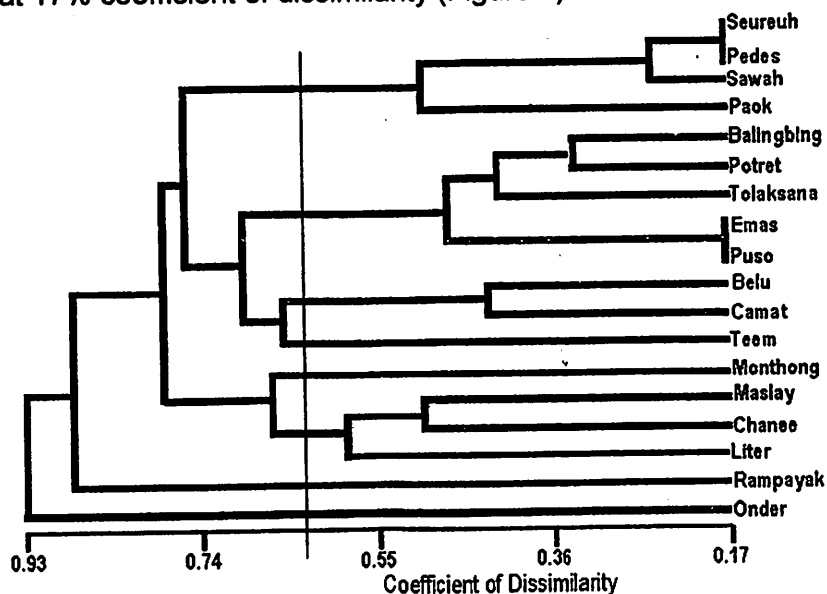


Figure 2. A dendrogram base on six enzymes system in isozyme analysis of durian landraces at three sub-district of Serang Regency

At 60% coefficient of similarity the landraces were separated into eight groups; first group consist of Seureuh, Pedes, Sawah, and Paok; second group consist of Balingbing, Potrét, Tolaksana, Emas and Puso; third group consist of Belu and Camat; fourth group is Teem; fifth group is Monthong; sixth group consist of Maslay, Chanee and Liter; seventh group is Rampayak; and eight group is Onder (Figure 2).

DISCUSSION

Clustering analysis revealed that variability of durian landraces of Serang regency in morphological markers was lower to those found in isozymes markers. The result indicated that isozyme analysis has advantages in genetic diversity analysis for the landraces. Subsequently the results also indicated that a variability pattern of morphological characters is not same to the pattern of isozyme analysis.

Association between grouping in morphological characters with grouping by isozyme analysis was evaluated by using *goodness of fit* base on Rohlf correlation value (1993), calculated *MxComp* correlation function with NTSYSpc program version 1.80 (Exeter software, New York). The concurrence analysis on morphological and isoenzymes analysis result, showed the very weak Rohlf correlation value ($r=0,074$). This result was indicated that grouping of durian landraces should be using joint of morphological-isozyme analysis.

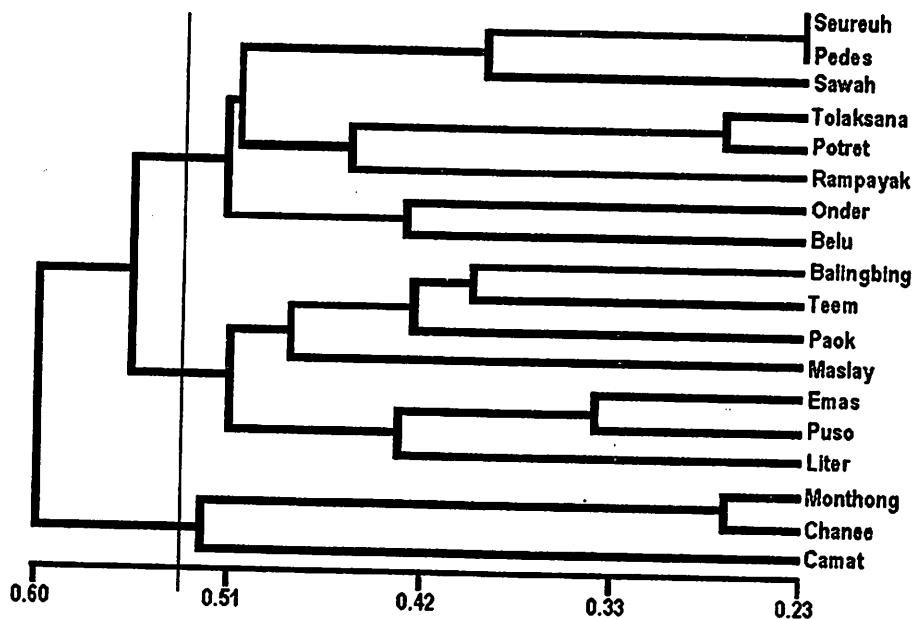


Figure 3. A dendrogram base on joint morphological-isozyme cluster analysis of durian landraces at three sub-district of Serang Regency

A dendrogram base on joint morphological-isozyme cluster analysis showed that genetics variability among evaluated trees were 60 % of dissimilarity level, and at 53 % level dissimilarity, the durian landraces in Serang Regency should be classified into three groups that first group consist of Seureuh, Sawah, Pedes, Tolaksana, Potret, Rampayak, Onder, Belu; second group consist of Balingbing, Teem, Paok, Maslay, Emas, Puso, Liter; and third group consist of Montong, Chanee, and Camat (Figure 3).

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