

ABSTRACT**GENETIC VARIATION AND MORPHOLOGY, PHYSIOLOGY, BIOCHEMICAL AND MOLECULAR MARKERS FOR EFFICIENT MAIZE****Makhziah¹⁾, Kusriningrum²⁾, Hery Punobasuki³⁾**

- 1) Post graduate student of Faculty of Science & Technology, Airlangga University
- 2) Faculty of Veterenery Medical, Airlangga University
- 3) Faculty of Science & Technology, Airlangga University

Nitrogen use efficiency (NUE) should become a good consideration in order to minimize the negative impacts of excessive N fertilization, particularly on crops that need lots of nitrogen (N) such as maize. Therefore, this research was carried out to enhance the understanding of genetic basis of NUE via morphological, physiological, biochemical traits and also molecular markers linked to NUE as criteria selection and find genetic materials for developing maize genotypes that use N efficiently or low-N tolerant. Three trials were carried out in this research; 1) evaluating genetic variation of maize for most of characters (morphology, physiology, biochemical) related to NUE and find out genetic materials for developing N efficient maize genotypes; 2) root system assessment in early growth stage; 3) protein profile analysis and molecular markers selection as candidate for marker assisted selection (MAS) in breeding for developing N-efficient maize genotypes or tolerant to N-low. Ten genotypes were evaluated at four N levels (0; 30; 90; 180 kg N/ha) in split plot randomized block design with three replications in field and in green house for root system assessment. Early root system growth of four genotypes was evaluated as criteria selection for N-efficient genotypes. Protein profile analyzed by SDS PAGE and random amplified polymorphism DNAs (RAPD) markers were selected for polymorphism to develop markers linked to NUE traits. Quantitative data was analyzed by heritability estimates, analysis of covariance (ANCOVA), honestly significant difference (HSD), and Pearson correlation analysis. Result showed N deprivation caused significantly ($P \leq 0,01$) varied reductions of plant height, leaves area, chlorophyll content, stay green, N uptake, biomass accumulation, grain yield and grain number among genotypes; but did increase anthesis-silking interval and N efficiency parameters. Heritability estimates were high for most of measured traits at all N levels. NK-33, Bisi-2, Pioneer-21, DK-979 and Bisma had more yield and high NUE therefore could be considered as genetic materials for developing N-efficient genotypes. Root system, biomass accumulation, N uptake, N uptake efficiency, N remobilization, NUE and agronomy efficiency were positive correlated significantly with yield, while nitrate reductase activity only related to yield at N-high. Some proteins (nitrate reductase, glutamine sintetase, glutamat dehidrogenase, dekarboksilase) may related to NUE. RAPD markers OPA2, OPA3, OPA5, OPA9, OPA11, OPA12, OPA13 and OPA18 showed polymorphism and could potentially as marker assisted selection (MAS) for identifying genotypes with high NUE or low-N tolerant genotypes in maize breeding program.

Key words: maize, nitrogen use efficiency, genetic variation, marker assisted selection.

*Allah adalah cahaya langit dan bumi
perumpamaan cahaya-Nya adalah ibarat sebuah misykat
dalam misykat itu ada pelita
pelita itu dalam kaca
kaca itu laksana bintang berkilau
dinyalakan dengan minyak pohon yang diberkati
pohon zaitun yang bukan di timur atau di barat
yang minyaknya hampir menyala dengan sendirinya
walaupun tiada api yang menyentuhnya
cahaya di atas cahaya!
Allah menuntun kepada cahaya-Nya,
siapa saja yang dia kehendaki
dan Allah membuat perumpamaan bagi manusia
sungguh Allah mengetahui segala (QS An Nur : 35).*

*Ya Tuhanku, berikanlah kepadaku ilmu dan masukkanlah
aku ke dalam golongan orang yang sholeh (QS As Syu'ara:83)*