



Genetic analysis and heterotic grouping of quality protein maize (*Zea mays* L.) inbred lines and derived hybrids under conditions of low soil nitrogen and drought stress

Godfred Afrifa Owusu · Ayodeji Abe ·
Priscilla Francisco Ribeiro

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Abstract Quality Protein Maize (QPM) varieties are rich in lysine and tryptophan, but suffer reduced grain yield (GY) in West and Central Africa (WCA) due to low soil nitrogen (low-N) and intermittent drought stress (DS). Development of stress-tolerant QPM hybrids will enhance sustainable maize production and improve nutritional health in WCA. Knowledge of combining ability, gene action and heterotic grouping of QPM inbred lines are crucial to successful breeding strategies for the development of superior hybrids with enhanced nutritional values. The objectives of this study were to: (i) determine the combining ability for GY and yield-related traits among 13 newly developed QPM inbred lines, and (ii) assign the QPM inbred lines to distinct heterotic groups based on general combining ability effects of multiple traits under low-N and DS conditions. Seventy-eight single cross hybrids were generated through half-diallel mating of 13 QPM inbred lines

and evaluated along with three commercial checks for GY and yield-related traits under the low-N and DS conditions. Significant general combining ability (GCA) and specific combining ability effects were obtained for GY and yield-related traits. Both additive and non-additive gene effects were involved in the inheritance of GY and other traits under low-N and DS conditions. However, the additive gene effect for GY was twice as large as non-additive gene effect. Three heterotic groups were each delineated under low-N and DS. Inbred lines, CRIZEQ-44 and CRIZEQ-77 belonging to different heterotic groups were identified as testers for the development of superior hybrids for low-N and DS environments.

Keywords Drought stress · General combining ability · Grain yield · Low soil nitrogen · Quality protein maize · Specific combining ability

Abbreviations

ASI	Anthesis-silking interval
BI	Base index
DAS	Days after sowing
AD	Days to 50% flowering
SD	Days to 50% silking
DS	Drought stress
EA	Ear aspect
EHT	Ear height
GCA	General combining ability
GY	Grain yield

G. A. Owusu (✉)
Pan-African University Institute of Life and Earth Sciences
(Including Health and Agriculture), PAULESI, University
of Ibadan, Ibadan, Nigeria
e-mail: godfredowusu098@gmail.com

G. A. Owusu · P. F. Ribeiro
CSIR-Crops Research Institute, Fumesua, Kumasi, Ghana

A. Abe (✉)
Department of Crop and Horticultural Sciences, University
of Ibadan, Ibadan, Nigeria
e-mail: ayodabe@yahoo.com