# Combining ability analysis and gene action underlying nutritional quality traits for silage from tropical maize germplasm


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## Abstract


A thorough understanding of the genetic basis and inheritance of nutritional quality traits is essential for developing a breeding pipeline to create silage maize hybrids and parental lines. This study determined the Nutritional composition, general combining ability (GCA), specific combining ability (SCA) and mode of gene action governing silage nutritional quality traits in tropical maize germplasm. Nineteen maize genotypes were crossed using the North Carolina II mating design to generate 84 single-cross hybrids. The hybrids alongside 4 local checks were then evaluated across three locations in Uganda. Maize foliage was harvested at 90 days, chopped and ensiled in 1 kg laboratory silos for 45 days. Silage samples were collected and analyzed for crude protein (CP), dry matter (DM), ash, ether extract (EE), potential Hydrogen (pH), crude fibre (CF) and metabolizable energy (ME). Significant ($P < 0.01$) GCA effects for male parents were observed for CP and at ($P < 0.001$), for DM and ME. However non-significant effects were observed among female parents except DM ($P < 0.001$). Significant ($P < 0.05$) SCA effects were detected for DM only. Dominance gene action played a crucial role in CP and ME traits expression, whereas additive gene action was predominant in DM trait expression. Correlation analysis between the studied traits varied from 0.32 to − 0.92 respectively where of the seven studied quality traits, strong positive correlations were observed between ME and EE, ME and DM, CF and ash and then ME and pH whereas strong negative correlations were exhibited between CF and DM, ash and DM, CF and EE, CF and ME, and CP and ME. SFDM-7 and NML88 were identified as the best general combiners for CP, exhibiting desirable GCA effects among the evaluated inbred lines. These lines are promising candidates for breeding maize varieties with improved ensiling traits, contributing to the development of high-quality silage maize hybrids for tropical environments.