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Automated Image Based Phenotyping for Identifying Tissue Water Status in Maize (*Zeamays L.*) Inbred Lines

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Abstract—*Phenomics, the study of the phenome, is a rapidly emerging area of science which aims at characterizing phenotypes in a rigorous way and links these traits to the associated genes. The present study was carried out to study with the objective to identify image based surrogates to derive results on the variability in water relations among the maize inbred lines. The experimental material comprised of well-watered and water stressed thirty maize inbred lines collected from different sources which were grown in a randomized complete block design with two replications initially under natural conditions and later shifted to phenomics platform after 32 days of sowing. Plant aspect ratio and bi angular convex-hull area ratio were estimated in both control and stress pots. The median value of bi-angular convex-hull area ratio for all inbred lines was within 1.40-4.83 in control and 1.06- 4.23 in stress pots. The lines showing maximum values for the ratio in control and stress pots were KDM-1156 and KDM-926B respectively. The median value of plant aspect ratio for all inbred lines was within 0.75-1.33 and 0.41-0.95. The lines showing maximum values for the ratio in control and stress pots were V-351 and KDM-926B.The estimated heritability for bi-angular convex-hull area ratio was moderate suggesting that the observed rotation is only partial under the direct control of genetics and is likely also regulated by environment factors as well as genotype by environment interactions.*

Among the other surrogates estimated from the study in addition to above include: Area, Boundary Point Count, Boundary Point Roundedness, Caliper Length, Centre of Mass to Boundary Distribution, Compactness, Convex Hull Circumference, Mean Colour Red and Object Sum Area. These surrogates differentiated the inbred lines between control and stress conditions. Moreover, in the study, the inbreds with lower canopy temperature had relatively higher yield under stress regime. Thus, the lines identified to be promising in the study should be crossed with locally adapted lines to develop mapping populations for traits of interest related to drought resilience in terms of improved tissue water status and map QTLs/Genes of Interest

Keywords*: Phenomics, Plant Aspect Ratio, Canopy Temperature, Bi-Angular Convex-Hull Area Ratio.*

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