

Analysis of Genotype and Environment Interaction Revealed Oleic Acid Plasticity in Peanuts

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Fatty acid composition in peanut seeds is an important trait in determining the seed quality and oil stability. Monounsaturated fatty acids such as oleic acid have known health benefits and can extend the oil shelf life due to its oxidative stability. Oleic acid content is controlled by two pairs of homeologous fatty acid desaturase genes (*FAD2A* and *FAD2B*), but environmental growing conditions can also have a significant effect on the fatty acid composition of peanut seeds. To study genotype and environmental effects on seed oil composition, a selected set of 52 peanut germplasm accessions were grown at three locations (Gainesville, FL; Byron, GA; and Clovis, NM) for two years (2017 and 2018). Data on the growing conditions from the three environments were collected for both years. Individual plants from each accession were genotyped with functional SNP markers from the *FAD2A* (448G/448A) and *FAD2B* (no insertion/442 insertion A) genes. Fatty acid composition of seeds harvested from different environments was determined by gas chromatography. These data revealed: (i) three genotypes (448G/no insertion A; 448A/no insertion A; and 448A/insertion A) designated as G/N, A/N, and A/A, respectively; (ii) A/A genotype averaged the highest oleic acid concentration (79.7%) followed by A/N (56.0%) and then G/N (41.5%); and (iii) oleic/linoleic acid plasticity was detected by G X E interaction analysis. For oleic acid, the A/N genotype exhibited higher phenotypic plasticity than the G/N and A/A genotypes. Oleic acid concentration of seeds with the A/N genotype grown at different locations were significantly different with those grown in Florida (63.9%) being higher than those in Georgia (55.8%) which in turn were higher than those in New Mexico (47.6%). The oleic acid phenotype plasticity revealed in this study would be very useful to peanut breeders, farmers, and processors of peanut products for manipulating this important trait.