Marker Identification for Increased Folate in Peanuts

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Tetrahydrofolate and its derivatives, known as folates, are essential vitamins used in the body as carbon acceptors and donors for various vital reactions. Folates are not produced in mammals *in vivo*, but legumes are excellent sources for folates with the most prevalent in peanut being 5-formyltetrahydrofolate. In order to implement a marker-assisted selection (MAS) approach to biofortify folates within cultivated peanut, a genome-wide association study (GWAS) was conducted to identify marker-trait associations to folate content in the peanut mini-core collection. To find the single nucleotide polymorphisms (SNPs) associated with folate content in the mini-core collection, we merged the original 58K-array genotypic data from PeanutBase with the locations from the 48K-array. The phenotypic data was downloaded from a study on nutrient content of the mini-core collection where folate content was collected through a bacterial and enzymatic digestion assay. Then, the genotypic and phenotypic data was uploaded into the Trait Analysis by association, Evolution and Linkage (TASSEL) software to conduct a GWAS. The results showed strong associations, but gave rise to concerns about the physical locations on the cv. 'Tifrunner' reference genome. Further work is needed to confirm the locations of these markers and then confirm the SNPs associations from the GWAS. To confirm the locations on the physical map, we will use the 48K probe set and our draft Virginia-type genome of Bailey II to identify differences in alignment and positioning. Three nested, recombinant inbred populations with Georgia Green as the common parent and three high folate peanut introductions from within the mini core as the other parents will be used to confirm the previously identified marker-trait associations for folate. The associated SNPs will be used to design PACE markers to be run on the three populations to create a representative subset to be phenotyped. With markers confirmed to be associated with increased folate content we will be able to more easily make selections in our breeding program for folate content. Cultivars with increased nutrient content will increase the dietary intake of folates for consumers and lead to reduced risks of deficiencies.