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Relationships between the Weedy (Amaranthaceae) and the Grain Amaranths [Abstract]

Previous phylogenetic work investigating the origins of the grain amaranths is plagued by two methodological faults. Primarily, no study to date has adequately sampled all of the grain species as well as the two putative weedy progenitors across their entire native species' ranges. Second, no study to date adequately investigates the genetic diversity component of both putative weedy species (*Amaranthus hybridus* L. and *Amaranthus quitensis* Kunth). Two hundred fifty-eight individuals from 56 taxa representing the three grain amaranth species and two putative weedy progenitors were sampled from their native species' ranges and subjected to microsatellite testing. Data were analyzed using principal component analysis, clustering algorithms, and genetic distance neighbor-joining tree dendrograms. Standard genetic diversity measures indicate strong inbreeding coefficients in all studied taxa. Principal component analysis, clustering algorithms, private alleles, and tree dendrograms all resolve a distinct *A. quitensis* group. The grain amaranths and *A. hybridus* were found to group together. Results from 11 simple sequence repeat loci indicate the following: (i) *A. hybridus* is the progenitor of all three grain amaranths in at least two separate domestication events, (ii) *A. quitensis* is its own species and not a variant of *A. hybridus*, and (iii) *Amaranthus caudatus* L. and *Amaranthus hypochondriacus* L. appear to be closely related.