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Kiel D. Kielinski
Felix Jimenez
Eric N. Jellen
Peter J. Maughan
Scott M. Smith

See next page for additional authors

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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.