Melon genome study reveals recent impacts of breeding

The first comprehensive genome analyses of 7 melon varieties was completed, providing breeders new knowledge important for understanding phenotypic variability and helping increasing plant quality yields by selective breeding.

The researchers sought to bridge the gap between expanding the genetic knowledge of melons and understanding important traits such as flavor, size and water use.

The study is the first comprehensive analysis of genetic diversity in melon, and describes more than 4.3 million single sequence DNA variants (SNPs), together with an important number of structural variants including deletions, inversions, duplications, and mobile element movements, The team proved that highly cultivated and bred lines show the least diversity, with wild melons being the most diverse. Similar studies of corn, rice, and soybeans have shown that the most farmed and domesticated varieties show the least genetic variability.

The study also revealed in great detail, the genomic architecture of the melon genome (which the researcher dub "melonomics"- see melonomics.net). Overall, they found 902 genes that may be affected by DNA structural variations, with 53 genes putatively involved in disease resistance (29), cell-wall metabolism (10), aroma volatiles metabolism (9), sugar metabolism (4) and carotenoid biosynthesis (1).

The mobile elements, gene-hopping structures called transposons, have been very active during recent melon evolution, and the study reports on a number of transposon insertions that may be linked to the variability of important agronomic traits, even between two closely related elite lines.

The melon genome as a whole has evolved under negative evolutionary selective pressure, removing deleterious traits over time to improve fitness and adaptation.

This study reveals the high plasticity of the melon genome, and paves the way for future analyses to address melon breeding goals, such as increasing the quality of the fruit, or resistance against pests and diseases. On a more general perspective, studies such as this one will be needed to breed new plant varieties allowing to respond to the challenges in agriculture, including a growing human population, land and water scarcity, and the future impact of climate change.

Source: http://www.sciencenewsline.com/articles/2015071422080007.html