

# Synthetic Cultivar Parent Number Impacts on Genetic Drift & Disease Resistance in Alfalfa

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Alfalfa (*Medicago sativa* L.) varieties are generally bred as synthetics. The number of selected parents to create a variety is important during breeding, as alfalfa suffers from severe inbreeding depression. In this study, we tested if there was more genetic drift in synthetic populations with fewer parents (i.e., narrow-based synthetics) as measured by two parameters: a loss of allelic richness and changes in disease resistance. Out of five base germplasms, parents were selected based on plant field vigor to create derived narrow-based (six-parent) and broad-based (56- to 86-parent) synthetics in order to test the new synthetics compared with their base populations for resistance to four diseases: anthracnose, Phytophthora root rot (PRR), Aphanomyces root rot (ARR), and Fusarium wilt (FW). Using simple sequence repeat (SSR) DNA markers, we also calculated allele frequency changes and allele richness for the original populations and the selected parents of the derived synthetics. Based on the DNA markers, we saw strong evidence of greater genetic drift in the narrow-based selections compared with the broad-based selections. The narrow selections had greater allele frequency changes and had fewer (11.5–33.9% fewer) alleles compared with the broad selections and original populations. There was only moderate evidence of genetic drift affecting disease resistance. Within some populations, parent number had an effect on anthracnose and FW resistance, but not PRR or ARR resistance. We suspect that because disease resistance is a complex, often multigenic trait in alfalfa, disease resistance is less influenced by genetic drift, particularly compared with neutral DNA markers.