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Production of Fully Homozygous Genotypes from Various Edible Alliums

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Allium is a very large genus containing over 700 distinct species including the various edible onions, garlics, chives, and leeks. About a dozen of the species are economically important as crops or garden vegetables where as many others are cultivated as ornamental plants. *Allium* breeding programs generally take very long time with low success due to problems such as long life cycle, sterility, polyploidy, high levels of heterozygosity. Development of inbreed lines is a very difficult process due to severe inbreeding depression. Doubled haploid (DH) techniques can be utilized to obtain fully homozygous *Allium* materials. In *Allium*s, gynogenesis is the major technique used to produce haploid and DH plants from unfertilized female gametes with reduced chromosome number. We are in the process of developing gynogenesis induction protocols for several edible *Allium* species. We showed that gynogenic embryos can be obtained from a wide range of *Allium* materials. About half of the gynogenic embryos continue to grow and become plantlets. In general, gynogenic plantlets are green, but some of them show chlorophyll abnomalities. Results obtained from flow cytometric analysis of nuclei isolated from gynogenic materials indicate that majority of the gynogenic *Allium* materials are haploid and DH plants. DH onion lines developed in our program are generally vigorous plants with high levels of fecundity. The seeds obtained from DH onions show high germination. Plants of DH onion lines grow uniformly and produce bulbs very uniform in size, shape, color and quality features. These DH lines are excellent inbreds to be used as male parents in the production of F1 hybrid onion lines. Success obtained in DH onion materials indicates that a similar approach can be applied in the breeding programs of other important *Allium*s.

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