

GROWTH AND REPRODUCTIVE ANALYSIS OF MEDICAGO COERULEA, M. FALCATA, M. INTERTEXTA, M. LUPULINA, M. SATIVA, AND M. TRUNCATULA

E. T. Bingham and W. P. Kojis
University of Wisconsin, Madison

Generation time in the greenhouse, autogamous seed production, and genome size are important in research using model species. Diploid *Medicago* species all have a relatively small genome. Hence, generation time and autogamous seed production are deciding factors. Cultivated alfalfa at the Diploid Level (CADL) *M. sativa* is a model alfalfa species in chromosome pairing studies, genome mapping, genetics, ploidy series, cell culture, and to produce defined mono- and diallelic tetraploids by chromosome doubling. *Medicago truncatula* is gaining wide use in genome mapping, and all aspects of symbiosis and nitrogen fixation research. In fact, at this time, it appears to be the model species of choice for the legume family, including soybeans and dry beans. *Medicago truncatula* is naturally autogamous, whereas only occasional CADL plants are autogamous, and then suffer in breeding depression if selfing is continued. However, the big question for us was the generation time for the respective materials.

Medicago species were seeded in the greenhouse in January 1998 and 1999 and grown to seed maturity except for *M. coerulea* and *M. intertexta* which were grown only in 1999. Generation times were very similar across materials for both years. Numbers reported are days from planting scarified seed to brown pods (not necessarily dry). *Medicago lupulina* and *M. truncatula*, cv >Caliph= had the shortest generation times (62-63 days) followed by *M. truncatula*s >Jemalong= (71 days), Paraggio (80 days). Then, *M. sativa* CADL and Vernal at 82 and 83 days, respectively). *Medicago coerulea* required 92 days and *M. intertexta* took 115 days. All materials are diploid except Vernal which is tetraploid. All are annual species except CADL, Vernal and *M. falcata*. All produce multiple seeds per pod except *M. lupulina* which has single-seeded pods. All have coiled pods except *M. falcata*. All contain hard seed, but CADL and Vernal had the least hard seed. Standard shoot cuttings were made from all species, except one-fourth of the plants in Caliph which would not form adventitious roots. *Medicago intertexta* had the most robust growth and biomass production in the greenhouse, surpassing even the tetraploid Vernal. Although the annual autogamous species produce self seed efficiently, they are difficult to cross pollinate. Much of our current and future model species research will require crossing in genetic studies, efficient transformation and free exchange of genes with cultivated alfalfa. CADL meets these requirements and inbreds are being developed by cyclic selection. Hence, we envision continued use of both CADL and *M. truncatula* as model species with respective advantages.