

MUTABLE ALLELES OF THE ANTHOCYANIN LOCUS C2 IN ALFALFA

W. M. Clement, Jr.
Gulf Shores, Alabama

Alfalfa with unstable anthocyanin pigmentation has been discovered on six occasions since 1958. Genetic studies showed that each of the six unstable stocks was due to an allele mutable at the basic anthocyanin locus C2 in alfalfa. The mutable alleles behave like transposable elements. The alleles are designated c2-m1 through c2-m6. Variegated phenotypes of m1, m2, and m3 are similar and express reversion from the recessive to the dominant state. This reversion produces streaks and sectors of pigment in flower petals and seeds that are otherwise white. Reversion occurs at various times in development and may result in periclinal chimeras. The c2-m4 allele is unique in that it arose during tissue culture, whereas the other mutables were discovered in plant populations. Interestingly m4 is very stable in plants and only rarely produces a sector flower, but is very unstable in vitro as measured by about 23% revertant plants regenerated from tissue cultures. Most m4 reversion occurs relatively early in development and results in completely pigmented in vitro revertants, and in large sectors on in planta revertants. Alleles m5 and m6 are phenotypically and genetically similar. Their flowers are basic purple with white streaks thus representing mutation from dominant purple to recessive white. White progeny of m5 and m6 are very stable both in planta and in vitro; reversion of white to purple was never observed. Thus, the loss of function of the dominant allele results in a stable recessive or a deficiency. The absolute stability of m5 white derivatives favors the deficiency model, because transposable element mutations might show reversion. Finally, several morphological mutations occur in the mutable populations. It is speculated that they are recent mutations due to transpositions of transposable elements. Mutable c2-m1 has been entered in the plant introduction collection (PI605704). Mutable c2-m2 and Mutable c2-m3 were entered in 2001 (PI619433 and PI619434, respectively).

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