2. A Case of Ac-induced Instability at the Bronze Locus in Chromosome 9

A case of insertion of Ac at the bronze locus in chromosome 9 has been found that results in instability of action at this locus. It originally appeared in a C sh bz wx carrying gamete produced by a plant that was Ac I Ds Sh Bz Wx/ ac C ds sh bz wx in constitution when this plant was crossed to one homozygous for ac, C, ds, sh, bz, and wx. Mutations to Bz occur at this mutable bz locus. They are Ac controlled and the mutational response to doses of Ac is similar to that expressed by other Ac controlled mutable loci -- the higher the dose of Ac, the later the time during development of a tissue that mutations occur. Tests to determine the location of Ac were conducted with 135 plants heterozygous for this mutable bz. In all of them, an Ac factor was present and situated close to or at the locus of bz^m. It could be determined that the mutational response to doses of Ac is dependent not only on the dose of bz^m that is present (Ac at the bronze locus) but also on that produced by additional Ac factors located elsewhere.

Several distinctly different phenotypes result from mutation at this bz^m locus. The most common of them gives rise to a Bz expression or to a stable bz expression, the latter occurring about five times more frequently than the former. Some of the mutations to Bz are stable in that no further mutations occur in the presence of Ac. Six such cases were examined and in all 6, Ac was no longer present at the Bz locus. Fourteen cases of mutation to stable bz were examined and again, in these cases, it could be shown that the change was associated with removal of Ac from the bz^m locus. In some of these cases, Ac was present in the chromosome complement but located elsewhere, either within chromosome 9 or at a position that gives no evidence of linkage with genetic markers carried in this chromosome. Three additional cases of mutation to Bz were examined. Each of them was characterized by instability of expression of Bz. Mutations to bz or to bz^m occurred. An Ac factor was found to be present in each case and located at or close to Bz^m. Analysis of the progeny produced by plants carrying one of these Bz^m mutants indicated that stability at the Bz locus could arise if Ac were removed from its immediate vicinity.

The Ac element originally present at this bz^m locus produced some chromosome breaks. They occurred with rather low frequencies in comparison with those mutations to bz or to Bz that are unaccompanied by gross chromosomal aberrations. However, a state of this Ac at Bz^m has appeared that gives rise to many dicentric-forming chromosome breaks and at rates that are comparable to those produced by known states of Ds.

In addition to the events described above that occur at this bz^m locus, other types of events also occur but with very much lower frequencies. Two of them have received some examination. Each appeared, initially, in a single gamete produced by a plant having bz^m and was detected because of a marked change in the appearance of the kernel produced by functioning or the gamete. In one case, the rate of mutation to Bz was strikingly increased in comparison with that usually produced by this bz^m. Tests of the plant arising from this kernel indicated that the mutations were no longer directly initiated by events occurring to Ac at the bz^m locus. The Ac factor present in this plant was located elsewhere. The evidence indicates that a two-factor system of mutational control is present and suggests that one of the factors is Ac.

The second type of altered pattern of mutation at the bronze locus was derived from a gamete of a plant that carried Bz^m (Ac at the Bz locus) in one chromosome 9 and a normal recessive, bz, in the homologue. The kernel showing the altered mutation pattern had a background coloration suggesting a weakened expression of Bz. Areas were present showing either a weaker or a stronger expression of Bz coloration. In the plant derived from this kernel, 2 Ac factors were present, one located close to this modified Bz^m locus, and the other located elsewhere. In the progeny of this plant, the pattern of mutation present in the kernel that gave rise to it was again repeated. However, present evidence is insufficient to indicate the mode of control of mutation.