Activation of silent Ac sequences

In a comparison of active and silent Ac sequences I have found that a single nucleotide polymorphism always appears at position 20, counting from the Ac9 5' end. All active Ac sequences have a T at that position. The B73 sequenced genome does not contain an active Ac, only a silent 4554 base Ac as well as 55 Ac fractionals that begin at the 5'end. All these have a G at that position. The portions of Ac which are critical to the formation of the transposase, promoter and the translated segment, extend from the 5' end to base 2451 of Ac9. The first 3100 bases of the active Ac9 and the 4554 base Ac, are identical except for seven single nucleotide polymorphisms. Of these, only the T to G change at base 20, is seen in all the 56 Ac sequences in the B73 genome. A T to G change is a rare mutation, but it is always seen at base 20 in silent Ac. By comparison, of the transposons with strong similarity to Ac that is limited to the first 110 bases, only one out of 175 have G in place of T at position 20. Also, of the 17 transposons in which the similarity to Ac is limited to the first 206 bases, only one has a G in place of T at position 20.

Studies are currently being undertaken to test the hypothesis that stress induced activation of the silent Ac involves a G to T nucleotide change at position 20. The transposase activity of Ac9 causes much damage to maize plants, as a result of chromosome breakage with the subsequent, breakage, bridge, fusion cycle, as well as gene inactivation from Ac induced insertions. Thus, in a stable environment, plants with an active Ac would be selected against. However, under conditions of stress caused by a drastic changes in the environment, an active Ac would play a major role in producing the mega-changes required for survival of the species and what would be better than activation induced by the simple change of only a single nucleotide.

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