4. The Effect of Dt on Mutations of A_1 to a_1

The effect of the gene Dt on a_1 has long been known but its relationship to the mutational behavior of the dominant allele A_1 has not been adequately reported. To determine whether or not Dt causes A_1 to mutate to a_1, a particular A_1 allele (A:D_2, which arose from a through the action of Dt) was tested for its mutation rate in homozygous Dt and dt cultures. The test consisted of crossing AA Dt Dt and dt dt cultures by an a dt pollen stock and examining the resulting ears for colorless (a a a) seeds. The data are shown below in table 1.

Table 1 Mutation of A:D2 in Female Germ Cells

Dt. Const.	Gametes Tested	Mutants
Dt Dt	56,000	19
dt dt	21,000	0

Another experiment was conducted to determine the effect of Dt on the frequency of colorless aleurone sectors on the colored Aaa seeds which were produced from crossing of homozygous a sh_2, Dt and dt by homozygous A Sh_2, Dt and dt. These crosses provided ears whose seeds had no Dt, Dt in the female parent, Dt in the male parent, and Dt in both parents. The sh_2 marker was added to permit recognition of losses due to chromosomal aberrations. Mutations of A:D2 to a should not be accompanied by changes of Sh to sh. The frequency of sectors indicating the loss of A Sh, A, and Sh are listed in table 2. Sectors including 1/8 of the seed surface or larger were scored.

Table 2 Mutation of A:D2 Expressed as Aleurone Sectors

		Sectors, 1/8 seed or larger		
Parents	No. of Seeds	a sh	a Sh	A sh
a sh Dt x A Sh dt	10,219	56	9	1
a sh Dt x A Sh Dt	1,550	7	2	1
a sh dt x A Sh Dt	5,650	48	2	3
	17,419	111	13	5
a sh dt x A Sh dt	34,604	178	2	3
Total Cases	52,023	289	15	8

The data from Table 1 and 2 clearly show that Dt does have a marked effect on the frequency of mutant changes of A to a both in female germ cells and in the aleurone. The data from Table 2 also show (1) that there is a remarkably high frequency of simultaneous losses of A and Sh (289) compared to the losses of either A (15) or Sh (8) alone. These simultaneous cases may be interpreted as actual losses of a chromosome segment including both A and Sh, while the single changes probably represent actual mutational changes and perhaps very small deficiencies, (2) That Dt, while strongly influencing the mutation frequency of A alone, has no significant effect on the coincident losses of A and Sh. If these coincident losses can be taken as deficiencies

arising from chromosome breakage one can conclude that Dt causes A to mutate to a but by a mechanism which does not alter the frequency of spontaneous chromosome breaks in the chromosome region to the left of A.