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1. Transposition of the control element affecting *bz-x3*.

Data were presented in the 1970 Newsletter on the induction by x-rays of three unstable mutants at the bronze locus. They were designated *bz-x3*, *bz-x4* and *bz-x5*. Tests with *bz-x3* have indicated that control is autonomous, i.e., there is a single regulating element which is either tightly or completely linked to the bronze gene. (For a complete discussion, see Theoret. and Applied Genet. 43: 190-195, 1973.)

Three hypotheses which could account for the data are: 1) the x-rays activated a dormant element similar to *Ac* or *Spm* which was present in the treated stock; 2) the regulatory gene which normally controls the bronze cistron (assuming that *Bz* is a structural gene) was altered resulting in instability; and 3) the x-rays created an element with the property of causing instability. The third possibility is highly unlikely since it would require a constructive alteration and the action of x-rays is primarily destructive.

To distinguish between the first two hypotheses, studies were conducted to determine if the element would undergo transposition. A regulatory gene normally at the bronze locus would not be expected to transpose but if the element were similar to *Ac* or *Spm*, transposition might occur.

Stocks containing one or two doses of *bz-x3* and homozygous for *A*, *A2*, *C*, and *C2* were crossed with four tester stocks, *a*, *a2*, *c* and *c2*. The *bz-x3* plants were used as pollen parents. If the element at the bronze locus transposed to the sites of any of the four endosperm characters, colorless kernels or kernels mosaic for colored and colorless tissue would appear in the testcross progeny. Results of these crosses are listed in Tables 1-4.

The phenotypic classes in the testcross progeny were divided into five groups as follows: 1) total loss represents colorless kernels in which the dominant phenotype is completely absent; 2) partial loss indicates fractional kernels in which a portion of the endosperm has lost the

Tables 1-4

Colorless and mosaic progeny from crosses of bz-x3 plants used as pollen parents and a, a2, c and c2 tester stocks. For an explanation of the column headings, see text.

Table 1. Plant #	♂ parent			F_1 progeny exhibiting no color or A/a mosaicism							
	Genotype	Kernel phenotype	Plant phenotype	Total loss	Partial loss	Loss & reversion	BBF	Misc	Total	Pop. size	% mosaic or colorless kernels
2977-1	bz-x3/bz	early reversion	non-str.	2	4	0	1	1	8	1,832	0.4
2978-2	"	late reversion	"	0	2	0	0	0	2	410	0.5
2982-1	"	"	"	1	1	1	0	0	3	641	0.5
2986-K	"	"	"	0	4	0	0	0	4	376	1.1
2986-M	"	"	striped	0	4	0	0	2	6	1,297	0.5
2986-N	"	"	"	2	8	1	0	2	13	2,243	0.6
2986-P	"	"	"	5	19	2	0	3	29	4,721	0.6
2986-W	"	"	"	0	1	0	0	0	1	186	0.5
2987-1	bz-x3/?	full reversion	"	0	0	0	0	1	1	67	1.5
2989-1	"	"	non-str.	5	4	0	0	0	9	1,258	0.7
2990-1	bz-x3/bz	early reversion	striped	3	7	1	0	3	14	1,566	0.9
2993-1	bz-x3/?	medium reversion	"	16	23	1	5	3	48	4,172	1.2
3006-1	"	"	non-str.	0	8	0	1	0	9	670	1.3

Table 1. (cont.) Plant #	♂ parent			F_1 progeny exhibiting no color or A/a mosaicism							
	Genotype	Kernel pheno-type	Plant pheno-type	Total loss	Partial loss	Loss & rever-sion	BBF	Misc	Total	Pop. size	% mosaic or color-less kernels
3011-N	bz-x3 / bz-x3	late reversion	striped	0	11	0	0	0	11	1,343	0.8
3011-P	bz-x3 / bz	"	"	5	48	4	0	0	57	4,059	1.4
3013-2	"	"	non-str.	0	3	0	0	0	3	293	1.0
total	-	-	-	39	147	10	7	15	218	25,134	0.8

Table 2. Plant #	♂ parent			F_1 progeny exhibiting no color or *C*/*c* mosaicism							
	Genotype	Kernel phenotype	Plant phenotype	Total loss	Partial loss	Loss & reversion	BBF	Misc	Total	Pop. size	% mosaic or colorless kernels
2982-1	bz-x3/bz	late reversions	non-str.	0	15	0	4	15	34	7,665	0.4
2985-1	"	medium reversions	?	13	47	7	2	7	76	6,037	1.3
2986-H	"	late reversions	non-str.	1	46	6	22	6	81	4,048	2.0
2986-K	"	"	"	2	14	2	6	2	26	1,927	1.3
2986-W	"	"	"	2	74	2	4	8	90	4,082	2.2
2989-2	bz-x3/?	full reversion	?	0	3	0	0	0	3	423	0.7
2990-1	bz-x3/bz	early reversion	striped	0	9	0	0	1	10	730	1.4
3012-1	"	late reversion	non-str.	4	26	1	4	1	36	1,952	1.8
3013-1	"	"	striped	0	38	6	1	0	45	2,219	2.0
3013-2	"	"	non-str.	0	41	3	5	6	55	2,899	1.9
3014-1	"	"	"	1	34	3	7	7	52	2,915	1.8
total	-	-	-	23	347	30	55	53	508	34,899	1.6

Table 3. Plant #	♂ parent			F_1 progeny exhibiting no color or A2/a2 mosaicism							
	Genotype	Kernel phenotype	Plant phenotype	Total loss	Partial loss	Loss & reversion	BBF	Misc	Total	Pop. size	% mosaic or colorless kernels
2986-W	bz-x3 / bz	late reversions	striped	0	0	0	0	1	1	191	0.5
2993-1	bz-x3 / ?	medium reversions	"	5	37	2	6	4	55	2,177	2.5
3011-P	bz-x3 / bz	late reversions	"	0	11	0	2	12	25	1,747	1.4
total	-	-	-	5	48	2	8	17	81	4,115	1.5

Table 4. Plant #	♂ parent			F_1 progeny exhibiting no color or C2/c2 mosaicism							
	Genotype	Kernel phenotype	Plant phenotype	Total loss	Partial loss	Loss & reversion	BBF	Misc	Total	Pop. size	% mosaic or colorless kernels
2990-1	bz-x3 / bz	early reversion	striped	1	4	0	0	0	5	2,171	0.2
2993-1	bz-x3 / ?	medium reversions	"	1	10	1	5	6	23	2,168	1.1
3011-P	bz-x3 / bz	late reversions	"	1	2	0	3	1	7	1,599	0.4
total	-	-	-	3	16	1	8	7	35	5,938	0.6

dominant phenotype; 3) loss and reversion means total or partial loss of the dominant phenotype with subsequent reversion resulting in a colorless background with small sectors of colored tissue; 4) BBF stands for the bridge-breakage-fusion pattern; and 5) Misc. includes phenotypes similar to blotched, r mottling and other patterns which do not fit the above categories. The columns in the tables entitled "Kernel phenotype" refer to the bronze/purple patterns of the kernels giving rise to the various male parents. Late, medium and early reversions refer to bronze kernels with small, medium and large sectors of purple, respectively, while full reversions represent completely purple kernels.

It must be stressed that these data constitute incomplete results since transmission of the unstable phenotypes must be demonstrated to be certain that transposition has occurred. Certain observations, however, can be made. Although no controls were performed to determine the frequency of endosperms in normal stocks with loss of the dominant characters, in the F_1 population of a cross between bz ♀♀ and Bz ♂♂ where pollen of the dominant stock was treated with x-rays, the frequency of kernels mosaic for Bz and bz was 1.4%. Since the frequencies in the radiation and transposition experiments are similar, it is probable that a substantial number of mosaic kernels in the current studies are not due to spontaneous events but rather to transposition of the element affecting bz-x3.

There appears to be no relationship between the instability pattern of the bz-x3 kernel or plant and the frequency of mosaic kernels in the testcross progeny. In progeny of bz-x3 individuals exhibiting full, early, medium and late reversions, the frequencies of mosaic offspring are similar. The same is true for progeny of striped and nonstriped plants.

Conclusions on the frequency of transposition must await the results of studies on transmission of the mosaic phenotypes in the testcross offspring. Currently, plants in a greenhouse crop from some of the A/a kernels are mosaic for purple and green striping. Thus, the mosaicism is being transmitted in some of the cases.

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