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1. An apparent effect of manganese on rate of crossing over in maize.

Recent work by Demerec and Hanson on Escherichia coli, and Mazia's discovery of calcium - magnesium chromosome linkages in Arabacia, followed by Steffensen, Levine, and Eversoll and Tatum's work on Tradescantia, Drosophila and Chlamydomonas respectively, makes it seem reasonable that applications of the manganous ion would affect the rate of crossing over and/or rate of chromosome aberration in maize.

The results of a preliminary experiment seem striking enough to be worth reporting.

Two rates and 5 times of manganous ion application were employed as follows:

Treat No.	Rate and Nature of Application					
1.	.2 molar	MnSO ₄	50 days	before	meiosis,	} repeated each 5 days thereafter until meiosis.
2.	" "	" "	40 "	" "	" "	
3.	" "	" "	30 "	" "	" "	
4.	" "	" "	20 "	" "	" "	
5.	" "	" "	10 "	" "	" "	
6.	.02	" "	50 "	" "	" "	
7.	" "	" "	40 "	" "	" "	
8.	" "	" "	30 "	" "	" "	
9.	" "	" "	20 "	" "	" "	
10.	" "	" "	10 "	" "	" "	

Treatments were made as foliar sprays. The upper surfaces of the leaves were thoroughly wetted at each treatment.

Rate of crossing over in treated plants was determined for 3 segments. In each case, plants heterozygous for marker loci were treated with manganous ion, and the proportion of crossover male gametes was determined by means of appropriate untreated female tester plants.

The three segments tested were as follows:

C (1) wx 0 (Chrom. 9) lg1 (2) gl2 (3) 0 v4 (Chrom. 2)

The results are given in the table on page 92.

Treat. No.	C - wx			lg1 - g12			g12 - v4			doubles in (2)-(3)		
	Size Prog.	% X-over	P	Size Prog.	% X-over	P	Size Prog.	X-over	P	Size Prog.	% double X-over	P
1.	131	45.0	.05*	20	40.0	.001**	20	40.0	.99	20	25.0	<.0005**
2.	391	36.1	.99	266	19.9	.01**	192	33.0	.20	192	4.7	.80
3.	426	34.5	.40	87	13.8	.99	87	31.0	.20	87	4.6	.95
4.	273	38.8	.50	418	17.5	.05*	141	39.7	.80	141	2.1	.20
5.	179	37.4	.90	465	18.9	.01**	212	34.0	.20	212	4.7	.80
6.	381	34.4	.40	83	12.0	.60	83	34.9	.50	83	1.2	.20
7.	266	36.8	.99	315	17.5	.10	227	40.5	.60	227	2.2	.05*
8.	251	35.9	.80	290	20.0	.005**	290	33.4	.10	290	3.8	.30
9.	155	29.7	.10	79	10.1	.40	79	41.8	.60	79	2.5	.30
10.	522	39.8	.20	--	--	--	--	--	--	--	--	--
Control	414	36.7	--	424	14.2	--	267	38.6	--	267	5.2	--

The effects of the manganous ion have been explained as a function of the ability of this ion to replace the calcium-magnesium ions of the divalent cation bonds, resulting in a net weakening of the chromosome structure.

The rates of crossing over in the $C - wx$ and the $lg_1 - gl_2$ segments appeared to be correlated throughout the 9 comparable treatments. The coefficient of correlation test gave a highly significant r value of .9134, with a probability of $<.01$.**

It is apparent from the data that crossing over in the $lg_1 - gl_2$ segment was most noticeably affected, while only one treatment affected the $C - wx$ segment, and no significant effects occurred in the $gl_2 - v_4$ segment. These results are precisely comparable to those of Eversoll and Tatum, who studied the effects of calcium and magnesium deficiency on crossing over in 3 segments in *Chlamydomonas*. (They reported a drastic effect for one segment, a slight effect for another, and no effect in a third segment.) It is an obvious conjecture that the effects of Mn^{++} may be modified by the proximity of the centromere and/or degree of chromaticity.

One aberrational progeny from treatment 2 was noted during the process of germinating seedlings for $lg_1 - gl_2 - v_4$ classification. All seedlings grown from one pollination were uniformly retarded and of uniformly spindly growth. Transmission of minus types in this progeny was drastically altered:

Size of Prog.	% transmission of lg_1		% transmission of gl_2		% transmission of v_4	
		P		P		P
39	28.2	.01**	7.7	$<.0005$ **	3.04	$<.0005$ **

More striking was the fact that minus types were recovered only in crossover strands.

Since most of the several possible explanations for this progeny involve pre-meiotic events, it would seem that a complete analysis of the effects of Mn should include a study of somatic aberrational tendencies. This estimation is strengthened by Steffensen's finding that a 12-fold increase in frequency of micronuclei present at prophase I occurred in *Tradescantia* plants grown in a Ca - Mg deficient nutrient solution. (These were clearly a result of pre-meiotic events.)

The most severe Mn treatments markedly retarded the growth of maize. Two plants of treatment one were "thrown" into a "rosette" type of growth for about two weeks. Normal symmetry was finally restored in spite of continued Mn treatments, and the plants matured in a normal, though diminutive, fashion.

If the rather frequent estimation is creditable that the rate of breeding progress in maize is limited by the rate at which genes may be "reshuffled," i.e., the rate of crossing over, it would seem worth while to further investigate the possibilities of utilizing agents affecting the cation linkages of the chromosomes in lifting this ceiling, if it exists.

The writer is indebted to Dr. E. B. Patterson and Dr. E. R. Leng for materials and guidance in this pilot experiment.

2. An effect of beta-hydroxyethylhydrazine on time of flowering in maize.

.075, .15, .3, and .6% concentrations of this chemical, which reportedly hastens date of flowering in pineapple, were applied as foliar spray to the maize single cross WF9 X 38-11, beginning at the 3 leaf stage, and repeated at 4 day intervals thereafter for 3, 6, 9, and 12 successive treatments. No important effects on either date of flowering or growth habit were noticeable.

However, one seed soaking treatment was made in addition to the foliar sprays. Seeds soaked over night in an .6% aqueous solution of beta-hydroxyethylhydrazine germinated more slowly than the controls, and growth was further drastically retarded after emergence. The treated seedlings became somewhat chlorotic, and made almost no progress for about 10 days. Normal growth then gradually resumed, and the plants flowered in a vigorous manner. A net delay in anthesis of about 14 days was obtained. A reduction in plant height of 2-3 feet occurred. Treated seeds experienced 40% mortality from this rate of treatment, with mortality occurring as both failure to emerge, and as post emergence dying.

Although only one rate of seed soaking treatment was attempted, the results obtained make it seem reasonable that lower rates of this chemical would be worth investigating as a possible means of obviating the costly and hazardous process of split planting in the production of some commercial maize hybrids.

3. Another source of id. (indeterminant growth habit).

A row of selfed maize was found to be segregating 7 indeterminant to 21 normal during the past season. Indeterminant plants were still vegetative as of Nov. 1, no inflorescences having been initiated. As yet, no photoperiodism studies have been made, or tests for allelism with the id recently studied by W. C. Galinat.