UNIVERSITY OF CALIFORNIA
Riverside, California

1. <u>A genetic factor for blotched leaves showing variable inheritance</u>.

A factor causing leaf blotching, which may be the same as that described by Emerson (Cornell Memoir 70, 1923) has been under study for several years. It behaves as a recessive gene, but with peculiarities. It appeared in an M23 inbred line of sweetcorn from Wisconsin; it causes internal breakdown of scattered areas of leaf tissue during late preflowering. The blotching does not appear on the first 3 to 4 leaves, and has not been detected on leaf sheathes or on culms. It appears not to be due to fungi or bacteria, nor to be spread by insect vectors. Symptoms are clear, but show many grades of severity within selfed or sibbed families. Blotching is completely absent in F_1 in crosses with other lines, and segregates in convincing 3:1 ratios in F_2 from such crosses. Pollen of blotched plants is normal, and full-set ears are obtained. Linkage has not been established.

Within the M23 line, progenies from selfing or sibbing of severely affected plants remain severely affected, on the average; but progenies from inbreeding of phenotypically normal or slightly affected plants regularly show a buildup toward severe symptoms. Selection for normality has thus usually, although apparently not always, failed to yield permanently normal sublines. Table 1 shows the correlation between parents and progeny from sibs and a self within the inbred line in one year. Grades of blotching are: 0, none; 1, very slight; 2, slight; 3,4, moderate and severe (combined).

Table 1
Leaf Blotching in Sibbed or Selfed Progenies of Inbred M23

Plant No.	Parent plants (Blotch grade)				Number of progeny plants in grades (Blotch grade)			
	0	1	2	3,4	0	1	2	3,4
7 x 15				x			6	35
8 x 26				x				20
6 x 9		x		x		1	18	8
25 x 27	x		x		9		8	24
12 ⊗		x			32	4	6	

The fairly orthodox behavior of F_1 and F_2 after outcrossing is shown in Table 2.

Table 2
Blotching in Progenies From Outcrossing With M23 Inbred

Outcross parent	No. of plants with blotching in F_1	No. of plants in F_2, in grades (Blotch grade) 0	1	2	3,4	% blotched plants in F_2
Me 41	0/23	76			20	21
M 3722	0/50	40			11	22
P 39A	0/50	17		1	3	19
Ia 2000	0/48	32	2	2	8	27
Lu. Hill	0/46	45	1	1	17	30

Data on selection in advanced generations, within the inbred line, are shown in Table 3. In the left half of the table, selection of phenotypically normal plants did not fix a normal line, and when selection was relaxed (in F_7) the progeny showed more severe symptoms. In the right half of the table, selection within higher grades of blotching led to severe blotching. In F_6 a sib between a 0 and a 3,4 grade failed to break the trend toward severe symptoms. The asterisks indicate the grade of the plant or plants used to produce the next generation. Two asterisks mean a sib; one, a self.

Table 3
Selection in Advanced Generations of M23 Sublines

Generation	Principal Selection Directed Toward: Normal (Blotch grade) 0	1	2	3,4	Severe (Blotch grade) 0	1	2	3,4	
F_2	6	8**	4	0	0	0	3	27**	
F_3	12*	0	4	2	0	0	6	35*	
F_4	6*	4	14	26	0	0	0	48	
					2	0	9*	32	Families not derived from previous starred plant
F_5	9*	6	5	0	0	3	4	30*	
F_6	2*	6	18	5	0	0	3	21	
					2*	6	18	5*	Families not derived from previous starred plant
F_7	2	9*	7	12	0	1	4*	18	
F_8	1	2	3	18	0	0	0	15	

In two instances (not shown in Table 3) normal sublines appear to have been obtained from selfs in affected families. These have remained normal for 3 to 4 years. The behavior of this blotch factor may be explainable by a combination of interactions involving modifiers, incomplete dominance, and/or variable penetrance, but it may be a function of some form of paramutation or gene conversion. Perhaps a less complete or more variable type of conversion is taking place here than in some other systems.

J. W. Cameron