

LINKAGE RELATIONS OF bulf

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The phenotype of bulf (burnt leaf), a mutant first isolated and described by Sharma (PNL 5:46, 1973), is characterized by brownish, papery, necrotic margins of the stipules and leaflets. The tendrils may also be affected. Occasionally, mutant expression is so slight that some mutant segregants can be taken as normal unless carefully scrutinized. Usually, however, homozygous recessive segregants can be readily discerned, even in the early seedling stage, and, although the adult plants may be weaker than normal, they produce adequate amounts of seed. Hence, bulf is a valuable seedling marker.

We originally obtained the type line for bulf, WL 5872, from Dr. Blixt for the purpose of testing it for allelism with a somewhat similar mutant with which we have been working (see page 52). Then we began a search for the linkage relations of bulf. In the combined F₂ populations in which bulf showed no linkage with the markers tested, the following segregation ratio was observed: Bulf 263 : bulf 105 ($X^2[3:1]=2.45^{**}$), indicating monogenic control with good penetrance. Evidence for linkage was detected in one small F₂ population involving chromosome 3 markers (Table 1). This was a three-point cross but two genes, st and chi-6, were in coupling whereas bulf was in repulsion. The cross yielded no chi-6-bulf recombinants and only 3 st-bulf recombinants in a total of 155 plants. F₃ progenies consisting of 21 seeds each from 22 different chi-6/chi-6 Bulf- F₂ plants produced 3 F₃ progenies segregating for bulf. Recombination between chi-6 and bulf based on these results is estimated as 7-4%. Among 25 st/st Bulf/- I plants progeny tested, 11 F₃ progenies segregated for bulf. The estimated recombination between st and bulf was 28-8% based on F₃ data and 26±7% based on F₂ data.

Table 1. Segregation in F₂ from the cross st chi-6 Bulf x St Chi-6 bulf

Population	<u>St Chi-6 Bulf</u>	<u>St Chi-6 bulf</u>	<u>St chi-6 Bulf</u>	<u>St chi-6 bulf</u>	<u>st Chi-6 Bulf</u>	<u>st Chi-6 bulf</u>	<u>st chi-6 Bulf</u>	<u>st chi-6 bulf</u>	Total
B279-181-192	58	30	18	0	29	3	17	0	155

Nine of the F₃ progeny test families segregated for both chi-6 and bulf, giving the combined joint segregation shown in Table 2. Again, as in the F₂, no chi-6 bulf recombinants were recovered in a total of 188 plants. Taken together, the data are consistent in showing a moderately strong linkage between bulf and chi-6 and a less strong but fairly clear linkage with st.

Table 2. Combined distribution of 9 small (21 plants each) F₃ progenies which showed joint segregation for chi-6 and bulf. F₃ progenies derived from cross st chi-6 Bulf x St Chi-6 bulf.

<u>Population</u>	<u>Chi-6 Bulf</u>	<u>Chi-6 bulf</u>	<u>chi-6 Bulf</u>	<u>chi-6 bulf</u>	<u>Total</u>
C379-6-39	100	47	41	0	188

New crosses have been initiated to get corroborating evidence and improved estimates of linkage not only between bulf and chi-6 and st, but also between bulf and other markers on chromosome 3.

The estimate of percent recombination between st and chi-6 was 37-5, which is consistent with estimates presented earlier (PNL 5:26) and with other evidence obtained in 1979 but not reported.

LINKAGE: RELATIONS OF A MUTANT CONFERRING MECHANICAL STERILITY

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After treating one of his lines with EMS, L. G. Cruger recovered a mutant which affects floral morphology and reproductive behavior. Subsequently he made seeds of the mutant available to me.

Mutant behavior is, in a number of respects, similar to that of crpt (crumpled petal), a mutant isolated and described by Sharma and Aravindan (PNL 3:50-51, 1971). Flowers are characterized by exerted pistils and crumpled petals and stamens. This abnormal floral morphology leads to mechanical sterility because the anthers are denied close proximity with the stigma. Still, based on the description of crpt, the two mutants appear to have some important dissimilarities. Unlike crpt, the plants are not waxless, fertility of selfed plants apparently is normal, and flowers are not typically "ball-shaped".

Plants homozygous for this recessive gene may show a range of mutant expression. Sterility appears to be enhanced under field conditions, whereas greenhouse conditions seem to promote more normal floral morphology and greater fertility (occasionally completely normal). Typically in the greenhouse the flowers are near normal in size, the corolla is more or less tubular when fully open, and the banner is not reflexed backward. The keel may be rather sharply curled and the filaments of the stamens compressed and twisted at the apex of the keel. Depending on the specific conditions, the pistil may or may not extrude from the keel.