Genetic Variability of Sugar Beets in Relation to Spider Mite Injury

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A rather serious infestation of spider mite occurred in a field of hybrid corn adjacent to a sugar beet variety test field on the Longmont Experiment Station in 1954. The corn field was dusted with parathion and sulfur on July 28. Shortly thereafter some fading and yellowing with subsequent dying of the leaf was observed on certain varieties of sugar beets. Later on some beets were completely killed. Upon examination, this was found to be the result of feeding by mass populations of spider mites, which had apparently moved in from the corn field since the effects were first noted in beet plots adjacent to the corn.

Included in the variety test field were a number of commercial and experimental strains, topcrosses, F_1 hybrids of inbreds x red beets, and many inbred lines. As the damage from the spider mite progressed across the field, it became obvious that certain varieties, hybrids and inbreds became heavily infested and damaged while others remained remarkably free of infestation, indicating that resistance to spider mite damage is heritable. Further study revealed a rather high degree of association between known resistance to leaf spot and freedom from infestation by the spider mite. Actually, only one variety was observed to be an exception to this association —this being a curly top resistant commercial number very susceptible to leaf spot but apparently quite resistant to the spider mite.

From these observations it seems probable that the chemical, anatomical or other characteristics which make for resistance to leaf spot, perhaps also curly top, render such plants distasteful to the spider mite. Since both leaf spot and curly top were practically absent in the field, the possibility of any cause-and-effect relationship between these diseases and spider mite attack is precluded.

Figure 1 indicates the general effect of spider mite damage with a leaf spot resistant variety on the left and a leaf spot susceptible variety on the right.

Since the damage occurred as a differential effect on a variety test field, some estimate of the effect is possible as shown by the following table where a comparison is made between GW59, susceptible to the mite, and GW359 which was quite resistant. These varieties are also, respectively, susceptible and resistant to leaf spot.

	Yield of Roots		Sugar Content		Total Sugar	
	6 Loc.	Longmont	6 Loc.	Longmont	6 Loc.	Longmont
GW359	100.0	100.0	100.0	100.0	100.0	100.0
GW59	91.9	77.0	90.9	72.9	84.5	56.1

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These data indicate the mean performance of the two varieties at six locations in Northern Colorado and Nebraska, where the spider mite was not a factor, as compared with their performance at Longmont where the damage was obvious. The actual figures for yield and sugar content have been calculated in percent of GW359 which was taken as 100. Although GW359 was superior to GW59 at the six locations for both yield and sugar content the difference was much greater at Longmont, with the combined effects being reflected in total sugar. GW59 produced 84.5 percent as much total sugar as GW359 for the mean of six locations, while at Longmont it produced only 56.1 percent as much. The difference between these two figures amounts to 18.4 percent and can fairly be assumed to be the result of spider mite damage.

This constitutes a first experience at this Station in which the spider mite has shown a real potential for serious injury in a field of sugar beets. Should it become a more general problem there is little doubt, judging from observations made in this field, that selection for further resistance or perhaps immunity would be effective.