

# A Promising Sugar Beet Hybrid of the Milpitas Wild Type X Commercial

H. W. DAHLBERG<sup>1</sup> AND H. E. BREWBAKER<sup>2</sup>

**I**N THE AREA around San Jose and Milpitas, California, there is a large population of sugar beets which grow wild along the main highway and the Southern Pacific tracks. They have also been observed growing in the industrial areas of San Jose and in lawns in that city. These beets are very prolific seed producers, and it is indicated that the same root not only produces seed the first year but also continues to grow and produce seed for several seasons in this area.

The senior author first observed these beets in the fall of 1937, as they were growing along the paved highway south of Milpitas. At that time 1 or 2 pounds of seed were gathered from 50 to 100 individual beets growing close to the highway. He was struck with their similarity to *Beta Maritima* individuals which he had studied on the coasts of France and England in 1934. Many of the seedstalks carry the same red-veined coloring as *Beta Maritima*, and the roots are tough and woody with many multiple crowns. These characters are quite common with *Beta Maritima* and as you will notice from the slides which will be shown, the beets also have the large side roots which are so evident in the wild types. It is our opinion that these Milpitas beets carry a high percentage of *Beta Maritima* blood and there can be little question that their origin goes back to the coasts of the Mediterranean Sea.

It is an interesting speculation as to when these wild types first reached this section of California. There are two distinct possibilities, either of which offers a satisfactory explanation.

1. According to Dan Gutleben, who has made a study of the early history of the beet sugar industry, sugar beets for commercial use were first grown in the south San Francisco area about 1856. The San Jose Pioneer Beet Sugar Manufacturing Company was organized in the spring of that year, and presumably beets were grown between south San Francisco and San Jose for one or more years. E. F. Dyer began building the Alvarado factory in 1869 and raised beets experimentally before that. Beet seed imported from Europe in these early years was not all sugar beet seed, and carried mangold and possibly other strains as well. The present Milpitas strain may represent the survivor of some of these types of beets first planted in California about 90 years ago.

2. The other possibility is that when the Franciscan Fathers built the Santa Clara and other missions about 100 years earlier, 1770 to 1780, they may have introduced various types of beets for use as vegetables or

<sup>1</sup>Research Manager, The Great Western Sugar Company.

<sup>2</sup>Director of Experiment Station, The Great Western Sugar Company, Longmont, Colorado.

salad greens. Our history books tell us that the Franciscans introduced into California many agricultural seeds, fruits and shrubs from Southern Europe, so they almost surely introduced beets of various types, including Beta Maritima. With the strong tendency to annualism in Beta Maritima, it would be a simple matter for these beets to become wild and grow like weeds year after year in the mild climate of California.

Our theory in using this wild material for breeding purposes was that the individuals which had survived drouth, diseases and other hazards for many generations might carry valuable genes for disease resistance, as well as other desirable characters. This material was found to possess considerable resistance to *Cercospora* leafspot when grown under conditions of heavy leafspot incidence on susceptible strains.

The wild Milpitas strain is a complete annual when grown in Colorado, and even after five generations of selection the present Milpitas-Great Western hybrid shows about 3 percent bolters. The original Milpitas strain segregates for about 25 percent red or pink roots and 75 percent white roots. In addition to severe selection against bolting, we have selected for desirable root type, white roots, and leafspot resistance. Our general procedure, which involved crossing, backcrossing, and selection, is given in detail as follows:

Parents: (1937-38) LSR-GW Gr. 3718 and B.Mar. "Milpitas."

F<sub>1</sub>, 1938--Segregated for bolting and color of root.

Backcross to Gr. 3719 in 1940--Segregated for bolting and color of root. Only white roots selected.

3rd gen., 1942--All white roots.

4th gen., 1944--Near-commercial in type of root.

5th gen., 1946--B332. Roots commercial in type.

The degree of improvement in reduced annualism secured in 5 years of selection is shown in table 1.

Table 1. Demonstration plots, 1947.

Lot or generation	Leafspot <sup>a</sup> rating	Bolters (percent)
B. mar. Milpitas	3	100.0
F <sub>1</sub> gen.	3	92.1
Backcross to Gr. 3719	2	25.4
3rd gen.	2	7.8
4th gen.	2	4.8
5th gen.	1	3.0

<sup>a</sup>Scale of 1 = very resistant to 10 = very susceptible.

In the fall of 1937 a greenhouse planting of the Milpitas strain was made and allowed to pollinate in close proximity to the leafspot-resistant G.W. strain 3718. Seed harvested from both parents was planted to the field in May 1938 at both Sterling and Longmont. The reciprocal sides of the cross showed a leafspot reading of 1 for both as compared with readings of 6 to 7 for the standard commercial GW18.

In 1939, 11 white and 13 red roots from the cross B. mar. Milpitas x Gr. 3718 and reciprocal were backcrossed to 16 roots of a closely related LSR strain Gr. 3719.

In 1940, a selection was made for leafspot resistance and non-bolting. This type of selection was repeated again in 1942 and 1944. Seed was produced from the last selection of 103 roots in 1945, and this represents the present hybrid strain known as B332. Variety-test results are presented for 1946 in table 2 and for 1947 in table 3. Varieties GW85 and GW59 used for comparison are "LSR" and "Yield" commercials.

Table 2.—Variety test, 1946.

Lot	Roots	Sugar	Sugar	Leafspot
	(tons)	(percent)	(pounds)	Rating
<b>Longmont:</b>				
B332	20.28	13.2	5354	--
GW85	21.27	13.7	5828	--
<b>Morgan Co.:</b>				
B332	25.53	13.53	6908	1.5
GW85	20.82	13.42	5598	4.7
LSD 5 percent pt.	2.77	.78	813	--

Table 3. Variety test, 1947.

Lot	Tons beets per acre			Percent sugar			Lbs. sugar per acre			Leaf-spot
	Lmt.	M. Co.	Mean	Lmt.	M. Co.	Mean	Lmt.	M. Co.	Mean	M. Co.
B332	17.17	28.55	22.86	14.77	15.26	15.02	5079	8713	6896	1.2
GW59	16.68	27.70	22.19	15.70	15.23	15.47	5157	8437	6797	4.7
GW85	16.20	24.92	20.56	14.92	15.66	15.29	4795	7805	6300	3.2
LSD 5 percent pt.	1.51	2.76	1.57	.55	.73	.46	497	853	494	

With the exception of having about 3 percent bolters, B332 is fully commercial in sugar production per acre and constitutes one of our outstanding leafspot-resistant strains. In 1947, when our commercial LSR variety GW85 had an LSR reading of 3.2 and completely susceptible varieties up to 6 or 7, B332 had an LSR reading of 1.2 in the Morgan County test. As an average of both tests it is equal to GW59 and superior to GW85 in production of total sugar per acre.

In the spring of 1947 a demonstration series of 6 plots, consisting of the original wild Milpitas seed and each generation of the cross with Grs 3718 and 3719, was planted at Fort Morgan. This series of plots provided a very striking demonstration of the reduction in bolting (table 1), also improvement in root type and commercial possibilities. In this planting the Milpitas wild strain showed some of the largest seedballs we have ever observed. We were able to count as many as 11 florets per seedball.

The development of the hybrid strain B332 has been a very interesting experience, and emphasizes the fact that breeding material may look very unpromising and still be very valuable, if one has the patience to spend

the time required for the elimination of many undesirable characters. Work already in progress is designed to eliminate the remaining 3 percent of bolters by planting seed under winter conditions in February and selecting only the non-bolters for seed production.

The annualism in this hybrid variety could have been eliminated more rapidly by selection from plantings made in the very early spring. However, we believe the procedure we used was safer in that if we had eliminated all the annuals in 1 or 2 years of selection we might at the same time have lost other valuable characters.

In this study, wild beets from Milpitas, California, were shown to possess decided resistance to *Cercospora* and to be a valuable source of breeding material. A hybrid resulting from a cross of these wild beets with a Great Western Strain now shows good production of sugar per acre along with outstanding resistance to leafspot and other desirable characters.