general practice. The tests are to be continued on a larger scale and more widely distributed in the sugar beet districts of the Northern Great Plains area. However, these results, taken in conjunction with reports from similar tests conducted elsewhere, do indicate definite promise that if initial stands are suitable, and if proper steps for weed control are taken, hand singling may in many cases be omitted without loss in yield of commercial beet roots per acre.

Literature Cited

1. Mervine, E. M. Field Tests of Mechanical Blocking and Thinning of Sugar Beets. Proc. Amor. Soc. Sug. Beet Tech. 256-258. 1940.
2. Mervine, E. M. and Barmington, Ray. Mechanical Thinning of Sugar Beets. Colo. Agr. Exp. Sta. Bul. 476. 1943.

Insects As a Minor Factor in Cross Pollination of Sugar Beets

DEWEY STEWART[1]

It is a common observation that numerous insects visit flowering sugar beets. The relative importance of insects and wind as agents of cross-pollination of sugar beets has not been determined. Tests were conducted in 1938 and 1940 at Arlington Farm, Va., to evaluate these two agencies of pollen transport.

Sugar beet plants were enclosed in 30-mesh wire cloth cages except for one or more flowering branches per plant that were left outside. The branches outside the cages were exposed to visitation of insects, whereas the plant inside was protected from large insects. It is thought that the screen wire offered little impediment to wind-borne pollen so that the portions of the plant inside a cage and the branches outside had equal exposures to wind-borne pollen. The plants were grown each year in a seed field approximately one-third acre in size. The relative percentages of cross pollinations for the two types of exposure were determined by means of the inheritance of the factors conditioning anthocyanin color. The general population of plants in the seed field were pink-hypocotyl type (R-) except for a small percentage of plants that were homozygous recessive. Green; hypocotyl plants or the recessive phenotype were caged. The pinkr hypocotyl seedlings in the progenies of these caged plants were identified crosses.

[1]Pathologist, Division of Sugar Plant Investigations, Bureau of Plant Industry, Soils, and Agricultural Engineering, Agricultural Research Administration, United States Department of Agriculture.

Results of a test with the sugar beet variety U. S. 215 are given in table 1. The mean percentage of identified cross pollinations within the cages was not significantly different from the mean percentage obtained from the branches outside.

Table 1.—Comparison of cross pollinations occurring in caged (30-mesh screen) and uncaged parts of U.S. 215 plants. Arlington Farm, Va.. 1938.

Location of plant		Total seedlings grown from seed produced		Pink hypocotyl seedlings grown from seed produced*	
		Inside of cage Number	Outside of cage Number	Inside of cage Percent	Outside of cage Percent
Within seed field	1	308	444	70.8	68.0
Within seed field	2	88	322	68.2	61.2
Within seed field	3	581	472	65.4	66.1
Within seed field	4	208	450	64.9	59.2
Mean†		......	.....	67.325	63.625
270 feet from field	5	51	57	59.8	68.4
850 feet from field	6	81	10	11.1	30.0

*Identified by the R factor. Mother plants rr. Pollen source not of one genotype but prevailingly R pollen was produced in the field.

†Mean difference of 3.7 percent not statistically significant by t-test.

Two sugar beet plants known to be of the rr genotype were placed in a meadow adjacent to the sugar beet seed field, one plant being placed 270 feet and the other 850 feet distant. It is interesting to note that the percentages of identified cross pollinations that occurred on the plant 270 feet from the seed field, irrespective of whether the branches were caged or not, did not differ strikingly from the cross pollination percentages obtained for plants located in the seed field. For this distance the wind apparently dispersed the pollen in a relatively effective amount.

The plant 850 feet from the seed field gave a marked reduction in cross pollination percentages. Seed production on the plant was largely from selfing.

Results of 1940 are given in table 2. The results were obtained with green-hypoeotyl plants of U. S. 22 grown in a seed Field in which the plants were essentially a pure stand of F_1 of U. S. 216 x U. S. 22 and other curly top resistant varieties. The F_1 plants were heterozygous (Rr) with respect to the genes conditioning hypocotyl color. The caged plants were the recessive genotype, and the seedling progenies grown from them should give an approach to a 1:1 ratio for hypocotyl color provided the plants caged were not self-fertile. The respective percentages of pink-hypocotyl seedlings, 44.2 percent and 45.3 percent for inside and outside the cages indicate that a high de-

Table 2.—Comparison of cross pollinations* occurring in caged (30-mesh screen) and uncaged parts of U. S. 22 plants. Arlington Farm, Va., 1940. (Values given as means of 8 plants grown within seed field.)

	Seed produced		
	Inside of cage	Outside of cage	Mean Diff.
Total seedlings	207.4	151.5	
Seedlings per seed ball	1.586	1.528	.058†
Percentage germination	70.4	46.9	23.5‡
Percentage pink-hypocotyl seedlings	44.2	45.3	1.1†

*Identified by the R factor. Mother plants rr. Pollen source prevailingly Rr plants (F_1's U. S. 216 x U. S. 22 and other curly-top resistant varieties).
†Not statistically significant by t-test.
‡Statistically significant. Odds greater than 99:1.

gree of cross pollination occurred. The mean percentage of the identified cross pollinations inside the cages was not significantly different from the mean percentage for the outside branches. The number of seedlings per viable seed ball indicates similar quality of seed was produced under the two exposures. The germination percentage is much lower for the seed produced on the outside branches that were exposed to the feeding of larger insects.

These experiments indicate that wind is an effective agent of cross pollination for sugar beets and it alone is sufficient to bring about the necessary transfer of pollen between plants within a seed field to assure seed production and a high degree of hybridity. Although larger insects may contribute to the total pollen exchanged between flowering sugar beets, they do not appear from these tests to be an essential agent of pollination and seed production. The role in cross pollination of sugar beets of thrips and other small insects not excluded by 30-mesh screen wire was not evaluated in these tests.