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1. Corn earworm resistance as affected by starchy (Su_1) and sugary (su_1) maize endosperm phenotypes.

In a continuing search for genetic factors contributing to resistance of corn to the corn earworm, Heliothis zea, the effect of the sugary (su_1) kernel phenotype as contrasted to the starchy (Su_1) phenotype, on similar or identical seed-parent backgrounds, was studied in replicated plots in 1964 and 1965. Other work has shown that husk tightness is important to resistance, but there has been much less evidence that other characters, including postulated chemical ones, play a very great role. The studies discussed here relate to earworm damage to ears on sweetcorn backgrounds, classified at fresh market harvest (some 15 to 20 days after pollination under Southern California conditions). Effects on ears carried to maturity, for seed, may be different.

In 1964, the sugary inbred, Purdue 39A, and a converted P39A homozygous for Su_1 were planted in randomized plots with 4 replications, and 20 top (upper) ears per replication were earbagged before any pollen shed in the early morning of the first day of silking. Each afternoon after pollen shedding had ceased, the bags were removed to allow egg-laying by the nocturnal earworm moth, which causes 98 to 100% natural infestation at Riverside; bags were replaced early each morning. On the 3rd and 5th days of silking the sugary ears were heavily hand-sib pollinated, while the homozygous starchy ears were open pollinated (since they would remain starchy anyway). Twenty days after silking the following data were obtained, expressed as earworm damage in inches measured downward from the tip of the ear (only ears filled to the tip were rated):

Inbred	A	B	C	D	Mean damage (inches)	Analysis of variance F test
P39A starchy	1.0	1.0	1.2	1.1	1.08	non-significant
P39A sugary	1.1	0.9	1.2	1.3	1.13	

The P39A starchy was a 4th backcross from a Su_1 line and it was highly similar to P39A itself in most characters, but average length of husk extension was 0.6 inch longer than in the P39A sugary. This difference should have had little effect on earworm resistance.

In 1965 three experiments were run, in which all the plants were F_1 hybrid sweet corn, thus eliminating genetic plant

and husk character variables. In the first experiment, using "F. M. Cross," replications and ear-bagging procedures were as in 1964 and natural earworm infestation was relied upon. Four replications were hand-pollinated by starchy pollen from a planting of the P39A starchy inbred, and four others were open pollinated by their own sugary pollen (with no starchy pollen nearby). The results of this test (below) indicated starchy kernels to be slightly the more susceptible.

F. M. Cross pollinated by	Replication A	B	C	D	Mean damage (inches)	F test
starchy (Su_1)	1.9	1.5	1.4	1.4	1.55	
sib (su_1)	1.4	1.3	1.3	1.1	1.28	significant at 5%

The second and third experiments were run with Golden Cross Bantam, T Strain, about 1 and 2 weeks later, but all ears, within each experiment, were hand-infested on the same day with three first or second instar earworm larvae, grown in culture. In both experiments the sugary ears averaged slightly but significantly more damage than the starchy ones. Since hand infestation on a single day should be more uniform than even the heavy natural infestation, the data suggest that the sugary kernel type does make for slightly more susceptibility during the first 15 to 20 days. It is also possible, but unlikely, that the starchy pollen used introduced other genes which affected endosperm attractiveness to the worm.

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