s of Fresh Market Sweet Corn

investigations indicate cultural practices may influence the incidence of shrivel of developing kernels on market corn

C. A. Shadbolt, A. Van Maren, and V. H. Schweers

A shrivelling— or arested development—of the kernels of fresh market sweet corn has been observed for several years in the San Joaquin Valley, the Coachella Valley and the Riverside area.

The disorder develops after pollination, and usually appears when the kernel has nearly completed development. In fact, mild cases of shrivel can be avoided —at least partially—by harvesting early.

Shrivel is a disorder that should not be confused with the problem of completely blank kernel areas on the body or the tip of the ears, which is the result of lack of pollination. Severe cases of tip blanking have been found often associated with shrivelling and—when this occurs—the shrivel is usually adjacent to the lower margin of the blanked area.

In less severe cases, shrivel occurs only at the tip of the ear, and does not necessarily interfere with its market quality. In more severe cases, however, shrivel may extend several inches down the ear —often on one side only—and generally affects the kernels in one or more pairs of rows. The second, or lower, ears and the tiller ears are much more subject to shrivel than are the first, or upper, ears.

Often the disorder can be detected before actual shrivel takes place, because —prior to shrivelling—the affected kernels appear slightly smaller, duller and somewhat lighter in color than normal kernels. These lighter colored kernels contain from 8%–12% total soluble solids on a fresh weight basis as compared to 18%–30% for adjacent normal kernels. The fact that the disorder appears in paired rows, with indications that the sugar content of affected kernels is low, suggests that the translocation of carbohydrates to the kernels is somehow impaired.

There is some evidence that varieties differ in susceptibility to shrivel. Varieties which tend to have a tapered tip appear to show the disorder to a greater degree than nontapered tip varieties.

Preliminary trials using normal, low, and high rates of irrigation did not show significant differences in the incidence of shrivel but further tests are planned.

To evaluate the degree of shrivel, an indexing system was used for all the experimental plots. The ears were rated into four groups according to the severity of the disorder and given a numerical designation: *1*—no shrivel; *2*—less than 1″; *3*—from 1″–2″; *4*—over 2″ of the ear affected. The numbers of ears which fell into groups *2*, *3*, and *4* were multiplied by the group number, summed, and the sum was divided by the total number of ears examined. The resulting index provided an indication of the relative degree of shrivel, a higher index denoting a higher incidence of the disorder.

In Coachella Valley and in Tulare County the removal of approximately one half of the leaf area of the plant caused a significant increase in the shrivel incidence. This increase was observed to be greater in the lower than in the upper ears. Root pruning could not be shown to influence the level of shrivel.

The effect of in-the-row spacing upon shrivelling was investigated in the Coachella Valley in the spring of 1957. Plants were thinned to 8″, 16″, 24″, and 32″ spacings when they were about 6″ high. Shrivelling was severe at the 8″ spacing but declined rapidly as spacing was increased to 16″ and beyond.

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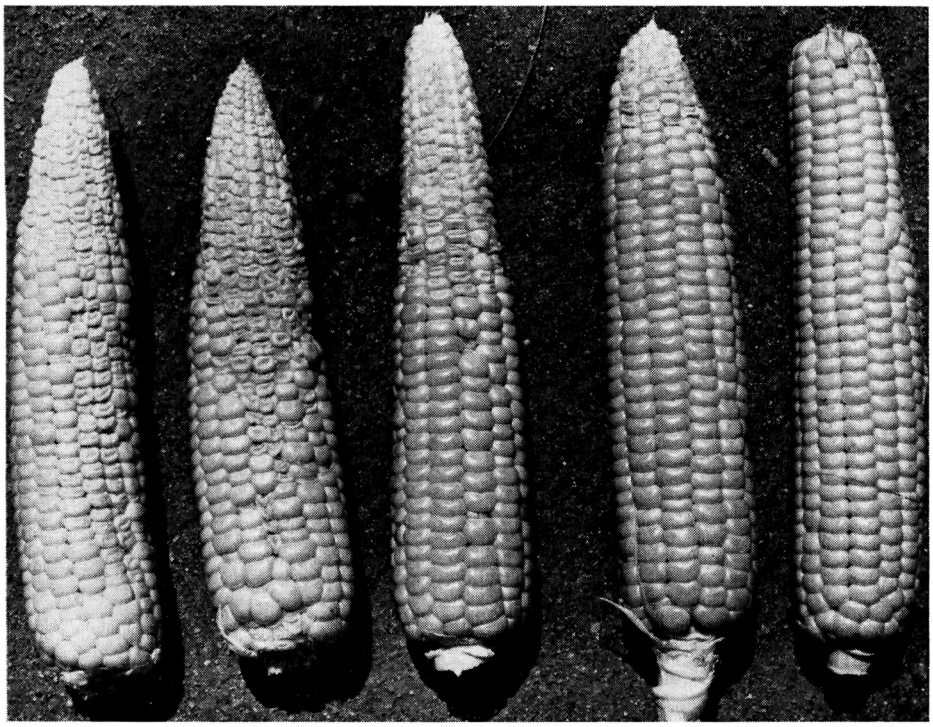
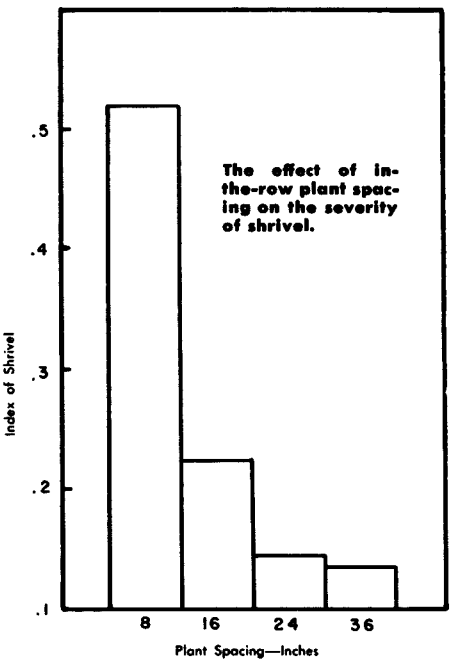
Shrivel of sweet corn. Severe case on left, normal ear on right. Note the paired rows of affected kernels in the two ears on the left.





The effect of in-the-row plant spacing on the severity of shrivel.

fact that vigorous plants usually silk early—when ample pollen is available—while weak plants silk late. Full stands of vigorous, uniform plants, silking over a relatively short period, are necessary to minimize blanking.

Varieties can show genetic differences in susceptibility to blanking. In three replicated variety trials in Coachella Valley and near Riverside, T Strain and T-51 showed an average of only 3% blanking, while Creamcross—poorly adapted to these areas—had 32% severe blanking. The difference was highly significant. None of these plots was subjected to serious wind. The blanking in Creamcross was principally near the tips, and reflects the frequent inability of this variety to develop ear tips on which kernels can develop.

Two replicated trials were planted in January and February, 1957, in Coachella Valley to test the effect of seed size on plant vigor and blanking. Random samples of seed from bulk lots of Golden Cross Bantam T Strain were separated into three size groups, averaging 219 mg—milligrams—177 mg, and 144 mg per seed. No significant differences were obtained in per cent germination, tillers per plant, or per cent of ears with blanking. However, weather conditions in these trials were favorable for rapid germination and growth. Under unfavorable conditions, it is possible that small seed might produce weaker plants, with more tendency toward blanking.

James W. Cameron is Associate Geneticist in Horticulture, University of California, Riverside.

Donald A. Cole, Jr., is Principal Laboratory Technician in Horticulture, University of California, Riverside.

When these studies were made, R. Kasmire was Farm Advisor, Riverside County, University of California; and C. D. McCarty was Principal Laboratory Technician in Horticulture, University of California, Riverside, and both men assisted in certain parts of the work.

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Under more optimum growing conditions shrivel could be expected to be much less severe than in this particular trial. Under adverse or suboptimal conditions, on the other hand, spacing could be a much more critical factor.

The timing of nitrogen sidedressing applications to the crop apparently affects the tendency toward shrivel. In the spring of 1957, six treatments were set out—with in-the-row plant spacing at 12″—in the Coachella Valley. Three of the plots received various total amounts of nitrogen, in two equal sidedressing applications: *1*, when the corn was 12″ high, and *2*, when the tassels began to appear and the corn was about 3′ high. One plot was treated only at the 12″ stage, and another only at the 3′ stage, using the same rate of nitrogen. One plot was held as a control without application of nitrogen. A high incidence of shrivel in the upper ears occurred in the control plot and the plot which did not receive the late application of nitrogen at the early tassel stage. In comparing the three plots that received the same total amount of nitrogen, it is evident that it is the time of the application which is important rather than the total amount applied. The control plot—which received no nitrogen at either growth stage—exhibited severe chlorotic symptoms in the latter part of the growing season. The severe stress placed on these plants is also indicated by yields about 50% lower than the other treatments.

Fertilizer Test Plots in Coachella Valley (Nitrogen applied by sidedressing)

N* lbs. at 12″	N* lbs. at 3′	Total lbs. N**	No. mkt. ears	Ears showing shrivel %	Shrivel index
103	103	278	104	4.2	0.136
68	68	208	105	4.0	0.122
34	34	140	102	5.2	0.164
68	0	140	100	14.5	0.459
0	68	140	91	4.0	0.094
0	0	72	46	32.4	1.096
Least significant difference (0.05)			19		0.168
Least significant difference (0.01)			26		0.232

*Nitrogen applied as ammonium sulfate.

**Includes 72 lbs. nitrogen applied prior to sidedressing application.

Results of these tests indicate that shrivelling in sweet corn can be greatly reduced by cultural practices such as choosing a satisfactory variety, an adequate fertilizer program, adjustment of plant spacing, and possibly irrigation practices.

C. A. Shadbolt is Assistant Olericulturist, University of California, Riverside.

A. Van Maren is Farm Advisor, Riverside County, University of California.

V. H. Schweers is Farm Advisor, Tulare County, University of California.

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following week. Thus, the second disking caused a loss equivalent to five days of normal production. The loss following the first—and more severe—disking appeared to be a little greater in terms of days lost. If hand-cut beds are disked on an average of once every 25 days, the over-all yield would be about 80% of the yield during the periods not affected by the diskings.

Hand cutting at the 6″-green stage, rather than at the usual 4½″-green stage for canning, did not affect the total number of spears but reduced both the weight per spear and the total yield by about 15%. In addition, a larger percentage of the spears were culls because of seedy or open heads, especially during warm weather.

Machine cutting Schedule *A*—with the longest time intervals between cuttings—was a little better than Schedule *C* and much better than Schedule *B* in regard to yields. Cutting less frequently decreases the percentage of spears shorter than 3½″ but the percentage of spears with seedy or open heads increases. Although Schedule *A* produced a considerably greater weight of seedy or open heads than did Schedule *C*, it also had about 10% more weight of 4½″ good spears and about the same total weight of 3½″ plus 4½″ good spears.

Harrowing the tops of the machine-cut beds to break the crust had no apparent effect upon yields. Reshaping the beds with the special shaper may result in the loss of a day's yield, or perhaps less, depending upon the depth to which the beds are disturbed.

Yields for UC hand cutting and for machine Schedule *A* were compared for periods during which the hand-cut yields were not affected by disking. Machine-harvested yields did not include spears missed by the machine. For the clay loam plot, the total harvested yield in cuttings 2–5, 8, and 9—periods with no hand-cut disking losses—was 41% of the corresponding hand-cut yield. On the peat soil plot, the machine-harvested yield for cuttings 2–5 was 38% of the hand-cut yield. Considering that the over-all hand-cut yield was about 80% of the average yield for periods not affected by disking, the machine-harvested yield of recovered spears becomes 50% of the over-all average yield for the 4½″-green UC hand-cut rows.

During the early part of the season, hand-cut yields obtained by the University personnel on the plot rows were compared with those obtained by two commercial cutters from the growers' crews on six adjacent rows. After only 10 days of cutting experience, the University cutters were getting about 10% more yield than the commercial cutters, even though the latter were considered to be better than average. Probably the adjustment applied to UC hand-cut yields

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