Blanking and Shrivel Disorder

strong winds during pollinating periods important cause of blanking disorder occurring on sweet corn for fresh market

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Incomplete ear fill—blanking—in fresh market sweet corn is due to the failure of individual kernels to begin development and has been particularly troublesome in the Coachella Valley. Usually blanking is most serious near the tip of the ear, but it can extend over the body of the ear.

Young ear at second day of silking. Long silks at base; short silks at tip.

General plant vigor, uniformity of silking time, and variety can affect blanking but experiments conducted during 1955, 1956, and 1957 have shown that strong winds—at critical periods—produce blanking.

Under normal conditions in Coachella Valley the corn tassel usually sheds its pollen over a 3–6-day period. Under warm, dry air conditions, shedding begins soon after sunup, and may end before noon. The pollen is wind blown, and seed set is dependent principally on cross pollination. Silking—in any one plant—usually begins 1–2 days after pollen shedding, and is completed in 3–5 days. Silks from the base of the ear emerge first, followed in succession by silks from the center and tip areas. One silk is attached to each potential kernel, and for this kernel to develop it is necessary that parts of the pollen grain grow down the silk and fertilize the egg cell. Otherwise, there will be a blank.

The photograph to the left shows a young ear in its second day of silking, with long silks growing from the basal ovules and short silks from the tip ovules. The shorter silks had not yet emerged from the husk tips. If this ear were pollinated only at the stage shown, the upper one fourth would be blank. If it were pollinated several days later—when the tip silks had grown out and the basal silks had died—the lower portion would be blank. Under normal field conditions, an ear is pollinated over a period of several days, as the silks appear.

In Coachella Valley, high winds at critical periods were suspected of causing blanking. Such winds occur frequently during the spring months, often during the afternoon and evening but occasionally during the morning period of pollen shedding. To test their effect on blanking,

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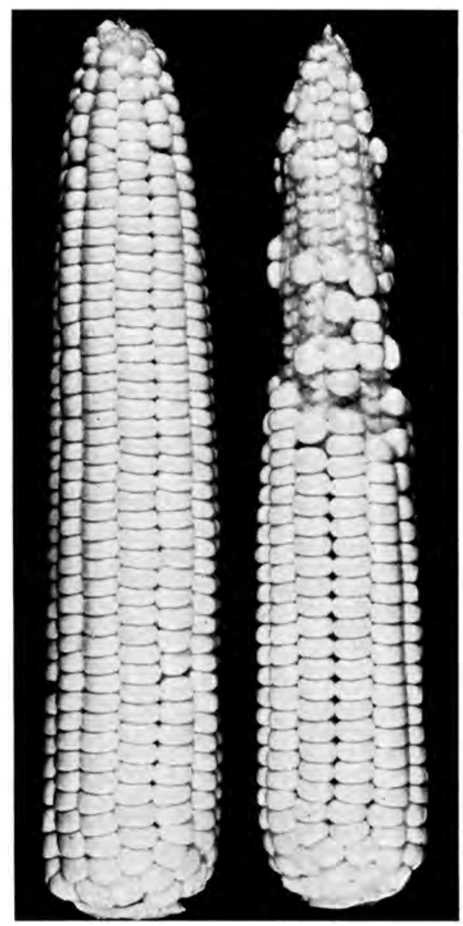
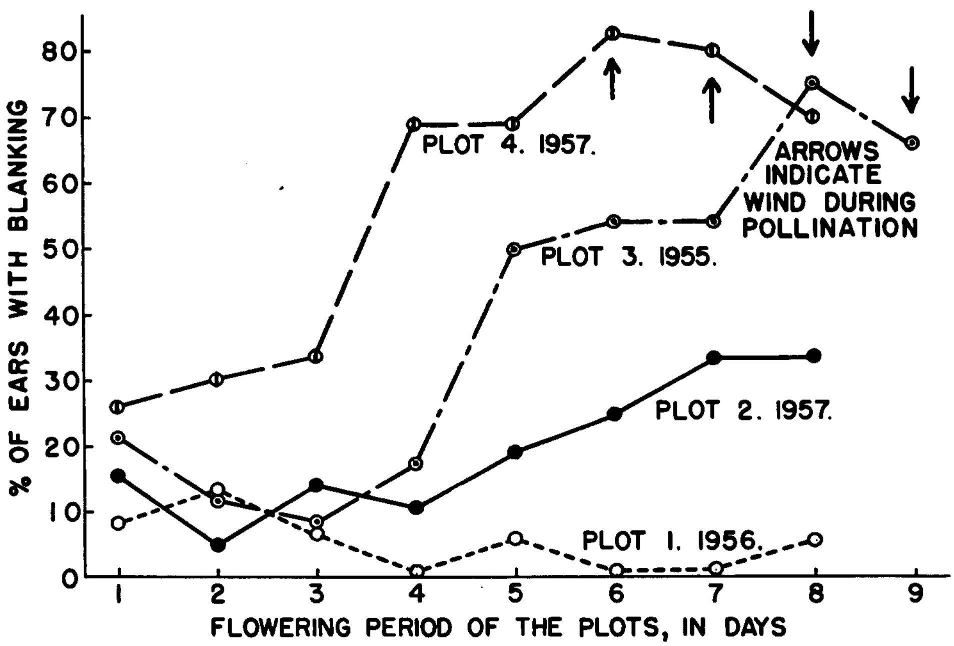
Left—normally filled ear; right—ear with severe blanking.



Per cents of ears with blanking in four sweet corn plots, in relation to wind. Each circle indicates the per cent of blanking in a group of plants which began to silk on that day.



BLANKING

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several plots of commercial hybrids were studied. Silking date and plant vigor, including number of tillers, were recorded for each of 100 or more plants in each plot. Continuous wind and temperature records were obtained at the Thermal airport. At harvest, the top ear from each plant was classified for degree of blanking, which was based on the size and location of blank areas.

All test plots had satisfactory cultural conditions and silked over periods of 8–9 days. Plot *1*—1956—and Plot *2*—1957—were not subjected to severe winds during morning pollinating periods. Plot *1* produced only a few ears with blanking. Plot *2* had low blanking among ears which silked during the first part of the flowering period, and increased blanking near the end of the period. Such an increase occurs where most of the plants flower early, leaving a few late ones without ample pollen. In Plot *3*—1955—winds of 18–32 miles per hour occurred on the eighth and ninth days during the morning pollinating period. These winds caused serious increases in blanking among ears which began to silk on and after the fifth day of the flowering period. Those ears had not completed their silking and so had not been completely pollinated before the wind interfered. Plot *4*—1957—showed even more serious effects. Winds of 17–43 miles per hour occurred during the mornings of the sixth and seventh days of the flowering period. Blanking occurred on most of the ears which first silked on and after the fourth day.

Wind interferes with pollination by blowing the pollen away so that it does not alight on the silks, and by causing pollen to dry out and die rapidly. Under drying conditions, corn pollen can die within five minutes after being shed. Wind also tends to dry and shorten the life of the silks, but this is not the most critical factor.

The days during the flowering period when a wind occurs are important. If it occurs only during the first days, most ears have opportunity to be pollinated after it subsides. But if it occurs later, as in Plot *3* and Plot *4*, little pollen is available afterward and the total damage is greater.

Data from one plot gave evidence of delayed pollination. When this occurs, kernels of two sharply different ages appear on the same ear. Of 243 ears examined, 36 showed this behavior and 34 of those 36 had begun to silk during the three days preceding a wind. Pollination was partly prevented during the wind, and was completed afterward, resulting in some kernels being much younger than others.

Relation Between Tillers per Plant—in High-Tillered Varieties—and Per Cent of Ears with Blanking

	Average number of tillers per plant					
	0–1		2		3–4	
	Number of plants	% of ears with blanking	Number of plants	% of ears with blanking	Number of plants	% of ears with blanking
Plot 5 Coachella Valley 1955	420	50	237	18	54	13
Plot 6 Coachella Valley 1956	149	21	79	13	18	11
Plot 7 Riverside area 1956	141	11	158*	2		

* Includes plants with 2–4 tillers.

In two plots grown in 1957, ears showed specific areas of blanking correlated with different silking dates, in relation to a two-day wind.

In the photograph on this page, the first ear—on the left—is fully set. The second, third, and fourth ears show blanking near the tip, above the center, and near the base. The second ear first silked 3–4 days before the wind, and its lower two thirds was fully pollinated. Wind then interfered and pollination near the tip was never completed. The third ear silked two days before the wind and was similar to the second ear except that the silks near the tip were apparently younger and survived to permit fertilization after the wind. The fourth ear—extreme right—silked one day before the wind. Pollination on its lower half was not yet complete when the wind occurred. Afterward, the basal silks no longer fully supported pollination, but the younger ones nearer the tip did.

Apart from wind effects, a general correlation exists between superior plant vigor and absence of blanking. In the varieties most studied—Golden Cross Bantam T Strain and Golden Cross Bantam T-51—high tillering, or suckering, is typical and is an indication of vigor. Blanking decreased in various plots as tiller number increased. This behavior in part reflects the greater stamina of the high-tillered plants, including longer survival of the silks. It also reflects the

Blanking on specific parts of ears, correlated with silking date and wind. *Left*—normally filled ear; *second, third,* and *right*—blanking near tip, above center, and near base.

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.

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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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SHRIVEL

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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.

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ASPARAGUS

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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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