University of Idaho
College of Agriculture

Cooperative Extension Service
Agricultural Experiment Station

Current Information Series No. 421

December 1977

Water Stress and Sweet Corn Seed Production

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Between 13 and 26 acre-inches of irrigation water are required to grow a sweet corn crop in the Treasure Valley. The amount of water actually applied will depend on the inbreds or cultivar grown, plant density per acre, time of planting, seasonal growing conditions and rainfall. About 63% of the water required for sweet corn seed production is needed in July and August. Sweet corn's average consumptive water use may reach 0.28 inches per day in August.

The interruption of irrigation water supplied may become more commonplace in the future due to lack of precipitation and increased non-agricultural use of water. With this in mind, preliminary studies were undertaken in 1976 to determine the effects of soil moisture deficits or drought on sweet corn seed yield and seed quality.

Four replications of the short-season inbred Luther Hill were grown at the Southwest Idaho Research and Extension Center in Parma. Recommended cultural practices were followed. Weeds were controlled mechanically. In the stress plots, the levels of soil moisture were depleted 75 or 85% at different times during the growing season (Table 1). This is the equivalent of 25 or 15%, respectively, of available soil moisture remaining. These two levels of soil moisture depletion occurred only once, either during silking, 3 weeks after or 6 weeks after silking. The no-stress (control) plants were irrigated whenever 40% of available soil moisture was depleted.

After harvest, the seed was sized into large flats, small flats, large rounds and small rounds. The term gradeable yield in Table 1 refers to the percentage contributed by these four sizes to the total harvested yield. Vigor index is a measure of field performance. This was determined by averaging the results of four vigor testing methods: 4-day count of the standard germination test, cold or vigor test, accelerated aging and rate of germination.

Results

Results (Table 1) indicate that water deficits, primarily during the time associated with silking, have their major effect on field performance or yield and not on subsequent seed quality or germination. Both levels of high soil moisture depletion during silking resulted in yield loss, reduced plant height and increased percentage of stalk rot. Although stress, particularly during silking, seemed to reduce the number of ears per acre and seed quality attributes, these differences were not statistically significant. No stress effects were observed in percent grade-out or seed size distribution.

Conclusions

These preliminary data indicate water stress does not have a profound effect on seed size or subsequent seed germination. Seed yield, however, can be reduced by as much as 40% when 85% of available soil moisture is depleted during the silking period of plant development.

Water stress during and shortly after silking will increase stalk rot. Stalk rot in turn can reduce yield through excessive lodging.

Recommendations

Sween corn may require as much as 26 acre-inches of irrigation water to produce a seed crop. For most production situations, this means sweet corn needs an uninterrupted water source until at least mid-August.

Irrigate on the basis of water need and not by calendar date. For example, the average daily consumptive rate for an acre of corn in May is only 0.06 acre inches. In July this increases to 0.25 acre inches!

Table 1. Effect of drought on both the field performance and subsequent seed quality of Luther Hill sweet corn seed.

Time of stress	Available soil moisture removed (%)	Yield (lb./A)	Ears/A	Plant height (in)	Stalk rot (%)	Gradeable yield (%)	Germination (%)	Vigor index
Silking	75	1750*	295,000	51*	50*	77	93	72
	85	1649*	305,000	49*	59*	75	94	73
3 weeks after silking	75	2367	355,000	57	21	78	96	74
	85	2146	329,000	56	28	77	96	76
6 weeks after silking	75	2425	379,000	58	8	76	90	75
	85	2124	304,000	56	13	76	90	74
No stress		2682	401,000	60	6	75	96	76

*Indicates significantly different than the no-stress control (at the 0.05 level).

Use tensiometers or other reliable soil moisture measuring devices. Locate them properly in the field. A good location usually is two-thirds the distance down the row from the head ditch. Avoid using visual symptoms such as leaf roll and darkening of the leaves to predict irrigation scheduling. When these signs occur, 60% or more of the available soil moisture has probably been depleted and the plant has been stressed. Corn plants required about 1 week to recover fully from the water deficits encountered in this study.

No more than 40% of available soil moisture should be depleted. Higher soil moisture depletion later in the growing season will not depress yields as much as stress during silking and tasseling periods.

Practice good weed control.

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5 cents per copy

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2M 12-77