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Comparison of Moisture Determination Techniques over a Range of Sweet Corn Seed Maturities

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Seed moisture content, an estimate of kernel maturity, is commonly used by the sweet corn industry to determine optimal harvest date. Depending on environmental conditions, moisture in sweet corn seed can drop rapidly. Therefore, a rapid determination of moisture content was necessary to study the effects of seed maturity at harvest on germination and vigor of *shrunken-2* sweet corn.

A moisture analyzer (model AVC-80; CEM Corp., Indian Trial, N.C.) consisting of a microwave drying oven, electronic balance, and a microprocessor was used. The microprocessor computes moisture content based on percent weight loss of the sample after it has been dried by microwave radiation. We compared the efficacy of such a moisture analyzer (MA) across a range of 40% to 70% moisture (fresh-weight basis) in *shrunken-2* sweet corn seed to two standard methods used by the seed industry, the air-oven (AO) and Brown Duvel distillation (BD). The moisture range was selected based on the industry's harvesting guidelines for *shrunken-2* sweet corn seed, which maximizes field performance (50% to 55% moisture on fresh weight basis).

Seed of two *shrunken-2* commercial hybrids, 'Florida Staysweet' and 'Crisp N' Sweet 710', was produced by controlled hand pollinations of field-grown parental inbreds in southern Minnesota. Four harvests from each cultivar, each within a single pollination date, were made as seed moisture reached ≈70%, 60%, 50%, and 40%. Moisture was determined using seeds cut to cob level from the center 9 cm of 20 randomly chosen ears and mixed to give a composite sample.

A 75-g sample from the composite was macerated for 1 to 2 min in a Waring blender because whole seeds cannot be used for microwave drying due to burning and spattering of the kernels (Becwar et al., 1977). About 2 g of the blended sample were used for each MA test; settings for power, time interval, and weight loss were adjusted at each harvest to ensure dry-down without carmelization. The AO method was conducted on 100-g samples as outlined for field corn (103C for 72 hr) (ASAE, 1979). Fifty-gram samples were used for BD distillation method as described for field corn (Coleman and Boemer, 1926). Four replications of each method were conducted.

Results from the three methods of moisture determination differed over the range of seed moistures examined (Table 1). Differences in sample size among the three methods (2 g vs. 50 g vs. 100 g) may have been the primary cause of differences in moisture readings at each harvest. For example, the 2-g sample used for the MA method may not have contained representative amounts of solids and liquids. The artificially high liquid : solid ratio may have produced a higher moisture reading in both cultivars at the first harvest when compared to the AO method.

At harvest 2, the variation in results between methods may be related to the chemical composition of the endosperm. The percent of hydrophilic components in the endosperm affects the rate of field drying (Nass and Crane, 1970) and may also affect the liquid : solid ratio at this moisture content.

The procedures used for the AO and BD were the standards developed for field corn. Temperatures and/or test times designed for a starchy endosperm may not be proper for the high sucrose content of the *shrunken-2* endosperm. Carmelization and volatilization of dry matter may have occurred and resulted in the higher moisture readings obtained for the AO and BD at harvests 3 and 4 in both cultivars. The reproducibility of moisture determination at a given harvest using the MA method was good, varying only 1.0% on average for both cultivars.

For seed maturity studies, the MA was ideal for monitoring the wide range of moisture contents. The MA is easier, quicker, and more convenient to use than the other methods. The 2% to 5% difference that we observed between the MA and the two other methods is no cause for concern, since harvests were selected at 10% moisture intervals.

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Table 1. Mean seed moisture content of 'Florida Staysweet' and 'Crisp N' Sweet 710' as measured by three moisture determination methods.'

Harvest	Cultivar	Method: Moisture analyzer	Method: Brown–Duvel	Method: Air oven
			Moisture (%)	
1	Florida Staysweet	69.8 a	70.2 a	65.1 b
	Crisp N' Sweet	70.6 a	70.6 a	67.0 b
2	Florida Staysweet	59.3 b	61.0 a	56.2 c
	Crisp N' Sweet	58.3 a	59.9 a	60.3 b
3	Florida Staysweet	49.6 a	53.2 b	52.8 b
	Crisp N' Sweet	52.7 a	56.3 b	55.7 b
4	Florida Staysweet	40.5 a	44.6 b	44.3 b
	Crisp N' Sweet	45.5 a	48.2 b	48.4 b

[z]Mean comparisons within rows by the Duncan-Wager test ($P \leq 0.05$).

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