Germination and Emergence of High-sugar Sweet Corn Is Improved by Presowing Hydration of Seed

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Abstract. Three presowing seed hydration treatments and a control were compared for stand establishment with a normal ('Jubilee') and two high-sugar ('Sweetie', 'Sugar Loaf') sweet corn (Zea mays L.) hybrids. Moisturizing (M) and soaking (S) improved early emergence, while an osmoconditioning (OC) treatment significantly reduced field emergence compared to control. Plant size was increased in the M and S treatments at an early (2- to 4-leaf) vegetative stage. The effectiveness of hydration treatments differed slightly with hybrid. Results from spring and fall plantings at several locations suggest that presowing seed hydration can be used to improve stands of sweet corn.

High-sugar sweet corn continues to be a popular fresh market commodity. Many high-sugar cultivars germinate poorly in cold, wet soil because the seeds often are shriveled, lightweight, and prone to physical damage (2, 6, 7). Planting these cultivars into soils is one solution, but it is not feasible if early market corn is desired. Reducing the time to emergence can improve uniformity of crop growth and development by shortening the duration of chilling, or by reducing the impact of soil crusting and pathogens on the emerging seedling (3–5, 8).

Our objectives were: a) to improve the germination and stand establishment of high-sugar sweet corn with a simple and inexpensive procedure—seed hydration; b) to determine which of three hydration treatments was most effective in improving seed performance; and c) to observe cultivar response to presowing seed hydration treatments.

Field studies were conducted at Becker and Waseca, Minn, to test the potential of seed hydration treatments as a method for improving high-sugar sweet corn stand establishment in cool (<15°C) soils. Treated sweet corn seeds of 'Jubilee', 'Sugar Loaf', and 'Sweetie' were stored in a controlled environment facility at 4° and 45% RH, prior to planting. Three seed hydration techniques (plus a control) were used. Seed moisturizing (M) consisted of samples of 350 seeds mixed with 60 g of #3 vermiculite, to which 75 ml distilled water had been added. The seeds and moist substrate were sealed in 1.4-liter ziplock plastic packets, mixed to allow uniform seed–substrate contact, and incubated at 25° for 20 hr. The partially hydrated sweet corn seeds then were screened from the vermiculite and packaged for planting. For the second treatment, seed soaking (S), samples underwent an overnight soak (16 hr) in distilled water at 25° and then were surface-dried at room temperature for 8 hr before being packaged for planting (5). The third treatment, osmoconditioning (OC), involved priming seeds with PEG 8000. A single layer of germination paper was placed in 9-cm petri dishes, with 10 ml of PEG solution (33% PEG-8000 in distilled water, w/v) and 100 seeds added to each petri dish. After 7 days at 20°, the seeds were removed from the petri dishes, rinsed in distilled water, surface-dried at room temperature for 8 hr, and packaged for planting (1). A dry seed control (C) also was included in which seeds received no presowing hydration treatment. Control seeds were planted at 8–10% seed moisture, compared to 30% moisture content for seeds subjected to hydration treatments M, S, and OC.

The experimental design was a split plot, with cultivars as main plots and the three
Fig. 2. Cumulative emergence of 'Jubilee', 'Sugar Loaf', and 'Sweetie' planted after seed hydration treatments (moistured, soaked, osmoconditioned) and no treatment (control). Becker, Minn., 21 May 1984 planting. Emergence values for a given number of days after planting are separated by Duncan's multiple range test, 5% level, or were nonsignificant.

The difference in vigor between the normal 'su' hybrid in this study ('Jubilee') and the two high-sugar cultivars ['Sugar Loaf' (heterozygous sh2) and 'Sweetie' (homozygous sh2)] is shown in Fig. 1. 'Sugar Loaf' and 'Sweetie' achieved a final emergence of only 50-60% for two fall plantings at Waseca. Soil temperatures at 5 cm for these plantings ranged from 7° to 22°C during the germination period. Treatment response results of each of the three cultivars revealed that early emergence of 'Jubilee' was significantly improved by planting M or S seed (Fig. 2). Emergence results beyond 10 days after planting were reduced only by planting OC seed. A similar response was noted with 'Sugar Loaf', but the hydration treatments M and S (especially M) tend to maintain an advantage in stand establishment throughout the emergence period. Results for the homozygous sh2 hybrid, 'Sweetie', were unique. With time, control seed rapidly equaled results for M and S seed and provided a greater final percentage of emergence; percentage of emergence at 11 and 16 days after planting was not significantly different for H, M, and C seeds, however. A similarity among the three cultivars was the reduction in emergence of osmoconditioned seeds compared to all other treatments.

Data on early seedling dry weights (2- to 4-leaf) indicate the vigor differences among cultivars, and the response of a given cultivar to presowing seed hydration (Fig. 3). Moisturized seed provided the most vigorous early seedling growth and osmoconditioned seed generally produced the smallest seedlings.

Moisturized seed appears to be the most effective of the three hydration techniques compared for germination and emergence of sweet corn, including the high-sugar types. Cultivar response does differ and should be considered in making specific recommendations. Our results from field studies demonstrate the potential of presowing seed hydration for improving the stand establishment of high-sugar sweet corn. By adding a seed hydration method to other management practices (e.g., site selection, tillage, cultivar selection), a grower may improve stands of sweet corn.
Fig. 3. Early seedling (two- to four-leaf) growth of 'Sweetie', 'Sugar Loaf', and 'Jubilee' planted after seed hydration treatments (M-moisturized, S-soaked, OC-osmoconditioned) and no treatment (C-control). Becker, Minn., 21 May 1984 planting (s.e. = standard error).

Literature Cited