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# Performance of Imported Sweet Corn Hybrids in Korea

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**ABSTRACT : The performance of 7 *sugary (su)* and 12 *shrunken-2 (sh2)* sweet corn hybrids which are commercially grown in the United States was tested in Korea. The 100-seed weight of *su* hybrids (16.5-23.6 g) was much heavier compared to that of *sh2* hybrids (10.9-17.5 g). The germination rate of *su* and *sh2* hybrids at 25°C ranged 93.3-100% and 86.7-98.9%, the emergence rate of *su* and *sh2* hybrids in cold test ranged 78.9-97.8% and 62.2-97.8%, and field emergence rate of *su* and *sh2* hybrids ranged 74.4-100.0% and 79.9-98.2%, respectively. In *su* hybrids, there was a significantly positive correlation between germination rate at 25°C and emergence rate in cold test or early growth. In contrast, in *sh2* hybrids seed weight was positively correlated with early plant growth, while not with the germination rate at 25°C or emergence rate in cold test and field. Most *sh2* hybrids produced larger and more marketable ears compared to *su* hybrids although there were significant differences among the hybrids in the same genotype. At harvest (24 days after pollination) soluble solids content of *su* hybrids (24.3-27.1 Brix %) was much higher than that of *sh2* hybrids (13.8-18.0 Brix %), while total sugars of *sh2* hybrids (21.4-28.6% on the dry weight basis) was much higher compared to *su* hybrids (2.4-15.9%). Considering germination and emergence rates, marketable ear production, and total sugar content, 'GCB 70' and 'Sweet Satin' in *su* hybrids and 'Ice Queen', 'Aspen', 'Sweet Magic', 'Bandit', 'Xtrasweet 82', 'Aspen', and 'Cambella 90' in *sh2* hybrids performed better than other hybrids.**

***Keywords*** : *sugary (su), shrunken-2 (sh2),* sweet corn, cold test, germination rate, emergence rate, marketable ears, total sugars, soluble solids.

Before the introduction of modern corn hybrids in Korea, local varieties of flint and waxy corns were grown for food. The fully ripened kernels were harvested and ground after drying to mix with rice or to cook corn porridge. In contrast, fresh corn was harvested before the kernels became hard and roasted, boiled, or steamed to eat as a snack. In 1970s in addition to the waxy and flint corns, some ears of dent corn cultivated for grain and silage production were harvested at dough ripening stage and sold as fresh corn to cook with adding some sweet additives.

In Korea, the commercial production of sweet corn hybrids with *sugary* (*su*) endosperm was started in early 1970s in Chuncheon, Gangwon Province and they have been grown more than 20 years in Gokseong, Jeonnam and Uiryeong, Gyeonam Provinces. Seeds of 'Golden Cross Bantam (GCB)' and 'GCB 70' were imported from the United States and now only 'GCB 70' is commercially grown. In Korea, 'Dangok 1' and 'Danok 2' were developed in 1983 and 1989, respectively, but they were not accepted by farmers due to their later maturity and too many branch production (Jong *et al.*, 1996).

The fresh market sweet corn industry in the United States has shown a shift from traditional hybrids with *sugary* (*su*) endosperm (normal sugary) to hybrids homozygous for the *shrunken-2* (*sh2*) endosperm mutation (super sweet) in 1990s (Juvik *et al.*, 1993). *Sh2* kernels have two to three times more sugars at "roasting ear" stage compared to *su* kernels (Greech, 1965; Lee *et al.*, 1987a) and maintain higher sugar levels for longer periods after harvest (Garwood *et al.*, 1976; Lee *et al.*, 1987b) because conversion of sugars to starch is slowed. Since the quality of fresh market sweet corn is closely related to sugar content, *sh2* hybrids provide additional time to transport and storage with superior quality and reduce the need for refrigeration after harvest (Alexander, 1988).

In Korea, the imported seeds of *sh2* hybrids such as 'Cocktail 51', 'Cocktail 86', 'Cocktail 90L', and 'Cambella 90' have been grown for long time, while only 'Cambella 90' is grown after late 1990s. 'Chodangok 1' was developed in Korea in 1992, but it have not been accepted by farmers. Although planting area of *sh2* hybrids is estimated to be about half of *su* planting area in Korea at the present time, *su* hybrids will be replaced by *sh2* in the near future like in the United States due to their higher sugar content and flavor. In fact, seed import of *su* hybrids decreased from 33,290 kg in 1999 to 13,650 kg in 2002, while that of *sh2* hybrids increased from 555 to 805 kg in the same period (National Seed Management Office, 2002). However, the problems of *sh2* hybrids production are inferior seed quality, reduced emergence, poor seedling vigor, poor uniformity of stands,

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and high seed price. Indeed, the germination rate of *sh2* inbreds ranged 7.7 to 74.1% (Young *et al.*, 1997) and seed companies recommend to plant 2-3 hybrid seeds in a hill to maintain optimum plant population in the field. However, information is very limited about the performance of *sh2* hybrids under the Korean environmental conditions.

Therefore, these experiments were conducted to select promising *su* and *sh2* hybrids which showed good emergence rate, high yield, and good flavor under the Korean environmental conditions.

## MATERIALS AND METHODS

Performance of 7 *sugary (su)* and 12 *shrunken-2 (sh2)* hybrids were tested in 2001 on the Yeungnam University Agricultural Research Farm in Gyeoungsan, Gyeongbug Province, in Korea. They are commercially grown hybrids and seeds were obtained from the Harris Moran Seed Company and Henry Field's Seed & Nursery Co. in the United States.

Before field trial the weight of 50 hybrid seeds was measured with six replications. For seed and seedling vigor test, thirty seeds were germinated on paper towels saturated with distilled water at 25°C and germination rate was observed 7 days after the initiation of germination test. To estimate the field emergence rate cold test was conducted in soil where corn was planted in the previous year and adjusted soil moisture to 70%. Thirty seeds were planted at the 2 cm depth and allowed to germinate at 10°C for 7 days followed by at 25°C for 7 days. A completely randomized block design was employed with four replications in both germination test at 25°C and cold test (AOSA, 1990).

The field performance of *su* and *sh2* hybrids were evaluated in the isolated fields to avoid cross pollination across the genotypes. Experimental designs were randomized block designs with four replications in each genotype. Before planting 150-120-120 kg/ha of N-$P_2O_5$-$K_2O$ were applied and incorporated into the soil using tractor-driven rotary hoes. Then soil was mulched with 0.03 mm black polyethylene (P.E.) film in a 60 cm row and two seeds were planted through the P.E. film at 25 cm distance on April 23. At the 3-4 leaf stage extra plants were thinned out to leave a plant in a hill. Field emergence rate of the hybrids were observed before thinning out the extra plants and field percent stand was observed before harvest of ears. For the evaluation of early growth, plant height and the number of leaves were measured 20 days after planting. Twenty four days after pollination, ears were harvested from 20 plants in the middle rows and length, diameter, and weight of ears were measured.

For the analysis of total sugars and soluble solids three plants were self-pollinated and ears were harvested 24 days after pollination. For total sugar analysis the kernels were dried immediately after harvest in an oven at 80°C for 48 hours and ground in a ball mill (Willey mill, USA) to pass a 40-mesh screen. To extract total sugars 10 mL of 80% ethanol was added to 0.5 g of each ground sample and boiled in a 85°C water bath for 30 minutes. Then the samples were centrifuged at 5,000 rpm for 15 minutes and the supernatant was collected, and the process was repeated two more times. The collected supernatant was boiled in a 85°C water bath to remove ethanol and make up to 25 mL with distilled water. Then, 5 mL of the sugar extracted solution was added slowly to the 10 mL of Anthrone reagent (2 g of Anthrone reagent was dissolved in 1,000 mL of 98% sulfuric acid) contained in a 20-mL test tube, reacted in a boiling water bath for 7.5 minutes, cooled down rapidly in ice water, and left at room temperature for 15 minutes. Absorption of the sample solution was measured at the 630 nm in a spectrophotometer (UVIKON Spectrophotometer, Italy) and calculated as glucose equivalent (Yoshida e*t al.*, 1972).

For soluble solids measurement, 10 g of fresh kernels were ground in a mortar with a pestle and centrifuged at 3,000 rpm for 10 minutes. A drop of the supernatant was applied to a reflectometer (Atago NI Reflectometer, Japan) and Brix % was measured.

Flavor of the cooked fresh corn was tested by 10 untrained students by the methods of Spalding *et al.* Each item was scored 1 to 5; 1 was poor, 3 was fair, 5 was excellent.

## RESULTS AND DISCUSSION

Seed weight, germination, and early growth of *su* and *sh2* hybrids are shown in Table 1. Seed weight was different depending on genotypes and hybrids. Seed weight of *su* hybrids (16.5-23.6 g) was much heavier than that of *sh2* hybrids (10.9-17.4 g). However, the 100-seed weight of some larger seed *sh2* hybrids ('Swifty', 'Fortune', and 'Cocktail E-51') was similar to that of smaller seed *su* hybrids ('GCB 70' and 'Early Sunglow').

Germination rate of *su* hybrids at 25°C ranged 93.3 to 100% and there were no significant differences among the hybrids, while the emergence rates of 'Sweet Riser', 'GCB 70', and 'Early Sunglow' were lower than those of other *su* hybrids in cold test and field. Emergence rates in cold test and field were lower than germination rate by 5.5%.

Germination rate of *sh2* hybrids at 25°C and emergence rate in cold test and in field ranged 86.7 to 98.9%, 62.2 to 97.8%, and 79.9 to 98.2%, respectively and there were significant differences among the hybrids. 'Confection', 'Ice Queen', 'Fortune', and 'Cocktail E-51' showed very high germination and emergence rates in cold test and field, while

**Table 1.** Seed weight, germination and emergence rates, and early growth of *sugary*(*su*) and *shrunken-2*(*sh2*) hybrids.

| Genotype | Hybrid | 100-seed wt. (g) | Germination rate (%) | Emergence rate (%) | | 20 DAP[†] | |
|---|---|---|---|---|---|---|---|
| | | | | Cold test | Field | Plant ht. (cm) | No. of leaves |
| *su* | Early Gold | 18.0 d[‡] | 97.7 ns | 97.8 a | 97.6 a | 14.8 a | 3.9 b |
| | Sundance | 21.5 b | 100.0 | 95.6 a | 100.0 a | 16.6 a | 4.5 a |
| | Sweet Rhythm | 19.3 c | 100.0 | 97.8 a | 99.4 a | 16.2 a | 3.7 b |
| | Sweet Satin | 16.5 f | 97.7 | 97.8 a | 97.6 a | 16.8 a | 3.8 b |
| | Sweet Riser | 23.6 a | 97.7 | 85.6 b | 74.4 d | 15.5 a | 3.9 b |
| | GCB 70 | 17.9 d | 93.3 | 78.9 c | 90.5 b | 12.3 b | 3.5 b |
| | Early Sunglow | 17.2 e | 93.3 | 87.8 b | 81.5 c | 11.8 b | 3.5 b |
| | **Mean** | **19.1** | **97.1** | **91.6** | **91.6** | **14.9** | **3.8** |
| *sh2* | Gold and Ice | 11.8 g | 88.9 e | 78.9 c | 92.9 abc | 10.2 h | 3.7 abc |
| | Sweet Magic | 10.9 i | 86.7 e | 77.8 c | 86.6 cd | 10.9 gh | 3.4 c |
| | Swifty | 16.3 b | 95.6 abc | 86.7 b | 92.0 abc | 13.9 bcd | 4.0 a |
| | Confection | 13.9 e | 97.8 ab | 91.1 ab | 98.2 a | 13.4 cde | 4.0 a |
| | Ice Queen | 13.7 e | 98.9 a | 97.8 a | 98.2 a | 15.9 a | 3.9 ab |
| | Bandit | 14.7 c | 90.0 de | 73.3 c | 87.1 cd | 11.9 efg | 3.5 bc |
| | Xtrasweet 82 | 11.4 h | 95.6 abc | 78.9 c | 95.1 ab | 13.9 bcd | 3.6 abc |
| | Fortune | 16.0 b | 94.4 bc | 94.4 ab | 98.2 a | 15.1 ab | 3.7 abc |
| | Snow White | 12.8 f | 93.3 cd | 91.1 ab | 89.7 bc | 11.4 fgh | 3.6 abc |
| | Aspen | 14.3 d | 86.7 e | 62.2 d | 79.9 d | 12.7 def | 3.6 abc |
| | Cambella 90 | 14.7 c | 90.0 de | 87.8 b | 90.6 abc | 15.4 ab | 3.9 abc |
| | Cocktail E-51 | 17.5 a | 93.3 cd | 92.2 ab | 97.8 a | 14.9 abc | 4.0 a |
| | **Mean** | **14.0** | **92.5** | **84.4** | **92.2** | **13.3** | **3.7** |

[†]Days after planting.
[‡]Means within a column in each genotype followed by the same letter are not significantly different at the 5% level by Duncan's New Multiple Range Test (DNMRT).

**Table 2.** Correlation coefficients between seed weight, germination rate, and emergence rates of *su* and *sh2* hybrids in cold test and in the field.

| Genotype | Character | Germination rate | Emergence rate (cold test) | Emergecne rate (field) | 20 days after planting | |
|---|---|---|---|---|---|---|
| | | | | | Plant height | No. of leaves |
| *su* (N=7) | Seed weight | 0.463 | -0.144 | -0.474 | 0.360 | 0.561 |
| | Germination rate | - | 0.759* | 0.515 | 0.931** | 0.726 |
| | Emergence rate (cold test) | - | - | 0.686 | 0.727 | 0.463 |
| *sh2* (N=12) | Seed weight | 0.250 | 0.325 | 0.246 | 0.596* | 0.622* |
| | Germination rate | - | 0.748* | 0.808* | 0.598* | 0.621* |
| | Emergence rate (cold test) | | - | 0.839* | 0.564 | 0.616* |

*,**Significant at the 5% and 1% level. respectively.

'Aspen' and 'Bandit' showed a little poor germination and emergence rate. The higher emergence rate of *sh2* hybrids in field compared to cold test probably comes from the relatively warm weather in spring and black P.E. film mulch in field.

Plant height and the number of leaves 20 days after planting differed significantly among the hybrids. Plant height of *su* and *sh2* hybrids ranged 11.8 to 16.8 cm and 10.2 to 15.9 cm and the number of leaves *su* and *sh2* hybrids ranged 3.5 to 4.5 and 3.4 to 4.0 leaves, respectively.

The relationships between seed weight, germination rate, emergence rate in cold test and field, and early plant growth are shown in Table 2. In *su* hybrids, there was a significantly positive correlation between germination rate and emergence rate in cold test or plant height 20 days after planting. In contrast, in *sh2* hybrids there were positive correlations between seed weight and plant height or the number of leaves 20 days after planting. Also, germination rate was positively correlated with emergence rate in cold test and field, plant height, or the number of leaves 20 days after planting.

The seed weight of commercial *su* and *sh2* hybrids did not affect on germination rate, while in *sh2* there were significant positive correlations between seed weight and plant

**Table 3.** Percent stand and major agronomic characteristics of *su* and *sh2* hybrids at harvest.

| Genotype | Hybrid | Plant stand (%) | No. of days to silking | Culm length (cm) | Ear height (cm) | Corn borer | Lodging |
|---|---|---|---|---|---|---|---|
| | Early Gold | 99.1 ab[†] | 57 | 150 b | 49.1 b | 3.3[‡] | 1.3 |
| | Sundance | 100.0 a | 53 | 116 d | 40.0 c | 1.8 | 1.0 |
| | Sweet Rhythm | 100.0 a | 57 | 139 c | 51.1 b | 1.5 | 1.0 |
| *su* | Sweet Satin | 100.0 a | 61 | 172 a | 64.6 a | 3.5 | 2.3 |
| | Sweet Riser | 96.4 bc | 55 | 148 b | 48.8 b | 2.0 | 1.0 |
| | GCB 70 | 96.4 bc | 57 | 144 bc | 49.7 b | 2.5 | 1.5 |
| | Early Sunglow | 95.5 c | 55 | 111 d | 33.3 d | 1.3 | 1.0 |
| | **Mean** | **98.2** | **56** | **140** | **48.1** | **2.3** | **1.3** |
| | Gold and Ice | 97.3 ns | 58 | 146 def | 52.5 e | 1.3 | 1.0 |
| | Sweet Magic | 98.2 | 59 | 132 g | 42.3 f | 3.5 | 1.0 |
| | Swifty | 98.2 | 55 | 113 f | 38.5 f | 1.0 | 1.0 |
| | Confection | 99.1 | 57 | 147 de | 55.6 de | 1.3 | 1.0 |
| | Ice Queen | 100.0 | 62 | 140 efg | 52.1 e | 1.0 | 1.0 |
| | Bandit | 98.2 | 65 | 183 a | 81.9 a | 3.8 | 1.5 |
| *sh2* | Xtrasweet 82 | 99.1 | 60 | 153 d | 60.4 cd | 1.3 | 1.0 |
| | Fortune | 99.1 | 58 | 148 de | 58.1 cd | 1.0 | 1.0 |
| | Snow White | 100.0 | 64 | 172 b | 67.4 b | 1.3 | 1.8 |
| | Aspen | 98.2 | 65 | 153 cd | 56.0 de | 1.8 | 1.0 |
| | Cambella 90 | 98.2 | 62 | 162 c | 62.6 c | 1.5 | 1.0 |
| | Cocktail E-51 | 99.1 | 55 | 136 fg | 52.1 e | 3.0 | 1.5 |
| | **Mean** | **98.7** | **60** | **149** | **57.5** | **1.8** | **1.2** |

[†]Means within a column in each genotype followed by the same letter are not significantly different at the 5% level by DNMRT.
[‡]Index of corn borer and lodging. 1; Resistant, 3; Moderately resistant, 5; Moderate, 7; Moderately susceptible, 9; Susceptible.

height or the number of leaves 20 days after planting.

Percent stand and major agronomic characteristics of *su* and *sh2* hybrids at harvest are shown in Table 3. Percent stand of all the hybrids was higher than 95% because two seeds were planted in a hill and thinned out to leave a plant for maintaining optimum plant population. Although percent stand of 'Sweet Riser', 'GCB 70', and 'Early Sunglow' in the *su* hybrids was lower compared to other *su* and *sh2* hybrids by 3.6-4.5%, it would not affect yield of sweet corn.

Generally, culm length and ear height of *sh2* hybrids higher than those of *su* hybrids and took longer periods from planting to pollination. However, there are differences in culm length and ear height among the hybrids in the same genotype. Damage index by corn borer of *su* and *sh2* ranged 1.5 to 3.5 and 1.0 to 3.8 and lodging index of *su* and *sh2* ranged 1.0 to 2.3 and 1.0 to 1.8, respectively.

The number of ears/ha of *su* and *sh2* hybrids are shown in Fig. 1 and 2, respectively. Although the total number of ears/ha was similar among the hybrids in the same genotype, the number of marketable ears of which length was over 15 cm significantly differed depending on hybrids. The number of marketable ears of 'Sweet Satin' and 'GCB 70' in *su* hybrids and that of 'Ice Queen', 'Aspen', 'Bandit', 'Sweet Magic', 'Cambella 90', and 'Xtrasweet 82' in *sh2* hybrids were higher compared to that of other hybrids due to their large ear length.

The kernel color, ear size, and soluble solids, and sugar content of kernels harvested 24 days after pollination are shown in Table 5. The contents of soluble solids of *su* hybrids (24.3-27.1 Brix %) was much higher than that of *sh2* hybrids (13.8-18.0 Brix %), while the total sugar content of *sh2* hybrids (21.4-28.6%) was much higher compared to *su* hybrids (2.4-15.9%). Among the *su* hybrids total sugar content of 'Sweet Riser' and 'GCB 70' was 15.9 and 11.7% on the dry weight basis, respectively and it was much higher than that of other *su* hybrids (2.4-9.6%). Although some farmers measure soluble solids of sweet corn as an index of sweetness, but it may not represent sweetness of sweet corn (Lee *et al.*, 1987a, Kim *et al.*, 1994).

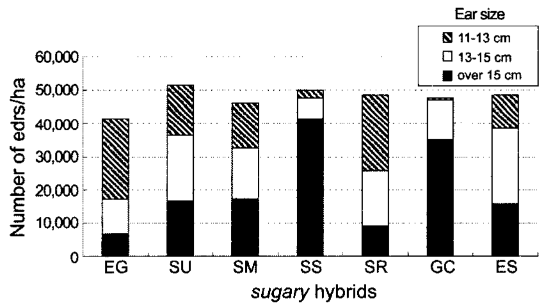


**Fig. 1.** Number of marketable ears according to husked ear length of *su* hybrids. EG; Early Gold, SU; Sundance, SM; Sweet Rhythm, SS; Sweet Satin, SR; Sweet Riser, GC; GCB 70, ES; Early Sunglow.

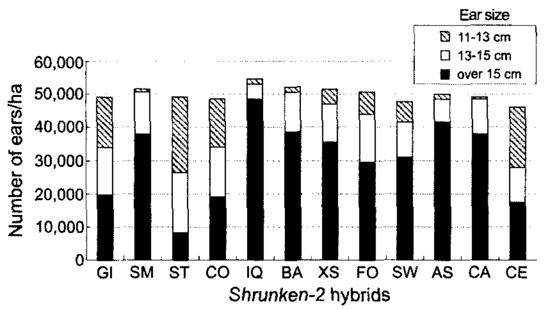


**Fig. 2.** Number of marketable ears according to husked ear length of *sh2* hybrids. GI; Gold and Ice, SM; Sweet Magic, ST; Swifty, CO; Confection, IQ; Ice Queen, BA; Bandit, XS; Xtrasweet 82, FO; Fortune, SW; Snow White, AS; Aspen, CA; Cambella 90, CE; Cocktail E-51.

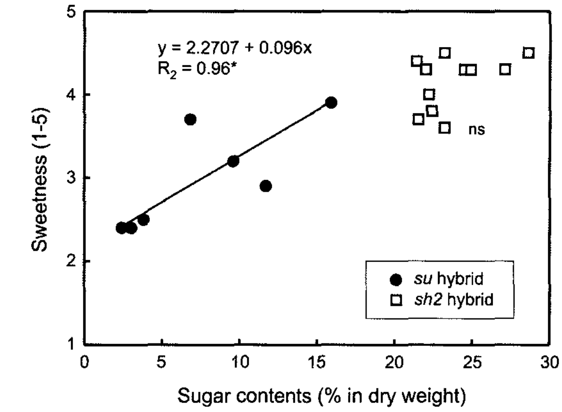


**Fig. 3.** Relationships between sugar content of kernels at harvest and taste panel evaluation of sweetness of cooked kernels.

The relationships between sugar content at harvest and sweetness of cooked kernels conducted by taste panel evaluation are shown in Fig. 3. In *su* hybrids the sugar content of kernels at harvest ranged 2.4 to 15.9% and it was positively correlated with the sweetness evaluated by taste panel, while the sugar content of *sh2* kernels ranged 21.4 to 28.6% and it was not correlated to the sweetness by panel test. Since the sugar content of *su* kernels is relatively low and the sugars transform to starch very rapidly at ambient temperature, it is very important to select *su* hybrids of which sugar content of kernels are high and the harvested ears should be stored at low temperature (Winster *et al.*, 1955). However, because of high sugar content of all *sh2* hybrids and a slower transformation of sugars to starch, the differences in sugar content among the kernels of the hybrids may not so important. However, sugar content was positively correlated with palatability during the kernel development in a *sh2* hybrid (Kim *et al.*, 1994).

## CONCLUSION

Performance of sweet corn hybrids should be evaluated

**Table 5.** Kernel color, ear size, soluble solids, and sugar contents of kernels of *su* and *sh2* hybrids.

| Genotype | Hybrid | Kernel color | Ear | | | Soluble solids (Brix %) | Total sugars[‡] (%) |
|---|---|---|---|---|---|---|---|
| | | | Length (cm) | Diameter (cm) | Weight (g) | | |
| *su* | Early Gold | Y[†] | 13.4 b | 4.6 bc | 181 bc | 26.4 ab | 2.4 d |
| | Sundance | Y | 14.2 b | 4.4 c | 168 bcd | 27.1 a | 3.0 d |
| | Sweet Rhythm | B | 14.0 b | 4.7 a | 191 b | 25.5 bc | 6.8 c |
| | Sweet Satin | W | 17.1 a | 4.7 ab | 235 a | 26.7 ab | 9.6 b |
| | Sweet Riser | Y | 13.6 b | 4.4 c | 163 cd | 24.3 c | 15.9 a |
| | GCB 70 | Y | 16.3 a | 4.2 d | 190 b | 25.6 bc | 11.7 b |
| | Early Sunglow | Y | 14.6 b | 4.0 e | 154 d | 27.1 a | 3.8 d |
| | **Mean** | - | **14.7** | **4.4** | **183** | **26.1** | **7.6** |
| *sh2* | Gold and Ice | B | 14.5 defg | 4.8 bc | 212 b | 15.5 d | 24.5 bc |
| | Sweet Magic | W | 15.8 bcd | 4.5 de | 198 bc | 13.9 f | 22.4 c |
| | Swifty | Y | 13.4 g | 4.6 cde | 176 c | 15.7 d | 23.2 c |
| | Confection | B | 14.2 fg | 4.6 cde | 187 bc | 17.3 bc | 28.6 a |
| | Ice Queen | W | 17.5 a | 4.8 bcd | 217 b | 14.5 e | 23.2 c |
| | Bandit | Y | 16.4 abc | 4.2 g | 189 bc | 16.9 c | 23.2 c |
| | Xtrasweet 82 | Y | 15.5 cdef | 4.2 fg | 164 c | 15.9 d | 21.4 c |
| | Fortune | Y | 15.5 bcde | 4.7 cde | 215 b | 16.9 c | 24.9 bc |
| | Snow White | W | 15.8 bcd | 4.7 cde | 215 b | 14.7 e | 27.1 ab |
| | Aspen | W | 17.0 ab | 4.5 ef | 204 bc | 18.0 a | 22.2 c |
| | Cambella 90 | Y | 16.5 abc | 5.1 a | 247 a | 13.8 f | 21.5 c |
| | Cocktail E-51 | B | 14.4 efg | 4.9 ab | 214 b | 17.6 ab | 22.0 c |
| | **Mean** | - | **15.5** | **4.6** | **203** | **15.9** | **23.7** |

[†]Y, W, and B represent yellow, white, and yellow/white bicolor, respectively.
[‡]Total sugar content on the dry weight basis.

considering germination and emergence rates, marketable ear production, and total sugar content, Among the *su* hybrids 'Sweet Satin' and 'GCB 70' produced higher marketable ear yield and contained relatively high sugar content, while germination rate and early plant growth were the average of *su* hybrids.

Among the *sh2* hybrids 'Ice Queen', 'Aspen', 'Sweet Magic', 'Bandit', 'Xtrasweet 82', and 'Cambella 90' produced more marketable ears and all hybrids contain high sugars at the harvest time (24 days after pollination). However, emergence rate of all the hybrids was relatively low (53.3-72.3%) in cold test compared to those of other *sh2* hybrids, thus it should be careful to maintain high emergence rate.

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## REFERENCES

Alexander, D. E. 1988. Breeding special nutritional and industrial types. p. 869-879. In Corn and Corn Improvement (3rd ed.) ed. by C. F. Sprague and J. W. Dudley. No. 18 in the series Agronomy. American Society of Agronomy, Crop Science Society of America, Soil Science of America, Madison, Wis. USA.

Association of Official Seed Analysis (AOSA). 1990. Rules for seed testing. *Proc. Assoc. Off. Seed. Anal.* 60 : 27-26.

Garwood, F. J., F. J. Mcardle, S. F. Vanderslice, and J. C. Shannon. 1976. Postharvest carbohydrate transformations and processed quality of high sugar maize genotypes. *J. Amer. Soc. Hort. Sci.* 101(4) : 400-404.

Greech, R. G. 1965. Genetic control of carbohydrate synthesis in maize endosperm. *Genetics* 52 : 1175-1186.

Jong, S. K., S. S. Lee, S. U. Park, and D. H. Bae. 1996. Corn. Technologies for Cultivation and Utilization (in Korean). Noglimsinmunsa. p. 325.

Juvik, J. A., M. C. Jangulo, J. H. Headrick, J. K. Pataky, and W. F. Tracy. 1993. Kernel changes in a *shrunken-2* maize population associated with selection for increased field emergence. *J. Amer. Soc. Hort. Sci.* 118(1) : 135-140.

Kientz, J. F., J. K. Greig, and H. L. Mitchell. 1965. Sugar components of sweet corn cultivars as influence by maturity. *Proc. Amer. Soc. Hort. Sci.* 87 : 313-317.

Kim, S. L., S. U. Park, S. W. Cha, J. H. Seo, and T. W. Jung. 1994. Changes of major quality characters during grain filling in waxy corn and super sweet corn. *Korean J. Crop Sci.* 39(1) : 73-78

Lee, S. S., T. J. Kim, and J. S. Park. 1987. Sugars, soluble solids and flavor as influenced by maturity of sweet corn. *Korean J. Crop Sci.* 32(1) : 86-91.

Lee, S. S., S. J. Lee, and D. Y. Kim. 1987. Quality of sweet corn stored at different temperatures and duration. *Korean J. Crop Sci.* 32(2) : 8137-143.

National Seed Management Office. 2002. Personal communication with Mr. Jung Soo Lim.

Spadling, D. H., P. L. Davis, and W. F. Reeder. 1978. Quality of sweet corn stored in controlled atmosphere or under low pressure. *J. Amer. Soc. Hort. Sci.* 103(6) : 592-595.

Winter, J. D., R. E. Nylund, and A. F. Legun. 1955. Relation of sugar content to flavor of sweet corn after harvest. Proc. Amer. Soc. Hort. Sci. 65:393-395.

Yoshida, S., D.A. Forno, J. H. Cock, and K. A. Gomez. 1972. Laboratory manual for physiological studies of rice (2nd ed.). IRRI. Los Banos, Philippines.

Young, T. E., J. A. Juvik, and D. A. Demason. 1997. Changes in carbohydrate composition and α-amylase expression during germination and seedling growth of starch-deficient endosperm mutants of maize. Plant Science. 129 : 175-189.