Six Tropical Supersweet Corn Inbreds

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Temperate sweet corn inbreds and hybrids routinely fail in the tropics. None of them show resistance in Hawaii to maize mosaic virus (MMV) or to the racial mixtures of southern rust (*Puccinia polysora* Underw.), common rust (*P. sorghi* Schw.), or northern leaf blight [*Exserohilum turcicum* (Pass.) L&S]. Damage is severe from tropical earworms (*Helicoverpa zea* Boddie) and fusarium rots (*Fusarium verticillioides* Sheld.), and seeds must be fungicide-coated to germinate satisfactorily. In addition, few temperate hybrids yield well under the short days and high temperatures of the tropics. Additional problems can include stalk rots, downy mildews, and other viruses and blights. The six tropical supersweet inbreds of corn (*Zea mays* L.) released here by Hawaii Foundation Seeds (HFS) have been bred to address these constraints and serve as parents of commercially marketed hybrids.

Origin

Inbreds Hi75, Hi76, Hi79, Hi80, Hi81, and Hi82 represent the first tropical supersweet inbreds to be released publicly. Breeding was initiated in 1962 and presently averages 33 generations of selection per inbred. The inbreds were initially reported in 2009 by HFS (www.ctahr.hawaii.edu/hfs). Previously released from Hawaii were 16 tropically adapted sweet corn populations based on *su1*, *sh2*, *bt1*, and *bt2* genes (Brewbaker, 1998). These populations were bred to serve as open-pollinated varieties for growers and as the basis for inbred development. The six inbreds being released derive largely from these populations and involved ≈25% temperate parentage. Each is homozygous for the linked complex (*bt1 c2*) of genes for high-sucrose endosperm (*brittle-1*) and lack of anthocyanin in plant (*colorless-2*). Each was selected for high quality and combining ability

for yield in commercially marketed hybrids under tropical conditions of short days, low light, and high disease and insect pressure. They resemble field corns rather than the distinctive temperate American sweet corns that all have the *gt* (*grassy-tiller*) gene that confers tillers and long husk leaves (Brewbaker and Josue, 2007). Five of the inbreds were converted to white kernels (*y* locus) and to the multiple mutant (*bt a2*)(*sh2 a1*).

Sweet corn is planted year-round in Hawaii and often planted weekly. This leads to intense pressure from diseases, insects, and abiotic stresses. Hawaii breeding nurseries were planted essentially monthly during the four decades of this inbred development. No fungicides or insecticides were ever applied to seeds or plants. Disease and insect pressure thus made it often impossible to harvest ears from temperate sweet corn hybrids used as checks. All breeding populations were advanced through recurrent pedigree selection in fields of the Waimanalo Research Station on Oahu in Hawaii (lat. 21° N, elev. 20 m, 24.5 °C average annual temperature). Environmental conditions ranged from the short-day (11 h), cloudy, high-rainfall winter to the long-day, low-rainfall, and high temperature (mean 28 °C) summer. Each season was characterized by specific disease epibiotics. These annual variations can result in a 50% reduction of maize grain yields in the winter (Brewbaker, 2003). The congenial environmental conditions at Waimanalo encouraged weekly observation and field taste-testing. The author participated in breeding all cycles of selection barefoot (Srinivasan, 1999). Inbreds and their hybrids were also evaluated regularly under the turcicum blight pressure at the Mealani Research Station on Hawaii Island (elev. 850 m, 17 °C average annual temperature).

Two diseases were pre-eminent and required genetic advance. These were the omnipresent leafhopper-transmitted MMV (Brewbaker, 1979; Ming et al., 1997) and kernel and seedling rots resulting from *Fusarium verticillioides* Sheld. (formerly *F. moniliforme*, perfect stage *Gibberella fujikuroi*). Southern rust (*Puccinia polysora* Underw.) was racially diverse and extremely severe in winters since 1993. Under these conditions, not a single temperate sweet or dent corn was resistant. Common rust (*Puccinia sorghi* Schw.) was seasonally severe and also involved races pathogenic to all known monogenes for resistance (Kim et al., 1988; Pataky et al., 2001). Populations of

earworms (*Helicoverpa zea* Boddie) were high in every breeding population. No commercial temperate hybrids showed resistance to the earworms or these four diseases. Other common diseases in breeding nurseries were brown spot (*Physoderma maidis* Miyabe) and bacterial leaf blight [*Acidovorax avenae* (Manns) Willems, also known as *Pseudomonas avenae* Manns]. Northern leaf blight [*Exserohilum turcicum* (Pass.) L&S] was severe at the highland Mealani station where all inbreds were evaluated. Less common in breeding nurseries were rotting *Erwinia caratovora* f. sp. *zea*, aflatoxin-inducing *Aspergillus* spp., common smut [*Ustilago maydis* (DC) Cda.], and maydis blight [*Bipolaris maydis* (Nisik.) Shoem.]. These were diseases to which the released inbreds showed tolerance but that would not have been major factors in genetic advance under selection.

Inbred development was begun in 1962 based on a tropical variety of sweet corn (*sugary-1* gene) known as ‘Hawaiian Sugar’ and bred by Dr. A.J. Mangelsdorf of Hawaii Sugar Planters’ Association in 1944. Early evaluations of this variety and of temperate sweet corn inbreds and hybrids in Hawaii (Brewbaker, 1965) revealed insurmountable problems of adaptability to biotic and abiotic stresses. As a result, the initial breeding focused on development of open-pollinated varieties derived from ‘Hawaiian Sugar’ and tropical field corns with high tolerance of specific diseases and stresses. Sixteen of these varieties were subsequently released (Brewbaker, 1998), including six based on *sugary-1*, seven on the high-sucrose gene *bt1* (*brittle-1*), one on *bt2* (*brittle-2*), and two on *sh2* (*shrunk-2*). Market preference for the high-sucrose or supersweet corns led to early conversions of *sugary-1* varieties by backcrossing and selfing to genes *bt1* and *sh2*. A *sh2* composite named ‘Hawaiian Supersweet #6’ was marketed for a few years (Brewbaker and Banafunzi, 1975) and another *sh2* composite, ‘Hawaiian Supersweet #2’, was converted to ‘Thai Supersweet’ and dominated the Thai market in the early 1970s. Later the *bt1* composite Hi bt Comp 3 was released as ‘Hawaiian Supersweet #9’ (Brewbaker, 1977, 1998). Breeding of *sh2* was discontinued in Hawaii as a result of seed quality problems linked largely to poor field germination and susceptibility to fusarium seedling rots. Zan and Brewbaker (1999) studied near-isogenic hybrids with these and other genes and showed *brittle-1* to be superior to *shrunk-2* in germination, fusarium tolerance, and storage life under diverse conditions in Hawaii. The problems with *shrunk-2* appeared to relate to its highly collapsed mature kernels with large vacuolar space and high rates of leachate in soils (Zan and Brewbaker, 1999). The genes *sh2* and *bt2* govern ADPG-pyrophosphorylases that block starch synthesis and create extremely sweet phenotypes. Attempts to breed with these genes and with the gene *sugary-enhancer* (*se*) that delays kernel dry-down largely failed as a result of severe kernel rots. However, breeders in Australia and Thailand have succeeded in marketing *sh2* hybrids

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under farm conditions that lack fusarium pressure, unlike Hawaii's year-round growers. Sweet corn production in Thailand is dominated about equally by hybrids ATS-5 (sh2) and ATS-8 (bt1) from Dr. Taweesak Pulam (Brewbaker et al., 2006).

'Hawaiian Supersweet #9' (Hi bt Comp 3) became integral to development of most Hawaii inbreds (Brewbaker, 1977). It combined good quality with exceptional tolerance of earworms and of fusarium-related seedling and ear rots. Advanced through 14 cycles of recurrent selection since its release, this variety continues to be marketed and grown around the tropics. Two cycles of selection in this composite involved field bite tests of 400 selfs of superior plants with 100 ears chosen for advanced breeding. This resulted in major advance for tenderness (Ito and Brewbaker, 1981) and for uniformity in color and appearance. A conversion to silvery white kernels was completed and marketed as 'Hawaiian Supersweet Silver' (Hi bt Comp 9) that has served in the conversions of inbreds to white kernels (Brewbaker, 2006). Another significant open-pollinated genetic resource for tropical breeders is the composite NE-EDRbt (PI 619436) bred in Hawaii with $\approx 50\%$ temperate parentage, currently in cycle 22 of selection (Brewbaker and Scully, 2002). This composite is also available in *sugary-1* and in *shrunk-2* versions.

Quality evaluations of the six inbreds were based on testcrosses with bite tests in the field at 18 to 20 d after pollination. Test-cross parents varied but always involved the inbred now designated Hi82, our most senior inbred and one with below-average tenderness. Undesirable flavors and inedible pericarp were quite uncommon during inbreeding considering the diversity of tropical maize races in the background of the Hawaii populations. We attributed this to the fact that most maize races were used as human food. Caribbean races played a major role in origin of 'Hawaiian Sugar' and they were known to be harvested routinely as a green vegetable and found to have thin pericarps (Brewbaker et al., 1996). The tedious measurements of pericarp thickness were taken periodically during the breeding, but genetic advance for tenderness came to rely heavily on the more pleasurable bite tests of ears in the field (Ito and Brewbaker, 1981).

Breeding nurseries involved 5-m plots planted at a density of 140,000/ha and later thinned to less than 70,000/ha. Roguing for agronomic traits focused on brace-root formation, lodging resistance, and ear position—traits in which tropical maize often rates poorly. Plants were selected for prolificacy, high leaf-area indices, dark plant coloration, early canopy closure, and stay-green. In none of these populations was the *gt* (*grassy-tiller*) gene retained with its tillers and long husk leaves that characterize temperate sweets and grassy mutants like *tillered* and *teosinte-branched* (Brewbaker and Josue, 2007). Erect-leaf plants were favored and ear selection was based on tapered 14-row ears with superior husk cover and no kernel rot or tip

emergence. Kernels with dark yellow endosperms were favored.

Table 1 provides background information on the origin of the six inbreds. Included are the prior names of the source inbreds and the composite populations or hybrids from which they originated. The numbers of cycles of breeding are recorded in the table and are detailed in the following section.

The six released inbreds showed a high degree of genetic diversity as evidenced by cluster analysis (Fig. 1) and by heterosis of their hybrids. Genetic similarity coefficients in this figure were calculated by Nourse (2000) from simple sequence repeat data on five *brittle-1* inbreds from Hawaii, two from Thailand, two from Australia, and one temperate *sh2* inbred Ia453. Inbreds are denoted in the figure by their original designations, i.e., 190 (Hi75), 217 (Hi76), bA11 (Hi79), Hi36 (Hi80), Hi37 (Hi81), and Hi38 (Hi82). Inbreds 190 (Hi75) and 217 (Hi76) showed the closest relationship. Also closely related were inbreds Hi36 (Hi80) and Hi37 (Hi81) as were two inbreds from Thai breeder T. Pulam, bA11 (Hi79) and its related bF47. Inbreds Kbt113 and Kbt132 from Ian Martin in Queensland, Australia, were derived from Hi bt Comp 3 and also clustered with Hi82 (Hi38). The temperate Iowa inbred Ia453 was most dissimilar. Inbreds bF47, Kbt113, and Kbt132 were not advanced in Hawaii breeding.

Description

Hi75. Inbred Hi75 has a pedigree of 16 generations of breeding. It was identified in 1994 along with Hi76 as outstanding inbreds among 45 retained after seven cycles of selfing and evaluation of ≈ 600 sublines from Hi bt SYN 2. This synthetic was based on diallel crosses of 15 S6 lines from earlier *bt1* composites and synthetics (including precursors of Hi80, Hi81, and Hi82). The superiority of Hi bt SYN 2 (Brewbaker, 1998) as a variety and breeding population is evidenced by the present retention of eight of the 45 lines as parents for pre-commercial hybrids in Hawaii, Australia, and Thailand (Brewbaker et al., 2006). Hi75 was identified as field plot 94-190 and subsequently underwent nine cycles of selection. It was evaluated as an inbred in more than 30 trials and in hybrids at least annually. Hi75 is agronomically typical of Hawaii inbreds—a short plant with broad leaves, high husk numbers (12 to 13), 14-row ears with ≈ 30 kernels per row, and dry kernel counts of 120 g per 1000 kernels (Table 2). It is very resistant to southern rust and excellent in stay-green, but it is unusually attractive to aphids (Table 3). Silks are light tan in color but plants are otherwise green. Mature ears have good rot resistance and kernels are dark yellow and rich in beta-carotenoids. Both

Table 1. Origin of Hawaii inbreds.

Inbred	Source	Origin of inbred	Breeding cycles
Hi75	190	Hi bt Syn2	16
Hi76	217	Hi bt Syn2	16
Hi79	bA11	Hi bt Comp 3 $\times$ Thai Comp 3-4	21
Hi80	Hi36c1	Hi bt Comp 3 ^a	39
Hi81	Hi37c2	Hi bt Comp 3	39
Hi82	Hi38c1	Hawaiian Sugar	72

^aMarketed as 'Hawaiian Supersweet #9'.

Fig. 1. Genetic similarity coefficients for ten supersweet corn inbreds.

Table 2. Horticultural characters of Hawaii inbreds versus Golden Cross Bantam (GCB).

Inbred	Silk date	Plant ht	Ear ht	No. of husks	No. of rows	No. of TBr ^z	Kernels per row	100 k wt	Kernel color ^y	Tender GCA ^x
Hi75	59	150	55	12.8	14	14	30.5	11.8	3	2.0
Hi76	59	155	54	11.3	14	11	31.4	11.8	1	2.5
Hi79	57	142	66	13.0	16	28	29.5	13.4	4	2.5
Hi80	58	155	51	12.4	14	15	29.6	13.3	3	3.0
Hi81	55	183	58	9.8	14	14	32.6	11.1	3	3.5
Hi82	56	155	53	12.5	14	11	40.4	10.9	1	4.5
GCB	49	130	35	9.0	12	19	41.1		8	

^zTBr = tassel branches.^yScale 1 (orange) to 9 (very pale yellow).^xScale 1 (extremely tender) to 9 (tough).Table 3. Reactions of Hawaii inbreds and Golden Cross Bantam (GCB) to pathogens and pests.^z

Inbred	Polysora	Turcicum	Fusarium ^y	Earworm	Aphid
Hi75	2	3	6	3	4
Hi76	2	2	6	3	4
Hi79	3	2	4	2	1
Hi80	3	8	1	3	1
Hi81	4	3	1	3	1
Hi82	4	8	1	2	1
GCB	9	9	9	8	3

^zScale: 1 (highly resistant) to 9 (highly susceptible).^yFusarium affecting germination and seedling emergence on untreated seeds.

Hi75 and Hi76 are very tender and prone to seedling loss in fusarium-rich soils. They are closely related (Fig. 1) and their hybrid is treated as a sister-line parent for modified single crosses like 'Sweet Sarah' [(Hi75 × Hi76) × Hi80].

Hi76. Inbred Hi76 has a pedigree of 16 generations of breeding. It was selected in 1994 along with Hi75 as outstanding S7 inbreds from Hi bt SYN 2. It is closely related to Hi75 (Fig. 1) and much of the description of Hi75 applies directly to Hi76. Hi75 was identified as plot 94-217 and subsequently underwent nine cycles of selection and evaluated as an inbred in more than 30 trials and as a hybrid in many more. It resembles Hi75 in rust resistance and stay-green and is similarly tender and prone to fusarium seedling mortality. It also shares Hi75's attractiveness to aphids and has dark yellow kernels rich in beta-carotenoids. Hi76 has green inner silks and is the preferred inbred as the female parent.

Hi79. Inbred Hi79 has a pedigree of 21 generations of breeding. It originated from inbred bA11 bred by Dr. T. Pulam in Thailand from hybrids of Hi bt Comp 3 ('Hawaiian Supersweet #9') and Thai Composite 3-4 that was based on tropical flint composite Suwan 1. Inbred bA11 was one parent of Dr. Pulam's widely grown, 16-row, processing hybrid ATS-2, a single cross that laid the foundation for Thailand's burgeoning supersweet corn industry (Brewbaker et al., 2006). Hawaii breeding began in 1998 with a focus on conversion to green silks and tassels together with improved resistance to MMV and fusarium. The Thai inbred was crossed with 'Hawaiian Supersweet Silver' (Brewbaker, 2006) followed by four backcrosses and 17 generations of selfing and sibbing. Green inner silks were achieved evidently as a result of exchanging the original (*bt A2*) linked genotype of bA11 for the (*bt a2*) from the

Hawaiian parent. Inbred Hi79 is characterized by superior combining ability for kernel tenderness, but kernels have an accompanying high sensitivity to fusarium seedling blight. In fusarium-rich soils, the inbred germinates poorly and seedlings are slow to develop healthy root systems. The plants are notable for stay-green, prolificacy, the persistence of rich green color after physiological maturity, and superior tolerance to turcicum blight. The tassels are large with about twice the branch number of other inbreds (Table 2), and it is suspected to carry the gene *Brta* (*branched tassel*) identified by Brewbaker and Yu (2009). The 16-row ears are somewhat irregular and on large cobs (25 mm), and the kernels are deep (13 mm). Its hybrids are called 'HiThai' in Hawaii and are of exceptional tenderness. They are attractive in the field with heavy 16-row ears at a low position on tall plants. Marketed hybrid 'HiThai2' is the modified single-cross (Hi75 × Hi76) × Hi79.

Hi80. Inbred Hi80 has a pedigree of 39 generations of breeding and was formerly known as Hi36c1. Its precursor, Hi36, was selected in 1979 together with Hi37 (now Hi81) as outstanding inbreds per se and as parents in test crosses to Hi82, then known as AA8bt. Hi36 and Hi37 originated as S6 selfed progenies from Hi bt Comp 3 in which the inbred AA8bt comprised 25% of its pedigree. The precursor of Hi80 was crossed in 1980 to a source of green inner silks, backcrossed five times, selfed and sibbed 12 cycles, and designated Hi36a in 1997. During 15 subsequent cycles of sib and self-pollination, it was made homogeneous for high tenderness, dark yellow kernels, high fusarium tolerance, and high prolificacy. The outstanding subline was designated Hi36c1. Hi36 enters the widely grown three-way hybrid 'Hawaiian Supersweet #10' with pedigree [(Hi80 × Hi81) × Hi82]. Sister lines Hi36c2 with pale yellow kernels (verified to be gene

y11) and Hi36cy1 with white kernels (gene *y1*) are used in breeding bicolors. Growers appreciate the bicolor expression of hybrids with *y11* partly because it aids identification of market maturity, although it is less striking than bicolor hybrid 'Sweet Jenny' [(Hi75 × Hi76) × Hi36cy1].

Hi81. Inbred Hi81 has a pedigree of 38 generations of breeding and was formerly known as Hi37c2. Its precursor, Hi37, was selected in 1979 together with Hi36 (now Hi80) and its origin from Hi bt Comp 3 and early breeding were identical to those described for Hi80. The original Hi37 was crossed in 1980 to a source of green inner silks, backcrossed five times, selfed and sibbed 12 cycles, and designated Hi37a in 1997. During 15 subsequent cycles of sib and self-pollination, it was selected for erect plant form, fusarium tolerance, and improved yield and quality in test crosses. Many related sublines of this and other inbreds have been retained and compared for test cross performance. The outstanding subline was designated Hi37c2 and is parent of the widely grown three-way hybrid 'Hawaiian Supersweet #10'. Inbred Hi81 has high general combining ability (GCA) values for ear length and yield and for tolerance to fusarium and blight but lower scores for tenderness and quality. Conversions have been made to white kernels.

Hi82. Inbred Hi82 has a long pedigree of 72 generations of breeding and was formerly known as Hi38c1. Hi82 traces to a *sugary-1* inbred called AA8 derived in 1967 from 'Hawaiian Sugar' as S6 line A19-6-1-1-1-1. It was fully resistant to the MMV that had crippled sweet corn production in Hawaii. AA8 became the parent of first two commercial tropical sweet corn hybrids 'Hi38' and 'Hi68', single crosses at one time marketed by Northrup-King and based on temperate parents P39 and IL442 (Brewbaker, 1968). These early hybrids were designated 'hapa-Hawaiian' (i.e., half-Hawaiian) and their failure to provide commercially acceptable disease resistance led to their replacement with hybrids based on 100% tropical parentage. AA8 was then converted to *bt1* and renamed AA8bt. It was notable for resistance to fusarium that kills temperate *sh2* inbreds in Hawaii's wet winter soils. Later AA8bt was converted to *Ht1* and *Rp1-d* genes for turcicum blight and common rust resistance, but these soon failed as a result of racial evolution. After 14 generations of selection for tenderness, yield, and horticultural traits, AA8bt was renamed Hi38 in 1979. It was chosen as the male parent for the first commercial release of 'Hawaiian Supersweet #10' and became the primary test cross parent for all new inbreds, entering the pedigree of synthetics such as Hi bt Syn 2 (Brewbaker, 1998). Eight generations involving hundreds of sublines were added to improve general resistance to common rust (*Rp1-d* having failed) and to improve test-cross performance, ear tip cover, and earworm resistance and it was renamed Hi38a in 1987. A second cycle of eight generations of improvement led to Hi38b and involved the incorporation of C cytoplasm (later discarded),

erect leaves, and high stay-green. A final cycle of 10 generations was focused on green inner silk and high combining ability for tenderness. A set of 23 superior sublines was evaluated as lines per se and in test cross yield trials during the years 1993 to 1997, resulting in selection and release of Hi38c. Related sublines that have been retained in HFS include Hi38-47 with high tenderness and Hi38-71 that is homozygous for a recessive aphid resistance gene (So et al., 2009). Hi38 was also converted to white kernels through crosses in 1990 to a Nigerian white flint inbred TZi17 followed by six backcrosses over 28 generations. White-seeded subline Hi38cy10 is marked by upright leaves and greatly increased resistance to southern rust compared with its Hi82 parent (Table 3), and commercial white hybrid 'Sweet Cynthia' is the single cross Hi36cy1 × Hi38cy10.

Performance

Horticultural traits of the six inbreds are summarized in Table 2 with comparative data for Golden Cross Bantam grown in the same Hawaii nurseries. Data are representative of midseason, 12-h day and 25 °C conditions. All inbreds flower ≈1 week later than typical temperate sweet corns. When grown under 4 h added light in Hawaii fields, they were delayed only ≈1 week to flowering. Heights in the table are to the top of the tassel and to the internode at the base of uppermost ear. All inbreds have low ear position on erect plants with good brace rooting. None would be characterized as "stiff-stalk," a trait that is suspected to be correlated with thick pericarps (Brewbaker et al., 1996; Wang and Brewbaker, 2001). Husk numbers exceed those of temperate sweet corns and range from 10 to 13 as a result of selection to minimize insect damage (Brewbaker and Kim, 1979). Inbred Hi79 has 16 rows of kernels, having been selected for processing. The other five inbreds average 14 rows that spiral slightly at the ear tip and provide a tapered tip, also minimizing earworm injury. Inbred Hi82 has the longest ears with more than 40 kernels per row and tends to create hybrids with tip emergence. Inbreds Hi79 and Hi80 have larger kernels and it is reflected in their hybrids. Average kernel depth at sweet corn stage is ≈9 mm in all inbreds except the deep-kerneled Hi79 (13 mm) that has 16 rows on a large indurate cob. All six inbreds were selected for dark yellow kernels. Conversions exist to white kernels (gene *y1*) of all inbreds except Hi79. Hi80 is also represented by a pale yellow sibling (gene *y11*). Inbreds Hi76 and Hi82 showed unusually high levels

of zeaxanthin (pro-vitamin A) in Australian studies of macular degeneration. Dry kernels are light in weight (11 to 15 g per 100 kernels) and a typical grower recommendation is ≈4 kg of seed per acre assuming 80% emergence. Their F1 hybrids (*brittle-1*) average from 15 to 20 g per 100 kernels and fieldcorn outcrosses average from 25 to 35 g per 100 kernels. Viability loss was very rapid in storage with 50% mortality levels ≈1 year at 25 °C and ≈2 years at 18 °C. Long-term storage has been in freezers. Fusarium loads were greatest from seeds harvested in Hawaii's wet winters, and this was directly reflected in seed viability, emergence vigor, and delayed flowering.

Performance of the six inbreds in relation to significant tropical diseases and insects is summarized in Table 3. Tolerance to fusarium (*F. verticillioides*) during germination and emergence was best in Hi80, Hi81, and Hi82 and possibly correlated with their relatively low tenderness values. The highly tender and related Hi75 and Hi76 (Fig. 1) were the most susceptible to fusarium and were also unusually attractive to aphids (So et al., 2010). However, none of the inbreds displayed significant kernel or ear rots resulting from fusarium or *Aspergillus* spp. All inbreds had adequate tolerance of polysora rust (*Puccinia polysora*). Tolerance of turicum blight (*Exserohilum turcicum*) was considered inadequate only in Hi80 and Hi82. All inbreds showed high tolerance to phyoderma stalk rots and to bacterial leaf blight, hot-weather diseases that can be serious on temperate sweet corns. All inbreds were bred homozygous for *Mv* locus conferring resistance to MMV, and all are believed to be resistant to strains of maize dwarf mosaic virus and sugarcane mosaic virus in the tropics (I. Martin, unpublished data).

Availability

Foundation seeds of these inbreds are available from Hawaii Foundation Seeds, Dept. of Tropical Plant and Soil Science, CTAHR, U. Hawaii, 3190 Maile Way, Honolulu, HI 96822 (www.ctahr.hawaii.edu/hfs).

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