weather was experienced some years. The number of frost free days have varied from 145 to 159 in the test years at Sturgeon Bay, Wis., and the annual heat units (base 10°C) have ranged from 1715 to 2240 (Franklin Gilbert, personal communication).

'Reliance', in addition, has performed well near San Antonio, Texas where it has been productive, disease resistant, and produced fruit with 27% soluble solids (Homer De-Viney, personal communication). In that location it is necessary to graft onto *Vitis berlandieri* rootstock however.

Availability

A plant patent for 'Reliance' has been applied for. A list of nurseries licensed to propagate 'Reliance' may be obtained from J.N. Moore, Department of Horticulture and Forestry, 316 Plant Science Building, University of Arkansas, Fayetteville, AR 72701.

Literature Cited

1. Moore, J.N. and Elvin Brown. 1977. 'Venus' grape. HortScience 12:585.

HortScience 18(6):964–965. 1983.

Sugary (*su*) Sweet Corn Germplasm with Resistance to the Maize Dwarf Mosaic Virus

M.A. Mikel,[1] Cleora J. D'Arcy,[2] A.M. Rhodes,[3] E.E. Carey,[4] and J.A. Juvik[5]

University of Illinois, Urbana, IL 61801

Additional index words. *Zea mays*, vegetable breeding

Maize dwarf mosaic (MDM) is an economically serious viral disease of sweet corn (*Zea mays* L.) in the United States. Early infection by the virus in sweet corn can cause stunted growth, delayed maturity, reduced yield, and poor ear quality (5). To aid in alleviating this problem, the Illinois Agricultural Experiment Station announces the release of 8 lines of sweet corn germplasm homozygous for the sugary (*su*) gene with improved resistance to maize dwarf mosaic virus (MDMV). These new lines have been designated: ILM6161a, ILM6222a, ILM6222b, ILM6222c, ILM6222d, ILM6222e, ILM6223a, and ILM6223b.

Origin

Pa405, an inbred dent corn was found to be highly resistant to the MDMV (4). A breeding program was initiated to introduce the genes for resistance to MDMV from Pa405 into sweet corn.

ILM6161a is S_4 generation seed from the 3-way cross ('Gold Cup' x Pa405)F_1 x IL677a. The 7 other germplasm releases are all S_3 generation seed. ILM6222a, ILM6222b, ILM6222c, ILM6222d, and ILM6222e are derived from different S_1 plants from the cross (Gold Cup x Pa405)F_1 x 59829F_1 where 59829 is [('Hawaiian sugary' x IL110g) x IL677a]S_5 x (T34 x IL677a)S_5 x [(IL677a x IL459a)S_5 x IL677a]. ILM6223a and ILM6223b are from the 3-way cross ('Gold Cup' x Pa405)F_1 x 59872F_1, where 59872 is ('Gold Cup' x 'Six Shooter White Dent')S_4 x [(IL677a x IL459a)S_5 x IL677a]S_4. IL677a is a high-quality sweet corn inbred which contains the *sugary enhancer* (*se*) gene (3).

Description

Plants of each generation from the original triple cross to the S_2 and S_3 generations were inoculated 4 or 5 times at regular intervals from the 3-leaf stage up until silking with MDMV strains A and B at the Urbana, Ill. breeding nursery. Because both MDMV-A and -B are present in Illinois, the inoculum consisted of a mixture of both strains. The original MDMV-A inoculum was from several natural-occurring isolates off of Illinois Johnsongrass, while strain B came from the ATCC (American Type Culture Collection). Strains A and B were cultured separately on susceptible sweet corn in the greenhouse prior to field inoculation. The purity of these cultures was tested using the ELISA or enzyme-linked immunosorbent assay technique (2).

Equal amounts of freshly harvested tissue infected with MDMV-A and MDMV-B were added to 0.05 M chilled sodium phosphate buffer (1 g/5 ml), pH 7.0, and ground in a Waring Blender for 30 sec. The homogenate was expressed through a triple layer of cheesecloth and a single layer of Miracloth. Before inoculation, 22 m Carborundum at 15 g/liter was added to the inoculum. Field plants were inoculated using a Wren artist's airbrush (Binks Manufacturing Co., Franklin Park, Ill.) with air supplied from a compressor operating at 4.9 kg/cm^2.

Selection for resistance was based on the absence of leaf mosaic, a symptom of MDMV infection. Lack of symptoms was shown to be an accurate criterion for the selection of resistance of genotypes, since the ELISA test for detecting the presence of MDMV in corn leaf tissue revealed that symptomless plants were virus-free (4). Selfed seed from individual plants with superior resistance and culinary quality were grown ear-to-row the following generation.

Comparative data on the disease incidence, maturity, and kernel sugar content of each line from a May 12, 1982 planting are displayed in Table 1. The S_2 and S_3 plant families from which the released seed originated were all 100% free of virus. A replicate plot planted later in mid-July showed more susceptibility in the MDMV-resistant lines. This later planting was subjected to severe heat and drought stress, which coupled with the probable presence of higher levels of natural and artificial inoculum in the field, could have resulted in the partial breakdown in resistance to MDMV. It is important to realize that the disease response of these lines may still be undergoing segregation and may vary also in different environments, especially where conditions of severe stress are encountered.

Gas chromatographic analysis of mature, dry kernel sugars reveals that all 8 releases contain more total sugar on a percentage of dry weight basis than the sample average of 3 high-quality sugary (*su*) sweet corn inbreds (IL11a, IL14h, and IL451b) and the commercial *su* hybrid, 'Iobelle' (these 4 genotypes represent the "standard sugary" entry in Table 1). ILM6161a, ILM6222a, and ILM6222d possess significantly more total sugar than IL677a, an inbred with the sugary enhancer (*se*) gene and excellent sweet corn quality. The release ILM6222a appears to possess the *se* gene since it not only shows enhanced sugar levels over the normal *su* genotypes but also has the amplified maltose content typical of plants homozygous for the *se* gene (1). All lines had higher sucrose, glucose, and fructose concentrations than standard sugary or IL677a.

These releases can be utilized directly for the development of MDMV-resistant sugary inbreds or as a source of germplasm for the backcrossing of resistance into elite inbreds. The alleles for sweet corn quality are not fixed in these releases. To obtain MDMV-resistant lines from this germplasm, inocu-

Received for publication March 12, 1982. The development of these germplasm releases was a part of Project No. 65-330 and No. 55-090 of the Agricultural Experiment Station, College of Agriculture, University of Illinois at Urbana-Champaign. The authors thank David Dickinson for his technical assistance and help in the preparation of this manuscript. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

[1]Research Assistant, Dept. of Plant Pathology.
[2]Assistant Professor, Dept. of Plant Pathology.
[3]Professor Emeritus, Dept. of Horticulture.
[4]Research Assistant, Dept. of Horticulture.
[5]Assistant Professor, Dept. of Horticulture.

Table 1. Sugar content, disease incidence, and maturity of Illinois maize dwarf mosaic virus-resistant sugary germplasm releases.

Identity	Sugar content (% dry wt)[z]					Disease incidence[y]	Days to mid-silk[x]	No. generations of selfing
	Fructose	Glucose	Sucrose	Maltose	Total			
ILM6161a	0.32	0.71	6.55	0.01	7.59	0/17	72	4
ILM6222a	0.29	0.81	5.65	0.75	7.50	0/18	71	3
ILM6222b	0.11	1.00	4.40	0.01	5.52	0/19	72	3
ILM6222c	0.21	0.72	4.33	0.01	5.27	0/19	69	3
ILM6222d	0.32	0.98	6.71	0.02	8.03	0/13	71	3
ILM6222e	0.19	0.40	4.65	0.01	5.25	0/22	75	3
ILM6223a	0.19	0.98	4.16	0.02	5.35	0/22	70	3
ILM6223b	0.10	0.45	4.05	0.00	4.60	0/23	---	3
IL677a[w]	0.07	0.16	3.76	2.00	5.99	19/19	77	14
Standard[v] sugary (*su*)	0.03	0.34	2.62	0.03	3.02	---	---	---

[z]Values are averages of 2 gas chromatographic analyses made on 3-g, mature, dry kernel samples from bulked seed of 9 to 15 ears.
[y]Disease incidence = number of plants displaying symptoms of MDMV/total number of plants repeatedly inoculated.
[x]Days to mid-silk = days from seed planting (May 12, 1982) to 50% silking.
[w]This original *su se* inbred was used as a "high sugar" reference sample.
[v]Data from 3 standard sugary (*su Se*) inbreds (IL11a, IL14h, and IL451b) and one commercial hybrid ('Iobelle') were averaged for use as a reference sample.

lation is necessary to ensure homozygosity of virus-resistant alleles, although a high proportion of these alleles appear to be fixed. Direct selfing and selection of each line would accomplish inbred development, while sibbing within each line would result in slower inbreeding and more time for selection of genotypes with improved sweet corn quality.

Availability

Reprints of this paper and a limited quantity of seeds (40 kernels per line) are available for distribution upon written request to J.A. Juvik, Department of Horticulture, University of Illinois, 1103 West Dorner Drive, Urbana, IL 61801.

Literature Cited

1. Carey, E.E. 1981. Studies of kernel sugar and sorbitol levels in sugary enhancer (*su se*) and sugary (*su Se*) vegetable corn lines. MS Thesis, Univ. of Illinois, Urbana.
2. Clark, M.V. and A.N. Adams. 1977. Characteristics of the microplate method of enzyme-linked immunosorbent assay for the detection of plant viruses. J. Gen. Virol. 34:475–483.
3. Ferguson, J.E., D.B. Dickinson, and A.M. Rhodes. 1979. Analysis of endosperm sugars in a sweet corn inbred (IL677a) which contains the sugary enhancer (*se*) gene and comparison of *se* with other corn genotypes. Plant Physiol. 63:416–420.
4. Mikel, M.A. 1982. Maize dwarf mosaic virus in *Zea mays* L.: inheritance of resistance, yield loss, serology, and seed transmission. PhD Thesis, Univ. of Illinois, Urbana.
5. Mikel, M.A., C.J. D'Arcy, A.M. Rhodes, and R.E. Ford. 1981. Yield responses of sweet corn to maize dwarf mosaic virus. Plant Dis. 65:900–901.

HortScience 18(6):965–966. 1983.

Release of Six Illinois Sweet Corn Inbreds with the Sugary Enhancer (*se*) Gene

J.A. Juvik,[1] M.A. Mikel,[2] E.E. Carey,[3] and A.M. Rhodes[4]
Department of Horticulture, University of Illinois, Urbana, IL 61801

Additional index words. *Zea mays*, vegetable breeding

Six sweet corn (*Zea mays* L.) inbreds homozygous for the genes sugary (*su*) and sugary enhancer (*se*) have been developed at the Illinois Agricultural Experiment Station. The *se* gene is a recessive modifier of the *su* genotype (2) and results in increased kernel sugar content, sweetness, and tenderness (3). Kernels with the *su se* genotype contain amounts of sugar comparable to those found in lines homozygous for the *shrunken*-2 (sh_2) gene but without a concomitant reduction in phytoglycogen (water-soluble polysaccharides) content (4). The high level of phytoglycogen found in *su* and *su se* cultivars contributes to their tender, creamy texture.

Received for publication March 12, 1983. The development of these inbreds was a part of Project No. 65-0330 of the Agricultural Experiment Station, College of Agriculture, University of Illinois at Urbana-Champaign. The authors thank David Dickinson for his technical assistance and help in the preparation of this manuscript. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked *advertisement* solely to indicate this fact.

[1]Assistant Professor.
[2]Research Assistant, Dept. of Plant Pathology
[3]Research Assistant.
[4]Professor Emeritus.

Origin

All 6 inbreds have been selfed at least 9 generations. IL747b is S_{10} seed from a cross between IL677a and 'Early Hi Quality Crookham' (ND56.ABE). IL768a is from the backcross (IL197a x IL677a)F_1 x IL677a. IL769a is also derived from a backcross: (IL451b x IL677a)F_1 x IL677a. IL775a is derived from the cross IL677a x B5421, where B5421 is (IL14a x IL11h)F_1 x 'Piricino Peruvian Flour'. The cross B5440 x IL677a, where B5440 is (IL14a x IL11h)F_1 x Argentina Cooperative 59-668, produced IL776a and IL776c.

The *se* gene was derived originally from the 3-way cross [IL44b (*su*) x Bolivia 1035 (*Su*)] x IL442a (*su*) (5). This 3-way cross produced the first *su se* inbred, IL677a, which has been used as a source of the *se* gene in the production of these inbred releases. Throughout the development of these inbreds, selfed seeds from individual plants with superior culinary quality and kernel sweetness were selected and planted ear-to-row the following generation.

Description

The 6 inbreds have good to excellent husk protection, were very tender and sweet-tasting in the field, and had large, uniform, and well-filled ears. They did not lodge during the wet growing seasons of 1979 and 1981, but displayed good seed set during the hot, dry summer of 1980. Maturity in days to 50% silk ranges from 66 to 73 days (Table 1).

The amplified sucrose content and the presence of high levels of maltose in the 6 inbreds indicate that they contain the *se* gene