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INTRODUCTION

Virus diseases were first observed in sweet corn in the USA in the early 1900's (1). In the early 1960's, maize dwarf mosaic disease outbreaks occurred in dent and sweet corn along the southern edge of the Corn Belt and other areas to the south. Since then this disease has been a limiting factor in sweet corn production in these more southern areas where johnsongrass is abundant (21). Johnsongrass is a major overwintering host for strain A of maize dwarf mosaic virus (MDMV-A). The virus is transmitted to corn from infected johnsongrass plants by many species of aphids (22, 23). Typical maize dwarf mosaic symptoms include a mosaic patterns of flecks, spots, rings, and streaks on corn leaves (26).

More recently, maize dwarf mosaic outbreaks have occurred principally in late planted sweet corn in areas of several states north of the normal geographical range of johnsongrass. Near Lake Erie in Ohio, disease incidences in some commercial sweet corn fields planted in late June or early July were ca. 100% for the years 1976 through 1978 (12). Maize dwarf mosaic has also caused significant losses in sweet corn in Massachusetts, New York, Illinois, Wisconsin, Minnesota, and Idaho (13, 14). Both MDMV-A and MDMV-B (the nonjohnsongrass strain) were involved in these outbreaks. The overwintering host for strain B is unknown, but this strain is also transmitted to corn by many species of aphids. Additional MDMV strains have been reported (24).

Maize chlorotic dwarf is another virus disease that limits corn production in johnsongrass areas. This disease was first recognized in the early 1970's and is caused by the maize chlorotic dwarf virus (MCDV). The virus is transmitted to corn principally by the blackfaced leafhopper *Graminella nigrifrons* (27, 28). The disease causes characteristic chlorosis in corn and johnsongrass. Ear production in dent corn and particularly in sweet corn is severely limited when plants are infected at an early growth stage with both MCDV and MDMV.

Sweet corn lines have been previously evaluated for virus resistance or tolerance by various techniques. In many of the earlier trials, the selected lines were planted in field areas of high virus disease incidence and resulting plants were rated for disease tolerance using a rating scale that reflected presence or absence of symptoms on leaves, plant height, and ear development (5, 6, 7, 8, 11, 17, 18, 19, 20). While this technique provided an evaluation for relative disease tolerance of selected groups of sweet corn lines at specific locations, the identity and incidence of the virus diseases at some locations were frequently unknown, unrecognized, or overlooked. In many of these trials, most lines rated poorly for disease tolerance, but actual yields often were not measured and the susceptibilities of the different entries to individual viruses were not recorded. Also, an entry's resistance to one virus was often overlooked because it was susceptible to another, coexisting virus. Furthermore, since the incidence of disease depended upon natural inoculation, it often varied drastically from one area or year to another. When conditions were not suitable for virus transmission or plant inoculation by insect vectors, many plants escaped infection, and detection of virus resistant entries was inefficient.

To overcome some of these difficulties, it seemed appropriate to expose sweet corn varieties to uniform inocula of individual viruses or virus strains, to rate entries for susceptibility to MDMV and MCDV when both viruses were present, and to evaluate their yield potential.

Yields of sweet corn plants have been recorded after natural inoculation (4), and after mechanical inoculation in the field with a mixture of virus strains (16). Resistance of MDMV in sweet corn has also been evaluated in the greenhouse by mechanically inoculating a limited number of plants (15). Although statistical separation of means was not presented in most of the previous trials, and many of the tested sweet corn lines were judged to be highly susceptible to MDMV, some resistance (2) and relative virus disease tolerance (4, 16) were identified.

This report details cooperative studies conducted by the Science and Education Administration-Agricultural Research, U. S. Department of Agriculture, and the Ohio Agricultural Research and Development Center to evaluate commercial and experimental sweet corn hybrids for resistance or tolerance to

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MDMV and MCDV. Sweet corn entries were selected and submitted by several seed producing companies on the basis of current and potential commercial usage, suspected MDMV resistance, or both.

MATERIALS AND METHODS

1977 Trials

The reaction of 72 sweet corn hybrids from 8 seed-producing companies, plus 3 selected standard sweet corn hybrids and a virus susceptible dent corn hybrid were evaluated after their exposure to MDMV and MCDV in two locations. Near Wooster, where the natural incidence of both virus diseases is normally low, 25 seeds of each of the 76 entries were hand-planted as single row plots replicated 3 times in a randomized block design in 11 different field areas. In five areas planted in mid-May, each seedling was mechanically inoculated at 2 weeks and again at 3 weeks of age with MDMV strain A, B, D, E, or F. Only one strain was used in each field area. In five areas planted in early July, two test rows containing the hybrid entries were alternated in the field with single rows of the WF9xOh51A dent corn hybrid. Seedlings of this hybrid were mechanically inoculated at 2 weeks and again at 3 weeks of age with one of the five available MDMV strains. The WF9x-Oh51A hybrid was selected as an inoculum source because of its high susceptibility to infection by all of the MDMV strains. At 1 to 2 weeks after inoculation, these rows of infected seedlings served as uniformly distributed acquisition sites for naturally occurring aphids to acquire and transmit the viruses to the interplanted test entries. The selected planting and inoculation dates for these five "aphid-inoculated" field areas permitted the coexistence of young test entry seedlings, suitable MDMV-infected source plants, and high aphid populations. Useful data were not obtained from the aphid-inoculated strain D plot because of heavy rains, soil erosion, and an adverse reaction in the corn seedlings to herbicides applied the previous year.

Hybrid entries were also planted at Wooster in early July in a uniform virus source area containing 2.75 m wide strips of johnsongrass infected with MDMV and MCDV. No test plant was seeded further than 2.40 m from a virus source. In this planting, inoculation of interplanted test entries depended on the naturally occurring winged aphids and *G. nigrifrons* leafhoppers. In all plantings at Wooster, single-row plots were 6.10 m long with 1.21 m aisles between ranges and 0.76 m between rows. Field areas receiving different viruses or virus strains were located at least 300 m apart to prevent cross contamination.

The 76 hybrid entries were also hand planted in mid-May in southern Ohio near Portsmouth where

the incidences of MDMV and MCDV are normally high. To provide uniform sources of inocula for vector acquisition in this experimental plot area, 14.60 m wide planting areas containing rows of the test entries were bordered on two sides with 2.75 m wide strips of johnsongrass naturally infected with both viruses. A border row of a virus tolerant dent corn hybrid separated the sweet corn entries from the johnsongrass strips. No test plant was located further than 6.90 m from a virus source. In this test area, the plots were 5.50 m long, with rows 0.91 m apart and 1.21 m aisles between ranges.

1978 Trials

In 1978, a total of 94 sweet corn hybrids from 12 seed-producing companies, plus 4 selected standard hybrids and WF9xOh51A were evaluated for virus resistance near Wooster and Portsmouth. Fifteen of these sweet corn hybrids had been tested in the 1977 trials. In each of two isolated field areas near Wooster, 25 seeds of each entry were planted in early May in single row plots in a randomized block design containing three replications. At Wooster the planting method and plant spacing were the same as in 1977. All plants in each plot were mechanically inoculated with MDMV-A or B at 4 weeks and again at 5 weeks after planting. At Portsmouth where the plants were exposed to natural inoculation, 25 seeds of each entry were machine planted in late May in single row plots in a randomized block design containing two replications. The rows were 5.80 m long, 0.91 m apart, and 0.61 m aisles separated the ranges.

Cultural Practices

All plot areas were spring-plowed and disc-harrowed to provide a seed bed consistent with conventional corn planting practices. Fertilizer was broadcast before final tilling at the per hectare rate of 168-84-168 kg and 281-152-152 kg of nitrogen, phosphorus (P_2O_5), and potash (K_2O) at Wooster and Portsmouth, respectively. In 1977 at Portsmouth, this fertilizer included 421 kg/ha of 6-24-24 applied in the rows with the corn planter as the field was being marked for hand planting. Weeds were controlled by pre-emergence applications of recommended herbicides and by cultivation.

Inoculum Production and Preparation

Stock cultures of the MDMV strains were maintained in the greenhouse by successive mechanical inoculations of inbred Oh28. As these repeated mechanical transfers often selected isolates that were not readily transmitted by aphids, one or two transfers of the viruses were made with aphids before the virus strains were increased for the aphid-inoculated plots. This ensured that the strains could be aphid transmitted from the source rows to the test rows.

For inoculum preparation, Oh28 plants grown in flats in the greenhouse were mechanically inoculated at the 3- to 4-leaf stage with inoculum prepared by grinding 1 g of infected leaf tissue from stock cultures (or cultures recently transferred by aphids) in 9 ml of 0.01 M phosphate buffer adjusted to pH 6.5 with monobasic and dibasic potassium phosphate. To prepare inoculum for field use, the two or three youngest leaves with well-developed mosaic symptoms were removed from plants 2-4 weeks after inoculation and ground 30 sec in a blender in the phosphate buffer (1 g of leaf tissue/9 ml buffer). The macerate was then strained through two layers of cheesecloth and the resulting liquid inoculum maintained near 0° C until its use in the field the same day.

Inoculation in the Field

Field-planted seedlings were inoculated by using a hand-held Paasche H Airbrush³ operating on 7.03-8.44 kg/cm² air pressure from a tractor-mounted compressor. One (1977) or two (1978) seats, with supporting beams attached to the 3-point hitch drawbar, were positioned behind a hydrostatic-drive tractor and provided vertical and lateral positioning of the individual inoculators over the corn rows. Just before the inoculation, the cooled inoculum and 1-2 g of 600-mesh carborundum were placed in the 85 ml airbrush bottle. With the system then pressurized, the airbrush nozzle was adjusted to emit a distinct liquid cone. With the tractor moving at about 0.8 km/hour, the operator inoculated each plant at the base of the whorl leaf by supporting the seedling with one hand and pushing the airbrush spray button with the other. Holding the airbrush nozzle 0.5 cm from the leaf and spraying about 1 sec produced a distinct water-soaked lesion on the leaf. About 10 to 30 plants, depending on plant size and leaf succulence, were inoculated with each milliliter of inoculum-carborundum mixture. All plants were inoculated twice, initially in the four to five leaf stage at 2-4 weeks after planting, and again about 1 week later.

Observations for Disease

Two observations for disease symptoms were made on all plants. In the mechanically inoculated plots, first counts of infected plants and stand counts were usually done 2 weeks after the last inoculation. Final observations for infection were made 2-4 weeks after the first observation, when plants were 7-9 weeks old. In the aphid-inoculated plots, final infection counts were made 6 weeks after the source rows were inoculated. In the mechanical and aphid-inoculated MDMV strain plots, plants were judged as infected or healthy based on the presence or absence of typical mosaic symptoms. In the johnsongrass plot at Woos-

ter and in the plots at Portsmouth, plants were judged as infected with MDMV, infected with MCDV, or healthy, based on the presence or absence of respective diagnostic symptoms. At Portsmouth in 1978, each row was rated for virus disease severity using a 1 to 9 scale to evaluate the extent of chlorosis, stunting, and ear development. The assigned rating values were 1 = healthy; 2 = virus-like symptoms in top two to three leaves, symptoms faint to mild, plant not stunted; 3 = virus-like symptoms in top two to three leaves, plant not stunted; 4 = virus-like symptoms in more than three leaves, plant slightly stunted; 5 = virus-like symptoms in more than three leaves, plant moderately stunted, ear size slightly reduced; 6 = severe virus-like symptoms in more than three leaves, plant height reduced $\frac{1}{4}$ to $\frac{1}{2}$, ear size moderately reduced; 7 = severe virus-like symptoms in more than three leaves, plant height reduced about $\frac{1}{2}$, poor ear shoot, many kernels; 8 = severe virus-like symptoms in more than three leaves, plant height reduced more than $\frac{1}{2}$, poor or no ear shoots, few or no kernels; 9 = dead or dying plant, no ear shoot.

Harvest Data

In 1977, ears were harvested at green maturity from the first 10 hills of each row in the five plots mechanically inoculated with one of the five MDMV strains. All rows were checked for maturity, tagged, and harvested three times weekly between July 21 and August 12. The ear samples were bagged and held in a 2° C cold room until data could be recorded (usually 1-3 days later) on the number and weight of unhusked ears, size of husked ears, and number and weight of marketable ears and culls. Ears were individually judged as marketable if they had fairly good tip fill and had not more than 6.5 cm² in area of missing or poorly developed kernels. The husked ears as a group from each row were also rated for maturity on a scale of 1 = undermature, 2 = mature, 3 = overmature, and 4 = dented.

In 1978, harvest data were collected only on the 12 hybrids that were also included in the 1977 study. Ears from the first 10 hills of each row were harvested on August 30 from the plot inoculated with MDMV-A. Ears were processed for data as they were in 1977.

Statistical Analyses

The percentage of virus-infected plants was calculated from total number of plants present and number of infected plants for each row. These values were subjected to analysis of variance with and without angular transformation. Yield data were analyzed without transformation. In 1977, where the ears in many entry rows were lost before harvest due to small animal damage, a one-way analysis of variance (replications not considered) was used.

³Paasche Airbrush Co., 1909 W. Diversey Parkway, Chicago, Illinois 60614.

RESULTS AND DISCUSSION

Growing Conditions, Plant Stands, and Disease Symptom Expression

In 1977, weather conditions at Wooster were favorable both for corn growth and for disease symptom expression through most of the season. Rainfall in early May provided suitable soil moisture for germination of seeds planted in mid-May, and plant stands averaged more than 84% for the first five plantings. Heavy rains in late June and early July made hand planting of the early July seedlings difficult and plant stands averaged only 79% for these five later plantings. In 11 plantings in 1977, only two lines, Del Monte EXP39941 and Crookham Cr7619, had less than a 70% stand.

At Portsmouth in 1977, seedling emergence averaged 88%. Weather conditions were generally favorable for corn growth, and diagnostic symptoms for MDMV and MCDV infection were readily apparent.

In 1978 at Wooster, cool temperatures in May delayed germination and initial plant growth. In addition, heavy rainfall in mid-May and mid-June caused excessive soil erosion in the plot inoculated with MDMV-A and resulted in 8% plant loss. The average plant stand for the three plots in 1978 was 75%, about 8% lower than in 1977. Entries with less than a 50% stand in all three plots included Ferry-Morse E4211 and Northrup-King 5125. Additional entries with poor germination under the cool and wet conditions at Wooster included Agway SP-833701, Green Giant 8, Northrup-King 36888-10405, and Robson B85.

At both Wooster and Portsmouth in 1978, the plants were under low moisture stress during much of July but rainfall was adequate for the rest of the season. The mosaic symptoms of MDMV infection were less apparent in 1978 than in 1977, particularly on more mature plants.

1977 Experiments

All sweet corn hybrids were highly susceptible to MDMV when 3-week-old seedlings were mechanically inoculated. There was no statistical difference between entries inoculated with strains A, D, or E; infection averaged 99.5% for these three plots. In the plot inoculated with strain B, Spring Gold, Seneca Star, Green Giant 3, Aztec, and Bellringer were less susceptible than the most susceptible entries (all plants infected). However, since infection in these less susceptible lines averaged more than 88%, they should not be considered resistant to strain B. In the plot inoculated with strain F, 19 sweet corn entries had significantly fewer infected plants than the most susceptible entries. However, since infectivity in these 19 entries averaged more than 79%, and none was significantly less susceptible than the dent corn sus-

ceptible check entry, all should be considered highly susceptible to strain F. The lower average percentage of infected plants in this plot (90.6%) compared with the averages in the other four mechanically inoculated plots (>99% average) may have been at least partly because the plants in the strain F-inoculated plot were 3-7 days older when inoculated and may have been less susceptible than plants in the other plots. Similar variations in host plant resistance to the different MDMV strains have been recorded previously (25).

The MDMV infection in the four aphid-inoculated plots at Wooster (Table 1) was lower than infection in the mechanically inoculated plots (43% vs 97%). Since inoculation in these plots depended upon the population and activity of aphids and since many plants may have been more mature and possibly more resistant to inoculation, infection, virus multiplication, and symptom expression, many more 'escapes' would be expected than in mechanically inoculated plots.

Statistically significant data were obtained in each of these four MDMV strain plots. In the plot containing strain A-infected source rows, three entries, Joseph Harris WH115, Comanche, and Joseph Harris H745, averaged only 20% infection, a 56% reduction compared with the susceptible WF9xOh-51A hybrid. Another 51 entries that averaged 34% infection were statistically similar to these three entries and less susceptible than WF9xOh51A.

Many sweet corn entries appeared resistant to aphid inoculation of MDMV-B. Infection in 43 entries was significantly less than in the dent corn check. Twenty-eight entries averaged only 9.3% infection and were statistically similar to the 3% infection in the best entry. The most resistant entries, with infection at less than one third of the plot's average infection, included Northrup-King NK51036, Joseph Harris 5841, Joseph Harris WH115, and Rogers Brothers 75-1766. In contrast, only one entry in each of the plots containing strain E- and strain F-inoculated source rows had significantly less infection than the dent corn check. These were Rogers Brothers 70-2049 (13% infection of strain E) and Robson RXP214 (56% infection of strain F).

Based on the average percentage of infection in the four aphid-inoculated strain plots, the five least susceptible entries were Joseph Harris H745, Joseph Harris 5841, Seneca Star, Joseph Harris YW1465, and Rogers Brothers 72-2093. However, since all five entries averaged more than 90% infection when mechanically inoculated with the same four virus strains, and only one entry (Seneca Star) was significantly less susceptible to one of the virus strains than the highly susceptible dent corn check (88%

TABLE 1.—Maize Dwarf Mosaic in Sweet Corn Hybrids About 5 Weeks After Exposure to Aphid Inoculation from Source Rows Mechanically Inoculated with Each of Four MDMV Strains at Wooster, Ohio in 1977.*

Entry	Company Submitting Entry†	Rank‡	Percentage of Plants Infected with Strain§				Entry	Company Submitting Entry†	Rank‡	Percentage of Plants Infected with Strain§			
			A	B	E	F				A	B	E	F
H745	5	1	22 (1)	13 (1)	15 (1)	64 (1)	Jubilee	8	46	41 (1)	14 (2)	56 (4)	73 (3)
5841	5	2	30 (1)	3 (1)	21 (1)	74 (3)	3	4	47	34 (1)	10 (1)	48 (4)	85 (4)
Seneca Star	7	3	28 (1)	11 (1)	27 (1)	65 (1)	1	4	48	41 (1)	19 (2)	46 (4)	75 (3)
YW1465	5	4	37 (1)	8 (1)	20 (1)	68 (1)	Hallmark	6	49	40 (1)	11 (1)	35 (1)	84 (4)
72-2093	8	4	34 (1)	12 (1)	22 (1)	63 (1)	NK199	6	49	25 (1)	12 (1)	45 (4)	91 (4)
WH115	5	6	18 (1)	6 (1)	17 (1)	73 (3)	Seneca Scout	7	49	24 (1)	19 (2)	42 (3)	87 (4)
W9625	5	7	24 (1)	7 (1)	33 (1)	63 (1)	Capitan	1	52	48 (4)	19 (2)	33 (1)	83 (4)
NK51036	6	8	38 (1)	4 (1)	19 (1)	68 (1)	Golden Cross Bantam	—	53	27 (1)	38 (4)	33 (1)	88 (4)
75-1766	8	8	37 (1)	3 (1)	34 (1)	63 (1)	Harmony	5	54	51 (4)	9 (1)	41 (3)	88 (4)
68-2578	8	10	41 (1)	10 (1)	24 (1)	70 (1)	74-3044	8	54	34 (1)	22 (2)	42 (3)	82 (4)
2	4	11	34 (1)	15 (2)	17 (1)	74 (3)	XP2500	1	56	49 (4)	27 (4)	24 (1)	82 (3)
66-2327	8	11	31 (1)	15 (2)	25 (1)	68 (1)	Commander	1	57	38 (1)	27 (4)	35 (1)	89 (4)
Gold Winner	5	13	31 (1)	13 (1)	19 (1)	71 (1)	XP2527	1	58	52 (4)	21 (2)	41 (3)	81 (3)
Reliance	6	14	27 (1)	12 (1)	38 (1)	65 (1)	Calico	1	59	51 (4)	27 (4)	30 (1)	82 (3)
Gold Cup	—	15	33 (1)	8 (1)	23 (1)	75 (3)	Cr7701	2	59	25 (1)	25 (4)	51 (4)	91 (4)
Spring Gold	5	16	38 (1)	8 (1)	40 (3)	70 (1)	Apache	1	61	37 (1)	36 (4)	46 (4)	84 (3)
5	4	16	44 (4)	7 (1)	16 (1)	68 (1)	75-2084	8	62	51 (4)	22 (2)	43 (4)	77 (4)
W7015	5	18	32 (1)	10 (1)	21 (1)	81 (4)	Guardian	1	63	40 (1)	25 (4)	53 (4)	94 (4)
75-1719	8	19	29 (1)	9 (1)	25 (1)	76 (3)	RXP232	7	63	44 (4)	23 (4)	52 (4)	79 (3)
Sugar Loaf	6	20	34 (1)	11 (1)	40 (3)	58 (1)	XP2529 B.C.	1	65	47 (4)	31 (4)	44 (4)	83 (4)
RXP214	7	21	38 (1)	29 (4)	19 (1)	56 (1)	Seneca Chief	—	66	67 (4)	25 (4)	40 (3)	85 (4)
RXP201	7	22	31 (1)	21 (2)	26 (1)	79 (3)	RXP207	7	67	52 (4)	27 (4)	61 (4)	78 (3)
Bellringer	5	23	37 (1)	9 (1)	30 (1)	71 (3)	XP2501 B.C.	1	68	41 (1)	36 (4)	62 (4)	87 (4)
Cherokee	1	24	36 (1)	15 (2)	21 (1)	72 (3)	75-2591	8	68	48 (4)	23 (4)	54 (4)	84 (4)
Cr7617	2	24	35 (1)	15 (2)	33 (1)	82 (3)	RXP204	7	70	52 (4)	30 (4)	49 (4)	90 (4)
Salute	1	26	34 (1)	10 (1)	23 (1)	86 (4)	WH1235	5	71	53 (4)	23 (4)	43 (4)	87 (4)
EXP31001	3	26	28 (1)	13 (1)	21 (1)	89 (4)	Cr7619	2	73	58 (4)	41 (4)	50 (4)	87 (4)
EXP37810	3	28	29 (1)	21 (2)	39 (1)	72 (3)	Sweet Sue	5	74	58 (4)	45 (4)	46 (4)	88 (4)
XP2513 B.C.	1	29	27 (1)	24 (2)	23 (1)	81 (3)	XP372	1	75	65 (4)	37 (4)	67 (4)	90 (4)
Comanche	1	30	20 (1)	14 (2)	32 (1)	84 (3)	EXP31071	3	76	69 (4)	41 (4)	76 (4)	93 (4)
Sundance	5	31	55 (4)	18 (2)	28 (1)	71 (3)	WF9xOh51A (dent corn)	—	72	46 (4)	43 (4)	45 (4)	86 (4)
Cr7614	2	32	24 (1)	12 (1)	39 (1)	84 (4)	Mean			38.7	19.0	34.7	78.4
Merit	1	32	40 (1)	22 (2)	32 (1)	75 (3)	LSD (5%)			19.9	14.2	27.7	17.5
RXP217	7	32	35 (1)	20 (2)	36 (1)	76 (3)							
RXP218	7	32	40 (1)	7 (1)	28 (1)	85 (4)							
EXP32350	3	36	32 (1)	23 (4)	19 (1)	80 (4)							
RXP223	7	36	36 (1)	21 (2)	38 (1)	82 (3)							
Cr7612	2	38	25 (1)	17 (2)	34 (1)	88 (4)							
Aztec	1	39	41 (1)	11 (1)	31 (1)	75 (3)							
Yukon	6	40	42 (2)	16 (2)	19 (1)	79 (3)							
Wintergreen	1	41	33 (1)	25 (4)	32 (1)	61 (1)							
4	4	42	46 (4)	20 (2)	21 (1)	80 (3)							
EXP39941	3	43	63 (4)	19 (2)	30 (1)	73 (3)							
H445	5	44	26 (1)	24 (4)	38 (1)	83 (3)							
70-2049	8	45	37 (1)	31 (4)	13 (1)	87 (4)							

*Planted 7/7, source rows inoculated 7/20-21 and 7/27, plants observed for symptoms on 8/30-31.

†1 = Asgrow Seed Co., 2 = Crookham Co., 3 = Dei Monte Corp., 4 = Green Giant Co., 5 = Joseph Harris Co., 6 = Northrup, King & Co., 7 = Robson Seed Farms Corp., 8 = Rogers Brothers Seed Co.

‡The final ranking values give equal weight to the ranked mean of the percentage values and the ranked mean of the statistical rating.

§Means followed by the same number (statistical rating) are not significantly different at the 5% level using Duncan's New Multiple Range Test and arcsin [square root (%)] transformed data. Further: 1 = not significantly different from most resistant entry; 2 = intermediate in resistance, significantly different from most resistant and most susceptible entries; 3 = intermediate in resistance but not significantly different from most resistant and most susceptible entries; 4 = not significantly different from most susceptible entry. LSD values are based on analyses of nontransformed data.

infection of strain B for Seneca Star as compared with 100% infection for WF9xOh51A), all entries in this study should be considered as highly susceptible to MDMV. The significant differences in the amount of infection among sweet corn entries in these four aphid-inoculated plots may have resulted from varietal influence on aphid behavior. Plants in some entries may be relatively less attractive to the vectors.

Aphid-inoculated plots would more closely approach normal field conditions than mechanically inoculated plots. The average amount of infection in aphid-inoculated plots (containing the same entries but different virus strains in source plants) would depend on the number of infected source plants, the number of aphids present, and the relative efficiency of aphids in transmitting virus strains. In this study, the percentages of infected plants in the source rows were 81, 59, 86, and 95 for plots inoculated with strains A, B, E, and F, respectively. Further, relative aphid populations as measured by yellow pan traps in these same four plot areas were 3.3, 1.0, 1.3, and 2.0, respectively, for the 5-week period following the presence of infected source plants in the field. Considering infected source plants and aphid populations, the calculated relative numbers of potentially inoculative aphids were 4.6, 1.0, 1.9, and 3.2 in the respective strain plots. If all strains were transmitted with equal efficiency by the aphids, this should lead to expected relative infection in plots A, E, and F of 87%, 37%, and 61%, respectively, compared with the 19% in plot B. The actual amount of infection in plot A was only 44% of the expected infection, suggesting that strain A was transmitted less efficiently than the other strains or that the sweet corn entries as a group are more resistant to strain A than to the other strains. The latter possibility is not supported by the results of the mechanical inoculation trials. The former was demonstrated previously in laboratory studies (21).

In two field plantings where sweet corn lines were exposed to natural vector inoculation of MDMV and MCDV (Table 2), MDMV incidence was high at both Wooster (80%) and Portsmouth (76%). Although the johnsongrass plants growing at Wooster had been artificially inoculated with MCDV, the incidence of maize chlorotic dwarf remained relatively low (19%) in the sweet corn entries. However, at Portsmouth more than 67% of the sweet corn plants were infected by MCDV and 55% were infected by both MDMV and MCDV. At Wooster, two entries (Sundance and Bellringer) appeared to have appreciable resistance to MDMV, although their infection averaged 39%. An additional 32 entries that averaged 70% infection were statistically similar to these more resistant hybrids. At Portsmouth two other

entries (Spring Gold and Harmony) were the most resistant to MDMV, but in each 41% of the plants were infected with MDMV; another 25 entries that averaged more than 65% infection were statistically similar to these two entries. At Wooster, MCDV infection was low and less than 10% of the plants in entries Northrup-King NK51036, Sugar Loaf, Comanche, Merit, Rogers Brothers 66-2327, and Crookham Cr7701 were infected. However, an additional 46 entries with infection levels as high as 23% were statistically similar to the above six entries. At Portsmouth, Northrup-King NK51036 and Sugar Loaf were again among the most resistant entries for MCDV. Less than 50% of the plants in those entries and in the Yukon and Crookham Cr7614 entries were infected with MCDV. The other four entries that had less than 10% MCDV infection at Wooster averaged 61% infection at Portsmouth. These four and another 45 entries were statistically similar to the two most resistant entries at Portsmouth.

More than 50% of the sweet corn plants had diagnostic symptoms of both maize dwarf mosaic and maize chlorotic dwarf in the Portsmouth planting. In only seven entries were less than 40% of the plants doubly infected. Of these, Northrup-King NK51036, Sugar Loaf, Spring Gold, Harmony, and Asgrow XP2513 B.C. were statistically similar to the best entries when the data were analyzed for the individual viruses. The two other entries, Robson RXP214 and Joseph Harris 5841, were among the most resistant group for MDMV resistance only. The 55% average for the observed double infections in this plot is higher than the expected value of 51.1% (based on individual virus infection counts), suggesting that corn plants are more likely to become infected with a second virus if they were previously infected with another.

In seven of the sweet corn entries at Portsmouth, a significant number of plants were dead 56 days after planting (Table 2). Since maturity dates of the entries in this group ranged from 66 to 80 days, and since the number of double infections in this group was slightly less than the plot average, it would appear that these entries were less tolerant of virus infections than most of the other entries.

Eleven sweet corn entries had a significantly greater number of healthy plants (average 20.1%) at Portsmouth than the 0% average of the 12 poorest entries (Table 2). The best entry, Northrup-King NK51036, had 37% less MDMV, 36% less MCDV, and 49% less double infections than the plot averages.

The infectivity results for 1977 are summarized in Table 3. The final rankings for MDMV and MCDV resistance give equal weight to the percen-

TABLE 2.—Sweet Corn Hybrids Infected with MDMV and MCDV when Planted Near Virus-infected Johnson-grass in Ohio in 1977.*

Entry	Company Submitting Entry†	Rank‡	Percentage of Plants at Wooster§			Percentage of Plants at Portsmouth§				Dead
			with MDMV	with MCDV	Healthy	with MDMV	with MCDV	MDMV + MCDV		
NK51036	6	1	66 (1)	3 (1)	37 (1)	48 (1)	43 (1)	28 (1)	0 (1)	
XP2513 B. C.	1	2	74 (1)	10 (1)	18 (3)	46 (1)	62 (1)	29 (1)	3 (1)	
Harmony	5	3	56 (1)	13 (1)	25 (1)	41 (1)	58 (1)	31 (1)	8 (1)	
Sundance	5	4	38 (1)	19 (3)	17 (3)	51 (1)	63 (1)	47 (1)	16 (1)	
RXP214	7	5	47 (1)	26 (4)	15 (1)	43 (1)	81 (2)	38 (1)	0 (1)	
Yukon	6	6	77 (1)	16 (3)	18 (1)	69 (1)	47 (1)	40 (1)	6 (1)	
Sugar Loaf	6	6	77 (4)	6 (1)	20 (1)	72 (1)	44 (1)	38 (1)	2 (1)	
75-1766	8	8	61 (1)	15 (3)	14 (3)	66 (1)	63 (1)	44 (1)	2 (1)	
5	4	9	70 (1)	11 (1)	10 (4)	73 (2)	65 (1)	50 (1)	2 (1)	
Cr7614	2	10	98 (4)	11 (1)	17 (1)	76 (2)	48 (1)	41 (1)	0 (1)	
Spring Gold	5	11	55 (1)	31 (4)	18 (1)	41 (1)	62 (1)	35 (1)	14 (4)	
Gold Cup	—	12	84 (4)	19 (3)	22 (1)	54 (1)	64 (1)	42 (1)	2 (1)	
WF9xOh51A (dent corn)	—	13	91 (4)	32 (4)	16 (1)	61 (1)	48 (1)	25 (1)	0 (1)	
Cherokee	1	14	76 (1)	11 (1)	12 (4)	75 (2)	65 (1)	53 (1)	0 (1)	
75-1719	8	15	85 (4)	21 (3)	16 (1)	61 (1)	60 (1)	43 (1)	6 (1)	
Bellringer	5	16	40 (1)	32 (4)	14 (3)	64 (1)	72 (1)	59 (2)	8 (1)	
Comanche	1	17	75 (1)	9 (1)	5 (4)	91 (4)	53 (1)	49 (1)	0 (1)	
EXP31001	3	18	77 (3)	10 (1)	8 (4)	78 (2)	57 (1)	52 (1)	8 (1)	
Merit	1	19	79 (4)	9 (1)	10 (4)	76 (2)	61 (1)	48 (1)	2 (1)	
Hallmark	6	20	74 (1)	20 (3)	7 (4)	77 (2)	66 (1)	49 (1)	0 (1)	
Gold Winner	5	21	76 (1)	11 (1)	8 (3)	76 (2)	74 (2)	58 (2)	0 (1)	
Reliance	6	22	85 (4)	24 (4)	17 (1)	69 (1)	62 (1)	49 (1)	0 (1)	
Sweet Sue	5	22	87 (4)	12 (1)	9 (3)	74 (2)	58 (1)	41 (1)	0 (1)	
Calico	1	22	81 (3)	18 (3)	3 (4)	67 (1)	61 (1)	41 (1)	9 (1)	
1	4	25	80 (3)	12 (3)	9 (4)	75 (2)	56 (1)	47 (1)	6 (1)	
H445	5	26	66 (1)	10 (1)	5 (4)	79 (2)	79 (2)	65 (2)	2 (1)	
Aztec	1	27	72 (1)	19 (3)	5 (4)	63 (1)	87 (2)	60 (2)	5 (1)	
RXP223	7	28	79 (3)	12 (1)	3 (4)	84 (4)	65 (1)	53 (1)	2 (1)	
WH115	5	28	55 (1)	20 (3)	4 (4)	64 (1)	66 (1)	55 (2)	21 (4)	
5841	5	30	85 (4)	20 (3)	7 (4)	53 (1)	75 (2)	35 (1)	0 (1)	
68-2578	8	30	71 (1)	10 (1)	1 (4)	92 (4)	66 (1)	61 (2)	3 (1)	
4	4	32	64 (1)	13 (3)	3 (4)	85 (4)	73 (2)	62 (2)	0 (1)	
YW1465	5	32	68 (1)	25 (4)	12 (3)	73 (1)	77 (2)	61 (2)	0 (1)	
Jubilee	8	34	72 (1)	16 (3)	9 (4)	83 (4)	62 (1)	55 (2)	0 (1)	
EXP39941	3	35	73 (3)	15 (3)	11 (3)	70 (1)	79 (2)	62 (2)	2 (1)	
RXP217	7	36	86 (4)	15 (3)	2 (4)	66 (1)	51 (1)	49 (1)	30 (4)	
Capitan	1	37	93 (4)	23 (4)	8 (4)	74 (2)	62 (1)	44 (1)	0 (1)	
H745	5	37	65 (1)	10 (1)	1 (4)	71 (1)	78 (2)	67 (2)	16 (4)	
Cr7612	2	37	69 (1)	24 (4)	8 (4)	73 (2)	76 (2)	57 (2)	0 (1)	
66-2327	8	40	82 (3)	9 (1)	5 (4)	90 (4)	66 (1)	60 (2)	0 (1)	
EXP32350	3	41	78 (4)	27 (4)	6 (4)	74 (2)	66 (1)	53 (1)	7 (1)	
Seneca Chief	—	42	86 (4)	30 (4)	6 (4)	81 (2)	57 (1)	49 (1)	4 (1)	
Cr7701	2	43	90 (4)	4 (1)	0 (4)	94 (4)	63 (1)	57 (2)	0 (1)	
Seneca Star	7	44	67 (1)	25 (4)	3 (4)	71 (1)	68 (1)	60 (2)	18 (4)	
EXP37810	3	45	59 (1)	41 (4)	0 (4)	60 (1)	62 (1)	56 (2)	35 (4)	
2	4	45	88 (4)	34 (4)	6 (4)	71 (1)	52 (1)	44 (1)	16 (3)	
XP2500	1	47	78 (3)	19 (3)	10 (3)	78 (2)	53 (1)	42 (1)	1 (1)	
RXP204	7	48	86 (4)	12 (1)	4 (4)	85 (4)	70 (1)	62 (2)	3 (1)	

*Planted at Wooster on 7/11 and at Portsmouth on 5/19; infection data taken when plants were 9 and 8 weeks of age at Wooster and Portsmouth, respectively.

†1 = Asgrow Seed Co., 2 = Crookham Co., 3 = Del Monte Corp., 4 = Green Giant Co., 5 = Joseph Harris Co., 6 = Northrup, King & Co., 7 = Robson Seed Farms Corp., 8 = Rogers Brothers Seed Co.

‡The final ranking values give equal weight to the ranked mean of the percentage values and the ranked mean of the statistical rating.
§Means followed by the same number (statistical rating) are not significantly different at the 5% level using Duncan's New Multiple Range Test and arcsin [square root (%)] transformed data. Further: 1 = not significantly different from most resistant entry; 2 = intermediate in resistance, significantly different from most resistant and most susceptible entries; 3 = intermediate in resistance but not significantly different from most resistant and most susceptible entries; 4 = not significantly different from most susceptible entry. LSD values are based on analyses of nontransformed data.

TABLE 2 (Continued).—Sweet Corn Hybrids Infected with MDMV and MCDV when Planted Near Virus-infected Johnsongrass in Ohio in 1977.*

Entry	Company Submitting Entry†	Rank‡	Percentage of Plants at Wooster§		Healthy	Percentage of Plants at Portsmouth§			
			with MDMV	with MCDV		with MDMV	with MCDV	with MDMV + MCDV	Dead
Guardian	1	49	96 (4)	16 (3)	6 (4)	82 (4)	64 (1)	52 (1)	0 (1)
XP2529 B.C.	2	49	92 (4)	10 (1)	1 (4)	94 (4)	65 (1)	62 (2)	0 (1)
75-2084	8	51	86 (4)	39 (4)	10 (3)	80 (2)	61 (1)	56 (2)	4 (1)
XP2501 B.C.	1	52	94 (4)	14 (3)	1 (4)	90 (4)	59 (1)	53 (1)	3 (1)
W9625	5	52	82 (4)	15 (3)	3 (4)	84 (4)	68 (1)	58 (2)	4 (1)
RXP218	7	52	79 (3)	16 (3)	3 (4)	87 (4)	68 (1)	62 (2)	4 (1)
3	4	55	85 (4)	22 (3)	0 (4)	73 (1)	62 (1)	53 (2)	19 (4)
WH1235	5	56	90 (4)	15 (3)	0 (4)	91 (4)	64 (1)	55 (2)	0 (1)
XP2527	1	56	87 (4)	19 (3)	3 (4)	86 (4)	67 (1)	56 (2)	0 (1)
72-2093	8	58	92 (4)	37 (4)	8 (4)	70 (1)	77 (2)	55 (2)	0 (1)
RXP232	7	59	94 (4)	14 (3)	1 (4)	84 (4)	67 (1)	56 (2)	4 (1)
Cr7617	2	60	93 (4)	20 (3)	0 (4)	88 (4)	66 (1)	56 (2)	3 (1)
Seneca Scout	7	61	87 (4)	11 (1)	0 (4)	90 (4)	78 (2)	73 (2)	5 (1)
Wintergreen	1	62	75 (3)	23 (3)	4 (4)	81 (4)	82 (2)	68 (2)	0 (1)
NK199	6	63	99 (4)	17 (3)	3 (4)	92 (4)	66 (1)	65 (2)	3 (1)
Golden Cross Bantam	—	64	86 (4)	37 (4)	4 (4)	79 (2)	81 (2)	69 (2)	4 (1)
Apache	1	65	85 (4)	30 (4)	2 (4)	89 (4)	68 (1)	62 (2)	3 (1)
75-2591	8	66	89 (4)	14 (3)	1 (4)	93 (4)	77 (2)	71 (2)	0 (1)
74-3044	8	67	100 (4)	16 (3)	0 (4)	84 (4)	78 (2)	66 (2)	4 (1)
Salute	1	68	81 (4)	26 (4)	0 (4)	86 (4)	73 (2)	63 (2)	5 (1)
Commander	1	69	87 (4)	13 (3)	3 (4)	85 (4)	88 (4)	76 (2)	0 (1)
RXP207	7	69	97 (4)	20 (3)	0 (4)	97 (4)	74 (2)	74 (2)	3 (1)
Cr7619	2	69	86 (4)	25 (4)	5 (4)	79 (4)	82 (2)	74 (2)	8 (1)
W7015	5	72	86 (4)	28 (4)	0 (4)	92 (4)	79 (2)	73 (2)	1 (1)
RXP201	7	73	93 (4)	24 (4)	1 (4)	89 (4)	84 (2)	74 (2)	0 (1)
70-2049	8	73	91 (4)	31 (4)	0 (4)	89 (4)	81 (2)	72 (2)	0 (1)
XP372	1	75	91 (4)	29 (4)	0 (4)	97 (4)	84 (2)	84 (4)	3 (1)
EXP31071	3	76	98 (4)	38 (4)	2 (4)	95 (4)	98 (4)	95 (4)	0 (1)
Mean			79.5	19.1	7.2	76.1	67.2	55.0	4.4
LSD (5%)			26.9	19.0	14.7	21.4	22.2	25.6	14.8

*Planted at Wooster on 7/11 and at Portsmouth on 5/19; infection data taken when plants were 9 and 8 weeks of age at Wooster and Portsmouth, respectively.

†1 = Asgrow Seed Co., 2 = Crookham Co., 3 = Del Monte Corp., 4 = Green Giant Co., 5 = Joseph Harris Co., 6 = Northrup, King & Co., 7 = Robson Seed Farms Corp., 8 = Rogers Brothers Seed Co.

‡The final ranking values give equal weight to the ranked mean of the percentage values and the ranked mean of the statistical rating.

§Means followed by the same number (statistical rating) are not significantly different at the 5% level using Duncan's New Multiple Range Test and arcsin [square root (%)] transformed data. Further: 1 = not significantly different from most resistant entry; 2 = intermediate in resistance, significantly different from most resistant and most susceptible entries; 3 = intermediate in resistance but not significantly different from most resistant and most susceptible entries; 4 = not significantly different from most susceptible entry. LSD values are based on analyses of nontransformed data.

age infection values (based on the final observation) and a rating index value for each particular type of field trial (mechanical inoculation, aphid inoculation, etc.). The rating index values were based on all statistically significant comparisons from the first and final observations on each plot and represent the number of times the entry was statistically similar to the most susceptible entry, subtracted from the number of times it was statistically similar to the most resistant entry. In the 11 field plantings where the entries were compared for resistance to MDMV, 16 of 22 analyses had significant F values. In the two field plantings where the entries were compared for

resistance to MCDV, four of four analyses had significant F values.

Based on the overall maize dwarf mosaic ranking, the seven most resistant entries in the 1977 trials were Seneca Star, Joseph Harris WH115, Robson RXP214, Northrup-King NK51036, Joseph Harris 5841, Joseph Harris H745, and Rogers Brothers 75-1766. Conversely, the seven most susceptible entries were Del Monte EXP31071, Joseph Harris WH1235, Robson RXP207, Asgrow XP372, Asgrow XP2529 B.C., Sweet Sue, and Apache. None of the most resistant entries was immune to MDMV infection. When mechanically inoculated, 91% to 97% of the

TABLE 3.—Summary of Response of Sweet Corn Hybrids to Infection by MDMV and MCDV in Ohio in 1977.

Entry	Company Submitting Entry*	Mean Percent Infection, Rating Index (RI†), and Ranking‡ for MDMV									
		Mechanical Inoculation		Aphid Inoculation				Leafhopper Inoculation			
		%	RI	Corn Source		Johnsongrass Source		Rank	Johnsongrass Source		Rank
				(5)	(6)	(4)	(8)		(2)	(2)	
Seneca Star	7	93	2	33	8	69	2	1	47	—1	59
WH115	5	94	—1	29	6	60	2	2	43	0	49
RXP214	7	91	4	36	4	45	2	3	54	—1	66
NK51036	6	95	—1	32	5	57	2	4	23	3	3
5841	5	93	1	32	7	69	0	5	48	0	57
H745	5	97	—3	29	7	68	2	6	44	1	41
75-1766	8	97	—2	34	6	64	2	7	39	2	24
Spring Gold	5	96	—3	39	7	48	2	8	47	—2	64
72-2093	8	94	0	33	7	81	0	9	57	—2	75
YW1465	5	98	—3	33	7	71	2	10	51	—2	70
75-1719	8	98	—2	35	4	73	0	11	41	0	43
68-2578	8	91	1	36	7	82	0	11	38	3	10
DM37810	3	97	—1	40	4	60	2	13	52	—2	71
2	4	94	0	35	6	80	0	14	43	—1	56
Bellringer	5	98	—2	37	4	52	2	15	52	—1	65
Sundance	5	96	—3	43	4	45	2	16	41	—1	49
Yukon	6	95	—1	39	—1	73	2	17	32	1	22
Cr7612	2	97	—1	41	2	71	1	18	50	1	52
66-2327	8	96	—1	35	6	86	—1	19	38	3	10
Gold Winner	5	98	—4	34	5	76	1	20	43	1	35
Hallmark	6	94	0	43	—1	76	—1	21	43	—1	35
Aztec	1	96	—4	40	1	68	2	22	53	—2	74
Cherokee	1	97	—3	36	2	76	1	22	38	2	21
Harmony	5	97	—2	47	—1	49	2	24	36	3	7
Gold Cup	—	98	—6	35	5	69	0	25	42	3	23
XP2513 B.C.	1	99	—4	39	3	60	2	26	36	3	7
EXP31001	3	98	—3	38	3	78	0	27	34	3	6
Sugar Leaf	6	98	—5	36	4	75	0	28	25	4	1
Reliance	6	98	—6	36	6	77	0	29	43	1	35
EXP39941	3	98	—3	46	3	72	1	30	47	2	40
RXP223	7	96	—1	44	4	82	—1	31	39	4	14
Comanche	1	98	—2	38	2	83	0	32	31	3	4
RXP217	7	98	—3	42	3	76	0	32	33	2	15
5	4	99	—6	34	4	72	1	32	38	3	10
3	4	96	—2	44	1	79	0	35	42	—1	54
Cr7617	2	94	—2	41	5	91	—2	36	43	3	26
WF9xOh51A (dent corn)	—	94	0	55	—7	76	0	37	40	1	31
Salute	1	97	—3	38	3	84	—2	38	50	—2	68
W9625	5	99	—5	32	6	83	—2	39	42	2	28
RXP201	7	98	—3	39	5	91	—2	40	54	0	62
70-2049	8	96	—1	42	0	90	—2	41	56	—1	69
1	4	99	—3	45	1	78	0	42	34	2	16
EXP32350	3	99	—4	39	1	76	—1	43	47	—1	59
H445	5	100	—4	43	1	73	1	44	45	3	30
W7015	5	98	—6	36	5	89	—2	45	54	—1	66
RXP218	7	98	—5	40	2	83	—1	46	42	2	28
74-3044	8	95	1	45	—2	92	—2	47	47	1	47
Jubilee	8	99	—4	46	2	78	0	48	39	2	24
4	4	99	—6	42	1	75	0	48	43	1	35

*1 = Asgrow Seed Co., 2 = Crookham Co., 3 = Del Monte Corp., 4 = Green Giant Co., 5 = Joseph Harris Co., 6 = Northrup, King & Co., 7 = Robson Seed Farms Corp., 8 = Rogers Brothers Seed Co.

†The rating index is the number of times the entry was equal to the most susceptible entry subtracted from the number of times it was equal to the most resistant entry for all statistically significant observations made at about 3 and 5 weeks after inoculation or exposure to the viruses or virus strains. The percent values are based on the last observations only. Numbers in parentheses above individual columns are the numbers of values contributing to the means in the respective columns.

‡The ranking is based on the mean rank of both percentage and rating index values.

TABLE 3 (Continued).—Summary of Response of Sweet Corn Hybrids to Infection by MDMV and MCDV in Ohio in 1977.

Entry	Company Submitting Entry*	Mean Percent Infection, Rating Index (RI [†]), and Ranking [‡] for									
		MDMV						MCDV			
		Aphid Inoculation						Leafhopper Inoculation			
		Mechanical Inoculation		Corn Source		Johnsongrass Source		Johnsongrass Source			
% (5)	RI (6)	% (4)	RI (8)	% (2)	RI (2)	Rank	% (2)	RI (4)	Rank		
Seneca Chief	—	96	0	54	—5	84	—1	50	44	1	41
Cr7614	2	99	—3	40	2	87	—1	51	30	4	2
Golden Cross Bantam	—	98	—3	47	0	83	—1	52	59	—1	71
Wintergreen	1	99	—4	38	—2	78	—1	53	53	0	61
NK199	6	97	—2	43	—1	96	—2	54	42	1	34
Calico	1	99	—6	48	—3	74	1	55	40	1	31
75-2084	8	98	—3	48	—5	83	—1	56	50	1	52
Commander	1	98	—2	47	—3	86	—2	57	51	1	55
Merit	1	100	—6	42	3	78	—1	58	35	2	17
RXP204	7	97	—1	55	—6	86	—2	59	41	2	27
XP2500	1	99	—6	46	—3	78	0	60	36	2	20
Cr7619	2	98	—2	59	—7	83	—2	61	54	0	62
RXP232	7	98	—3	50	—4	89	—2	62	41	0	43
Capitan	1	99	—6	46	—1	84	—1	63	43	1	35
Seneca Scout	7	99	—5	43	—1	89	—2	64	45	1	45
Guardian	1	98	—5	53	—3	89	—2	65	40	3	17
75-2591	8	99	—3	52	—7	91	—2	66	46	1	46
Cr7701	2	99	—4	48	—3	92	—2	67	34	4	4
XP2501 B.C.	1	98	—5	57	—4	92	—2	68	37	3	9
XP2527	1	100	—6	49	—2	87	—2	69	43	0	49
Apache	1	100	—6	51	—2	87	—2	70	49	0	58
Sweet Sue	5	100	—6	59	—8	81	—1	71	35	2	17
XP2529 B.C.	1	99	—6	51	—6	93	—2	72	38	3	10
XP372	1	99	—4	65	—8	94	—2	73	57	—3	76
RXP207	7	99	—6	55	—5	97	—2	74	47	1	47
WH1235	5	100	—5	52	—8	91	—2	75	40	1	31
EXP31071	3	100	—6	70	—8	97	—2	76	68	—1	73
Mean		97.3	—3.0	42.7	1.0	77.8	—3		43.2	1.0	

*1 = Asgrow Seed Co., 2 = Crookham Co., 3 = Del Monte Corp., 4 = Green Giant Co., 5 = Joseph Harris Co., 6 = Northrup, King & Co., 7 = Robson Seed Farms Corp., 8 = Rogers Brothers Seed Co.

†The rating index is the number of times the entry was equal to the most susceptible entry subtracted from the number of times it was equal to the most resistant entry for all statistically significant observations made at about 3 and 5 weeks after inoculation or exposure to the viruses or virus strains. The percent values are based on the last observations only. Numbers in parentheses above individual columns are the numbers of values contributing to the means in the respective columns.

‡The ranking is based on the mean rank of both percentage and rating index values.

plants in this most resistant group became infected. This was only 5.3% less than the average amount of infected plants in the most susceptible group. Hybrids of the most resistant group appeared relatively less susceptible when inoculated by aphids. In the six aphid-inoculated plots, they averaged 37% less MDMV infection than the most susceptible group. This differential response between mechanical and aphid inoculation suggested that the resistance of the seven best entries should be attributed more to "aphid resistance" than to "virus resistance".

The entries most resistant to maize chlorotic dwarf were Sugar Loaf, Crookham Cr7614, Northrup-King NK51036, Comanche, Crookham Cr7701, Del Monte EXP31001, Harmony, and Asgrow

SP2513 B.C. These entries averaged 31% infection when inoculated naturally by leafhoppers at two locations compared with an average of 57% in the seven most susceptible entries (Asgrow XP372, Rogers Brothers 72-2093, Aztec, Del Monte EXP31071, Golden Cross Bantam, Del Monte EXP37810, and Joseph Harris YW1465). Since MCDV can only be vector-inoculated, it was not possible to distinguish between virus resistance and vector resistance in the corn entries.

Only one hybrid, Northrup-King NK51036, ranked in the most resistant group for both maize dwarf mosaic and maize chlorotic dwarf. Del Monte EXP31071 and Asgrow XP372 were consistently among the most susceptible.

TABLE 4.—Yield of Marketable Ears from Sweet Corn Hybrids Mechanically Inoculated with One of Five Strains of MDMV at Wooster, Ohio, in 1977.

Entry	Company Submitting Entry*	Rank†	Mean Percentage of Total Ear Production‡ from Plants Inoculated with Strain				
			A	B	D	E	F
Sundance	5	1	100 (1)	67 (1)	72 (1)	65 (1)	60 (1)
Harmony	5	2	83 (1)	55 (2)	72 (1)	88 (1)	56 (1)
Cherokee	1	3	50 (3)	92 (1)	58 (1)	83 (1)	63 (1)
Cr7617	2	4	59 (1)	97 (1)	39 (3)	76 (1)	56 (1)
75-1719	8	5	80 (1)	47 (2)	43 (3)	93 (1)	49 (1)
Jubilee	8	6	22 (4)	78 (1)	83 (1)	55 (1)	50 (1)
RXP207	7	6	73 (1)	54 (2)	53 (1)	50 (3)	58 (1)
XP2527	1	8	27 (4)	87 (1)	60 (1)	77 (1)	40 (3)
Gold Winner	5	9	72 (1)	51 (2)	60 (1)	67 (1)	12 (4)
Salute	1	10	48 (3)	52 (2)	72 (1)	69 (1)	37 (3)
WH1235	5	10	27 (4)	50 (2)	62 (1)	63 (1)	57 (1)
Guardian	1	10	17 (4)	76 (1)	43 (3)	96 (1)	46 (1)
Gold Cup	—	13	67 (1)	50 (2)	56 (1)	75 (1)	8 (4)
H745	5	14	69 (1)	23 (4)	60 (1)	75 (1)	36 (3)
72-2093	8	15	59 (1)	31 (4)	63 (1)	71 (1)	36 (3)
Apache	1	16	56 (4)	60 (1)	87 (1)	54 (3)	34 (3)
75-1766	8	17	67 (1)	38 (4)	52 (1)	51 (3)	47 (1)
Merit	1	18	27 (4)	89 (1)	61 (1)	43 (4)	56 (1)
Seneca Star	7	19	62 (1)	34 (4)	62 (1)	74 (1)	19 (3)
RXP232	7	20	17 (4)	69 (1)	55 (1)	68 (1)	37 (3)
RXP204	7	21	0 (4)	71 (1)	92 (1)	46 (4)	46 (1)
Wintergreen	1	22	44 (3)	39 (4)	80 (1)	64 (1)	25 (3)
W7015	5	23	62 (1)	40 (4)	58 (1)	74 (1)	6 (4)
Capitan	1	24	45 (3)	39 (4)	87 (1)	62 (1)	16 (4)
Reliance	6	25	45 (3)	62 (1)	23 (4)	56 (1)	33 (3)
WH115	5	26	61 (1)	37 (4)	66 (1)	29 (4)	41 (3)
Seneca Scout	7	27	11 (4)	63 (1)	77 (1)	44 (4)	20 (3)
Bellringer	3	28	48 (3)	51 (2)	37 (4)	52 (3)	30 (3)
Sugar Loaf	6	29	3 (4)	32 (4)	77 (1)	56 (1)	29 (3)
75-2084	8	30	0 (4)	44 (2)	58 (1)	69 (1)	16 (4)
RXP217	7	31	71 (1)	5 (4)	60 (1)	53 (3)	6 (4)
Comanche	1	32	31 (4)	9 (4)	71 (1)	58 (1)	19 (3)
Cr7612	2	33	37 (4)	43 (2)	67 (1)	25 (4)	29 (3)
W9625	5	34	20 (4)	8 (4)	81 (1)	79 (1)	12 (4)
RXP218	7	35	61 (1)	6 (4)	52 (1)	37 (4)	22 (3)
66-2327	8	35	25 (4)	11 (4)	53 (1)	44 (4)	63 (1)
EXP37810	3	37	38 (4)	55 (2)	47 (3)	46 (4)	38 (3)
XP2501 B.C.	1	38	0 (4)	70 (1)	40 (3)	47 (3)	24 (3)
Spring Gold	5	39	—	60 (1)	24 (4)	53 (3)	12 (4)
74-3044	8	40	45 (3)	42 (2)	34 (4)	52 (3)	18 (4)
5841	5	41	12 (4)	9 (4)	68 (1)	50 (3)	37 (3)
XP2513 B.C.	1	42	10 (4)	43 (2)	3 (4)	55 (1)	42 (3)
Sweet Sue	5	42	23 (4)	43 (2)	10 (4)	83 (1)	10 (4)
YW1465	5	44	17 (4)	26 (4)	81 (1)	29 (4)	24 (3)
Yukon	6	45	30 (4)	49 (2)	11 (4)	60 (1)	11 (4)
Commander	1	46	23 (4)	44 (2)	20 (4)	48 (3)	38 (3)
NK199	6	47	13 (4)	23 (4)	48 (3)	73 (1)	13 (4)
H445	5	48	7 (4)	36 (4)	53 (1)	50 (3)	17 (4)

*1 = Asgrow Seed Co., 2 = Crookham Co., 3 = Del Monte Corp., 4 = Green Giant Co., 5 = Joseph Harris Co., 6 = Northrup, King & Co., 7 = Robson Seed Farms Corp., 8 = Rogers Brothers Seed Co.

†The final ranking values give equal weight to the ranked mean of the percentage values and the ranked mean of the statistical rating.

‡Means followed by the same number (statistical rating) are not significantly different at the 5% level using Duncan's New Multiple Range Test and arcsin [square root (%)] transformed data. Further: 1 = not significantly different from most resistant entry; 2 = intermediate in resistance, significantly different from most resistant and most susceptible entries; 3 = intermediate in resistance but not significantly different from most resistant and most susceptible entries; 4 = not significantly different from most susceptible entry. LSD values are based on analyses of nontransformed data.

TABLE 4 (Continued).—Yield of Marketable Ears from Sweet Corn Hybrids Mechanically Inoculated with One of Five Strains of MDMV at Wooster, Ohio, in 1977.

Entry	Company Submitting Entry*	Rank†	Mean Percentage of Total Ear Production‡ from Plants Inoculated with Strain				
			A	B	D	E	F
XP2500	1	48	11 (4)	13 (4)	61 (1)	53 (3)	13 (4)
70-2049	8	50	33 (4)	9 (4)	13 (4)	60 (1)	23 (3)
Hallmark	6	51	0 (4)	33 (4)	3 (4)	58 (1)	35 (3)
Cr7619	2	52	23 (4)	40 (2)	44 (3)	39 (4)	13 (4)
Seneca Chief	—	53	33 (4)	25 (4)	61 (1)	36 (4)	0 (4)
4	4	54	43 (3)	0 (4)	24 (1)	32 (4)	3 (4)
NK51036	6	55	31 (4)	2 (4)	66 (1)	12 (4)	6 (4)
EXP31071	3	56	4 (4)	5 (4)	70 (1)	23 (4)	10 (4)
5	4	56	57 (3)	23 (4)	17 (4)	44 (4)	10 (4)
Cr7614	2	58	18 (3)	13 (4)	37 (4)	53 (3)	16 (4)
XP2529 B.C.	1	59	23 (4)	35 (4)	38 (3)	42 (4)	0 (4)
RXP214	7	60	5 (4)	52 (2)	8 (4)	20 (4)	25 (3)
EXP31001	3	61	21 (4)	0 (4)	56 (1)	22 (4)	0 (4)
EXP39941	3	61	23 (4)	33 (4)	44 (3)	33 (4)	3 (4)
RXP201	7	63	13 (4)	27 (4)	39 (3)	41 (4)	9 (4)
Aztec	1	64	0 (4)	26 (4)	7 (4)	53 (3)	25 (3)
2	4	65	20 (4)	6 (4)	40 (3)	6 (4)	21 (3)
RXP223	7	66	34 (4)	16 (4)	17 (4)	26 (4)	17 (4)
68-2578	8	67	13 (4)	7 (4)	13 (4)	20 (4)	20 (3)
Golden Cross Bantam	—	68	17 (4)	36 (4)	8 (4)	12 (4)	16 (4)
1	4	69	45 (3)	62 (1)	23 (4)	56 (1)	33 (3)
Calico	1	70	20 (4)	13 (4)	19 (4)	7 (4)	0 (4)
Cr7701	2	71	7 (4)	14 (4)	7 (4)	24 (4)	6 (4)
75-2591	8	72	6 (4)	3 (4)	8 (4)	22 (4)	0 (4)
EXP32350	3	73	10 (4)	0 (4)	0 (4)	19 (4)	7 (4)
3	4	74	4 (4)	4 (4)	7 (4)	7 (4)	0 (4)
XP372	1	75	3 (4)	0 (4)	9 (4)	0 (4)	7 (4)
WF9xOh51A (dent corn)			47 (3)	3 (4)	13 (4)	49 (3)	32 (3)
Mean			30.9	35.5	45.3	48.6	24.7
LSD (5%)			56.5	32.4	39.6	39.7	35.9

*1 = Asgrow Seed Co., 2 = Crookham Co., 3 = Del Monte Corp., 4 = Green Giant Co., 5 = Joseph Harris Co., 6 = Northrup, King & Co., 7 = Robson Seed Farms Corp., 8 = Rogers Brothers Seed Co.

†The final ranking values give equal weight to the ranked mean of the percentage values and the ranked mean of the statistical rating.

‡Means followed by the same number (statistical rating) are not significantly different at the 5% level using Duncan's New Multiple Range Test and arcsin [square root (%)] transformed data. Further: 1 = not significantly different from most resistant entry; 2 = intermediate in resistance, significantly different from most resistant and most susceptible entries; 3 = intermediate in resistance but not significantly different from most resistant and most susceptible entries; 4 = not significantly different from most susceptible entry. LSD values are based on analyses of nontransformed data.

Measurement of the yield of marketable ears is one method of evaluating virus-susceptible sweet corn hybrids for disease tolerance. Although hybrids immune to virus infection would be the most desirable for planting in areas where virus diseases are epiphytotic, virus-susceptible hybrids may also be suitable if the infected plants produce large proportions of marketable ears. Table 4 lists the 1977 yield results for 76 MDMV-inoculated sweet corn hybrids harvested in the green corn stage and visually rated for marketable ears. Significant yield differences among hybrids were apparent when plants were infected with each of the five MDMV strains. Although the

average disease incidence was 97% in the harvested plots, 37% of the total ear production was marketable. More marketable ears were produced by plants inoculated with strain E than strain F, suggesting that strain F was more damaging to sweet corn. Average percentages of marketable ears from Sundance (73%), Harmony (71%), Cherokee (69%), and Robson RXP207 (58%) were consistently higher than from Asgrow XP372 (4%). Other hybrids (Guardian and Robson RXP204) yielded many marketable ears from plants infected with one MDMV strain but few marketable ears when plants were infected with a different strain.

TABLE 5.—Average Yield Values for Sweet Corn Hybrids Mechanically Inoculated with Five MDMV Strains at Wooster, Ohio, in 1977.*

Entry	Company Submitting Entry†	Rank‡	Unhusked Ears per 10 Plants		Marketable Husked Ears				Maturity Rating**	Rating Index Mean					
			Number	Weight (g)	Percentage of Total Number		Total Weight (g)	Weight per Ear§ (g)			Length per Ear (cm)				
XP2527	1	1	10.0	—1	3405	4	58	2	1452	4	249	22	4	2.8	2.6
Jubilee	8	2	10.6	—1	3314	4	58	3	1316	4	215	21	2	2.4	2.4
RXP232	7	3	10.8	0	3132	2	49	2	1135	3	215	21	3	2.4	2.0
Apache	1	4	11.0	1	3178	3	58	2	1271	2	198	20	1	2.6	1.8
WH1235	5	5	11.6	1	3178	1	52	2	1044	2	173	20	2	2.0	1.6
Capitan	1	6	10.6	—1	3632	5	50	0	1135	0	215	22	3	2.8	1.4
Cherokee	1	6	10.0	—1	2814	—1	69	4	1362	4	198	20	1	2.6	1.4
Merit	1	6	10.6	—1	3405	3	55	1	1407	3	241	21	1	2.6	1.4
Sugar Loaf	6	9	12.4	4	3178	2	39	0	908	0	187	19	0	2.4	1.2
W9625	5	9	11.2	0	3223	3	40	—1	862	0	192	22	4	2.6	1.2
XP2501 B.C.	1	9	10.2	—2	3541	5	36	0	862	—1	235	22	4	2.6	1.2
XP2513 B.C.	1	9	10.4	—1	3677	5	31	—1	817	0	252	22	4	2.6	1.2
Commander	1	13	10.6	—1	3495	4	35	—2	953	1	258	21	3	2.8	1.0
RXP204	7	13	10.8	0	3450	3	51	1	1089	0	198	20	1	2.8	1.0
W7015	5	13	10.2	—1	3223	1	48	1	1044	2	212	20	2	2.6	1.0
66-2327	8	13	11.6	2	3223	2	39	—1	771	0	170	20	2	1.8	1.0
75-1766	8	13	11.0	—1	2951	1	51	2	1135	3	201	19	0	2.0	1.0
Guardian	1	18	10.2	—2	3223	1	56	2	1180	1	207	20	2	2.6	0.8
Gold Cup	—	19	11.6	2	2587	—2	51	2	953	1	161	19	0	2.2	0.6
C7617	2	19	10.6	0	2633	—1	65	4	1089	1	158	18	—1	2.0	0.6
5841	5	19	11.0	1	3132	0	35	—1	953	0	246	22	3	2.8	0.6
72-2093	8	19	11.0	1	3041	1	52	2	1180	0	207	19	—1	1.8	0.6
Salute	1	23	10.4	—1	2905	0	56	2	1135	2	195	19	—1	2.6	0.4
WH115	5	23	12.6	2	3268	3	47	0	1044	0	175	18	—3	2.0	0.4
75-2084	8	23	10.6	—1	2905	0	37	0	953	0	244	21	3	2.6	0.4
RXP214	7	26	11.6	1	3586	4	22	—3	499	—4	190	21	3	2.6	0.2
Sundance	5	27	10.2	—1	2542	—4	73	5	1225	—3	164	16	—3	2.0	0
Wintergreen	1	27	10.6	—2	2860	0	50	1	908	—1	170	20	2	2.2	0
H745	5	27	10.8	0	2860	—2	53	2	908	0	158	19	0	2.0	0
XP2529 B.C.	1	27	10.4	—2	3495	4	28	—4	635	—2	218	22	4	2.4	0
74-3044	8	27	11.4	1	3495	4	38	—2	998	0	229	20	1	2.4	0
Hallmark	6	32	10.0	—2	3268	3	26	—2	590	—2	227	20	2	2.6	—0.2
Harmony	5	32	9.4	—1	2678	—3	71	4	1089	2	164	17	—3	2.0	—0.2
EXP39941	3	32	10.6	0	3405	4	27	—4	590	—3	207	20	2	2.2	—0.2
H445	5	32	11.6	1	3132	1	33	—2	681	—3	178	20	2	2.4	—0.2
RXP207	7	32	10.4	—1	2678	—1	58	3	953	0	158	18	—2	2.2	—0.2
RXP217	7	32	11.8	1	2814	0	39	0	817	1	178	17	—3	2.0	—0.2
YW1465	5	32	10.6	0	3132	2	35	—2	681	—2	184	20	1	2.0	—0.2
Seneca Scout	7	39	11.0	0	2951	—1	43	0	862	0	181	18	—1	2.6	—0.4
EXP31001	3	39	10.6	—3	3586	4	20	—3	454	—2	215	20	2	2.2	—0.4
Gold Winner	5	41	10.8	—1	2678	—3	52	2	862	—2	153	19	1	2.0	—0.6
2	4	41	10.8	—1	3178	3	19	—3	408	—4	198	21	2	2.6	—0.6
NK51036	6	43	10.4	—1	2678	—1	23	—3	454	—2	190	20	1	2.0	—0.8
75-1719	8	43	9.4	—3	2360	—5	62	3	1135	0	195	19	1	2.2	—0.8
75-2591	8	43	10.2	—1	3314	4	8	—5	181	—5	221	22	3	2.6	—0.8
EXP32350	3	46	11.0	0	3314	4	7	—5	181	—5	235	20	1	2.8	—1.0
XP372	1	46	10.2	—2	3314	4	4	—5	90	—5	221	21	3	2.8	—1.0
XP2500	1	46	10.2	—1	2814	—1	30	—2	635	—1	207	20	0	2.2	—1.0
1	4	46	10.6	0	2996	2	15	—5	408	—5	258	21	3	2.4	—1.0
70-2049	8	46	10.4	—1	2769	—1	28	—2	635	—2	218	19	1	2.2	—1.0

*Values are based on means from five plots, each inoculated with one of five MDMV strains. The positive or negative numbers following the means are rating index values. The rating index value is the number of times the hybrid entry was equal to the poorest entry subtracted from the number of times it was equal to the best entry for all statistically significant comparisons in each category of evaluation. There were four significant comparisons in the number of unhusked ears and length of marketable husked ears categories, and five significant comparisons in the other three categories of evaluation.

†1 = Asgrow Seed Co., 2 = Crookham Co., 3 = Del Monte Corp., 4 = Green Giant Co., 5 = Joseph Harris Co., 6 = Northrup, King & Co., 7 = Robson Seed Farms Corp., 8 = Rogers Brothers Seed Co.

‡The ranking is based on the rating index mean.

§Calculated value based on number of unhusked ears and percentage and weight of marketable husked ears.

**Maturity rating values: 1 = ears undermature, 2 = ears mature, 3 = ears overmature.

TABLE 5 (Continued).—Average Yield Values for Sweet Corn Hybrids Mechanically Inoculated with Five MDMV Strains at Wooster, Ohio, in 1977.*

Entry	Company Submitting Entry†	Rank‡	Unhusked Ears per 10 Plants		Marketable Husked Ears							Rating Index Mean
			Number	Weight (g)	Percentage of Total Number	Total Weight (g)	Weight per Ear§ (g)	Length per Ear (cm)	Maturity Rating**			
Calico	1	51	9.8 —2	3268 3	12 —5	317 —4	269	21 2	2.6	—1.2		
Seneca Star	7	51	9.8 —2	2542 —4	50 2	817 —1	167	18 —1	1.6	—1.2		
EXP37810	3	51	10.6 —1	2633 —3	45 —2	908 —1	190	20 1	2.0	—1.2		
Comanche	1	54	10.6 —1	2315 —5	38 0	590 —2	147	18 1	2.0	—1.4		
NK199	6	54	10.0 —1	2542 —2	34 —2	681 —2	201	19 0	2.4	—1.4		
Sweet Sue	5	56	10.0 —2	2724 —3	34 —2	635 —2	187	20 1	2.6	—1.6		
RXP201	7	56	10.8 0	2996 2	26 —4	499 —5	178	18 —1	2.6	—1.6		
RXP218	7	56	10.2 —3	2633 —2	36 0	635 —2	173	18 —1	2.0	—1.6		
RXP223	7	56	10.6 —2	3087 1	22 —5	499 —4	215	20 2	2.6	—1.6		
Seneca Chief	—	60	10.6 —2	2678 —3	31 —3	635 —2	192	20 1	3.0	—1.8		
68-2578	8	60	11.0 0	2951 1	15 —4	317 —5	192	18 —1	2.2	—1.8		
Bellringer	5	62	11.2 0	2678 —3	44 —1	681 —4	139	17 —2	1.6	—2.0		
Cr7701	2	62	10.2 —1	2814 —1	12 —5	272 —5	221	20 2	2.6	—2.0		
Reliance	6	64	9.8 —2	2133 —5	44 1	681 —3	158	18 —2	2.0	—2.2		
Yukon	6	64	10.2 —2	2360 —5	32 —2	499 —3	153	20 1	2.0	—2.2		
Cr7614	2	64	10.4 —2	2678 —3	27 —4	544 —3	192	19 1	2.4	—2.2		
Cr7612	2	67	9.8 —3	2406 —4	40 —1	681 —4	173	18 0	2.6	—2.4		
EXP31071	3	67	8.4 —4	2315 —1	22 —3	499 —3	269	18 —1	2.2	—2.4		
4	4	67	10.4 —1	2678 —4	20 —4	454 —4	218	20 1	2.0	—2.4		
Aztec	1	70	10.2 0	2270 —4	22 —3	454 —3	201	17 —3	2.0	—2.6		
Spring Gold	5	70	9.8 —2	1997 —4	37 —1	635 —3	175	16 —3	2.3	—2.6		
Golden Cross Bantam	—	72	10.2 —2	2678 —4	18 —5	317 —4	173	19 1	2.4	—2.8		
5	4	72	10.0 —2	2451 —5	30 —4	635 —3	212	19 0	2.0	—2.8		
Cr7619	2	74	10.0 —2	2088 —5	32 —3	544 —4	170	18 —2	2.8	—3.2		
3	4	74	9.2 —4	2406 —5	4 —5	90 —5	246	21 3	2.4	—3.2		
WF9xOh51A (dent com)	—		10.2 —3	3677 5	29 —2	908 1	306	24 4	2.6	1.0		
Mean			10.5	2951	37.0	771	198	20	2.3			

*Values are based on means from five plots, each inoculated with one of five MDMV strains. The positive or negative numbers following the means are rating index values. The rating index value is the number of times the hybrid entry was equal to the poorest entry subtracted from the number of times it was equal to the best entry for all statistically significant comparisons in each category of evaluation. There were four significant comparisons in the number of unhusked ears and length of marketable husked ears categories, and five significant comparisons in the other three categories of evaluation.

†1 = Asgrow Seed Co., 2 = Crookham Co., 3 = Del Monte Corp., 4 = Green Giant Co., 5 = Joseph Harris Co., 6 = Northrup, King & Co., 7 = Robson Seed Farms Corp., 8 = Rogers Brothers Seed Co.

‡The ranking is based on the rating index mean.

§Calculated value based on number of unhusked ears and percentage and weight of marketable husked ears.

**Maturity rating values: 1 = ears undermature, 2 = ears mature, 3 = ears overmature.

Significant differences among hybrids in total weight of ears rated as marketable were also apparent in each of the five strain-inoculated plots. These and additional yield-related data are summarized in Table 5. Based on a total weight measurement, only Cherokee, Jubilee, Merit, Robson RXP232, and Asgrow XP2527 were statistically similar to the best yielding hybrids when infected with each of the five MDMV strains. These hybrids averaged 132 g of marketable ears per plant compared to a 5-plot, 76-entry average of 77 g. The poorest hybrids, Green Giant 3 and Asgrow XP372, produced only 9 g of marketable ears per plant.

In Table 5 the hybrids were ranked with a rating index system that placed equal value on the number of unhusked ears, weight of unhusked ears, per-

centage of marketable husked ears, total weight of marketable husked ears, and length of marketable husked ears. On this basis the eight most productive hybrids in 1977 were Asgrow XP2527, Jubilee, Robson RXP232, Apache, Joseph Harris WH1235, Cherokee, Merit, and Capitan (last three tied for 6th ranking). The nine least productive hybrids were Green Giant 3, Crookham Cr7619, Golden Cross Bantam, Green Giant 5, Spring Gold, Aztec, Green Giant 4, Crookham Cr7612, and Del Monte EXP-31071 (last three tied for 67th ranking). The most productive hybrids had 9% more unhusked ears, 37% more weight of unhusked ears, a 2.2-fold higher percentage of marketable ears, a 2.6-fold higher total weight of marketable ears, 4% higher weight per ear, and 13% greater ear length than the least productive

hybrids. Since the average maturity index of the most productive group was 10% higher (more mature) than the average maturity index of the least productive group, the actual yield advantage of the most productive group may be more in the order of a calculated 2.5-fold higher total weight of marketable ears, rather than the 2.6-fold factor listed above. Actual yield loss due to virus infection was not measured since not enough healthy plants were available for the comparison.

1978 Experiments

Since all sweet corn hybrids tested in 1977 were highly susceptible to MDMV, an additional attempt was made in 1978 to identify resistance in other commercial and experimental hybrids. A few hybrids were included both years to permit year-to-year comparisons.

Results of the virus resistance trials in 1978 are listed in Table 6. Disease incidence was similar in the 1977 and 1978 trials when plants were mechanically inoculated with MDMV-A; 99.9% of the plants in the 15 hybrids tested both years were infected. All plants in 85 hybrids inoculated with MDMV-A in 1978 had typical mosaic symptoms. Only six sweet corn entries had significantly less than 100% infection. Green Giant 8 and Robson Su1503 appeared to have appreciable resistance to MDMV-A. However, Green Giant 8 had only a 12% stand while Su1503 was an open pollinated tropical variety, phenotypically more similar to a dent corn hybrid than a sweet corn hybrid. The other four less susceptible hybrids, Del Monte 55323, Northrup-King S29074, Robson B85, and Robson's Seneca RXP258, averaged 86% infection, with Robson B85 having only a 7% stand in this planting.

In the 1978 planting containing strain B-inoculated plants, the average incidence was about 14% less than in the 1978 strain A-inoculated planting and a similar 14% less than the 1977 strain B-inoculated planting. This lower infection level in 1978 may have been the result of less favorable conditions for plant growth and infection on the inoculation dates. In this planting, 27 sweet corn entries were statistically similar to the least susceptible entry. However, these entries averaged 67% infection and were just as susceptible to MDMV-B as the dent corn hybrid check. The three best hybrids, Ferry-Morse 2257 x 2256-76, Robson Seneca RXP258, and Agway XP-833701, had less than 50% of their plants infected with MDMV-B. Another 12 entries with an 81% infection average had significantly more virus infection than the best entry, but less infection than the poorest entries. The 59 most susceptible sweet corn hybrids averaged 92% infection.

In southern Ohio, under conditions of natural vector inoculation, more maize chlorotic dwarf than maize dwarf mosaic was apparent in the sweet corn hybrids in 1978. The opposite had occurred in 1977. In 1978, 21 sweet corn entries exhibited some resistance to MDMV (average 23% infection), while another 37 entries had significantly less maize dwarf mosaic than the poorest entry but significantly more than the best entry. The 37 intermediate entries averaged 45% infection and the remaining 40 poorest entries averaged 66% infection. Only three entries in the best group, Green Giant 8, Northrup-King S.29111, and Robson Su1503, had significantly less maize dwarf mosaic than the dent corn hybrid check. These three entries averaged less than 8% MDMV infection. The Green Giant 8 hybrid had a closer to normal plant stand in this plot than in the two plots at Wooster. Green Giant 8 and Robson Su-1503 were also among the better entries in both the mechanically inoculated plots. The six entries in the most resistant group in the plot inoculated with MDMV-A at Wooster were also in the most resistant group in southern Ohio.

Most of the maize dwarf mosaic in southern Ohio has been caused by strain A (21); frequently 10-15% of the plants showing maize dwarf mosaic symptoms contain MDMV-B. However, in this southern area in 1978, assays of 66 corn plants revealed all were infected with strain A and none contained strain B.

The incidence of MCDV was about the same in 1977 and 1978 in the Portsmouth sweet corn plot. However, data for this virus disease were not significant in 1978; infection in different hybrids ranged from a low of 23% to a high of 100%.

The disease rating values (Table 6) reflect the resistance or tolerance of the hybrids to both maize dwarf mosaic and maize chlorotic dwarf. All of the sweet corn entry rows rated above 3, indicating that disease symptoms were apparent on most of the plants. About 50% of the hybrids rated 6.5 or below, significantly better than the poorest rated entries. The best rated hybrids were Robson Su1503 and Silver Queen; the poorest rated hybrids were Gold Crest, Ferry-Morse 2257 x 2256-76, Joseph Harris H12266-2347, and Seneca Chief. The six sweet corn entries that were the least susceptible to mechanical inoculation of MDMV-A at Wooster rated 4 to 5 in this naturally inoculated plot. Since MDMV-B was not a significant factor in the virus population in this plot area in 1978, the favorable reaction of Ferry-Morse 2257 x 2256-76 to strain B inoculation at Wooster was of little consequence in the survival of this hybrid at Portsmouth. In this naturally inoculated planting, an average rating of 6.7

TABLE 6.—Reaction of Sweet Corn Hybrids to Mechanical Inoculation of MDMV-A and MDMV-B at Wooster and Natural Inoculation of MDMV at Portsmouth, Ohio, in 1978.*

Entry	Company Submitting Entry†	Rank‡	Percentage of Plants Infected with§			Virus Disease Rating**	Rating Index Mean††
			MDMV-A	MDMV-B	MDMV		
8	7	1	33 (1)	67 (1)	5 (1)	4.5 (1)	4
RXP258	11	2	87 (2)	45 (1)	27 (1)	5.0 (1)	3
Sul503	11	2	25 (1)	89 (4)	9 (1)	4.0 (1)	2
55323	4	4	74 (2)	84 (2)	36 (1)	4.5 (1)	2
Silver Queen	12	5	100 (4)	76 (1)	20 (1)	4.0 (1)	2
B85	11	6	89 (2)	100 (4)	12 (1)	5.0 (1)	1
4	7	7	100 (4)	74 (1)	30 (1)	5.0 (1)	2
55501	4	8	95 (4)	72 (1)	35 (1)	6.5 (2)	1
XP833701	1	8	100 (4)	47 (1)	30 (1)	7.5 (4)	0
10	7	10	100 (4)	87 (4)	14 (1)	5.0 (1)	0
55661	4	10	98 (4)	83 (2)	20 (1)	6.5 (2)	0
S.29074	10	12	93 (2)	90 (4)	22 (1)	4.5 (1)	1
37031-10205	10	13	100 (4)	74 (1)	32 (1)	6.5 (2)	1
RXP257	11	14	98 (4)	70 (1)	34 (1)	7.0 (4)	0
S.29111	10	15	100 (4)	98 (4)	9 (1)	5.0 (1)	0
RXP261	11	16	100 (4)	77 (1)	40 (2)	5.5 (1)	1
RXP255	11	17	99 (4)	97 (4)	16 (1)	4.5 (1)	0
BE1266-917	8	18	100 (4)	70 (1)	44 (2)	6.5 (2)	0
XP2541BC	2	19	98 (4)	87 (4)	32 (1)	5.5 (1)	0
Seneca Star	11	20	100 (4)	64 (1)	38 (2)	8.5 (4)	—1
White Lightning	3	21	100 (4)	74 (1)	44 (2)	6.5 (2)	0
S.29077	10	23	100 (4)	94 (4)	28 (1)	4.5 (1)	0
S.29118	10	23	100 (4)	99 (4)	23 (1)	4.5 (1)	0
H12166-1647	8	25	100 (4)	59 (1)	48 (2)	8.5 (4)	—1
XP833702	1	26	100 (4)	50 (1)	57 (4)	6.5 (2)	—1
Early Fortune	1	27	100 (4)	69 (1)	41 (2)	8.0 (4)	—1
74-3045	12	28	100 (4)	83 (2)	42 (2)	5.5 (1)	0
S.29189	10	29	100 (4)	77 (4)	36 (2)	6.0 (1)	—1
Bonanza	5	30	100 (4)	86 (4)	28 (1)	6.5 (2)	—1
YW2036	8	31	100 (4)	72 (1)	45 (2)	7.5 (4)	—1
74-3044	12	31	100 (4)	71 (1)	56 (4)	6.0 (1)	0
Wintergreen	2	33	100 (4)	81 (2)	47 (2)	5.0 (1)	0
72-2945	12	33	100 (4)	73 (1)	55 (2)	6.5 (2)	0
E4220	5	35	100 (4)	64 (1)	54 (2)	7.0 (4)	—1
Illini-Xtra-Sweet	9	36	100 (4)	80 (4)	39 (2)	6.0 (1)	—1
NCX2028	6	37	100 (4)	80 (1)	41 (2)	7.0 (4)	—1
2387-73	5	38	100 (4)	92 (4)	30 (1)	6.5 (2)	—1
Jubilee	12	39	100 (4)	73 (1)	53 (2)	7.0 (4)	—1
RXP214	11	40	100 (4)	87 (4)	49 (2)	5.5 (1)	—1
XP2518	2	40	98 (4)	80 (1)	64 (4)	6.0 (1)	0
XP2534BC	2	42	100 (4)	91 (4)	39 (2)	4.5 (1)	—1
RXP259	11	43	100 (4)	85 (4)	46 (2)	4.5 (1)	—1
NCX2009	6	44	100 (4)	95 (4)	38 (2)	5.5 (1)	—1
Pageant	12	44	100 (4)	82 (2)	40 (2)	7.5 (4)	—2
2257x2256-76	5	46	100 (4)	45 (1)	79 (4)	9.0 (4)	—2
H1236-1337	8	47	100 (4)	80 (2)	45 (2)	8.5 (4)	—2
Resister	6	48	100 (4)	93 (4)	48 (2)	6.0 (1)	—1
Bullseye	5	49	100 (4)	61 (1)	68 (4)	8.0 (4)	—2
Guardian	2	50	100 (4)	92 (4)	39 (2)	6.5 (2)	—2
RXP256	11	51	100 (4)	98 (4)	46 (2)	6.0 (1)	—1
E4211	5	52	100 (4)	66 (1)	66 (4)	7.0 (4)	—2
H445	8	53	100 (4)	77 (1)	57 (4)	8.0 (4)	—2
NCX2020	6	54	100 (4)	87 (4)	48 (2)	6.5 (2)	—2
5	7	55	100 (4)	85 (4)	52 (2)	6.5 (2)	—2
74-1720	12	56	100 (4)	86 (4)	42 (2)	7.5 (4)	—3
XP855	1	57	100 (4)	86 (4)	56 (4)	6.0 (1)	—2
H1256-1227	8	58	100 (4)	90 (4)	43 (2)	8.5 (4)	—3
Southern Belle	8	58	100 (4)	88 (4)	56 (4)	6.0 (1)	—2
36888-10405	10	58	100 (4)	83 (2)	61 (4)	6.5 (2)	—2

TABLE 6 (Continued).—Reaction of Sweet Corn Hybrids to Mechanical Inoculation of MDMV-A and MDMV-B at Wooster and Natural Inoculation of MDMV at Portsmouth, Ohio, in 1978.*

Entry	Company Submitting Entry†	Rank‡	Percentage of Plants Infected with§			Virus Disease Rating**	Rating Index Mean††
			MDMV-A	MDMV-B	MDMV		
76-2944	12	58	100 (4)	85 (4)	48 (2)	7.0 (4)	—3
Golden Gleam	8	62	100 (4)	92 (4)	53 (2)	6.5 (2)	—2
H11666-2647	8	63	100 (4)	74 (2)	65 (4)	8.5 (4)	—3
S.29101	10	63	100 (4)	98 (4)	41 (2)	7.0 (4)	—3
Golden 80	1	65	100 (4)	94 (4)	48 (2)	8.5 (4)	—3
E4219	5	65	100 (4)	96 (4)	46 (2)	7.5 (4)	—3
3	7	65	100 (4)	93 (4)	57 (4)	5.5 (1)	—2
6	7	68	100 (4)	82 (2)	61 (4)	7.5 (4)	—3
Silver Treat	1	69	100 (4)	95 (4)	50 (2)	7.0 (4)	—3
Goldcrest	5	70	100 (4)	75 (1)	84 (4)	9.0 (4)	—2
CrMA7803	3	71	100 (4)	100 (4)	47 (2)	7.0 (4)	—3
Sugar Daddy	5	71	100 (4)	79 (2)	68 (4)	8.0 (4)	—3
7	7	71	100 (4)	89 (4)	58 (4)	6.5 (2)	—3
Capitan	2	74	100 (4)	95 (4)	67 (4)	5.5 (1)	—2
Golden Cross Bantam	—	75	100 (4)	86 (4)	50 (2)	7.5 (4)	—3
XP2539	2	76	100 (4)	97 (4)	51 (2)	7.5 (4)	—3
Stylepak	5	76	100 (4)	82 (2)	66 (4)	7.5 (4)	—3
Patriot	12	78	100 (4)	82 (2)	69 (4)	7.0 (4)	—3
S.29191	10	79	100 (4)	96 (4)	60 (4)	6.5 (2)	—3
Buttercorn	1	80	100 (4)	91 (4)	67 (4)	8.5 (4)	—3
Florida Stay Sweet	9	81	100 (4)	90 (4)	56 (4)	8.5 (4)	—4
56437	4	82	100 (4)	93 (4)	71 (4)	6.5 (2)	—3
Cherokee	2	83	100 (4)	87 (4)	63 (4)	8.0 (4)	—4
XP2527	2	84	100 (4)	91 (4)	77 (4)	6.5 (2)	—3
74-1763	12	85	98 (4)	95 (4)	60 (4)	7.5 (4)	—4
5125	10	86	100 (4)	93 (4)	63 (4)	7.5 (4)	—4
57103	4	87	100 (4)	90 (4)	67 (4)	7.5 (4)	—4
2	7	88	100 (4)	96 (4)	62 (4)	8.0 (4)	—4
9	7	89	100 (4)	98 (4)	62 (4)	8.0 (4)	—4
XP856	1	90	100 (4)	93 (4)	68 (4)	7.5 (4)	—4
Merit	2	91	99 (4)	97 (4)	66 (4)	7.5 (4)	—4
32350	4	91	100 (4)	92 (4)	70 (4)	7.5 (4)	—4
00895	4	93	100 (4)	97 (4)	66 (4)	7.0 (4)	—4
1	7	93	100 (4)	100 (4)	63 (4)	7.0 (4)	—4
H12266-2347	8	95	100 (4)	95 (4)	69 (4)	9.0 (4)	—4
Seneca Chief	—	95	100 (4)	89 (4)	75 (4)	9.0 (4)	—4
XP857	1	97	100 (4)	97 (4)	72 (4)	8.0 (4)	—4
lochief	—	98	100 (4)	97 (4)	87 (4)	7.5 (4)	—4
Butter and Sugar	—	99	100 (4)	95 (4)	94 (4)	8.5 (4)	—4
WF9xOh51A (dent corn)	—	22	100 (4)	81 (1)	44 (2)	5.0 (1)	1
Mean			97.8	84.0	49.1	6.7	
LSD (5%)			7.9	21.3	33.4	2.3	

*For plots inoculated with MDMV-A (A) and MDMV-B (B), respectively; planted A = 5/10, B = 5/11; inoculated A = 6/6 and 6/14-15, B = 6/9 and 6/15-16; plants observed for symptoms A = 7/20, B = 7/21. Portsmouth plot planted 5/25-26; plants observed for symptoms on 7/11; rows rated for disease on 8/23.

†1 = Agway, Inc., 2 = Asgrow Seed Co., 3 = Crookham Co., 4 = Del Monte Corp., 5 = Ferry-Morse Seed Co., 6 = FMC Corp., 7 = Green Giant Co., 8 = Joseph Harris Co., 9 = Illinois Foundation Seeds, Inc., 10 = Northrup, King & Co., 11 = Robson Seed Farms Corp., 12 = Rogers Brothers Seed Co.

‡The final ranking values give equal weight to the ranked mean of the percentage values and the ranked mean of the statistical rating.

§Means followed by the same number (statistical rating) are not significantly different at the 5% level using Duncan's New Multiple Range Test and arcsin [square root (%)] transformed data. Further: 1 = not significantly different from most resistant entry; 2 = intermediate in resistance, significantly different from most resistant and most susceptible entries; 3 = intermediate in resistance but not significantly different from most resistant and most susceptible entries; 4 = not significantly different from most susceptible entry. LSD values are based on analyses of nontransformed data.

**Used a 1-9 disease rating scale: 1 = healthy, 9 = dead or dying plant with no ear shoot. Based on observations of symptoms caused by MDMV and MCDV; an average of 66% of the plants were infected with MCDV.

††The rating index mean is the number of times the entry was equal to the most susceptible entry subtracted from the number of times it was equal to the most resistant entry for all statistically significant observations.

TABLE 7.—Average Yield Performance of Sweet Corn Entries Infected with MDMV-A at Wooster, Ohio, in 1977 and 1978.

Entry	Company Submitting Entry*	Rank†	All Ears‡		Marketable Ears§		
			Number per Plant	Length per Ear (cm)	Percentage	Weight per Ear (g)	Dozen per Acre
Capitan	1	1	1.1 (4)	21.3 (1)	70 (1)	238 (2)	1302
XP2527	1	2	1.0 (4)	21.3 (1)	54 (3)	272 (1)	945
Merit	1	3	1.1 (4)	19.8 (3)	53 (3)	275 (1)	985
RXP214	2	4	1.3 (1)	19.8 (3)	27 (4)	312 (1)	630
Guardian	1	5	1.1 (4)	20.3 (1)	56 (1)	221 (2)	1057
Jubilee	3	5	1.1 (4)	20.3 (3)	45 (3)	235 (4)	811
74-3044	3	5	1.2 (1)	19.0 (4)	46 (4)	261 (1)	951
Cherokee	1	8	1.0 (4)	19.8 (3)	63 (3)	213 (4)	1100
Wintergreen	1	9	1.2 (4)	18.7 (4)	58 (3)	227 (2)	1207
Golden Cross Bantam	—	10	1.3 (1)	19.0 (3)	29 (4)	224 (4)	720
Seneca Chief	—	10	1.3 (1)	19.3 (4)	29 (4)	201 (4)	631
Mean			1.1	20.3	50	249	940

*1 = Asgrow Seed Co., 2 = Robson Seed Farms Corp., 3 = Rogers Brothers Seed Co.

†Final rank places equal weight on rankings each year of number of ears per plant, length of ears, percentage of marketable ears, and weight of marketable ears.

‡Means followed by the same number (statistical rating) are not significantly different at the 5% level using Duncan's New Multiple Range Test and arcsin [square root (%)] transformed data. Further: 1 = not significantly different from best entry, 2 = significantly different from best and from poorest entry, 3 = not significantly different from best and from poorest entry, 4 = not significantly different from poorest entry. The means are based on 2 years of data; the statistical rating values are based on 1978 data only.

was obtained from average maize dwarf mosaic and maize chlorotic dwarf incidences of 49% and 55%, respectively. In a similar experiment containing 46 commercial and experimental dent corn hybrids planted in this same plot area and rated for disease on the same day, an average rating of 3.1 was obtained from maize dwarf mosaic and maize chlorotic dwarf incidences of only 5% and 23%, respectively (10). Similar infection values were obtained from comparable sweet corn and dent corn plantings in this area in 1977 (9). These 3- to 10-fold higher incidences of virus disease in the sweet corn hybrid population emphasize the extreme vulnerability of sweet corn genotypes to losses caused by MCDV and MDMV, as compared with the more resistant or tolerant dent corn genotypes currently available.

Yield data based on 11 hybrids evaluated for MDMV tolerance suggest that for the 2 years at Wooster the hybrids tolerated MDMV better in 1978 than in 1977. An average of 66% marketable ears was produced in 1978 compared with only 30% in 1977. The ears were shorter but heavier and there were more per plant in 1978. Although four hybrids averaged 1.5 ears per plant in 1978, these were among the poorest hybrids in percentages and the numbers of marketable ears. Based on the 1978 data only, the greatest percentages of marketable ears were pro-

duced by Capitan and Guardian. Using a 2-year average for plants inoculated with MDMV-A only (Table 7), Capitan and Wintergreen had the highest yield and two selected standard sweet corn entries, Seneca Chief and Golden Cross Bantam, had the lowest yields and appeared to have the least tolerance to MDMV infection.

By placing equal weight on number of ears per plant, ear length, ear weight, and percentage of marketable ears for a 2-year period, Capitan and Asgrow XP2527 had the best yield performance from MDMV-A-infected plants.

Although actual yield losses were not measured in these studies, the number of marketable ears produced by six of the MDMV-infected sweet corn hybrids in Table 7 averaged only 16% less than the average produced from uninoculated plants in other yield trials conducted in Ohio in 1978 (3). The 2.4-fold higher yield from inoculated plants in 1978 as compared with 1977 may reflect seasonal variations that alter host plant physiology and allow them to better tolerate virus infection. As the season progressed in 1978, typical mosaic symptoms became less apparent and plants of many sweet corn hybrids appeared to recover from the disease. This emphasizes the need to evaluate hybrids for virus tolerance in more than one environment.

SUMMARY

One hundred fifty-eight commercial and experimental sweet corn hybrids were evaluated for resistance to at least two strains of maize dwarf mosaic virus and to maize chlorotic dwarf virus using mechanical or natural inoculation methods in the field. Many hybrids were also evaluated for tolerance to maize dwarf mosaic by measuring the yield of marketable ears from diseased plants.

No immunity to MDMV or MCDV was detected in the sweet corn hybrids. Almost all plants of all tested entries became infected with MDMV when the seedlings were mechanically inoculated with one of the MDMV strains.

Natural inoculation by insect vectors generally resulted in a relatively low incidence of maize dwarf mosaic and maize chlorotic dwarf. Although many of the plants escaped infection, this method did permit statistical comparisons among sweet corn entries and aided in selection of the least susceptible or most susceptible group of hybrids for individual viruses or virus strains.

In 1977, 37% of the ears from MDMV-infected plants were rated marketable. Commercially available hybrids that yielded the highest proportion of marketable ears from infected plants were Sundance, Harmony, Cherokee, and Jubilee. The lowest proportion of marketable ears was from Calico, Golden Cross Bantam, Aztec, and Seneca Chief. Based on the produced weight of marketable ears, hybrids that were the most tolerant to the MDMV strains were Merit, Cherokee, Jubilee, and Apache.

In 1978, Silver Queen was the most virus-tolerant commercial hybrid when compared to 98 sweet corn hybrids planted under conditions of natural inoculation of MDMV and MCDV in southern Ohio.

Based on 2-year yield averages from 11 MDMV-A-infected hybrids, the most marketable ears were obtained from Capitan and Wintergreen (1300 and 1200 dozen ears per acre, respectively); the lowest yielding hybrid (Seneca Chief) produced only about 630 dozen ears per acre.

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of research at the Ohio Agricultural Research and Development Center. All Ohioans benefit from this product.

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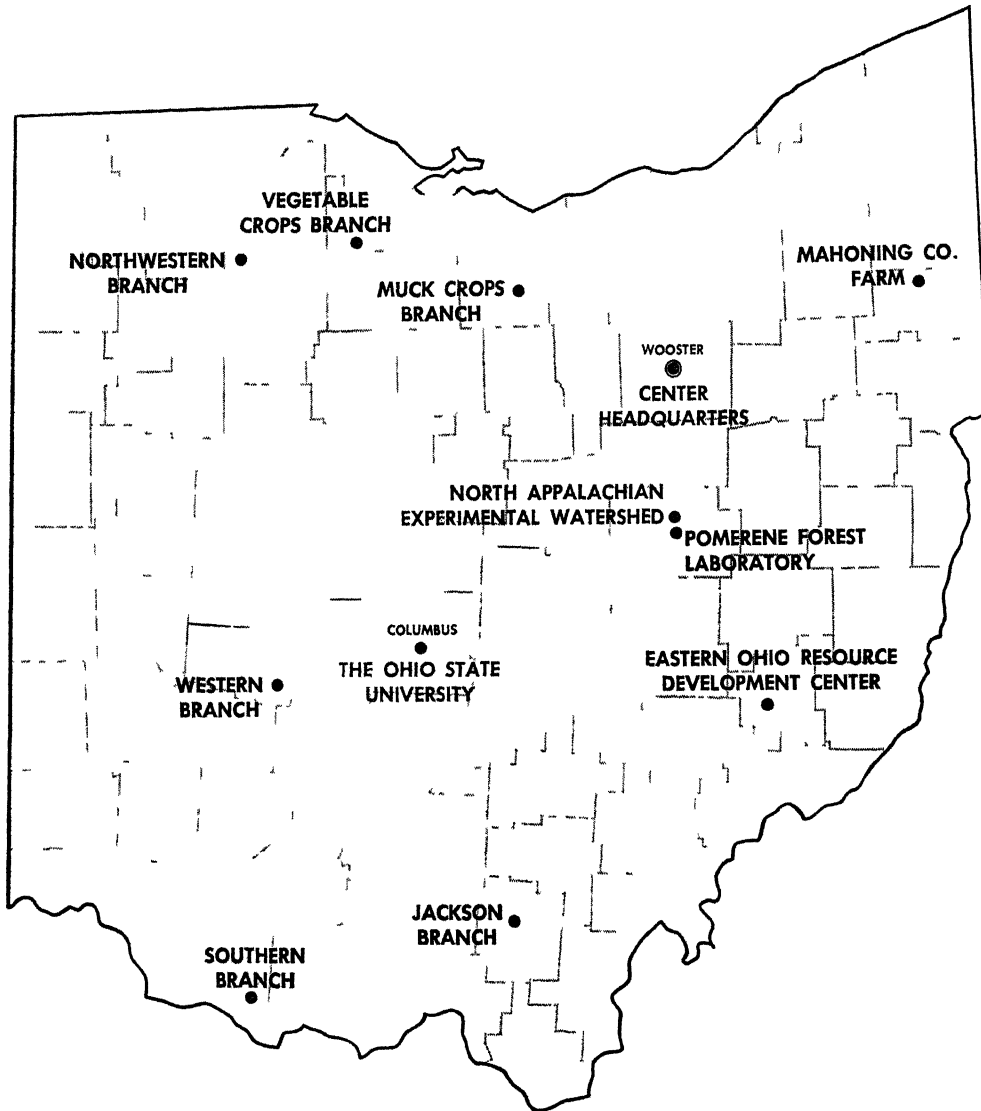
But the greatest benefits of agricultural research flow to the millions of Ohio consumers. They enjoy the end products of agricultural science—the world's most wholesome and nutritious food, attractive lawns, beautiful ornamental plants, and hundreds of consumer products containing ingredients originating on the farm, in the greenhouse and nursery, or in the forest.

The Ohio Agricultural Experiment Station, as the Center was called for 83 years, was established at The Ohio State University, Columbus, in 1882. Ten years later, the Station was moved to its present location in Wayne County. In 1965, the Ohio General Assembly passed legislation changing the name to Ohio Agricultural Research and Development Center—a name which more accurately reflects the nature and scope of the Center's research program today.

Research at OARDC deals with the improvement of all agricultural production and marketing practices. It is concerned with the development of an agricultural product from germination of a seed or development of an embryo through to the consumer's dinner table. It is directed at improved human nutrition, family and child development, home management, and all other aspects of family life. It is geared to enhancing and preserving the quality of our environment.

Individuals and groups are welcome to visit the OARDC, to enjoy the attractive buildings, grounds, and arboretum, and to observe first hand research aimed at the goal of Better Living for All Ohioans!

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Ohio's major soil types and climatic conditions are represented at the Research Center's 12 locations.

Research is conducted by 15 departments on more than 7000 acres at Center headquarters in Wooster, eight branches, Pomerene Forest Laboratory, North Appalachian Experimental Watershed, and The Ohio State University.

Center Headquarters, Wooster, Wayne County: 1953 acres

Eastern Ohio Resource Development Center, Caldwell, Noble County: 2053 acres

Jackson Branch, Jackson, Jackson County: 502 acres

Mahoning County Farm, Canfield: 275 acres

Muck Crops Branch, Willard, Huron County: 15 acres

North Appalachian Experimental Watershed, Coshocton, Coshocton County: 1047 acres (Cooperative with Science and Education Administration/Agricultural Research, U. S. Dept. of Agriculture)

Northwestern Branch, Hoytville, Wood County: 247 acres

Pomerene Forest Laboratory, Coshocton County: 227 acres

Southern Branch, Ripley, Brown County: 275 acres

Vegetable Crops Branch, Fremont, Sandusky County: 105 acres

Western Branch, South Charleston, Clark County: 428 acres