Maize Dwarf Mosaic Virus in Greece

P. C. PANAYOTOU, Plant Virologist, Plant Protection Research Institute, Ministry of Agriculture, Partas, Greece

ABSTRACT

PANAYOTOU, P. C. 1980. Maize dwarf mosaic virus in Greece. Plant Disease 64:803-804.

Maize dwarf mosaic virus was isolated from nine corn and 27 johnsongrass plants in corn fields in Achaia County in northwestern Peloponnese. All of the isolates were maize dwarf mosaic virus, strain A. Effects of the virus on height and stalk diameter of 10 commercial corn hybrids were determined.

Maize dwarf mosaic virus (MDMV) has worldwide distribution (8). It has been reported from Mediterranean countries, Spain (1), Italy (5), Turkey (2), Yugoslavia (6), and Bulgaria (7), all of which have weather conditions similar to those of Greece.

0191-2917/80/08080302/$03.00/0

This article concerns the first detection of MDMV in Greece. The virus was identified by symptomatology, host range, in vitro physical properties, and aphid transmissibility. No viruses of corn have previously been reported in Greece.

MATERIALS AND METHODS

Indicator plants were corn (*Zea mays* L. 'Pioneer 3369A' and 'IC 228'), sorghum (*Sorghum bicolor* L. 'Rio,' 'Atlas,' 'Sart,' and 'MN 1056'), johnsongrass (*S. halepense* (L.) Pers.), and wheat (*Triticum aestivum* L. 'Michigan Amber'). Seeds treated with organomercurial fungicide were provided by the Institute of Cereals, Thessaloniki, Greece, or by the National Seed Storage Laboratory of the U.S. Department of Agriculture. Plants were grown in steam-sterilized potting compost (7:3:2 by volume of loam, peat, and fine sand) in 9-cm plastic pots.

Inoculum was prepared by grinding leaves of virus-infected plants in 0.01 M phosphate buffer, pH 7.0. Indicator plants were dusted with 600-mesh Celite, rubbed with inoculum, and rinsed with distilled water.

Aphid transmission tests were done

with *Rhopalosiphum maydis* Fitch and *R. padi* L. and two isolates of the virus, MDMV-A(C) and MDMV-A(JG), from corn and johnsongrass plants, respectively. All aphids were apterous, late instars, and were starved for about 1 hr before acquisition feedings of 20 and 60 sec on discolored areas of detached leaves. Duration of the inoculation feeding was 24 hr, terminated by spraying with pirimicarb.

The thermal inactivation point was determined in two tests: samples of crude sap from infected IC 228 corn were exposed to 30–90 C temperatures at 10° increments and 50–60 C at 2° increments. Subsequently, inocula were rubbed onto IC 228 corn. The dilution end point was found by diluting the crude sap in 0.01 M phosphate buffer, pH 7.0, before inoculation to IC 228 corn.

Effects of MDMV-A(C) on plant height and stalk diameter were studied under field conditions with commercial corn hybrids Pioneer 3369A, IC 228, IC 870, IC 080, IC 042, IC 962, IC 079, OH-C-92, IC 20, and SC 46A. Plants were individually sown in plastic pots in the glasshouse.

One-hundred uniform plants of each hybrid were included in the test; 50 were manually inoculated and 50 were kept as controls. After symptoms appeared, seedlings were transplanted into the field. The lots of 50 plants per hybrid and treatment were transplanted at random in 20 subplots. Each subplot consisted of five 3-m rows of 10 plants, 0.75 cm apart. Treatment and hybrid plots were separated from adjacent plots and from the margins of the field by a 2-m passage.

All plants were sprayed twice a week with pirimicarb to control disease spread. When most of the hybrids were at a growth stage adequate for silage, plants were cut at ground level, and plant heights and stalk diameters were determined.

RESULTS AND DISCUSSION

MDMV was isolated from nine of 25 corn samples and 14 of 22 johnsongrass samples in 1979 and from 13 of 18 johnsongrass samples in 1980 collected from cornfields in Achaia County.

Symptomatology. Isolates from corn and johnsongrass produced similar symptoms on indicator plants.

Corn hybrids 3369A and IC 228 and johnsongrass showed intense systemic mosaic 6–8 days after inoculation and noticeable dwarfing 2 wk after inoculation.

On Atlas, Rio, Sart, and MN 1056, chlorotic lines developed into fine whitish striae in older leaves, and later scattered necrotic spots on leaves progressively coalesced to red stripes, followed by dwarfing of the plants.

No symptoms developed on Michigan Amber wheat, and virus was not detected by back inoculations to IC 228 corn. These results indicate that wheat streak mosaic virus was not involved (4).

Aphid transmission. Both MDMV-A(C) and MDMV-A(JG) were transmitted by *R. maydis* and *R. padi* in a nonpersistent manner (Table 1). In comparative transmission tests, *R. maydis* transmitted the virus after 20-sec acquisition feeding; *R. padi* requires 60 sec for acquisition. Bancroft et al (3) and Thongmeearkom et al (9) reported that *R. padi* was a more efficient vector of MDMV than was *R. maydis*. The transmission rates were consistent with those reported previously (3,9).

Physical properties. The thermal inactivation point and the dilution end point of both isolates in IC 228 corn sap were 56 C and 10^{-3} to 10^{-4}, respectively, and are consistent with those reported previously (5,7,8,10,11).

Effect of MDMV-A on growth of maize. Height of Pioneer 3369A, IC 228, IC 962, IC 042, and IC 20 plants and stalk diameter of Pioneer 3369A, IC 228, and IC 962 plants were reduced by MDMV infection (Table 2).

These results indicate that MDMV is widely spread in corn in northwestern Peloponnese and that it can be damaging to some corn hybrids.

Table 1. Efficiency of *Rhopalosiphum maydis* and *R. padi* in transmitting maize dwarf mosaic virus (MDMV) isolates to corn

Virus isolate[a]	Vector	Acquisition feeding[b] 20 sec	Acquisition feeding[b] 1 min
MDMV-A(C)	*R. maydis*	4/20[c]	1/10
	R. padi	0/19	2/10
MDMV-A(JG)	*R. maydis*	2/15	2/18
	R. padi	0/15	0/20

[a] MDMV-A(C) isolate from corn; MDMV-A(JG) isolate from johnsongrass.
[b] Preacquisition starving and inoculation access periods were constant, 1 and 24 hr, respectively.
[c] Infected/infested plants; one aphid per plant.

Table 2. Effect of maize dwarf mosaic virus infection on height and diameter of 10 commercial corn hybrids

Hybrid	Height (cm)[a,b] Infected	Height (cm)[a,b] Control	Stalk diameter (cm)[a,b] Infected	Stalk diameter (cm)[a,b] Control
Pioneer 3369A	183.7*	197.3	2.5*	2.7
IC 228	157.8*	201.5	2.1*	2.4
IC 870	148.6	155.5	1.9	2.0
IC 080	182.5	186.8	2.3	2.4
IC 042	142.5*	153.8	2.5	2.4
IC 962	165.5*	193.0	2.4*	2.8
IC 079	209.8	211.8	2.3	2.4
OH-C-92	205.0	205.8	2.6	2.7
IC 20	130.9*	144.8	2.1	2.0
SC 46A	197.2	205.1	3.0	2.9

[a] Means from 50 infected plants and 50 control plants.
[b] * indicates significant difference ($P = 0.05$) between infected and corresponding control plants.

LITERATURE CITED

1. ANONYMOUS. 1929. Work of the stations of agricultural phytopathology. The advisory service in connection with pests and diseases of cultivated plants in the year of 1927. Rev. Appl. Mycol. 8:152.
2. ANONYMOUS. 1956. Sugar cane diseases and their world distribution. Rev. Appl. Mycol. 36:275.
3. BANCROFT, J. B., A. J. ULLSTRUP, M. MESSIEHA, C. E. BRACKER, and T. E. SNAZELLE. 1966. Some biological and physical properties of a midwestern isolate of maize dwarf mosaic virus. Phytopathology 56:474-478.
4. BRAKKE, M. K. 1971. Wheat streak mosaic virus. Descriptions of Plant Viruses, No. 48. Commonw. Mycol. Inst., Kew, Surrey, England. 4 pp.
5. LOVISOLO, O. 1957. Contributo sperimentale alla conoscenza ed alla determinazione del virus agente dell'arrossamento striato del sorgo e di un mosaico del mais. Boll. Staz. Patol. Veg. Roma 14:261-321.
6. LOVISOLO, O., and M. ACIMOVIC. 1961. Sorghum red stripe disease in Yugoslavia. Rev. Appl. Mycol. 41:387.
7. MARKOV, M. 1964. Virus diseases of maize and sorghum in Bulgaria. Rastit. Zasht. 12:31-37.
8. PIRONE, T. P. 1972. Sugarcane mosaic virus. Descriptions of Plant Viruses, No. 88. Commonw. Mycol. Inst., Kew, Surrey, England. 4 pp.
9. THONGMEEARKON, P., R. E. FORD, and H. JEDLINSKI. 1976. Aphid transmission of maize dwarf mosaic virus strains. Phytopathology 66:332-335.
10. TOSIC, M., M. P. BENETTI, and M. CONTI. 1977. Studies on sugarcane mosaic virus (SCMV) isolates from northern and central Italy. Ann. Phytopathol. 9:387-393.
11. TOSIC, M., and R. E. FORD. 1974. Physical and serological properties of maize dwarf mosaic and sugarcane mosaic viruses. Phytopathology 64:312-317.