

UNIVERSITAT DE LLEIDA  
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EL VIRUS DEL MOSAICO ENANIZANTE DEL  
MAIZ (MDMV) EN CATALUÑA



TESIS DOCTORAL  
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Tabla 21. Medias de la altura de las plantas, en los cvs. Moltó, P-3183, AD-640, y reducciones de altura inducidos por la inoculación de MDMV en dos localidades y en dos años de estudio.

	Termens			Mas Badia		
	T	I	▼	T	I	▼
AD-640 a	184 a	<u>1990</u> 198 a	7,0	288 a	<u>1990</u> 265 b	7,9
P-3183 a	219 a	214 a	2,2	296 a	272 b	8,1
Moltó a	220 a	214 a	2,7	281 a	272 a	3,2
Inoculación	207 a	208 a	3,9	288 a	269 b	6,4
AD-640 b	184 a	<u>1991</u> 168 a	8,7	260 a	<u>1991</u> 257 a	1,1
P-3183 ab	190 a	187 a	1,5	280 a	266 b	5,0
Moltó a	194 a	190 a	2,0	266 a	260 a	2,0
Inoculación	189 a	181 a	3,4	268 a	261 b	2,7

Medias con la misma letra entre cultivares y inoculación dentro de una misma localidad no presentan diferencias a un nivel de significación  $\alpha < 0,05$  en la prueba de DUNCAN. Medias con la misma letra entre inoculados y testigos dentro de un mismo cultivar no presentan diferencias a un nivel de significación  $\alpha < 0,05$  con la prueba de la mínima diferencia significativa. T: testigo (no inoculados); I: inoculados; ▼: descensos relativos de altura de las plantas calculados según: [(I-T):T]x100;

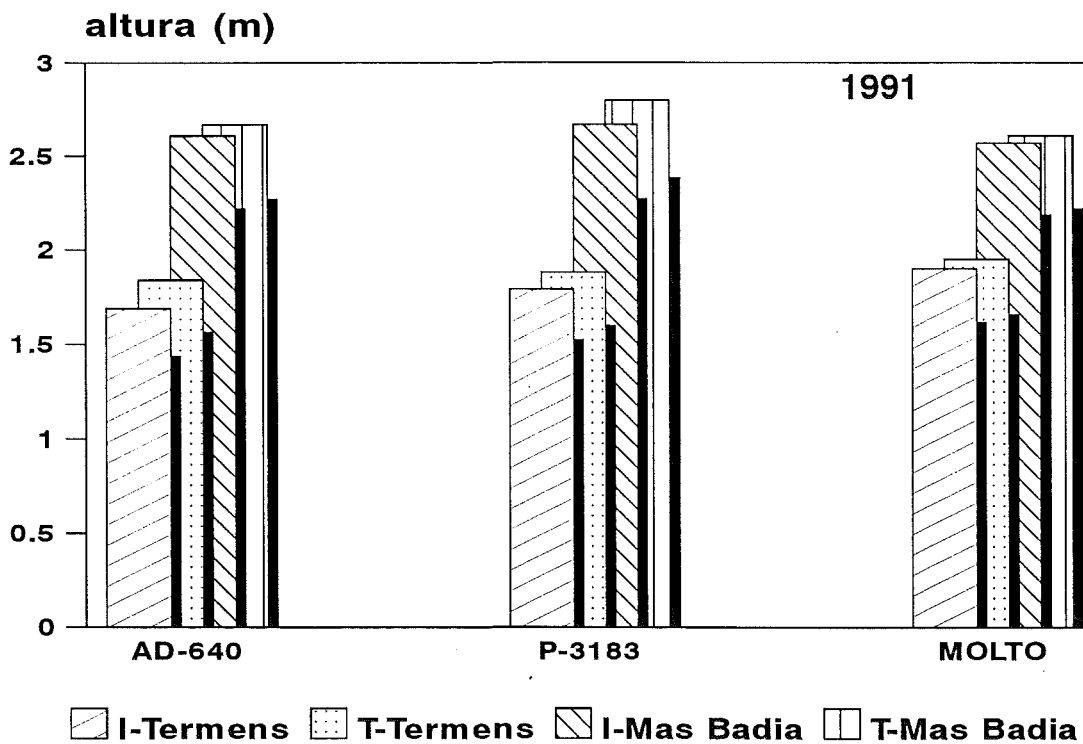
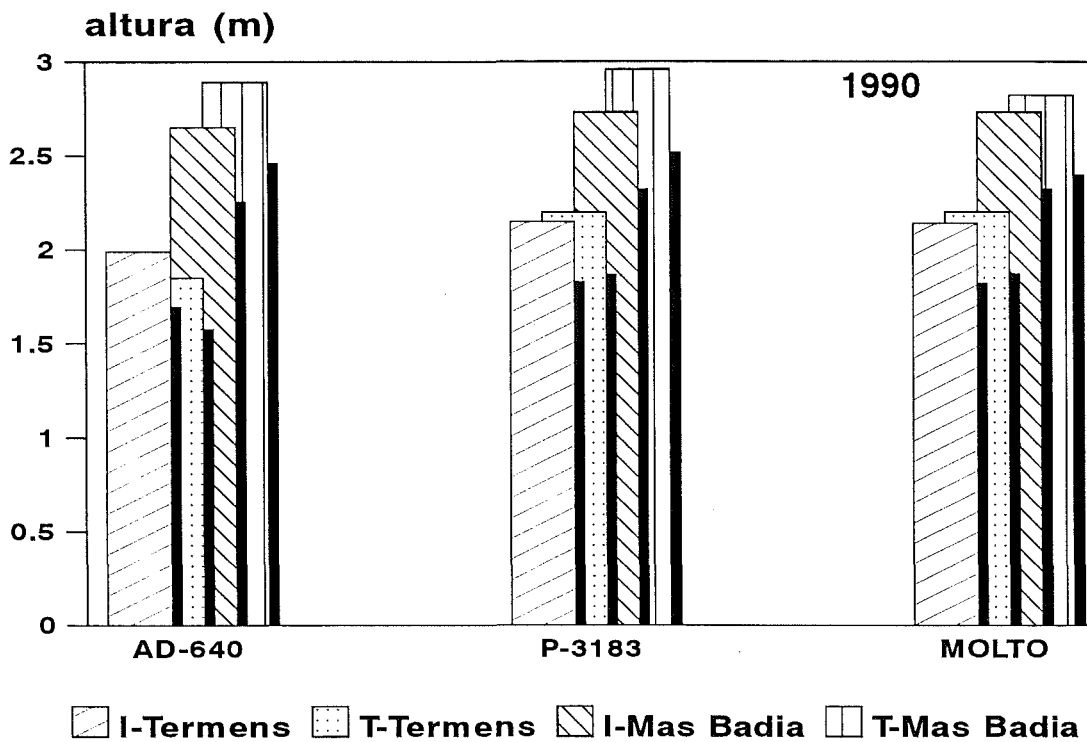


Figura 24. Altura de las plantas en los cvs. AD-640, P-3183, Moltó inoculados y no inoculados con el virus. I: inoculados, T: no inoculados

#### **4. CONCLUSIONES**

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1. La presencia de MDMV fue más elevada en los campos experimentales de la Noguera (Lleida) que en la comarca del Baix Empordà (Girona). Los cultivares que presentaron mayor porcentaje de plantas infectadas fueron AE-703, AD-640 y XL-72; y menor los de nueva introducción Moltó y Dracma.

2. En las muestras analizadas no se ha detectado la presencia de SCMV-D y sí la presencia uniforme de MDMV.

3. Las condiciones óptimas para ensayos de propagación de MDMV en maíz:

a) se puede utilizar cualquiera de los cultivares ensayados; la dilución de uso 1:2; fuente de inóculo plantas inoculadas 10-20 días antes; y realizar la inoculación en el estado de dos hojas,

b) usar agua destilada como tampón de extracción para inoculaciones de pequeño volumen y tampón fosfato más  $\beta$ -mercaptoetanol para inoculaciones de gran número de plantas.

4. Los aislados de MDMV-L y MDMV-G presentes en Cataluña son transmitidos de forma no persistente y en orden de eficiencia por *Schizaphis graminum*, *Rhopalosiphum maidis*, *Rhopalosiphum padi*, *Sitobion avenae*.

5. Con el número de semillas probadas no se ha detectado la transmisión del virus a través de semilla. Pero la infección de MDMV reduce la nascencia de las semillas entre un 2 y un 34 %.

6. Los tres aislados estudiados inducen reacciones similares a la cepa A de MDMV, con el juego de cvs. de sorgo y avena, diferenciadores de los virus del subgrupo del mosaico de la caña de azúcar, salvo el aislado MDMV-Gs.

Estos aislados infectan a *B. rubens*, característica que no comparten con los aislados americanos de la cepa A de MDMV, pero si con algunos aislados europeos.

7. Se ha determinado la susceptibilidad del género *Aegilops*, a MDMV, y determinado como nuevos huéspedes: *Aegilops ventricosa*, *Bromus alopecurus*, *Echinaria capitata* y *Lolium rigidum*. Estas tres últimas especies junto con *B. rubens* podrían actuar como reservorios invernales del virus además de las especies perennes, *S. halepense* y *Paspalum dilatatum*

8. El aislado MDMV-G induce la formación de las cuatro formas de inclusiones cilíndricas descritas por Edwarson, por tanto no pertenecería a ninguna de las subdivisiones establecidas por éste mismo autor.

9. El análisis de la secuencia del extremo 3' del RNA del aislado MDMV-G y su homología con la cepa A de MDMV indican que el aislado MDMV-G es una cepa de MDMV o una subcepa de MDMV-A.

10. La proteína de cubierta pierde un péptido de 39 aa de su extremo N-terminal con el almacenamiento de la misma a 4°C. Péptido responsable de los epitopos específicos del N-terminal de éste aislado.

11. Con las pruebas comparativas, realizadas con los tres aislados sólo se ha podido detectar diferencias a nivel de huéspedes.

12. Los descensos de producción inducidos por la inoculación mecánica de MDMV, en la localidad de Mas Badia, oscilaron entre un 11-19,5 %. Moltó fue el cv. que menores descensos de producción presentó en esta localidad y, P-3183 y AD-640 los presentaron muy similares. En la localidad de Termens, el mayor descenso lo experimentó AD-640 que alcanzó un 39,4, y el menor P-3183.

Los resultados obtenidos en estos ensayos podrían indicar, que además de la infección de MDMV, influyen otros factores con efecto aditivo, en las causas del bajo rendimiento del maíz en la localidad de Termens.

Los menores descensos relativos de producción del cv. Moltó en la localidad de Mas Badia y la mayor producción de éste en la localidad de Termens, podrían indicar que este cultivar es el más idóneo frente a la infección de MDMV.

13. La reducción en altura de las plantas, inducida por MDMV, no supera el 7%. En la localidad de Mas Badia, el cv. P-3183, es el que presentó una mayor reducción y Moltó el que la presentó menor. En la localidad de Termens, la mayor reducción la presentó AD-640.

## 5. BIBLIOGRAFIA



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**Abbott, E.V., Tippet, R. L. (1966).** Strains of sugarcane mosaic virus. U. S. Department of Agriculture Research Services Technical Bulletin 1340, 1-25.

**Abu-Samah, N., Randles, J. W. (1981).** A comparison of the nucleotide sequence homologies of three isolates of bean yellow mosaic virus and their relationship to other potyvirus. *Virology* 110:438-444.

**Albajes, R., Artigues, M., Avilla, J., Eizaguirre, M., Pons, X., Sarasua, M. J. (1985).** Ensayo de control de MDMV mediante tratamientos insecticidas. Actas do II Congreso Iberico de Entomología 3:280-310.

**All, J. N., Kuhn, C. W., Gallaher, R. N., Jellum, M. D., Hussey, R. S. (1977).** Influence of no-tillage-cropping, carbofuran and hybrid resistance on dynamics of Maize chlorotic dwarf and maize dwarf mosaic diseases of corn. *J. Econ. Ent.* 70:221-225.

**Allison, R., Sorenson, J. C., Kelly, M. E., Armstrong, F. B., Dougherty, W. G. (1985a).** Sequence determination of the capsid protein gene and flanking regions of tobacco etch virus: evidence for synthesis and processing of a polyprotein in potyvirus genome expression. *Proc. Natl. Acad. Sci. USA.* 82: 3969-3972.

**Allison, R., Dougherty, W. G., Parks, T. D., Willis, L., Johnston, R. E., Kelly, M. E., Armstrong, F. B. (1985b).** Biochemical analysis of the capsid protein of tobacco etch virus: N-terminal amino acids are located on the virion's surface. *Virology* 147:309-316.

**Allison, R., Johnston, R. E., Dougherty, W. G., (1986).** The nucleotide sequence of the coding region of tobacco etch virus genomic RNA: evidence for the synthesis of a single polyprotein. *Virology* 154:9-20.

**Antignus, Y. (1987).** Comparative study of two maize dwarf mosaic virus strains infecting corn and johnsongrass in Israel. *Plant Dis.* 71:678-691.

**Atreya, C. D., Raccah, B., Pirone, T. P. (1990).** A point mutation in coat protein abolishes aphid transmissibility of a potyvirus. *Virology* 178:161-165.

**Atreya, P. L., Atreya, C. D., Pirone, T. P., (1991).** Amino acid substitutions in the coat protein result in loss of insect transmissibility of a plant virus. *Proc. Natl. Acad. Sci. USA.* 88:7887-7891.

**Atreya, C. D. (1992).** Application of genome sequence information in potyvirus taxonomy: an overview. En: "Potyvirus taxonomy" (Barnett O. W. Eds). Springer, Wien New York, pp 17-23. (Arch Virol [Suppl] 5).

**Atreya, C. D., Atreya, P. L., Thornbury, D. W., Pirone, T. P. (1992).** Site-directed mutaciones in the potyvirus HC-Pro gene affect helper component activity, virus accumulation and symptom expression in infected tobacco plants. Virology 191:106-111.

**Barnett, O. W. (1992).** Potyvirus taxonomy. Springer-Verlag Wien New York. (Arch. of virol [suppl] 5). pp 450.

**Baumoch, D. A., Hari, V. (1990).** Potato virus Y helper component protein is associated with amorphous inclusions. J. Gen. Virol. 72:487-492.

**Baumoch, D. A., Das, P., Browning, M. E., Hari, V. (1991).** A temporal study of the capsid, cytoplasmic inclusion and nuclear inclusion proteins of tobacco etch potyvirus in infected plants. J. Gen. Virol. 71:2479-2482.

**Bell, A. C. (1989).** Use of oil and pyrethroid sprays to inhibit the spread of potato virus Y<sup>N</sup> in the field. Crop protection 8:37-39.

**Berger, P. H., Toler, R. W., Harris, K. F. (1983).** Maize dwarf mosaic virus transmission by greenbug biotypes. Plant Dis. 67:496-497.

**Berger, P. H., Zeyen, R. J., Groth, J. V. (1987).** Aphid retention of maize dwarf mosaic virus (potyvirus): epidemiological implications. Ann. Appl. Biol. 111:337-344.

**Berger, P. H., Harris, K. F., Toler, R. W. (1989a).** Rate of loss of infectivity of maize dwarf mosaic virus by *Schizaphis graminum* Rondani after different acquisition acces periods. J. Phytophalogy 125:336-342.

**Berger, P. H., Luciano, C. S., Thornbury, D. W., Benner, H. I., Hill, J. H., Zeyen, R. J. (1989b).** Properties and in vitro translation of maize dwarf mosaic virus RNA. J. Gen. Virol. 70:1845-1851.

**Berger, P. H. (1992).** The usefulness of aphid transmission as a taxonomic criterion for potyviruses. En: "Potyvirus taxonomy" (Barnett O. W. Eds.). Springer, Wien New York, pp 251-255. (Arch Virol [Suppl] 5).

**Birnboim, H. C., Doly, J. (1979).** A rapid alkaline extration procedure for screening recombinant plasmid DNA. Nucleic Acids Res. 7: 1513-1523.

**Bonciarelli, F. (1987).** Coltivazioni erbacee da pieno campo. Edagricole. Bologna. pp.347.

**Boothroyd, C. N. (1978).** Seed transmission of maize dwarf mosaic virus in sweet corn and yield reduction in plants from an infected seed lot. Ne-14 Proceedings Phytology.

**Boss, L. (1992).** Potyviruses, chaos or order?. En: "Potyvirus taxonomy" (Barnett O. W. Eds) . Springer, Wien New York, pp 31-46. (Arch Virol [Suppl] 5).

**Brakke, M. K., Ball, E. M., Hsu, Y. H., Langenberg, W. G. (1987).** Wheat streak mosaic virus cylindrical inclusion body proteins. J. Gen. Virol. 68. 281-287.

**Brunt, A. A. (1992).** The general properties of potyviruses. En: "Potyvirus taxonomy" (Barnett O. W. Eds). Springer, Wien New York, pp 3-16. (Arch Virol [Suppl] 5).

**Carrington, J. C., Dougherty, W. G. (1987a).** Small nuclear inclusion protein encoded by plant potyvirus genome is a protease. Journal of Virology 61(8): 2540-2548.

**Carrington, J. C., Dougherty, W. G. (1987b).** Processing of the tobacco etch virus 49K protease requires autoproteolysis. Virology 160:355-362.

**Carrington, J. C., Dougherty, W. G. (1988).** A viral cleavage site cassette: Identification of amino acid sequences required for tobacco etch virus polyprotein processing. Proc. Natl. Acad. Sci. USA. 85:3391-3395.

**Carrington, J. C., Carry, S. M., Dougherty, W. G. (1988).** Mutational analysis of tobacco etch virus polyprotein processing: cis and trans proteolytic activities of polyproteins containing the 49-kilodalton proteinase. Journal of Virology 62(7) :2313-2329.

**Carrington, J. C., Carry, S. M., Parks, T. D., Dougherty, W. G. (1989a).** A second proteinase encoded by a plant potyvirus genome. EMBO Journal 8:365-370.

**Carrington, J. C., Freed, D. D., Sanders, T. C. (1989b).** Autocatalytic processing of the potyvirus helper component proteinase in *Echerichia coli* and in vitro. Journal of Virology 63(10):4459-4463.

**Carrington, J. C., Freed, D. D. (1990).** Cap independent enhancement of translation by a plant potyvirus 5' nontranslated region. Journal of Virology 64(4): 1590-1597.

**Carrington, J. C., Freed, D. D., Oh, C-S. (1990).** Expression of potyviral polyproteins in transgenic plants reveals three proteolytic activities required for complete processing. EMBO J. 9(5):1347-1353.

**Carrington, J. C., Herndon, K. L. (1992).** Characterization of the potyviral HC-pro autoproteolytic cleavage site. Virology 187:308-315.

**Cervera, M. T., Riechmann, J. L., Martin, M. T., Garcia, J. A. (1993).** 3' Terminal sequence of the plum pox virus PS and 16 isolates: evidence for RNA recombination within the potyvirus group. *J. Gen. Virol.* 74:329-334.

**Chang, C.A., Hierbert, E., Purcifull, D. E. (1988).** Analysis of in vitro translation of bean yellow mosaic virus RNA: inhibition of the proteolytic processing by antiserum of the 49k nuclear inclusion protein. *J. Gen. Virol.* 69:1117-1122.

**Chang, C. A., Hierbert, E., Purcifull, D. E. (1988).** Purification, characterization, and immunological analysis of nuclear inclusions induced by bean yellow mosaic and clover yellow vein potyviruses. *Phytopathology* 78:1266-1275.

**Clark, M. F., Bar-Joseph M. (1984).** Enzyme immunosorbent assay in plant virology. *Methods in Virology* 7:51-85.

**Cole, D. R., MacKenzie, D. R., Boyle, J. S., Ercegovich, C. D. (1969).** Maize dwarf mosaic-effects of virus strain A and B and interaction effects of atrazine and the virus on yield. *Plant. Dis. Rep.* 53(5):340-344.

**Comas, J., Pons, X., Albajes, R. (1992).** The role of maize in the epidemiology of barley yellow dwarf virus in northeast Spain. *J. Phytopathology* 138: 244-248.

**de Mejia, M. V. G., Hierbert, E., Purcifull, D. E. (1985a).** Isolation and partial characterization of the amorphous cytoplasmic inclusions associated with infections caused by two potyviruses. *Virology* 142:24-33.

**de Mejia, M. V. G., Hierbert, E., Purcifull, D. E., Thornbury, D. W., Pirone, T.P. (1985b).** Identification of potyviral amorphous inclusion protein as a nonstructural virus-specific protein related to helper component. *Virology* 116:235-252.

**Derks, A. F. I. M. (1992).** Some unusual serological reactions among potyviruses. En: "Potyvirus taxonomy" (Barnett O. W. Eds). Springer, Wien New York, pp 77-80. (*Arch Virol* [Suppl] 5).

**Dijkstra, J. (1992).** Importance of host ranges and other biological properties for the taxonomy of plant viruses. En: "Potyvirus taxonomy" (Barnett O. W. Eds). Springer, Wien New York, pp 173-176. (*Arch Virol* [Suppl] 5).

**Dolia, V. V., Boyko, V. P., Agranovsky, A. A., Koonin, E. V. (1991).** Phylogeny of capsid proteins of rod-shaped and filamentous RNA plant viruses: two families distinct patterns of sequence and probably structure conservation. *Virology* 184:79-86.

**Domier, L. L., Franklin, K. M., Shahabuddin, M., Hellmann, G. M., Overmeyer, J. H., Hiermath, S. T., Siaw, M. F. E., Lomonosoff, G. P., Shaw, J. G., Rhoads, R. E. (1986).** The nucleotide sequence of tobacco vein mottling virus RNA. *Nucleic Acids Res.* 14:5417-5430.

**Domier, L. L., Shaw, J. G., Rhoads, R. E. (1987).** Potyviral proteins share amino acid sequence homology with picorna-, Como-, and Caulimoviral proteins. *Virology* 158:20-27.

**Domier, L. L., Franklin, K. M., Hunt, A. G., Rhoads, R. E., Shaw, J. G. (1989).** Infectious in vitro transcripts from cloned cDNA of a potyvirus, tobacco vein mottling virus. *Proc. Natl. Acad. Sci. USA.* 86: 3509-3515.

**Donofrio, J. C., Kuchia, J., Moore, R. Kaczmarczyk, W. (1986).** Properties of a solubilized replicase isolated from corn infected with maize dwarf mosaic virus. *Can. J. Microbiol.* 32:637-644.

**Dougherty, W. G., Hierbert, E. (1980a).** Translation of potyvirus RNA in a rabbit reticulocyte lysate: Identification of nuclear inclusion proteins as products of tobacco etch virus RNA translation and cylindrical inclusion protein as a product of the potyvirus genome. *Virology* 104:174-182.

**Dougherty, W. G., Hierbert, E. (1980b).** Translation of potyvirus RNA in a rabbit reticulocyte lysate: cell-free translation strategy and genetic map of the potyviral genome. *Virology* 104:183-184.

**Dougherty, W. G., Hierbert, E. (1980c).** Translation of potyvirus RNA in a rabbit reticulocyte lysate: Reaction conditions and identification of capsid protein as one of the products of in vitro translation of tobacco etch and pepper mottle viral RNAs. *Virology* 101: 466-474.

**Dougherty, W. G. (1983).** Analysis of the viral RNA isolated from tobacco leaf tissue infected with tobacco etch virus. *Virology* 131:473-481.

**Dougherty, W. G., Allison, R. F., Parks, T. D., Johnston, R. E., Field, M. J. (1985a).** Nucleotide sequence at the 3' terminus of pepper mottle virus genomic RNA: Evidence for an alternative mode of potyvirus capsid protein gene organization. *Virology* 146:282-291.

**Dougherty, W. G., Willis, L., Johnston, W. E. (1985b).** Topographic analysis of tobacco etch virus capsid protein epitopes. *Virology* 144:66-72.

**Dougherty, W. G., Carrington, J. C. (1988a).** Expression and function of potyviral gene products. *Ann. Rev. Phytopathol.* 26:123-143.

**Dougherty, W. G., Carrington, J. C., Cary, S. M., Parks, T. D. (1988).** Biochemical and mutational analysis of a plant virus polyprotein cleavage site. *EMBO J.* 7:1281-1287.

**Dougherty, W. G., Parks, T. D. (1989).** Molecular genetic and biochemical evidence for the involvement of heptapeptide cleavage sequence in determining the reaction profile at two tobacco etch virus cleavage sites in cell-free assays. *Virology* 172: 145-155.

**Dougherty, W. G., Parks, T. D., Cary, S. M., Bazan, J. F., Fletterick, R. J. (1989a).** Characterization of the catalytic residues of the tobacco etch virus 49 kDa proteinase. *Virology* 172:302-310.

**Dougherty, W. G., Cary, S. M., Parks, T. D. (1989b).** Molecular genetic analysis of a plant virus polyprotein cleavage site: A model. *Virology* 171:356-364.

**Dougherty, W. G., Parks, T. D. (1991).** Post-translational processing of the tobacco etch virus 49-kDa small nuclear inclusion polyprotein: identification of an internal cleavage site and delimitation of VPg and proteinase domains. *Virology* 183:449-456.

**Edwardson, J. R., (1974).** Some properties of potato virus Y-group. *Fla. Agric. Exp. Stat. Monogr. Ser., n°4.*

**Edwardson, J. R., Ko, N. J. (1984).** Potyvirus cylindrical inclusions-Subdivision-IV. *Phytopathology* 74:1111-1114.

**Edwardson, J. R. (1992).** Inclusions bodies. En: "Potyvirus taxonomy" (Barnett O. W. Eds). Springer, Wien New York, pp 25-30. (*Arch Virol [Suppl]* 5).

**Eggenberger, A. L., Stark, D. M., Beachy, R. N. (1989).** The nucleotide sequence of a soybean mosaic virus coat protein-coding region and its expression in *Echerichia coli*, *Agrobacterium tumefaciens* and tobacco callus. *J. Gen. Virol.* 70:1853-1860.

**Feinberg, A. P., Vogelstein, B. (1984).** A technique for radiolabelling DNA restriction endonuclease fragments to high specific activity. *Anal. Biochem.* 137:266-267.

**Ferro, D. N., Mackenzie, J. D., Margolies, D. C. (1980).** Effect of mineral oil and a systemic insecticide on field spread of aphid-borne maize dwarf mosaic virus in sweet corn. *J. Econ. Entomol.* 73: 730-735.

**Findley, W. R., Louie, R., Knoke, J. K., Dollinger, E. J. (1977).** Breeding corn for resistance to virus in Ohio. pp 123-127 In: *Proc. Int. maize virus dis. colloq. Workshop.* (Willians, L. E., Gordon, D. T., Nault, L. R. Eds.). Ohio Agric. Res. Devel. Center. Wooster. 145 pp.

**Ford, R. E., Tasic, M. (1972).** New hosts of maize dwarf mosaic virus and sugarcane mosaic virus and comparative host range study of viruses infecting corn. *Phytopathologische Zeitschrift* 75:315-348.

**Ford, R. E., Tasic, M. and Shukla, D. D. (1989).** Maize dwarf mosaic virus. CMI/AAB. *Descriptions of Plant Viruses* N°341.

**Francki, R. I. B, Milne, R. G., Hatta, T. (1985).** Potyvirus group. In "Atlas of plant viruses", Volumen II, pp 183-217, New York. Academic Press.

**Frenkel, M. J., Ward, C. W., Shukla, D. D. (1989).** The use of 3' non-coding nucleotide sequences in the taxonomy of potyvirus: application to watermelon mosaic virus 2 and soybean mosaic virus-N. *J. Gen. Virol.* 70:2775-2783.

**Frenkel, M. J., Jilka, J. M., McKern, N. M., Strike, P. M., Cark Jr. J. M., Shukla, D. D., Ward, C. W. (1991).** Unexpected sequence diversity in the amino-terminal ends of the coat proteins of strains of sugarcane mosaic virus. *J. Gen. Virol.* 72:237-242.

**Frohman, M. A., Dush, M. K., Martin, G. R. (1988).** Rapid production of full-length cDNAs from rare transcripts: Amplification using a single gene-specific oligonucleotide primer. *Proc. Natl. Acad. Sci. USA* 85: 8998-9002.

**Fuchs, E., Graüntzig, M., Kozelsks, S. (1987).** Investigations on occurrence of serogroups of maize dwarf mosaic virus in G.D.R. *Zentralbl. Mikrobiol.* 142:41-47.

**Gáborjányi, R., Duons, H.N. (1991).** Complexity of potyviruses infecting maize in Hungary. *Cereal Research Communications* 19:337-344.

**Gadh, I. P. S., Hari, V. (1986).** Association of tobacco etch virus related RNA with chloroplasts in extracts of infected plants. *Virology* 150:304-307.

**Gal-On, A., Antignus, Y., Rosner, A., Raccah, B. (1990).** Nucleotide sequence of the zucchini yellow virus capsid-encoding gene and its expression in *Echerichia coli*. *Gene* 87:273-277.

**Gal-On, A., Antignus, Y., Rosner, A., Raccah, B. (1991).** Infectious in vitro RNA transcripts derived from cloned cDNA of the cucurbit potyvirus, zucchini yellow mosaic virus. *J. Gen. Virol.* 72:2639-2643.

**Gal-On, A., Antignus, Y., Rosner, A., Raccah, B. (1992).** A zucchini yellow mosaic virus coat protein gene mutation restores aphid transmissibility but has no affect on multiplication. *J. Gen. Virol.* 73:2183-2187.

- García, J. G., Riechmann, J. L., Laín, S. (1989a).** Artificial cleavage site recognized by plum pox potyvirus Protease in *Echerichia coli*. *Journal of Virology* 63(6):2457-2460.
- García, J. G., Riechmann, J. L., Laín, S. (1989b).** Proteolytic activity of plum pox potyvirus NI<sub>a</sub>-like protein *Echerichia coli*. *Virology* 170:362-368
- García, J. G., Riechmann, J. L., Martín, M. T., Laín, S. (1989c).** Proteolytic activity of plum pox potyvirus NI<sub>a</sub>-protein on excess of natural and artificial substrates in *Echerichia coli*. *Febs Letts.* 257(20):269-273.
- García, J. G., Laín, S., Cervera, M. T., Riechmann, J. L., Martín, M. T. (1990).** Mutational analysis of plum pox potyvirus polyprotein processing by the NI<sub>a</sub> protease in *Echerichia coli*. *J. Gen. Virol.* 71:2773-2779.
- García, J. G., Laín, S. (1991).** Proteolytic activity of plum pox vitus-tobacco etch virus chimeric NI<sub>a</sub> proteases. *Febs Letts* 281(1-20):67-72.
- García, J.G., Martín, M.T., Cervera, M.T., Riechmann, J. L. (1992).** Proteolytic processing by the of the plum pox potyvirus polyptotein by NI<sub>a</sub> protease a novel cleavage site. *Virology* 188:697-703.
- Genter, G. F., Roane, C. W., Tolin, S. A. (1973).** Effects of maize dwarf mosaic virus mechanically inoculated maize. *Crop Sci.* 13:531-535.
- Ghabrial, S. A., Smith, H. A., Parks, T. D., Dougherty, W. G. (1990).** Molecular analysis of the soybean mosaic virus NI<sub>a</sub> proteinase. *J. Gen. Virol.* 71:1921-1927.
- Giorda, L. M., Toler, R.W., Miller, F. R. (1986).** Identification of sugarcane mosaic virus strain H isolate in comercial grain sorghum. *Plant Dis.* 70:624-628.
- Gordon, D. T., Bradfute, O. E., Gingery, R. E., Knoke, J. K., Louie, R., Nault, L. R., Scott. G. E. (1981).** Introduction : history, geographical distribution, pathogen characteristics, and economic importance. En: " Virus and viruslike diseases of maize in the United States" (Gordon, D. T., Knoke, J. K., Scott. G. E., Eds.).pp 1-12 South. Coop. Ser. Bull.247.
- Gough, K. H., Shukla, D. D. (1981).** Coat protein of potyviruses I. Comparison of the four strains of sugarcane mosaic virus. *Virology* 111:455-462.
- Gough, K. H., Azad, A. A., Hanna, P. J., Shukla, D. D. (1987).** Nucleotide sequence of the capsid and nuclaer inclusion protein genes from Johnson grass strain of sugarcane mosaic virus RNA. *J. Gen. Virol.* 68:297:304.



**Govier, D. A., Woods, R. D. (1971).** Changes induced by magnesium ions in the morphology of some plant viruses with filamentous particles. *J. Gen. Virol.* 13: 127-132.

**Govier, D. A., Kassanis, B. (1974a).** Evidence that a component other than the virus particle is needed for aphid transmission of potato virus Y. *Virology* 57:285-286

**Govier, D. A., Kassanis, B. (1974b).** A virus-induced component of plant sap needed when aphids acquire potato virus Y from purified preparations. *Virology* 61:420-426.

**Govier, D. A., Kassanis, B., Pirone, T. P. (1977).** Partial purification and characterization of potato virus Y helper component. *Virology* 78,306-314.

**Gregory, L. V., Ayers, J. E. (1982).** Effect of inoculation with maize dwarf mosaic virus at several growth stages on yield of sweet corn. *Plant Dis.* 66:801-804.

**Gubber, U., Hoffman, B. J. (1983).** A simple and very efficient method for generating cDNA libraries. *Gene* 25,263

**Graybosch, R., Hellmann, G. M., Shaw, J. G., Rhoads, R. E., Hunt, A. G. (1989).** Expression of a potyvirus non-structural protein in transgenic tobacco. *Bioc. and biop. Research communications* 160(2):425-432.

**Grumet, R., Fang, G. (1990).** cDNA cloning and sequence analysis of the 3'-terminal region of zucchini yellow mosaic virus RNA. *J. Gen. Virol.* 71:1619-1622.

**Hammond, J., Hammond, R. W. (1989).** Molecular cloning, sequencing and expression in *Echerichia coli* of the bean yellow mosaic virus coat protein gene. *J. Gen. Virol.* 70:1961-1974.

**Hanaham, D. (1985).** Techniques for transformation of *E. coli*. En : "DNA cloning: A practical approach", (Glover D. M., Eds.), vol. I. IRL Press, Oxford. pp 109-135

**Hari, V., Siegel, A., Rozek, C., Timberlake, W. E. (1979).** The RNA of tobacco etch virus contains Poly (A). *Virology* 92:568-571.

**Hari, V. (1981).** The RNA of tobacco etch virus: further characterization and detection of protein linked to RNA. *Virology* 112:391-399.

**Harrison, B. D., Murant, A. F. (1984).** Involvement of virus-coded proteins in transmission of plant viruses by vectors. In "Vectors in Virus Biology", (Mayo MA. A. y Harrap K. A., Eds). New York: Academic Press. pp 1-36

**Harrison , B. D. (1987).** Plant virus transmission by vectors:Mechanisms and consequences. In "Molecular Basis of disease", (Russell, W. C. y Almond, J.,Ed.) Symposium 40 of the Society for General Microbiology. Cambridge University Press. pp 319-344

**Harrison, B. D., Robinson, D. J. (1988).** Molecular variation in vector-borne plant viruses:epidemical significance. Philosophical Transactions of the Royal Society of London 321:447-462

**Hellmann, G. M., Shaw, J. G., Lesnaw, J. A., Yun chu, L., Pirone, T. P., Rhoads, R. E. (1980).** Cell-free translation of tobacco vein motting virus RNA. Virology 106:207-216.

**Hellmann, G. M., Shahabuddin, M., Shaw, J. G., Rhoads, R. E. (1983a).** Molecular cloning of DNA complementary to tobacco vein motting virus RNA. Virology 128: 210-220.

**Hellmann, G. M., Thornbury, D. W., Hiebert, E., Shaw, J. G., Pirone, T. P., Rhoads, R. E. (1983b).** Cell-free translation of tobacco vein motting virus RNA. II. Immunoprecipitation of products by antisera to cylindrical inclusion, nuclear inclusion, and helper component proteins. Virology 124:434-444.

**Hellmann, G. M., Shaw, J. G., Rhoads, R. E. (1985).** On origin of the helper component of tobacco vein motting virus : translational initiation near the 5' terminus of the viral RNA and termination by uag codons. Virology 143:23-34.

**Hellmann, G. M., Shaw, J. G., Rhoads, R. E. (1988).** In vitro analysis of tobacco vein motting virus NI<sub>a</sub> cistron: Evidence for a virus-encoded protease. Virology 163:554-562.

**Hiebert, E., Thornbury, D. W., Pirone, T. P.(1984).** Immunoprecipitation analysis of potyviral in vitro translation products using antisera to helper component of tobacco vein mottling virus and Potato virus Y. Virology 135:1-9.

**Hiebert,E., Tremaine, J.H., Ronald, W. P. (1984).** The effect of limited proteolysis on amino acid composition of five potyviruses and on the serological reaction and peptide map of the tobacco etch virus capsid protein. Phytopathology 74:411-416.

**Hill, J. H., Ford, R. E., Benner, H. L. (1973).** Purification and partial characterization of maize dwarf mosaic virus strain B (Sugarcane mosaic virus). J. Gen. Virol. 20:327-339.

Hill, J. H., Martinson, C. A., Ruseell, W. A. (1974). Seed transmission of maize dwarf mosaic and wheat mosaic virus and response of inbred lines. *Crop Sci.* 14:232-235.

Hill, J. H., Zeyen, R. J., Morrison, R. H. (1977). The occurrence of maize dwarf mosaic virus in Minnesota. *Plant. Dis. Rep.* 61:968-969.

Hill, E. K., Hill, J. H., Durand, D. P. (1984). Production of monoclonal antibodies to viruses in the potyvirus group: use in radioimmunoassay. *J. Gen. Virol.* 65:525-532.

Himmler, G., Frank, S., Steinkelner, H., Ruker, F., Mattanovich, D., Katinger, W. D. (1990). Detection of the trans activity of the plum pox virus N1a-like protease in infected plants. *J. Gen. Virol.* 71:1623-1625.

Hollings, M., Brunt, A. A. (1981). Potyvirus Group. CMI /AAB Descriptions of Plant Viruses N° 245.

Hua Li, X., Crrington, J.C. (1993). Nuclear transport of tobacco etch potyviral RNA-dependent RNA polymerase is highly sensitive to sequence alterations. *Virology* 193:951-958.

Huttinga, H., Mosch, W. H. M. (1974). Properties of viruses of potyvirus group. 2. Buoyant density, S value, Particle morfology, and molecular weight of the coat protein subunit of bean yellow mosaic virus, pea mosaic virus, lettuce mosaic virus, and potato virus Y<sup>N</sup>. *Neth. J. Pl. Path.* 80:19-27.

Izquierdo, J. (1986). Estudi de la flora arvensa dels camps de panis a la provincia de Lleida. Aproximació al fenomen de competencia mala herba-conreu. Proyecto Final de Carrera. ETSEAL

Jagadish, M. N., Ward, C. W., Gough, K. H., Tulloch, P. A., Whittaker, L. A., Shukla, D. D. (1991). Expression of potyvirus coat protein in *Escherichia coli* and yeast and its assembly into virus-like particles. *J. Gen. Virol.* 72:1543-1550.

Jagadish, M. N., Huang, D., Ward, C. W. (1993). Site-directed mutagenesis of potyvirus coat protein and its assembly in *Escherichia coli*. *J. Gen. Virol.* 74:893-896.

Janson, B. F., Ellet, C. W. (1963). A new virus disease in Ohio. *Plant Dis. Rep.* 47:1107-1108.

Jarjees, M. M., Uyemoto, J.K. (1983). Maize dwarf mosaic virus: effect of time of inoculation and symptomatology on performance of sorghum (*Sorghum bicolor*). *Plant Dis.* 67:488-489.

**Jarjees, M. M., Uyemoto, J.K. (1984).** Serological relatedness of strains of maize dwarf mosaic and sugarcane mosaic viruses as determined by microprecipitin and enzyme-linked immunosorbent assays. *Ann. of Appl. Biol.* 104:497-501.

**Jayaram, Ch., Hill, J. H., Miller, W. A. (1991).** Nucleotide sequences of the coat protein genes of two aphid-transmissible strains of soybean mosaic virus. *J. Gen. Virol.* 72:1001-1003.

**Jayaram, Ch., Hill, J.H., Miller, W.A. (1992).** Complete nucleotide sequences of two soybean mosaic virus strains differentiated by response of soybean containing the Rsv resistance gene. *J. Gen. Virol.* 73:2067-2077.

**Jensen, S. G., Long-Davidson, B., Seip, L. (1986).** Size variation among proteins induced by sugarcane mosaic viruses in plant tissue. *Phytopathology* 76:528-532.

**Jensen, S. G., Staudinger, J. L. (1989a).** A Kansas isolate of MDMV (KS-1) is serologically similar to MDMV-O. *Phytopathology* 79:1004.

**Jensen, S. G., Staudinger, J. L. (1989b).** Serological grouping of the cytoplasmic inclusions of 6 strains of sugarcane mosaic virus. *Phytopathology* 79:1215.

**Johansen, E., Rasmussen, O. F., Heide, M., Borkharot, B. (1991).** The complete nucleotide sequence of pea seed-borne mosaic virus RNA. *J. Gen. Virol.* 72:2625-2632.

**Jordan, R., Hammond, J. (1991).** Comparison and differentiation of potyvirus isolates and identification of strain-virus-, subgroup-specific and potyvirus group-common epitopes using monoclonal antibodies. *J. Gen. Virol.* 71:25-36.

**Josephson, L. M., Hilty, J. W., Arnold, J. M., Kincer, H. C., Overton, J. R. (1969).** Grain yield of corn reduced by maize dwarf mosaic virus infection. *Plant Dis.* 53(1):61-63.

**Josephson, L. M., Naidu, B. (1971).** Reaction of diallele crosses of corn inbred (*Zea mays*) to maize dwarf mosaic virus. *Crop Sci.* 11:664-667.

**Kashiwazaki, S., Minobe, Y., Omura, T., Hibino, H. (1990).** Nucleotide sequence of barley yellow mosaic virus RNA 1: a close evolutionary relationship with potyvirus. *J. Gen. Virol.* 71:2781-2790.

**Kashiwazaki, S., Minobe, Y., Hibino, H. (1991).** Nucleotide sequence of barley yellow mosaic virus RNA 2. *J. Gen. Virol.* 72:995-990.

- Kerlan, C., Lapierre, H. Moreau, J. P. (1974).** Observations sur l'apparition du virus de la mosaïque nanisante du maïs (Maize dwarf mosaic) dans le nord de la France. *Ann. Phytopathol.* 6(4):455-470.
- Knoke, J. K., Louie, R., Anderson., R.J., Gordon, D. T. (1974).** Distribution of maize dwarf mosaic and aphid vectors in Ohio. *Phytopathology* 64:639-645.
- Knoke, J. K., Louie, R. (1981).** Epiphytology of maize virus disease. En: "Virus and viruslike diseases of maize in the United States", (Gordon, D. T., Knoke, J. K., Scott. G. E., Eds.). *South. Coop. Ser. Bull.* 247. 218 pp.
- Knoke, J. K., Louie, R., Madden, L. V., Gordon, D. T. (1983).** Spread of maize dwarf mosaic virus from Johnsongrass to corn. *Plant Dis.* 67:367-370.
- Knorr, D. A., Dawson, W. O. (1988).** A point mutation in the tobacco mosaic virus coat protein gene induces hypersensitivity in *Nicotiana glauca*. *Proc. Natl. Acad. Sci. USA* 85:170-174.
- Koike, H., Gillaspie, A. G. (1978).** Strain M, a new strain of sugarcane mosaic virus. *Plant Dis. Rep.* 60(1):50-54.
- Koziel, M. G., Hari, V., Sigel, A. (1980).** *In vitro* translation of tobacco etch virus RNA. *Virology* 106:177-179.
- Krass, C. J., Ford, R. E. (1969).** Ultrastructure of corn systemically infected with Maize dwarf mosaic virus. *Phytopathology* 59:431-439.
- Kuhn, C. W., Jellum, M. D., All, J. N. (1975).** Effect of carbofuran treatment on corn yield, maize chlorotic dwarf and maize dwarf mosaic virus diseases, and leafhopper populations. *Phytopathology* 65: 1017-1020.
- Kuhn, C. W., Smith, T. H. (1977).** Effectiveness of a disease index system in evaluating corn for resistance to Maize dwarf mosaic virus. *Phytopathology* 67:288-291.
- Lain, S., Riechmann, J. L., Mendez, E., García, J. A. (1988).** Nucleotide sequence of the 3' terminal region of Plum Pox Potyvirus RNA. *Virus Research* 10:325-342.
- Lain, S., Riechmann, J. L., García, J. A. (1989a).** The complete nucleotide sequence of plum pox potyvirus RNA. *Virus Research* 13:157-172.
- Lain, S., Riechmann, J. L., Martín, M. T., García, J. A. (1989b).** Homologous potyvirus and flavivirus proteins belonging to a superfamily of helicase-like proteins. *Gene* 82:357-362.

**Lain, S., Riechmann, J. L., García, J. A. (1990).** RNA helicase: a novel activity associated with a protein encoded by a positive strand RNA virus. *Nucleic Acid. Res.* 18:7003-7006.

**Lain, S., Riechmann, J. L., García, J. A. (1991).** Novel catalytic activity associated with positive-strand RNA virus infection: nucleic acid-stimulated ATPase activity of the plum pox potyvirus helicaselike protein. *Journal of Virology* 65:1-6.

**Lamiemli, U. K. (1970).** Cleavage of structural proteins during the assembly of the head of bacteriophage T4. *Nature, London* 227:680-685.

**Langenberg, W. G., Schroeder, H. F. (1973).** Electron microscopy of unstable inclusion induced in maize by maize dwarf mosaic virus. *Phytopathology* 63:1066-1073.

**Langenberg, W. G. (1986).** Virus protein associated with cylindrical inclusions of two viruses infect wheat. *J. Gen. Virology* 67:1161-1168.

**Langenberg, W. G. (1991).** Cylindrical inclusion bodies of wheat streak mosaic virus and three other potyviruses only self-assemble in mixed infections. *J. Gen. Virol.* 72:493-497.

**Langeveld, S.A., Dore, J.M., Memelink, J., Derks, A.F.L.M., Van der Vlugt, C.I.M., Asjes, C.J., Bol, J.F. (1991).** Identification of potyviruses using the polymerase chain reaction with degenerate primers. *J. Gen. Virol.* 72:1532-1541.

**Lebrach, H., Diamond, D., Wozney, J. M., Boedtke, H. (1977).** RNA molecular weight determinations by gel electrophoresis under denaturing conditions, a critical reexamination. *Biochemistry* 16,4743-4751.

**Lecop, H., Piltrat, M. (1985).** Specificity of the helper component mediated aphid transmission of three potyviruses infecting muskmelon. *Phytopathology* 75:890-893.

**Lei, L. D., Agrios, G. N. (1986).** Mechanisms of resistance in corn to maize dwarf mosaic virus. *Phytopathology* 76:1034-1040.

**Lesemann, D. E. (1988).** Cytopathology. En: "The plant viruses", (Milne R. G., Ed.) vol. 4, the filamentous plant viruses. Plenum Press, New York & London. pp 179-235

**Lesemann, D. E., Shukla, D. D., Tosic, M., Huth, W. (1992).** Differentiation of the four viruses of the sugarcane mosaic virus subgroup based on cytopathology. En: "Potyvirus Taxonomy", (Barnett O. W., Eds.). Springer. Wien New York. pp 353-361 (Arch. Virol.[Suppl]5).

**Loesch, P. J., Zuber, M. S. (1976).** An inheritance study of resistance to maize dwarf mosaic virus in corn (*Zea mays* L.). *Agron J.* 59:423-426.

**Louie, R., Knoke, J. K. (1975).** Strains of maize dwarf mosaic virus. *Plant Dis. Rep.* 59(6) :518-522.

**Louie, R., Darrah, L. L. (1980).** Disease resistance and yield loss to sugarcane mosaic virus in East African-adapted maize. *Crop Sci.* 20:638-640.

**Louie, R. (1986).** Effects of genotype and inoculation protocols on resistance evaluations in maize to maize dwarf mosaic virus. *Phytopathology* 76:769-773.

**Louie, R. and Knoke, J. K. (1991).** Detection of maize dwarf mosaic onset in Northern Ohio. *Phytopathology* 81:760-765.

**Louie, R., Knoke, J. K., Findley, W. R. (1990).** Elite maize germoplasm: reactions to maize dwarf mosaic and maize chlorotic dwarf viruses. *Crop Sci.* 30:1210-1215.

**Lovisolo, O. (1992).** Ecology and taxonomy of some European potyviruses. En: "Potyvirus Taxonomy", (Barnett O. W., Eds.). Springer. Wien New York. pp 311-316 (Arch. Virol. [Suppl]5).

**Luciano, C. S., Rhoads, R. E., Shaw, J. G. (1987).** Synthesis of potyviral RNA and proteins in tobacco mesophyll protoplasts inoculated by electroporation. *Plant Science* 51:295-303.

**Luciano, C.S., Murphy, J. F., Rhoads, R. E., Shaw, J. G. (1991).** VPg-mediated aggregation of potyviral RNA. *J. Gen. Virol.* 72:205-208.

**Madden, L. V., Knoke, J. K., Louie, R. (1986).** Effect of source strength, distance and direction on the spread of maize dwarf mosaic virus. *J. Phytopathology* 117:92-96.

**Madden, L. V., Louie, R., Knoke, J. K. (1987).** Temporal and spatial analysis of maize dwarf mosaic epidemics. *Phytopathology* 77:148-156.

**Maiss, E., Breyel, E., Brisske, A., Casper, R. (1988).** Molecular cloning of DNA complementary to the RNA-genome of plum pox virus (PPV). *J. Phytopathology* 122:222-231.

**Maiss, E., Timpe, U., Brisske-Rode, A., Jelkmann, W., Casper, R., Himmler, G., Mattanovich, D., Katinger, W. D. (1989).** The complete nucleotide sequence of plum pox virus RNA. *J. Gen. Virol.* 70:513-524.

- Maiss, E., Timpe, U., Brisske-Rode, A., Lesemann, D. E., Casper, R. (1992).** Infectious in vivo transcripts of plum pox potyvirus full-length cDNA clone containing the cauliflower mosaic virus 35S RNA promoter. *J. Gen. Virol.* 73:709-713.
- Marín, J. P., Segarra, J., Almacellas, J. (1992).** Enfermedades de los cereales en Cataluña durante 1988-90. *Invest. Agr.: Prod. Prot. veg.* 7(2):261-275.
- Martín, M. T., Lopez Otin, C., Lain, S., García, J.G. (1990).** Determination of polyprotein processing sites by amino terminal sequencing of nonstructural proteins encoded by plum pox potyvirus. *Virus Research* 15:97-106.
- Martín, M. T., García, J. G. (1991).** Plum pox potyvirus RNA replication in a crude membrane fraction from infected *Nicotiana clevelandii* leaves. *J. Gen. Virol.* 72:785-790.
- Martín, M. T., García, J.G., Cervera, M.T., Goldbach, R. W., van Lent, J. W. M. (1992).** Intracellular localization of three non-structural plum pox potyvirus proteins by immunogold labelling. *Virus Research*:25:201-211.
- Mayhew, D. E., Ford, R. E. (1974).** Detection of ribonuclease-resistant RNA in chloroplasts of corn leaf tissue infected maize dwarf mosaic virus. *Virology* 57:503-509.
- McDaniel, L. L., Gordon, D. T. (1985).** Identification of a new strain of maize dwarf mosaic virus. *Plant Dis.* 69:602-607.
- McDaniel, L. L., Gordon, D. T. (1989).** Characterization of the oat-infecting strain of maize dwarf mosaic virus. *Phytopathology* 79:113-120.
- McKern, N. M., Whittaker, L. A., Strike, P. M., Ford, R.E., Jensen, S. E., Shukla, D. D. (1990).** Coat protein properties indicate that maize mosaic virus-KSI is a strain of johnsongrass mosaic virus. *Phytopathology* 80:907-912.
- McKern, N. M., Shukla, D. D., and Toler, R.W., Jensen, S.E., Tosic, M., Ford, R.E., Leon, O., Ward, C.W. (1991).** Confirmation that the sugarcane mosaic virus subgroup consists of four distinct potyviruses by using peptide profiles of coat proteins. *Phytopathology* 81:1025-1029.
- McMullen, M. D., Louie, R. (1989).** The linkage of molecular markers to a gene controlling the symptom response in maize to maize dwarf mosaic virus. *Mol. Plant-Microbe Interact.* 2:309-314.



- Mikel, M. A., D'Arcy, C. J., Rhodes, A. M., Ford, R. E. (1981a).** Yield loss in sweet corn correlated with time of inoculation with maize dwarf mosaic virus. *Plant Dis. Rep.* 65:902-904.
- Mikel, M. A., D'Arcy, C. J., Rhodes, A. M., Ford, R. E. (1981b).** Yield response of sweet corn to maize dwarf mosaic virus. *Plant Dis.* 65:900-901.
- Mikel, M. A., D'Arcy, C. J., Rhodes, A. M., Ford, R. E. (1982a).** Effect of maize dwarf mosaic virus on sweet corn Pollen and Silk. *Phytopathology* 72:428-431.
- Mikel, M. A., D'Arcy, C. J., Rhodes, A. M., Carey, E. E., Juvik, J. A. (1983).** Sugary (su) sweet corn germoplasm with resistance to the maize dwarf mosaic virus. *HortScience* 8:964-965.
- Mikel, M. A., D'Arcy, C. J., Ford, R. E. (1984a).** Seed transmission of maize dwarf mosaic virus in sweet corn. *Phytopath. Z.*, 110: 185-194.
- Mikel, M. A., D'Arcy, C. J., Rhodes, A. M., Ford, R. E. (1984b).** Genetics of resistance to two dent corn inbreds to maize dwarf mosaic virus and transfer of resistance into sweet corn. *Phytopathology* 74:467-473.
- Moghal, S. M., Francki, R. I. B. (1976).** Towards a system for the identification and classification of Potyvirus. I. Serology and amino acid composition of six distinct viruses. *Virology* 73: 350-382.
- Murphy, J. F., Rhoads, R. E., Hunt, A. G., Shaw, J. G. (1990).** The VPg of tobacco etch virus RNA is the 49-kDa proteinase or the N-terminal 24-kDa part of the proteinase. *Virology* 178:285-288.
- Murphy, J. F., Jarlfors, U., Shaw, J. G. (1991a).** Development of cylindrical inclusions in potyvirus-infected protoplasts. *Phytopathology* 81: 371-374.
- Murphy, J. F., Rychlik, W., Rhoads, R. E., Hunt, A. G., Shaw, J. G. (1991b).** A tyrosine residue in the small nuclear inclusion protein of tobacco vein mottling virus links the VPg to the viral RNA. *Journal of Virology* 65: 511-513.
- Murry, L. E., Elliott, L. G., West, J., Capitant, S., Hanson, K., Scarafia, L., et al. (1993).** Transgenic maize plants are resistant to maize dwarf mosaic virus in single and mixed infections. In *Proc. of IXth International Congress of Virology* W70-7.

**Nault, L. R., Knoke, J. K. (1981).** Maize vectors, pp 77-84, In Gordon, D. T., Knoke, J. K., Scott, G. E. (Eds.), "Virus and viruslike diseases of maize in the United States". South. Coop. Ser. Bull.247. 218 pp.

**Nagel, J., Hierbert, E. (1985).** Complementary DNA cloning and expression of the papaya ringspot potyvirus sequences encoding capsid protein in *Escherichia coli*. Virology 143:435-441.

**Niblett, C. L., Zagula, K. R., Calvert, L. A., Stark, D. M., Smith, C. E., Beachy, R. N., Lommel, S. A. (1991).** cDNA cloning and nucleotide sequence of the wheat streak mosaic virus capsid protein gene. J. Gen. Virol. 72:494-504.

**Nicolas, O., Laliberte, J. F. (1991).** The use of PCR for cloning of large cDNA fragments of turnip mosaic potyvirus. J. Virol. Methods 32:57-66.

**Nicolas, O., Laliberte, J. F. (1992).** The complete nucleotide sequence of turnip mosaic potyvirus RNA. J. Gen. Virol. 73:2785-2793.

**Oh, C-S., Carrington, J. C. (1989).** Identification of essential residues in potyvirus proteinase HC-Pro by site-mutagenesis. Virology 173:692-699.

**Olson, A. J., Pataky, J. K., D'Arcy, C., Ford, R. E. (1990).** Effects of drought and infection by maize dwarf mosaic virus on sweet corn. Plant Dis. 74: 147-151.

**Panayotou, P. C. (1980).** Maize dwarf mosaic virus in Greece. Plant Dis. 64:803-804.

**Panayotou, P. C. (1981).** Investigations on Seed transmission of maize dwarf mosaic virus and its effect on the establishment of seedlings. Journal of Plant Dis. and Protection 88(10): 621-625.

**Parks, T. D., Dougherty, W. G. (1991).** Substrate recognition by the NIa proteinase of two potyviruses involves multiple domains: Characterization using genetically engineered hybrid proteinase molecules. Virology 182:17-27.

**Parks, T. D., Smith, H. A., Dougherty, W. G. (1992).** Cleavage profiles of tobacco etch virus (TEV)-derived substrates mediated by precursor and processed forms of the TEV NIa proteinase. J. Gen. Virol. 73:149-155.

**Peña Iglesias, A., Fresno, J. (1986).** Situación actual de los virus del maíz en España. IV Jornadas Técnicas del maíz. Enfermedades:5-13.

- Persley, D. M., Henzell, R. G., Greber, R. S., Teakle, D. S., Toler, R. W. (1985).** Use of a set of differential sorghum inbred lines to compare isolates of sugarcane mosaic virus from sorghum and maize in nine countries. *Plant Dis.* 69:1046-1049.
- Pirone, T. P., Megahed, E. (1966).** Aphid transmissibility of some purified and viral RNAs. *Virology* 30:631-637.
- Pirone, T. P. (1972).** Sugarcane mosaic virus. CMI/AAB Descriptions of Plant Viruses, no.88.
- Pirone, T. P. (1977).** Accessory factors in nonpersistent virus transmission. En "Aphids as virus vectors", (Harris K. F. y Maramorosch K., Eds.). Academic Press Inc, New York. pp 221-235.
- Pirone, T. P., Harris, K. F. (1977).** Non-persistent transmission of plant viruses by aphids. *Annual Review of Phytopathology* 15:55-73.
- Pirone, T. P. (1981).** Efficiency and selectivity of the helper-component-mediated aphid transmission of purified potyviruses. *Phytopathology* 71:922-924.
- Pirone, T. P., Thornbury, D. W. (1983).** Role the virion and helper component in regulating aphid transmission of tobacco etch virus. *Phytopathology* 73:872-875.
- Pirone, T. P., Thornbury, D. W. (1984).** The involvement of a helper component in nonpersistent transmission of plant viruses by aphids. *Microbiol. Sci.* 1. 191-199.
- Pirone, T. P., Thornbury, D. W. (1987).** Quantity of virus required for Aphid transmission of a potyvirus. *Phytopathology* 78:104-107
- Plaskitt, K. A., Watkins, P. A. C., Sleat, D. E., Gallie, D. R., Shaw, J. G., Wilson, T. M. A. (1988).** Immunogold labeling locates the sites of disassembly and transient gene expression of tobacco mosaic virus-like pseudovirus particles *in vivo*. *Mol. Plant-Microbe interact.* 1:10-16.
- Pons, X., Albajes, R. (1986).** Los pulgones como transmisores de virosis en el maíz. IV Jornadas Técnicas sobre maíz. *Plagas*:28-44
- Pring, D. R., Langenberg, W. G. (1972).** Preparation and properties of maize dwarf mosaic virus ribonucleic acid. *Phytopathology* 62:253-255.
- Puertas, G. (1986).** Estudio de las causas de bajo rendimiento del maíz en la comarca de la Noguera en Lleida. Problemas producidos por virus. IV Jornadas Técnicas sobre maíz. *Enfermedades*:3-26.

**Purcifull, D. E., Hierbert, E. (1992).** Serological relationships involving potyviral nonstructural proteins. En: "Potyvirus taxonomy", (Barnett O. W., Eds.) Springer. Wien New York, pp 97-120 (Arch Virol [Suppl] 5).

**Puurand, U., Makinen, K., Bauman, M., Saarma, M. (1992).** Nucleotide sequence of the 3'-terminal region of potato virus A RNA. *Virus Research*, 23:99-105.

**Quemada, H., L'Hostis, B., Golsalves, D., Reardon, I. M., Heinrikson, R., Hierbert, E. L., Sieu, L. C., Slightom, J.L. (1990a).** The nucleotide sequences of the 3'-terminal regions of papaya ringspot virus strains W and P. *J. Gen. Virol.* 71:203-210.

**Quemada, H., Sieu, L.C., Siemieniak, D. R., Golsalves, D., Slightom, J. L. (1990b).** Watermelon mosaic virus II and zucchini yellow mosaic virus: cloning of 3'- terminal regions, nucleotide sequences and polylogenetic comparisons. *J. Gen. Virol.* 71:1451-1460.

**Racchah, B., Pirone, T. P. (1984).** Characteristics of and factors affecting helper-component-mediated aphid transmission of a potyvirus. *Phytopathology* 74:305-308.

**Racchah, B. (1987).** Nonpersistent viruses: epidemiology and control. *Adv. Virus Res.* 31:387-427.

**Ravelonandro, M., Varveri, C., Delbos, R., Dunez, J. (1988).** Nucleotide sequence of the capsid protein gene of plum pox potyvirus. *J. Gen. Virol.* 69:1509-1516.

**Restrepo, M. A., Freed, D. D., Carrington, J. C. (1990).** Nuclear transport of a plant potyvirus proteins. *The Plant Cell* 2:987-998.

**Restrepo-Hartwig, M. A., Carrington, J. C. (1992).** Regulation of nuclear transport of a plant potyvirus protein by autoproteolysis. *Journal of Virology* 66:5662-5666.

**Reynolds, E. S. (1963).** The use of lead citrate at high pH as an electron-opaque stain in electron microscopy. *Journal of Cell biology* 17:208-212.

**Riechmann, J. L., Laín, S., García, J. A. (1989).** The genome-linked protein and 5' end RNA sequence of plum pox potyvirus. *J. Gen. Virol.* 70:2785-2789.

**Riechmann, J. L. Laín, S., García, J. A. (1990).** Infectious in vitro transcripts from a plum pox potyvirus cDNA clone. *Virology* 177:710-716.

**Riechmann, J. L., Laín, S., García, J. A. (1991).** Identification of the initiation codon of plum pox potyvirus genomic RNA. *Virology* 185:544-552.

**Riechmann, J. L., Laín, S., García, J. A. (1992).** Highlights and prospects of potyvirus molecular biology. *J. Gen. Virol.* 73:1-16.

**Roane, C. W., Tolin, S. A., Genter, C. F. (1983).** Inheritance of resistance to maize dwarf mosaic virus inbred line Oh7B. *Phytopathology* 73: 845-850.

**Roane, C. W., Tolin, S. A., Aycocock, H. S. (1989a).** Genetics of reaction to maize dwarf mosaic virus strain A in several maize inbred lines. *Phytopathology* 79: 1364-1368.

**Roane, C. W., Tolin, S. A., Aycocock, H. S., Donahue, P. J. (1989b).** Association of Rmd1, a gene conditioning reaction to maize dwarf mosaic virus, with genes conditioning endosperm color (y1) and type (su2) in maize. *Phytopathology* 79: 1368-1372.

**Robaglia, C., Durand-Turdif, M., Tronchet, M., Boudazin, G., Astier-Manifacier, S., Casse-Delbart, F. (1989).** Nucleotide sequence of potato virus Y (N strain) genomic RNA. *J. Gen. Virol.* 70:935-947.

**Rodríguez-Cerezo, E., Shaw, J. G. (1991).** Two newly detected nonstructural viral proteins in Potyvirus-infected cells. *Virology* 185:572-579.

**Rodríguez-Cerezo, E., Gamblee Klein, P., Shaw, J. G. (1991).** A determinant of disease symptom severity is located in the 3'-terminal noncoding region of the RNA of a plant virus. *Proc. Natl. Acad. Sci. USA* 88:9863-9867.

**Rorrer, K., Parks, T. D., Sheffler, B., Bevan, M., Dougherty, W. G. (1992).** Autocatalytic activity of the tobacco etch virus NIa proteinase in viral and foreign protein sequences. *J. Gen. Virol.* 73:775-783.

**Rosenkranz, E. (1977).** Grasses natives or adventive to the United States as new hosts of maize dwarf mosaic and sugarcane mosaic viruses. *Phytopathology* 68:175-179.

**Rosenkranz, E., Scott, G. E. (1978).** Effect of plant age at time of inoculation with maize dwarf mosaic virus on disease development and yield in corn. *Phytopathology* 68:1688-1692.

**Rosenkranz, E. (1980).** Taxonomic distribution of native grass species susceptible to maize dwarf mosaic and sugarcane mosaic viruses. *Phytopathology* 70:1056-1061.

**Rosenkranz, E. (1983).** Susceptibility of representative native Mississippi grasses in six subfamilies to maize dwarf mosaic virus strains A and B and sugarcane mosaic virus strain B. *Phytopathology* 73:1314-1321.

**Rosenkranz, E. (1987).** New hosts and taxonomic analysis of the Mississippi native species tested for reaction to maize dwarf mosaic and sugarcane mosaic viruses. *Phytopathology* 77:598-607.

**Rosenkranz, E., Scott, G. E. (1987).** Comparison of inoculation with maize dwarf mosaic virus on the abaxial and adaxial leaf surfaces in corn. *Phytopathology* 77:1243-1246.

**Rosner, A., Raccach, B., Mayoral, M. L., Bar-Joseph, M. (1986).** Synthesis of DNA complementary to the polyadenylated genomic RNA of potato virus Y and its molecular cloning. *Plant Pathology* 35:178-184.

**Roth, J. (1983).** The colloidal gold marker system for light and electron microscopic cytochemistry. En "Techniques in Immunochemistry", ( Bullock G. R. y Petruz, P., Eds.) Volume 2. Academic Press. pp 217-284.

**Rubies, C. (1982).** Presencia del raquitismo del maíz (maize dwarf mosaic virus) en maíz híbrido y en *Sorghum halepense* en Lérída. En I Congreso Nacional de Fitopatología 30.

**Saito, T., Meshi, T., Takamatsu, N., Okada, Y. (1987).** Coat protein gene sequence of tobacco mosaic virus encodes a host response determinant. *Proc. Natl. Acad. Sci.* 84:6074-6077.

**Sako, N., Ogata, K. (1981).** Different helper factors associated with aphid transmission of some potyvirus. *Virology* 112:762-765.

**Salomon, R., Raccach, B. (1990).** The role of N-terminus of potyvirus coat in aphid transmission. In *Proc. of the VIIIth International Congress of Virology*. Berlin, P83-007.

**Salomon, R. (1992).** Proteolytic cleavage of the N-terminal region of potyvirus coat protein and its reation to host recovery and vector transmission. En: "Potyvirus taxonomy", (Barnett O. W., Eds.). Springer. Wien New York, pp 75-76 (*Arch Virol* [Suppl] 5).

**Sambrook, J., Fritsch, E. F., Maniatis, T. (1989).** *Molecular cloning*, 2nd Edn., Cold Spring Harbor Laboratory Press.

**Sanchez, F., Romero, J., Ponz, F. (1993).** Diversidad de potyvirus de maíz en distintas regiones españolas. *Invest. Agr.: Prod. Prot. veg.* 8(2):265-273.

**Sanger, F., Nicklen, S., Coulson, A. R. (1977).** DNA sequencing with chain-terminating inhibitors. *Proc. Natl. Acad. Sci. USA* 74:5463-5467.

**Sanger, F., Coulson, A. R., Barell, B. G., Smith, A. J. H., Roe, B. A. (1980).** Cloning in single-stranded bacteriophage as a aid to rapid DNA sequencing. *Journal of Molecular Biology* 143:161-178.

**SEA (1983).** Estudi del baix rendiment del conreu de panís a la comarca de Balaguer. Fulls d'Informació. SEA 9/83.

**Seifers, D. L. (1984).** Optimum condictiones for studies of maize dwarf mosaic virus strains A and B in sorghum. *Plant Dis.* 68:1067-1069.

**Seifers, D. L., Harvey, T. L. (1989).** Effect of carbofuran on transmission of maize dwarf mosaic virus in *Sorghum* mechanically and by aphid *Schizaphis graminum*. *Plant Dis.* 73:61-63.

**Schägger, H., von Jagow, G. (1987).** Tricine-Sodium Dodecyl sulfate-Polyacrylamide gel electrophoresis for the separation of proteins in the range from 1 to 100 kDa. *Analytical Biochemistry* 166:368-379.

**Scheifele, G. L. (1969).** Effect of early and late inoculation of maize dwarf mosaic virus strain A and B on shelled grain yields of susceptible and resistant maize segregates of a three-way hybrid. *Plant. Dis. Rep.* 53:345-347.

**Scott, G. E., Rosenkranz, E. E. (1981).** Effect of field distribution of maize dwarf mosaic-diseased corn plants on yield. *Plant Dis.* 65:802-803.

**Scott, G. E., Rosenkranz, E. E. (1982).** A new method to determinate the number of genes for resistance to maize dwarf mosaic virus strain A in five corn inbred lines. *Crop Sci.* 22:756-761.

**Scott, G. E., Rosenkranz, E. E. (1987).** Variable reaction within corn inbreds to maize dwarf mosaic virus not genetically controlled. *Crop Sci.* 27:78-79.

**Scott, G. E. (1985).** Nonrandom spatial distribution of aphid-vectored maize dwarf mosaic. *Plant Dis.* 69:893-895.

**Scott, G. E., Darrah, L. L., Wallin, J. R., West, D. R., Knole, J. K., Louie, R., Gudauskas, R. T., Bockholt, A. J. Damsteegt, V. D., Uyemoto, J. K. (1988).** Yield losses caused by maize dwarf mosaic virus in maize. *Crop. Sci.* 28:691-694.

**Shahabuddin, M., Shaw, J. G., Rhoads, R. E. (1988).** Mapping of the tobacco mottling virus VPg cistron. *Virology* 163, 635-637.

**Shaunak, K. K., Pitre, H. N. (1973).** Comparative transmission of maize dwarf mosaic virus by *Aphis fabae*, *aphis gossypii*, *Schizaphis graminum*. Plant. Dis. Rep. 57:533-536.

**Shepherd, R. J., Holdeman, Q. L. (1965).** Seed transmission of Johnson grass strain of the sugarcane mosaic virus in corn. Plant. Dis. Rep. 49:468-469.

**Shepherd, R. J. (1965).** Properties of a mosaic virus of corn and johnson grass and its relation to sugarcane mosaic virus. Phytopathology 55:1250-1256.

**Shields, S. A., Wilson, M. A. (1987).** Cell-free translation of turnip mosaic virus RNA. J. Gen. Virol. 68:169-180.

**Shukla, D. D., Gough, K. H., Ward, C. W. (1987).** Coat protein of potyvirus. 3. Comparison of amino acid sequences of coat proteins of four australian strains of sugarcane mosaic virus. Arch. Virol. 96:59-74.

**Shukla, D. D., McKern, N. M., Gough, K. H., Trancy, S. L., Letho, S. G. (1988a).** Differentiation of potyviruses and their strains by high performance liquid chromatographic peptide profiling of coat protein. J. Gen. Virol. 69:493-502.

**Shukla, D. D., Strike, P. M., Trancy, S. L., Gough, K. H., Ward, C. W. (1988b).** The N and C termini of the coat proteins of potyviruses are surface-located and the N terminus contains the major virus-specific epitopes. J. Gen. Virol. 69: 1497-1508.

**Shukla, D. D., Ward, C.W. (1988c).** Amino acid sequence homology of coat proteins as a basis for identification and classification of the potyvirus group. J. Gen. Virol. 69:2703-2710.

**Shukla, D. D., Thomas, J. L., McKern, N. M., Trancy, S. L., Ward, C. W. (1988d).** Coat protein of potyviruses. 4. Comparison of biological properties, serological relationships, and coat protein amino acid sequences of four strains of potato virus Y. Arch. Virol. 105: 143-151.

**Shukla, D. D., Ward, C.W. (1989a).** Structure of potyvirus coat proteins and its application in the taxonomy of the potyvirus group. Adv. Virus Res. 36:273-314.

**Shukla, D. D., Jilka, J., Tasic, M., Ford, R.E. (1989b).** A novel approach to the serology of potyvirus involving affinity-purified polyclonal antibodies directed towards virus-specific N termini of coat proteins. J. Gen. Virol. 70:13-23.

**Shukla, D. D., Tasic, M., Jilka, J., Ford, R. E., Toler, R. W., Langham, M. A. C. (1989c).** Taxonomy of potyviruses



infecting maize, sorghum, and sugarcane in Australia and the United States as determined by reactivities of polyclonal antibodies directed towards virus-specific N-termini of coat proteins. *Phytopathology* 78:223-229.

**Shukla, D. D., Teakle, D. S. (1989d).** Johnsongrass mosaic virus. CMI/AAB Descriptions of Plant Viruses N<sup>o</sup> 340.

**Shukla, D. D., Frenkel, M. L., Ward, C. W. (1991).** Structure and function of potyvirus genome with special reference to the coat protein coating region. *Can. J. Plant Pathol.* 13:178-191.

**Shukla, D. D., Lauricella, R., Ward, C. W. (1992a).** Serology of potyvirus: current problems and some solutions. En: "Potyvirus Taxonomy", (Barnett O. W., Eds.). Springer. Wien New York. pp 57-70 (*Arch. Virol.*[Suppl]5).

**Shukla, D. D., Frenkel, M. L., McKern, N.M., Ward, C. W., Jilka, J., Ford, R. E. (1992b).** Present status of the sugarcane mosaic potyvirus subgroup. En: "Potyvirus Taxonomy", (Barnett O. W. Eds.) Springer. Wien New York. pp 363-373 (*Arch. Virol.*[Suppl]5)..

**Siaw, M. F. E. Shahabuddin, M., Ballard, S., Shaw, J. G. Rhoads, R. E. (1985).** Identification of a protein covalently linked to the 5' terminus of tobacco vein mottling virus RNA. *Virology* 142: 134-143.

**Signoret, P. A. (1974).** Les maladies a virus des graminees dans le Midi de la France. *Acta Biol. Iugoslav Ser B* 11:115-120.

**Snazelle, T. E., Bancroft, J. B., Ullstrup, A. J. (1971).** Purification and serology of maize dwarf mosaic and sugarcane mosaic viruses. *Phytopathology* 61:1059-1063.

**Splittstoesser, W. E., Rest, E. B., D'Arcy, C. J. (1990).** Rapid spread of maize dwarf mosaic. *HortScience* 25(3):360.

**Stakic, D. and Saviv, C. (1984).** Effect of maize virus disease on germination of maize seeds and dimension of primary roots of maizen seedings. *Zastilc bilja* 35(4): 373-377. 621-625.

**Stram, Y., Sela, I., Edelbaum, O., Tanne, M.K., Karchi, H. (1993).** Expression and assembly of the potato virus Y (PVY) coat protein (CP) in *Escherichia coli* cells. *Virus Research* 28:29-35.

**Straub, R. W., Boothroyd, C. W. (1980).** Relationship of corn leaf aphid and maize dwarf mosaic disease to sweet corn yields in Southeastern New York. *J. Econ. Entomol.* 73: 92-95.

**Straub, R. W. (1982).** Occurrence of four aphid vectors of maize dwarf mosaic disease in Southeastern New York. *J. Econ. Entomol.* 75: 156-158.

**Stromberg, E. L., Zeyen, R. L., Johnson, H. G. (1978).** An epidemic of maize dwarf mosaic virus in sweet corn in Minnesota. *Phytopathology News* 12, 123. (citada pero no consultada)

**Suzuki, N., Kudo, T., Shirako, Y., Ehara, Y., Tachibana, T. (1989).** Distribution of cylindrical inclusion and capsid proteins of watermelon mosaic virus 2 in systematically infected pumpkin leaves. *J. Gen. Virol.* 70:1085-1091.

**Teycheney, P. Y., Tavert, G., Delbos, R., Ravelonandro, M., Dunez, J. (1989).** The complete nucleotide sequence of plum pox virus RNA. *Nucleic acids Res.* 17:10115-10116.

**Teakle, D.S., Shukla, D. D., Ford, R. E. (1989).** Sugarcane Mosaic Virus. *CMI/AAB Descriptions of Plant Viruses N° 342.*

**Thompson, D. L., Hebert, T.T. (1970).** Development of maize dwarf mosaic symptoms in eight phytotron environments. *Phytopathology* 60:1761-1764.

**Thongmeearkom, P., Ford, R. E., Jedlinski, H. (1976).** Aphid transmission of maize dwarf mosaic virus strains. *Phytopathology* 66:332-335.

**Thornbury, D. W., Pirone, T. P. (1983).** Helper components of two potyvirus are serologically distinct. *Virology* 125:487-490.

**Thornbury, D. W., Hellmann, G. M., Rhoads, R. E., Pirone, T. P. (1985).** Purification and characterization of potyvirus helper component. *Virology* 144:260-267.

**Thornbury, D. W., Patterson, C. A., Dessens, J. T., Pirone, T. P. (1990).** Comparative sequence of the helper component (HC) region of potato virus Y and a HC-defective strain, potato virus C. *Virology* 178:573-578.

**Timian, R. G., Jons, V. L., Lamey, H. A. (1978).** Maize dwarf mosaic virus in North Dakota. *Plant Dis. Rep.* 62: 674-675.

**Toler, R. W., Miller, F. R. (1983).** Effect of various combinations of inoculation pressure and concentration on varietal disease response of sorghum. *Crop Sci.* 23:83-85.

**Toler, R. W., Bhola, N., Roose, D., Kaula, G. M. (1989).** Occurrence of maize dwarf mosaic virus in Zambia. *Plant Dis.* 73: D.N.

- Tosic, M., Ford, R. E. (1972).** Grasses differentiating sugarcane mosaic and maize dwarf mosaic viruses. *Phytopathology* 62:1466-1470.
- Tosic, M., Ford, R. E. (1974).** Physical and serological properties of maize dwarf mosaic and sugarcane mosaic viruses. *Phytopathology* 64:312:317.
- Tosic, M., Benetti, M. P., Conti, M. (1977).** Studies on sugarcane mosaic virus (SCMV) isolates from northern and central Italy. *Ann. Phytopathol.* 9(3):387-393.
- Tosic, M., Ford, R. E., Shukla, D. D., Jilka, J. (1990).** Differentiation of sugarcane, maize dwarf, Johnsongrass, and sorghum mosaic viruses based on reactions of oat and some sorghum cultivars. *Plant Dis.* 74 :544-552.
- Tu, T. C., Ford, R. E., Krass, C. J. (1968).** Comparisons of chloroplasts and photosynthetic rates of plants infected and not infected by maize dwarf mosaic virus. *Phytopathology* 58: 285-288.
- Tu, T. C., Ford, R. E. (1968).** Influence of host nutrition on susceptibility of, multiplication in, and symptom expression by corn to infection by maize dwarf mosaic virus. *Phytopathology* 58: 1343-1348.
- Tu, T. C., Ford, R. E. (1969).** Infectivity changes of maize dwarf mosaic virus in vivo and in vitro. *Phytopathology* 59: 1947-1949.
- Tu, T. C., Ford, R. E. (1969).** Effect of temperature on maize dwarf mosaic infection, incubation, and multiplication in corn. *Phytopathology* 59: 699-702.
- Tu, T. C., Ford, R. E. (1971).** Factors affecting aphid transmission of maize dwarf mosaic virus to corn. *Phytopathology* 61: 1516-1521.
- Turpen, T. (1989).** Molecular cloning of a potato virus Y genome: nucleotide sequence homology in non-coding regions of potyvirus. *J. Gen. Virol.* 70:1951-1980.
- Uyeda, I., Takahashi, T., Shikata, E. (1991).** Relatedness of nucleotide sequence of the 3' terminal region of clover yellow vein potyvirus to bean yellow mosaic potyvirus RNA. *Intervirology* 32:234-245.
- Vance, V. B., Beachy, R. N. (1984).** Translation of Soybean Mosaic virus *in vitro*: evidence of protein processing. *Virology* 132:271-281.
- Van Der Vlugt, R., Allefs, S., Dehaan, P., Goldrath, R. (1989).** Nucleotide sequence of the 3'-terminal region of potato virus Y<sup>N</sup> RNA. *J. Gen. Virol.* 70:229-233.

**Verchot, J., Koonin, E. V., Carrington, J. C. (1991).** The 35-kDa protein from the N-terminus of the potyviral polyprotein functions as a third virus encoded proteinase. *Virology* 185: 527-535.

**von Baumgarten, G., Ford, R. E. (1981).** Purification and partial characterization of maize dwarf mosaic virus strain A. *Phytopathology* 71:36-41

**von Wechmar, M. B., Chauhan, R., Enox, E. (1992).** Fungal transmission of a potyvirus: uredospores of *Puccinia sorghi* transmit maize dwarf mosaic virus. En: "Potyvirus taxonomy", (Barnett O. W., Eds). Springer. Wien New York, pp 239-250 (Arch Virol [Suppl] 5).

**Wang, D., Hayes, I. M., Maule, A. J. (1992).** Procedures for the efficient purification of pea seed-borne mosaic virus and its genomic RNA. *J. Virol. Methods* 1-8.

**Ward, C. W., Shukla, D. D. (1991).** Taxonomy of potyviruses: Current problems and some solutions. *Intervirology* 32:269-296.

**Wetzel, T., Candresse, T., Ravelonandro, M., Delbos, R. P., Mazyard, H., Aboul-Ata, A. E., Denez, J. (1991).** Nucleotide sequence of the 3'-terminal region of the RNA of the El Amar strain of plum pox potyvirus. *J. Gen. Virol.* 72:1741-1746.

**Williams, L. E., Alexander, L. J. (1965).** Maize dwarf mosaic, a new corn disease. *Phytopathology* 55:802-804.

**Williams, L. E., Findley, W. R. Dollinger, E. J., Ritter, R. M. (1968).** Seed transmission studies of maize dwarf mosaic virus in corn. *Plant Dis. Rep.* 52:863-864

**Xiao, X. W.; Frenkel, M. J., Ward., C. W., Shukla, D. D. (1993).** Sequence diversity in the surface-exposed N-terminal region of coat protein may be an important factor in the evolution of new species of potyviruses. In Proc of IXth International Congress of Virology P-68-18.

**Yen, D-S., Gonsalves, D. (1985).** Translation of papaya ringspot virus *in vitro* : Detection of a possible polyprotein that is processed for capsid protein, Cylindrical-inclusion protein, and amorphous-inclusion protein. *Virology* 143:260-271.

**Zeyen, R. J., Stromberg, E. L., Kuehnast, E. L. (1987).** Long-range aphid transport hypothesis for maize dwarf mosaic virus: history and distribution in Minnesota, USA. *Ann. Appl. Biol.* 111:325-336.

**Zeyen, R. J., Berger, P. H. (1990).** Is the concept of short retention times for aphid-borne nonpersistent plant viruses sound?. *Phytopathology* 80: 769-771.

**Zitter T. A., Tsai, J. H. (1977).** Transmisión of three potyviruses by the leafminer *Liriomyza sativae* (Diptera: Agromyzidae). Plant Dis. Rep. 61:1025-1028.

**Zuber, M. S., Hilderbrand, E. S., Loesch, P. L., Keaster, A. J. (1972).** Prediction of reactions to maize dwarf mosaic virus in double-cross hybrids based upon single-cross reaction. Crop Sci. 13:172-175.

**Zummo, N. (1973).** Sugarcane mosaic virus strain L: a new virulent strain of sugarcane mosaic virus from Meiegs, Georgia. Plant Pathology 305:309.

