NEW SOURCES OF RESISTANCE TO PEPPER VEINAL MOTTLE VIRUS IN PEPPER BREEDING LINES

GEBRE SELASSIE K., POCHARD E. (*), MARCHOUX G., THOUVENEL J.C. (**)

I.N.R.A., Centre de Recherche Agronomique d'Avignon,
Station de Pathologie Végétale ; (*) Station d'Amélioration des Plantes Maraîchères
Domaine Saint Maurice, F 84140 MONTFAVET
(**) O.R.S.T.O.M., Laboratoire de Virologie, B.P. V 51, Abidjan,
République de Côte d'Ivoire, Afrique de l'Ouest.

At least the following six Potyviruses have been reported to affect **Capsicum** species in different parts of the world : Pepper Mottle Virus (PeMV), and Tobacco Etch Virus (TEV), mainly predominant in the North and Central America ; Pepper Severe Mosaic Virus (PSMV) and Peru Tomato Virus (PTV), in South America ; Pepper Veinal Mottle Virus (PVMV), in Africa and South East Asia . In Europe and the mediterranean countries, it's mainly Potato Virus Y (PVY). The same virus also cause important damages in the above continents.

The damages they can cause can vary very much ; it depends upon the strains, and the cultivars ; it depends also, if it is a single or a mixed infection. Breeding lines, and/or cultivars resistant to certain strains of PeMV, PVY and TEV have been already reported in the american continents ; whereas, for the other viruses and in particular for PVMV, no resistance has been reported, except certain tolerance from Malaysia (SOH et al., 1977). New promising andrógenetic lines resistant to this virus have been obtained at the Plant Breeding Station (INRA), Montfavet, France.

MATERIALS AND METHODS

Hosts

The performance of different genitors and cultivars which were reported elsewhere to possess resistance to certain strains of PVY, PeM and TEV, have been already tested with different strains of PVY collected in our region (POCHARD, 1977 ; POCHARD et al., 1983 ; GEBRE SELASSIE et al., 1985). Out of these different cultivars and genitors three of them [i.e. "Yolo Wonder" (Y. W.), "Yolo Y" (Y. Y), "Florida VR-2" (VR-2)] have been crossed to "Perennial" (Per.) and the progeny tested for resistance to the strains of PVY and PVMV.

Viruses and strains

The PVY strains were TO-72, SON-41 and VR-2. They were isolated respectively from tomatoes, **Solanum nigrum** and "Florida VR-2", but only after subsquente transfer on the same cultivar. The PVMV strains were received either from Brunt G.C.R. Ghana or isolated by the last author in Ivory Coast.

Inoculation techniques

The inoculum was prepared by grinding in 0.03 M Na_2HPO_4 solution and 0.2 % of Sodium diethyldithiocarbamate (DIECA) containing activated charcol and carborundum. Plants were mechanically sap inoculated on the cotyledons, at the 1st true leaf stage, or on the two youngest leaves, at 5 - 6 leaf stage.

Serology

The SDS-Immunodiffusion (SDS-ID), the double antibody sandwich form of the Enzyme Linked Immunosorbent Assay (ELISA), and Immun-Electron Microscopy (IEM) techniques were applied as previously (GEBRE SELASSIE and al., 1985). The antiserum of PVMV was received at the same time with the strains.

RESULTS

Characterization and separation of the most commonly recognized Potyviruses

- *Biology*

None of our PVY strains can produce local lesions on **Capsicum frutescens** cv. "Tabasco" like PeMV, nor wilt like TEV. They can be differentiated from PVMV, by that they produce local lesions on **C. annuum** cv. "Anaheim F6" and mosaic or necrotic type infection on **Nicotiana tabaccum** cv. "Xanthi nc." while PVMV produces only mosaic type infection on Anaheim F6 and does not infect systemically "Xanthi nc."

PeMV and PVY can be separated from TEV, by inoculating to **Datura stramonium** which is susceptible to TEV but not to PeMV and PVY.

- *Serology*

The PVY strains showed no serological relationship (SDS-ID) or were distantly related (IEM) to PeMV, PVMV and TEV. Whereas the different strains of PVY (about 257 isolates) showed very close relationship between them and with the reference strains PVY^N and TO-72, and belonged mainly to the zero pathotype.

Infact, at present, all the **Capsicum** species, and cultivars that we have tested showed susceptibility or only certain tolerance to PVMV. This is the first report of **Capsicum** lines resistant under field and greenhouse conditions after natural and artificial infections. These lines have been obtained in the progeny of a cross involving two susceptible parents. We hope the same material will be resistant in other parts of the world where the virus exists.

REFERENCES

BRUNT A. A., KENTEN R. H. and PHILLIPS S., 1978. Symptomatologically distinct strains of pepper veinal mottle virus from four West African solanaceous crops. Ann. Appl. Biol., 88, p. 115-119.

COOK A.A., 1963. Genetics of response in pepper to three strains of Potato Virus Y. Phytopathology, 53, 720-722.

GEBRE SELASSIE K., MARCHOUX G., DELECOLLE B. et POCHARD E., 1985. Variabilité naturelle des souches du virus Y de la Pomme de Terre dans les cultures de piment du Sud-Est de la France. Caractérisation et classification en pathotypes. Agronomie, 5, 621-630.

NAGAI H., 1983. Melhoramento de Pimentão (**Capsicum annuum** L.) visando resistência ao virus Y. Hort. Bras., 1 (2), 3-9.

POCHARD E., 1977. Etude de la résistance aux souches européennes de Virus Y de la Pomme de terre (PVY) chez le piment. C.R. 3e Congr. Eucarpia Piment, Avignon, 109-118.

POCHARD E., GEBRE SELASSIE K. et MARCHOUX G., 1983. Oligogenic resistance to Potato Virus Y pathotype 1-2 in the line "Perennial". Capsicum Newsletter, 2, 7-9.

SMITH P.G., 1974. Resistance to the tobacco etch virus in peppers. "Genetics and breeding of Capsicum". Rept. 2nd Eucarpia Meet., Budapest, July 1974, 127-135.

SOH A.C., YAP T.C. and GRAHAM K.M., 1977. Inheritance of resistance to Pepper Veinal Mottle Virus in Chilli. Phytopathology, 67, 115-117.

From the F1 cross of (Per x VR-2), homozygous lines issued by androgenesis (ADH) have been obtained. These lines have been tested with three strains of the PVY and one strain of PVMV under insect-proof growth chambers. 4 out of 28 lines have been found more resistant than their parents when checked serologically (ELISA). The same ADH-lines were grown in 1982, and 1985 under field conditions in the Ivory Coast at Adiopodoume where infection with PVMV is often observed. During the two years, the ADH lines remained resistant after visual observation and serological tests.

Table 1

Percentage of infected plants of the different cultivars and ADH lines with PVMV under field conditions at Adiopodoume.

Years	Varieties				A D H lines			
	Y. W.	Y. Y	VR-2	Per.	801	818	832	485 a-30
1982	58 %	67	75	59	0	0	0	NT
1985	50	NT	48	0	0	NT	0	0

% = average of 2 replications of 30 plants
NT = not tested

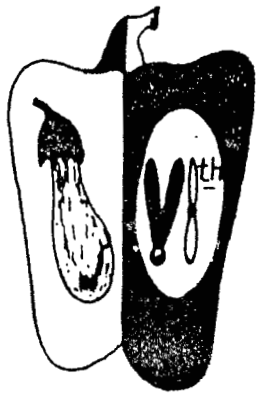
CONCLUSION AND DISCUSSION

The isolates collected from peppers, tomatoes and **Solanum nigrum** have been compared to PeMV, PVMV and TEV by their reactions on differential hosts, and different techniques of serology. We have found our isolates showed no close serological relationship to the above viruses but only to PVY. Previously we have reported our isolates can be grouped into 3 pathotypes i.e. Pathotype zéro (P-0), P-1 and P-1-2 (GEBRE et al., 1985). The same situation has been reported in the U.S.A. (COOK, 1963 ; SMITH, 1974), in Brazil (NAGAI, 1983).

The situation of PVMV, previously considered as limited to West-African countries, and only limited to peppers (BRUNT et al., 1978), has changed, because PVMV covers almost the whole parts of Africa and as far as South East Asia. The source for resistance to PVY strains of the different pathotypes seems more rich than for PVMV.

EUROPEAN ASSOCIATION FOR RESEARCH ON PLANT BREEDING

EUCARPIA



VIth MEETING ON GENETICS AND BREEDING ON CAPSICUM AND EGGPLANT

ZARAGOZA (SPAIN), October 21-24, 1986

DIPUTACION GENERAL DE ARAGON

AGRICULTURAL RESEARCH SERVICE
SERVICIO DE INVESTIGACION AGRARIA