Potato Res. 20 (1977): 85–88 SHORT COMMUNICATION

Reaction of Red Kidney bean to potato virus S

A. KOWALSKA

Institute for Potato Research, Department of Genetics, Młochów, 05-832 Rozalin, Poland

Accepted for publication: 5 November 1976

Keywords: Potato virus S, test plants

Summary

Potato virus S produced minute local lesions on Red Kidney bean 5 days after inoculation. The number of lesions depended on the virus isolate.

Introduction

Phaseolus vulgaris L., cultivar Red Kidney, was described by Hiruki (1970) as a useful local lesion host for potato virus M (PVM). It appeared very suitable for quantitative work with PVM and for detection of the virus (Hiruki, 1970; 1973; Hiruki et al., 1974; Dziewońska & Ostrowska, 1973; Kowalska & Waś, 1976; Kowalska & Skrzeczkowska, 1976). Data presented in this paper indicate that local lesions on this test plant may also be caused by potato virus (PVS) which is related to PVM.

Materials and methods

Average temperature in the greenhouse where experiments were conducted fluctuated between 16 and 22°C. From October to March plants were given supplementary illumination for 6–12 hours daily. Antisera used in the experiments had been produced in the Laboratory of Serology of the Institute for Potato Research in Gdańsk.

Primary leaves of Red Kidney bean, 9–12 days after sowing, were dusted with carborundum and inoculated by rubbing with crushed leaves of potato plants infected with PVS, after which they were rinsed with tap water.

Thirty-five potato plants of different cultivars, which were infected with PVS, were used for inoculation, one bean plant being inoculated with a leaf sample from each potato plant tested. It was a fundamental prerequisite of the experiments that the potato plants used should be free from PVM. This was established by inoculation to *Lycopersicon chilense* and by serological tests using the agglutination method. In addition, in order to eliminate the possibility that local lesions apparently produced on Red Kidney bean by PVS were in fact produced by PVM, despite this having not been previously detected in the potato plants, attempts were made to isolate the virus

from single local lesions and to identify it. The following method was employed. It usually gives satisfactory results when used for PVM isolation from single local lesions on Red Kidney bean (Kowalska, unpublished).

A necrotic area was cut out from the leaf with a piece of razor-blade, crushed in 1–2 drops of 0.057 *M* solution K_2HPO_4 and inoculated to one leaf of *Chenopodium quinoa*. After about two weeks the *C. quinoa* leaf was crushed in K_2HPO_4 solution and inoculated on one *L. chilense* plant; 3–4 weeks after inoculation the *L. chilense* plant was tested serologically.

Apart from experiments employing infected potato plants as a source of inoculum, further information was obtained from an additional series of experiments.

Eight PVS isolates were propagated on tomato plants cultivar Nevskij which is a good source of this virus (Shcherbakova & Truskinov, 1972). Leaves (2–3 months after inoculation) were ground in 0.057 *M* solution K_2HPO_4 using 1 ml solution per 1 g leaves. The sap was then pressed through cheese-cloth and divided into two portions. Antiserum against PVM was added to one portion and antiserum against PVS to the other using 1 ml antiserum per 1 ml sap. The mixtures were incubated for 10 min at 37°C and left at 4°C overnight. Next day they were centrifuged for 3 min at 2100 *g*. Each sample of the supernantant was inoculated to 10 bean leaves. On each bean plant one leaf was inoculated with sap incubated with antiserum against PVM, and the opposite leaf with sap incubated with antiserum against PVS. Lesions were counted 10 days after inoculation. Each PVS isolate was tested two or three times.

Results

1. *Inoculation from PVS-infected potato plants.* Five days after inoculation minute brown lesions developed on 27 out of 35 bean plants.
2. *Attempts to isolate virus from lesions.* Sixty five minute lesions were cut out from

Table 1. The average number of local lesions per leaf produced on Red Kidney bean by different PVS isolates after inoculation with sap incubated with antisera against PVM and PVS.

PVS isolate	Sap incubated with antiserum against	
	PVM	PVS
S5a	6.9	0
S6a	0.3	0
S28a	0.6	0
S46a	11.8	0.1
S53a	20.6	0.1
S63a	65.7	0.4
S65a	14.8	0.1
S66a	132.7	0.9

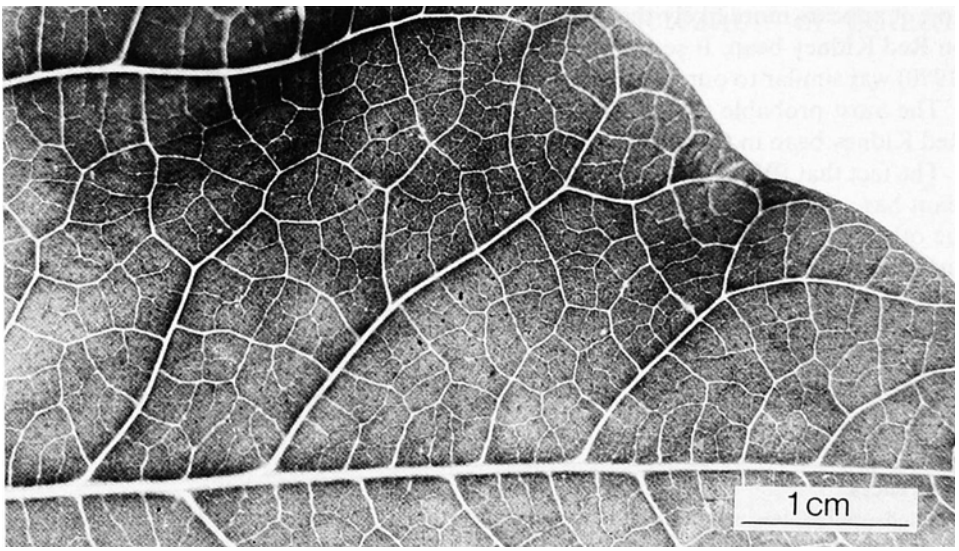

Fig. 1. Local lesions on the leaf of Red Kidney bean inoculated with PVS, isolate S66a.

leaves of Red Kidney. PVS was recovered from only three lesions. From the remainder no virus was isolated.

3. *Inoculation with PVS-infected tomato sap after incubation with antisera.* The results of one typical experiment are presented in Table 1.

On bean leaves incoulated with sap incubated with antiserum against PVS only occasional single lesions developed. On leaves inoculated with sap treated with antiserum against PVM the number of lesions depended on the virus isolate. After inoculation with isolates S6a and S28a only 0–2 lesions per leaf developed. The greatest numbers of lesions were produced by isolates S63a and S66a (Fig. 1).

Discussion

According to Hirucki (1970) Red Kidney bean is immune to PVS but the results presented in this paper indicate that PVS may produce on this test plant minute local lesions and that the number of lesions depends on the virus isolate. It would be supposed that in the present studies the differences in number of lesions caused by individual PVS isolates correspond to differences in the virus concentration in sap obtained from tomato cultivar Nevskij. Though this possibility was not tested in this study, it seems impossible that differences in virus concentration could be responsible for such big differences in the number of lesions. According to our previous observations, the Nevskij is a good source plant for all our PVS isolates, thus all isolates are easily detected in it by serological methods. Rather than differences in concentra-

tion, it appears more likely that PVS isolates differ in their ability to produce lesions on Red Kidney bean. It seems probable that the PVS isolate investigated by Hiruki (1970) was similar to our isolates S6a and S28a and had no ability to produce lesions.

The most probable reason for difficulties in isolating PVS from single lesions on Red Kidney bean in this study seems to be the very small size of these lesions.

The fact that PVS may produce lesions on Red Kidney bean indicates that this test plant has a limited value as a differential host for distinction of PVM and PVS. On the other hand it may be a useful bioassay plant for those PVS isolates which produce numerous lesions.

Acknowledgments

My thanks are due to Mrs G. Juchnik-Kędziorek and Mrs J. Krysik for technical assistance.

References

Dziewońska, M. A. & K. Ostrowska, 1973. Fasola odmiany Red Kidney jako roślina rozpoznawcza do wykrywania wirusa M ziemniaka – komunikat. *Biul. Inst. Ziem.* 11: 87–91.

Hiruki, C., 1970. Red Kidney bean, a useful bioassay host for qualitative and quantitative work with potato virus M. *Phytopathology* 60: 739–740.

Hiruki, C., 1973. Detection of potato virus M in tubers, sprouts, and leaves of potato by the French bean test. *Potato Res.* 16: 202–212.

Hiruki, C., E. Pountney & K. N. Saksena, 1974. Factors affecting bioassay of potato virus M in Red Kidney bean. *Phytopathology* 64: 807–811.

Kowalska, A. and S. Skrzeczkowska, 1976. Zastosowanie roztworu fosforanu potasowego przy wykrywaniu wirusa M ziemniaka na fasoli Red Kidney. *Biul. Inst. Ziem.* (in press).

Kowalska, A. & M. Waś, 1976. Detection of potato virus M and potato virus S on test plants. *Potato Res.* 19: 131–140.

Shcherbakova, N. M. & E. V. Truskinov, 1972. O vozmozhnosti zarazheniia tomatov virusom S kartofelia. *Dokl. Vaskhnil* 10: 17–18.