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FINDING OF SOWBANE MOSAIC VIRUS IN  
SUGAR BEET

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## Introduction

During investigations of the virus diseases of sugar beet in Semberia (Bosnia, central part of Yugoslavia), Buturović et al. (1978) isolated four viruses: beet mosaic virus, cucumber mosaic virus, tomato black ring virus and one virus which showed many similarities with sowbane mosaic virus (SMV). This latter virus, however, was not definitely identified.

There is no evidence in the literature on natural occurrence of SMV in sugar beet, although this plant can be artificially infected with that virus (Kado 1971). Until now SMV has been isolated from several herbaceous plants (Bennett and Costa 1961, Diaz and Waterworth 1967) and also from several woody plants (Bercks and Querfurth 1969, Bancroft and Tolin 1967, Quacquarelli 1971). In Yugoslavia SMV was found in *Chenopodium quinoa* exemplars cultivated in greenhouse (Šarić 1969), sour cherry (Šarić 1971), sowbane (Juretić 1976), grapevine (Šarić and Juretić 1976) and plum tree (Šutić and Juretić 1976).

This paper deals with a more accurate identification and also with some properties of the virus similar to SMV which Buturović et al. (1978) have isolated from sugar beet.

## Material and Methods

The investigated virus isolate was found on sugar beet bred at locality Batković (Semberia, Bosnia). In this paper it is denoted as SMV-S.

For the serological comparison 3 other isolates of sowbane mosaic virus (SMV) were involved in the experiments. They were the isolate SMV-A kindly supplied by Dr. H. E. Waterworth (Plant Introduction Station, Glenn Dale, USA), SMV-Y found in sowbane in Yugoslavia (Juretić 1976) and isolate SMV-T which was isolated from grapevine in Yugoslavia (Šarić and Juretić 1976).

In the serological tests two immune sera to SMV were involved; one of them was sent us by Dr. H. E. Waterworth (titre 1/1024) and the other was prepared against SMV-Y by the junior author (titre 1/2048). Serological experiments were performed by means of double radial immune diffusion tests (van Regenmortel 1976) and single radial immune diffusion tests (Juretić and Mamula 1980).

## Results

### 1. Test plant reactions

The isolate SMV-S was mechanically transmitted to a number of test plants (Table 1). Several test plants were unsusceptible to SMV-S isolate. They were: *Capsicum annuum* L. cv. Yolo Y, *Cucumis sativus* L. cv. Delikates, *Datura stramonium* L., *Lycopersicon esculentum* L., *Petunia hybrida* Vilm., *Nicotiana glutinosa* L., *N. megalosiphon* Heurecke et Muell., *N. sylvestris* Spegaz. et Comes, *N. tabacum* L. cv. Samsun and White Burley, *Phaseolus vulgaris* L.

Table 1. Reactions in some plants inoculated with the isolate SMV—S

Test plants	Reactions
<i>Beta vulgaris</i> L. var. <i>saccharifera</i> Lange cv. Osječka Poly 1	S* mosaic, variegation
<i>Chenopodium album</i> L.	L** chlorotic spots; S mosaic, deformations
<i>C. amaranticolor</i> Coste et Reyn.	L chlorotic spots
<i>C. foetidum</i> Schrad.	S mild mottling which disappeared
<i>C. murale</i> L.	S mosaic, mottling, deformations
<i>C. quinoa</i> Willd.	L necrotic lesions, S chlorotic zones, mosaic, curling, necroses on top leaves
<i>Tetragonia expansa</i> (Pall.) O. O. Ktze.	L chlorosis

\*S symptoms on noninoculated leaves    \*\*L symptoms on inoculated leaves

On the basis of above data SMV-S shares symptomatological properties and host range with SMV (Kado 1971, Kado 1967). It is important to say that the isolate SMV-S was transmitted mechanically to sugar beet where it was established by infection tests and also by serological reactions.

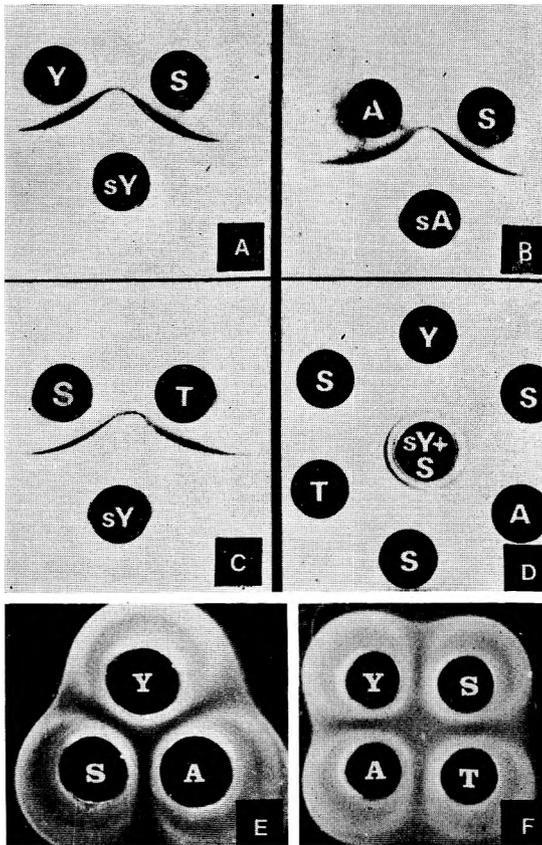


Fig. 1.

Serological comparison of the investigated SMV—S isolate with the three other isolates of sowbane mosaic virus (SMV); the reactions were obtained by the agar gel double diffusion tests (A—D) and the agar gel single diffusion tests (E, F). Abbreviations: S investigated SMV—S isolate, Y SMV isolate found in sowbane in Yugoslavia, A American SMV isolate, T SMV isolate found in grapevine in Yugoslavia, sY immune serum to Y isolate, sA immune serum to A isolate,

## 2. Properties in vitro

These properties were investigated on the basis of the number of infected *C. quinoa* samples. The thermal inactivation point of the isolate SMV-S was between 84 and 86°C, dilution end point over  $10^{-6}$  and longevity in vitro at room temperature over 50 days. Consequently, these data suggest that SMV-S can belong to SMV (comp. K a d o 1967).

## 3. Serological properties

The investigated isolate SMV-S was compared serologically with 3 isolates of SMV described earlier: they were isolates SMV-A, SMV-Y and SMV-T (see Material and Methods). The serological tests were performed by both double and single immunodiffusion methods.

The isolate SMV-S did not differ from the Yugoslav isolates SMV-Y (Fig. 1A) and SMV-T (Fig. 1C); neither did it differ from the American isolate SMV-A (Fig. 1B). In addition, no differences were found when SMV-S was compared with these 3 SMV isolates in the experiments performed by the intragel absorption tests (Fig. 1D). Nor were any differences observed in the experiments performed by single radial immunodiffusion tests (Fig. 1E, F).

## Discussion

Our finding of sowbane mosaic virus (SMV) is an additional proof that this virus is positively widespread in Yugoslavia. So far it has been isolated from several wild and cultivated plants in Yugoslavia which belong to herbaceous or woody plants (Š a r i ć and J u r e t i ć 1976). It is true that SMV is seed-borne in a high percent, especially chenopods can be a significant source of contamination with that virus. However, SMV can also be brought into the greenhouse involuntarily. Therefore, it is advisable to have the immune serum against SMV readily available because the most reliable identification of that virus can be done serologically.

The sugar beet from which SMV-S was isolated showed pronounced mosaic symptoms with dark green blister patches. However, symptoms on the artificially infected sugar beet samples were rather milder and often disappeared. In the sap of these plants SMV was established serologically and also by means of test plants. Unfortunately, the sap of the field sugar beet which was the source of our isolate was not directly tested by SMV antiserum. Therefore, one may wonder whether the SMV-S isolate was brought into the greenhouse through test plant seeds, e. g. through seeds of *Chenopodium* spp. However, we do not believe so. The first test plants inoculated with the sap of infected sugar beet specimens were *C. amaranticolor* and *C. quinoa*; for the testing of various sugar beet specimens with virus symptoms, separate sets (about 50 plants) of *C. amaranticolor* and *C. quinoa* were available. The seeds from which these test plants were grown originated each from the same small pouch. SMV-S was established in all *C. amaranticolor* and *C. quinoi* specimens inoculated with virus sample which was denoted as No. 7, but this virus was not found in other chenopods which were inoculated with the sap of other sugar beet samples. These latter contained some other viruses (B u t u r o v i ć et al. 1978).

## Summary

Sowbane mosaic virus (SMV) was isolated from sugar beet found in the central part of Yugoslavia (Semberia, Bosnia). Serological tests performed by single and double diffusion tests showed that the investigated isolate could not be distinguished from an American isolate of SMV and two SMV isolates found in Yugoslavia earlier.

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## S A Ž E T A K

## NALAZ VIRUSA MOZAIKA LOBODE U ŠEĆERNOJ REPI

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U toku istraživanja virusnih bolesti šećerne repe na području Bosne, iz jednog zaraženog uzorka izolirali smo virus mozaika lobode (sowbane mosaic virus; SMV) koji smo u radu označili kraticom SMV-S. Repa iz koje je virus izoliran sabrana je u Semberiji kod mjesta Batković (okolica Bijeljine). U literaturi nema podataka o dolaženju SMV u šećernoj repi.

Virusni izolat SMV-S identificirali smo na osnovi reakcija na pokusnim biljkama, vladanja *in vitro* i seroloških osobina. SMV-S smo uspjeli mehaničkom inokulacijom prenijeti samo na biljke iz kruga domaćina SMV-a (Tabla 1). I po vladanju *in vitro* SMV-S nije se razlikovao od tipičnog SMV. U serološkim pokusim (sl. 1) koji su bili izvedeni metodama jednostruke i dvostruke radijalne imunodifuzije u agarском gelu, izolat SMV-S nije se razlikovao od dvaju izolata SMV ranije nadenih u Jugoslaviji (Šarić i Juretić 1976, Juretić 1976) niti od američkog izolata SMV koji nam je poslao dr. H. E. Waterworth (Glenn Dale, USA).

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