

Cowpea Chlorotic Mottle and Bean Yellow Stipple Viruses

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ABSTRACT

Cowpea chlorotic mottle virus (CCMV) and bean yellow stipple virus (BYSV) are related. A third serologically distinct strain from beans was also recorded. The CCMV group of viruses is apparently widespread in southern United States and in Central America in several legumes.

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Bean yellow stipple virus (BYSV) was isolated and described by Zaumeyer and Thomas in 1950 (9) from a mixture of viruses in beans (*Phaseolus vulgaris* L.) grown in Illinois. In 1958, Walters (7) isolated BYSV from soybeans [*Glycine max* (L.) Merr.] in Arkansas. Gámez in 1972 (2) reported BYSV in beans in Central America and demonstrated that the virus was transmitted by two species of beetles, *Cerotoma ruficornis* Oliv. and *Diabrotica balteata* Lec. Cowpea chlorotic mottle virus (CCMV) was isolated from cowpea [*Vigna sinensis* (Torner) Savi] and described by Kuhn in 1964 (4). Kuhn

(5) subsequently described a strain from soybeans (CCMV-S). The virus was also isolated from a wild legume, *Desmodium laevigatum* L., by Walters and Dodd (8). They transmitted their isolate of CCMV with the beetles *Cerotoma trifurcata* Forst. and *Diabrotica undecimpunctata howardi* (Mann.). Through an exchange of antisera we have discovered that BYSV from Central America is related to CCMV. The purpose of this note is to record the synonymy of CCMV and BYSV, and to suggest that viruses in this group are widespread in beans and other legumes.

During 1974, CCMV was obtained from beans in several locations in Arkansas. On one occasion a serologically distinct type, designated CCMV-A, was obtained from beans. The virus was also isolated from cowpeas in several locations, and occasionally was found in soybeans. The type isolate of CCMV as well as antiserum to type CCMV were supplied by C. W. Kuhn, University of Georgia, Athens. Neither the original isolate of BYSV (9) nor the *Desmodium* isolate of CCMV (8) is available for comparison.

We utilized antisera prepared against type CCMV, BYSV, and the *Desmodium* isolate of CCMV (6). We could distinguish no difference in reactions obtained with antisera prepared against type CCMV or the *Desmodium* isolate of CCMV. Any one of these antisera could distinguish between CCMV, BYSV, and CCMV-A. Homologous virus spurred with each of the heterologous strains and a spur was apparent between the two heterologous strains (Fig. 1) with each antiserum. All collections of CCMV from cowpea, soybean, and bean in Arkansas were serologically homologous to type CCMV, with the exception of the single isolation of CCMV-A.

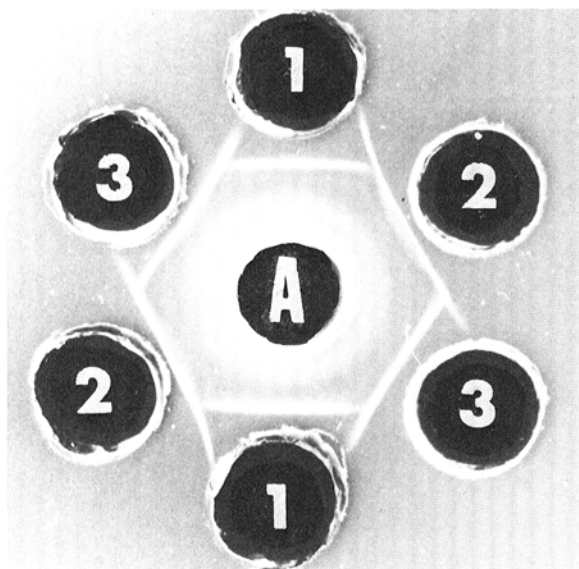


Fig. 1. Gel diffusion test showing reactions of cowpea chlorotic mottle virus (CCMV) isolates to CCMV antiserum. Center well A contains antiserum to type CCMV. Peripheral wells contain sap from plants infected with (1) bean yellow stipple virus (BYSV), (2) CCMV, and (3) CCMV-A.

Some differences in symptomology between the three strains could be recognized such as a consistently more severe mottle produced by BYSV in Pinto bean, but these differences were not sufficient to be a factor in distinguishing the three strains. Each of the three strains was readily purified from either Pinto bean or Monarch cowpea according to the method of Bancroft, Hills and Markham (1) which involves blending tissue in 0.2 M acetate buffer, pH 4.5, and several cycles of differential ultracentrifugation. Purified preparations of each strain in 0.1 M sodium acetate, pH 5.0, exhibited a single component in the analytical ultracentrifuge. The sedimentation coefficients were essentially the same at

81S. No differences among strains were detected when purified preparations were negatively stained and viewed in the electron microscope.

Apparently CCMV is widespread both as to host (cowpea, bean, soybean, and *Desmodium laevigatum*) and area (throughout southern United States and in some areas of Central America). The virus exists as several strains. Kuhn (5) has indicated two strains which are serologically homologous, but which differ in symptom production and relative infectivity. This note adds two serologically distinct strains (BYSV and CCMV-A). No doubt in the bromoviruses (3) CCMV specifies a group of serologically related viruses analogous to other groups of beetle-transmitted viruses.

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