

## SEED TRANSMISSION OF POTATO SPINDLE TUBER METAVIRUS THROUGH THE OVULE OF SCOPOLIA SINENSIS

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### Abstract

Potato spindle tuber metavirus was transmitted through the seeds of *Scopolia sinensis*. Pollination of infected flowers with pollen from healthy *S. sinensis* plants resulted in 71% infected seedlings, indicating transmission through the ovules. Infected seeds germinated without delay. Symptoms developed within 3-8 weeks after emergence of seedlings and consisted of lesions, necrotic spotting on the leaves, and stunting. In view of the facility with which seed transmission occurs, plants used in seed production should be selected with care.

### Introduction

Potato spindle tuber metavirus (PSTM) (2), is known to be seed transmissible in several hosts (1,3,4,5) and has been shown to be transmitted through the pollen and ovule of infected potatoes and tomatoes (1,5).

*Scopolia sinensis* Hemsley is a local lesion host of PSTM (6,7). Infected plants react by developing local necrotic lesions followed by systemic necrotic symptoms throughout the plant (6,7).

Recently a technique of seed production in *Scopolia* was developed (2), which enabled us to attempt seed transmission studies with PSTM in order to find out if the pathogen is seed transmissible in this host. The results are the subject matter of this paper.

### Experimental and discussion

Sixteen plants of *S. sinensis* infected with the severe strain of PSTM were set out in the field in 1971. In a separate plot, 400 healthy plants were grown. The plants developed normally and overwintered successfully. The following summer, crosses were made to produce seed, as described by Hanneman and Singh (2). The following crosses were made: healthy x infected, infected x infected, infected x healthy, and healthy x healthy. No fruits resulted from the first two crosses, i.e., where pollen from infected plants was used. Generally, the anthers from infected flowers contained very little pollen and most of them failed to stain with acetocarmine, indicating reduced viability.

Numerous fruits developed in crosses where pollen from a healthy plant was used.

Seeds were collected at maturity (6-8 weeks) and stored at 4 C.

The seed obtained from crosses involving healthy pollen were soaked in water in petri dishes for sprouting. The sprouted seeds were individually planted into 3-inch pots containing a greenhouse soil-peatmoss mix. Seedlings were grown with light intensity of 400-600 ft-c and a photoperiod of 14-18 hours, with temperatures ranging from 22-25 C (7).

Three weeks after planting, when seedlings had developed the first pair of true leaves, necrotic lesions or spots (Fig. 1) appeared on the leaves of some seedlings. The lesions generally started at the tip of the leaf, progressing rapidly towards the petiole. Within 2 weeks after the appearance of lesions on primary leaves, additional leaves on the same plant developed lesions, while the primary leaves became chlorotic and dried down. Some plant leaves were ground and sap inoculated to other healthy *S. sinensis* plants for the determination of the presence of PSTM in seedlings; all tests using plants showing the symptoms were positive for PSTM.

Table 1 shows the data on seed transmission and germination. Of the 1,208 seeds obtained from an infected x healthy cross, 1,090 (90%) germinated. Of these, about 40 seedlings died prematurely before developing true leaves. Of the remaining seedlings, 748 (71%) developed typical systemic symptoms indicating transmission of PSTM through the ovule or maternal tissues. Most of these plants, about 691, developed symptoms within 3-6 weeks after germination. About 2% of the plants developed symptoms in the 7th-8th week of growth. No seedling obtained from a healthy x healthy cross developed PSTM symptoms.

As was noted earlier, potato spindle tuber metavirus is known to be seed transmissible in several hosts, and the results with *S. sinensis* were not unexpected. Apart from its significance as further

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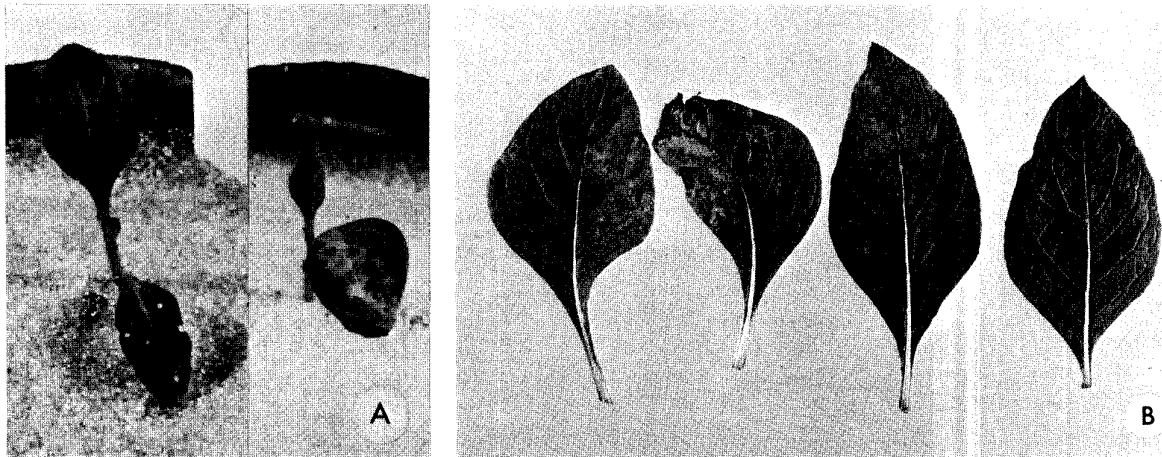


Figure 1. Seedlings of *Scopolia sinensis* grown from seed infected with potato spindle tuber metavirus; A) Necrotic lesions on first true leaves, 2 weeks after seedling emergence; B) Symptoms on first four true leaves of a 6-week-old plant; oldest leaf at left.

Table 1. Seed transmission of potato spindle tuber metavirus in *Scopolia sinensis*

	No. of seeds planted	No. of seeds germinated	No. of seedlings with PSTIM symptoms <sup>a</sup>	Percent transmission
Infected x healthy	1,208	1,050 <sup>b</sup>	748	71.23
Healthy x healthy	563	504	0	0

<sup>a</sup> About 60 seedlings were indexed by sap inoculation to healthy *S. sinensis* plants for the detection of PSTIM and all were positive for PSTIM.

<sup>b</sup> Of the 1,208 seeds planted, 1,090 (90%) germinated and of these 40 seedlings died prematurely.

evidence on the mode of transmission of PSTM, this result is of practical importance since it points out the necessity of taking precautions in the selection of mature plants for seed production. Although most of the infected seedlings developed symptoms within 3-6 weeks, and thus could be discarded before being used in any indexing tests, a small percentage of seedlings developed symptoms as late as the 8th week after emergence: if selected earlier these could be mistaken for healthy seedlings and thus complicate the indexing.

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