

## The Brazilian Approach

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About 170,000 ha of potatoes are grown a year with a production of 2,000,000 tons. Approximately 30% of the seed come from the formal seed production system.

The virology laboratory at the Centro Nacional de Pesquisa de Hortalizas of EMBRAPA - CNPH (National Research Center for Vegetable Crops) supports the breeding programs by characterizing and diagnosing viruses. It also produces some of the antisera for cucurbit and solanaceous viruses. Specifically on potato, it cooperates with:

1. the potato breeding program for PVY and PLRV resistance;
2. indexing of the pre-basic seed, advanced clones and potato germplasm for viruses and viroids;
3. production of antisera. It also provides technical assistance to other government and private biotechnology companies involved in seed-potato production.

In the early 1980s, CNPH/EMBRAPA established a program on potato virology to provide Brazil with modern seed-potato production techniques. The main objective was to reduce seed imports by increasing the internal production of high quality seed. These programs depended on reliable virus detection systems.

The first phase was on staff training. The virologist was first trained at the University of Brasilia (UnB), which provided the laboratory facilities. During this period (1982-86), CNPH set up its Virology Laboratory with international funds (GTZ) and CIP's technical assistance. CIP's experts came to CNPH and Brazilian virologists had the opportunity to be trained at CIP. In 1984, the pre-basic seed production began at CNPH and the Serviço de Produção de Sementes Básicas of EMBRAPA (Basic Seed Production Service) was involved in the process. The micro-tubers were produced at CNPH and sent to SPSB for greenhouse and field multiplications.

The antisera production was initiated at CNPH and CNPFT (Centro Nacional de Pesquisa de Fruteiras de Clima Temperado/EMBRAPA - National Research Center for Temperate Climate Fruit Crops) and the first attempt was on latex flocculation techniques. Antisera were produced for PVY, PVX, and PVS, and a kit for laboratory and field detection of these viruses was released. CIP also participated in a joint PSTVd survey as well as in the first report of APMV detection on potatoes in Brazil. Antisera used were as produced at CIP and as previously agreed. CNPH later sent back the antisera produced in Brazil to other countries through CIP.

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By 1987, a collaborative program with the Canadian International Development Agency (CIDA) started on seed-potato production. It provided CNPH with facilities for viroid detection by Return Polyacrylimide Gel Electrophoresis (R-PAGE). Before this, all PSTVd work in Brazil was done by CIP with NASH. Membranes were sent to Peru for testing. Today, some private companies still have CIP's support on viroid indexing, but CNPH tests its own material by R-PAGE. CIDA also provided some other equipment and chemicals which permitted the production and sensibilization of antisera for ELISA and its use on a larger scale. A training program involving Brazilian and Canadian specialists was also carried out.

Antisera are available at CNPH for detection of PVS, PVX, PVY, and APMV by ELISA (Table 1). These antisera are being successfully used at CNPH and by other public and private companies to index their material. The success of this work is due to the integration of researchers from CNPH, CIP, CIDA, JICA in addition to the collaborative work and consultancy of Dutch scientists.

Table 1. Crude antisera produced at CNPH for ELISA.

Virus	Vol.(ml)
APMV	118,0
PVS	33,0
PVX	127,0
PVY	136,0

Antisera production for PLRV has so far been unsuccessful. Despite the high specific titer in some of the antisera produced, non-specific reactions occur in such high levels that these antisera are not reliable for diagnostic use. Today CIP still intermediates the importation of PLRV antisera and alkaline-phosphatase, which assures the continuation of the CNPH antiserum production program. Besides CIP and CIDA, CNPH is developing cooperative programs with Italy, the U.S., West Germany, and Hungary.

Future goals are to increase certified seed production in Brazil; to integrate government and private companies; to continue the research on PLRV antisera; and to breed for virus resistance.

We can summarize the Brazilian approach on virus and viroid detection in potatoes in two main points:

1. Access to different sources for: information, training, funds.
2. Commercial production of seed-potato: joint government/private company programs.

CNPH is now beginning to work on virus detection in sweet potato.