Production of seed potatoes in Cyprus: incidence and economic importance of virus diseases

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Accepted for publication: 9 June 1987

Additional keywords: potato viruses, yield loss, Spunta, Cara, planting date

Summary

Since 1981 seed potatoes have been produced on a semi-commercial scale in Cyprus by single multiplication of imported class A stocks. The main virus in these locally produced seed potatoes was potato leaf roll virus (PLRV) which was detected in 369 of 658 seed crops examined, at an average incidence of ca 1.5% (range 0.1% - 15%). Tuber infections were detected in 203 of 223 samples tested, at an average incidence of ca 6.8% (range 1% - 32%), indicating a considerable spread of the virus during local seed multiplication. Potato viruses Y, X and A, and alfalfa mosaic virus occurred at much lower incidence than PLRV.

The effect of secondary PLRV infection on ware-potato yield was determined in the cultivars Spunta and Cara, each planted on two different dates. In all four cultivar-planting date combinations there was a very close negative correlation between yield and virus incidence. At 100% infection, losses in total yield varied from 46% (later planting of Cara) to 72% (earlier planting of Spunta). The threshold level of infection for significant losses was ca 10%.

Introduction

Ware-potato production is a major industry in Cyprus. Two crops are grown in a 12-month period; a major spring crop, usually planted in December-January, and a minor autumn crop, planted in July-August. An intermediate crop, planted in September-October, has been successfully grown in recent years. Seed potatoes for the spring crop have traditionally been imported from northern European countries, mainly the Netherlands, the United Kingdom and the Irish Republic. Recent trials (Vakis, 1980) showed that good quality seed potatoes, similar in performance to imported class A seed, could be successfully produced in Cyprus. Consequently, since 1981 seed potatoes have been produced locally on a semi-commercial scale and local production now meets about 10% of the annual seed requirements. The simplest form of seed production, a single multiplication of imported class A stocks in the spring, is used. The progeny are kept in cold storage and planted for ware production in September-October or the spring of the following year.

Quality standards adopted, including tolerance levels for virus diseases, are similar to those for 'certified' grade seed potatoes used by European (Hiddema, 1972) and American (Shepard & Claflin, 1975) certification schemes. However, information on the identity, prevalence and economic importance of virus and other tuber-borne diseases in local seed potatoes is lacking. Such information would enable the formulation of more rational certification standards, facilitate disease detection and quality assessment of the local seed and, most important, could serve as a basis for the de-
The objectives of this study were to determine the incidence, etiology and extent of spread of virus diseases in seed-potato crops in Cyprus and to assess losses in ware potatoes grown from local seed with various levels of virus infection.

Materials and Methods

Virus infections in local seed potatoes
During 1981–1986, imported class A stocks of Spunta, Cara, Arran Banner, Up-to-Date and, to a lesser extent, of several other cultivars were planted in February–March in experimental and semi-commercial plots (0.1–2 ha each) in Paphos and Pitsilia, the two main candidate areas for seed-potato production (Vakis, 1980). Cultural practices were similar to those described by Vakis (1980). Seed was planted whole with mechanical planters (Paphos) or by hand (Pitsilia) at 20 cm distances in rows spaced 60 cm apart. Fertilizer rates were 150–200 kg N, 150–250 kg P and 130–150 kg K per hectare, applied as basal dressing at planting. These rates are slightly lower than those usually applied by growers in ware-potato crops but much higher than the rates recommended by Krentos & Orphanos (1979). The crops were irrigated by sprinklers at approximately weekly intervals with the equivalent of 0.8 of pan evaporation (Stylianou & Orphanos, 1981). The total amount of irrigation water applied varied with season but on average it was about 2500 m³/ha, given in 10–12 irrigations. Depending on environmental conditions, up to six sprays with carbamate or systemic fungicides were made against late blight but there was no routine chemical control of aphids practised. Roguing, although strongly recommended, was done regularly by only a few growers. The plant tops were mechanically destroyed 90–110 days after planting (depending on cultivar and weather conditions) and the tubers usually were harvested within 10 days from haulm destruction. During this period light sprinkle irrigations were applied to prevent soil cracking and so exposing tubers to attack by the potato tuber moth (*Phthorimaea operculella* Zell.).

The health status of seed crops was assessed during their growth by two field inspections and by laboratory assays on leaf samples from diseased plants. Potato leaf roll virus (PLRV) was identified by field symptoms augmented by aphid (*Myzus persicae* Sulzer) transmission to *Physalis floridana* Rybd. and *Datura stramonium* L. (Beemster & Rozendaal, 1972; de Bokx, 1972). The mechanically transmissible potato viruses A, X and Y (PVA, PVX and PVY) and alfalfa mosaic virus (AMV) were identified by sap inoculation to a series of diagnostic test plants: *Capsicum annuum* L., *Chenopodium amaranticolor* Coste & Reyn, *Chenopodium quinoa* Willd., *D. stramonium*, *Gomphrena globosa* L., *Nicotiana tabacum* L., *Phaseolus vulgaris* L., *P. floridana*, *Solanum demissum* Lindl. 'A6', *S. tuberosum* L., *Vicia faba* L. and *Vigna unguiculata* (L.) Walp. (Oswald et al., 1954; Beemster & Rozendaal, 1972; de Bokx, 1972; Zimmerman-Gries et al., 1973; de Bokx & Mooi, 1974). The presence of PVX and PVY was further confirmed serologically by microagglutination tests under paraffin oil (van Slogteren, 1972) and by immunodiffusion tests in agar gels containing sodium dodecyl sulfate (SDS) and sodium azide (Purciful & Batchelor, 1977). Leaf samples from potato and from inoculated test plants were also subjected to enzyme-linked immunosorbent assay (ELISA) to detect the presence of PLRV and PVY (Gugerli, 1978, 1979). Strains of PVY were distinguished by symptoms on potato, *P. floridana* and *N. tabacum* (Beemster & Rozendaal, 1972).