Screening tuber-bearing Solanum spp. for resistance to Globodera rostochiensis Rol Woll. and G. pallida Pa2/3 Stone

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Accepted for publication: 28 April 1995

Additional keywords: potato, cyst nematodes, Solanum tuberosum L.

Summary

Accessions of tuber-bearing Solanum spp. related to S. tuberosum subsp. tuberosum were obtained from the German-Dutch collection (Braunschweig, Germany) and the Inter-regional potato collection (Sturgeon Bay, USA). They were screened for resistance to G. rostochiensis Rol and G. pallida Pa2/3. Among 1567 clones from 52 accessions, 135 clones (23 accessions) were resistant to G. rostochiensis Rol and 105 clones (32 accessions) were resistant to G. pallida Pa2/3. They mainly represented S. andigena, gourlayi, spagazzinii and vernei. Among 1689 clones (74 accessions), about 25 clones were resistant to both species.

Introduction

Potato cyst nematodes (PCN): Globodera rostochiensis Woll. and G. pallida Stone are major pests of the potato crop. Control can be obtained by crop rotation, nematicides or resistant cultivars. The latter solution is the most attractive method, but the choice of such cultivars is still limited. No resistance has been found within the tetraploid cultivated species Solanum tuberosum subsp. tuberosum, although resistance is available in related species and has been widely used in breeding programmes (Ross, 1986; Phillips, 1994). However, it is desirable to search for additional sources of resistance in order to enlarge the pool of genetic variability.

Materials and methods

Solanum spp. True seeds of tuber-bearing Solanum spp. were introduced in 1988 from the Inter Regional Potato Collection, Sturgeon Bay, USA and from the German-Dutch Collection, Braunschweig, Germany. The choice of the accessions was based on the indications of resistance (‘R’ or ‘RS’) given in the respective
catalogues to *Globodera rostochiensis* and *G. pallida* (Hanneman & Bamberg, 1986; Hoekstra & Seidewitz, 1987). In the German-Dutch collection resistance was indicated to specific pathotypes: Ro1 or Ro1–5 of *G. rostochiensis* and Pa3 of *G. pallida*.

Twelve *Solanum* spp. were chosen because they readily hybridise with diploid or tetraploid *S. tuberosum* subsp. *tuberosum*. Abbreviations for the specific names are as follows (Huaman & Ross, 1985): *acaule* (acl), *tuberosum* subsp. *andigena* (adg), *berthaultii* (ber), *bulbocastanum* (blb), *chacoense* (chc), *gourlayi* (grl), *kurtzianum* (ktz), *phureja* (phu), *spagazzinii* (spg), *sparsipilum* (spl), *stenotomum* (stn), *vernei* (vrt).

Samples of about 50 seeds were received of 52 accessions for *G. rostochiensis* and 74 for *G. pallida*. Some accessions were common to both sources. Seeds were sown in autumn 1988, and the clones maintained as tubers by planting in a glasshouse every autumn. During the growing period, the day length decreased from about 13.5 to 8.5 h, which is the most favourable for tuber set. However, plants profited only by natural light, and solar radiation decreased from about 10 to 3 MJ/m² per day. That was low compared to radiation in the areas of origin of the species, e.g. 20–22 MJ/m² per day is the 7 year average at Huancayo, Peru (International Potato Center, 1991), and under our conditions light might have acted as a limiting factor for growth of plants and tubers.

**Screening test.** Tubers were planted in plastic pots (6 cm diameter x 7 cm deep) filled with 160 g of a mixture of soil, sand and compost. Three cysts of *Globodera* were wrapped in nylon mesh (150 µ) and introduced into the pots in order to achieve an infestation of 3–5 juveniles per gram of soil. Pathotype Pa2/3 (Chavornay population) of *G. pallida* and pathotype Ro1 (standard Ecosse population) of *G. rostochiensis* were used. The control was cv. Désirée. Plants were regarded as susceptible when females were seen through the pot or when more than five females were present after the substrate was analysed with Kort’s elutriator and females extracted by centrifugation. The first screening test was done on one tuber per clone. All clones showing infection in the first test were discarded as non resistant. The others were multiplied, and the test was repeated the year after if there were sufficient tubers. In this second test, two tubers per clone were planted and the infestation level was 10–15 juveniles per gram of soil. The same procedure was used and genotypes with less than five females were considered as resistant.

**Results**

The rate of germination was not very high. so some accessions were represented by very few plants. In both series of tests many clones (47% and 38% respectively) were not tested or maintained because of their inadequate tuber production. This caused a great loss of genotypes, and also explains the difference between the number of resistant clones in the first screening and the number tested in the second screening.

*G. rostochiensis*. Among 873 clones screened, 43% were resistant in the first test (Table 1). Resistance was confirmed in about half (48%) the genotypes in the second