

Multiple resistance to PSbMV and BYMV and tolerance against PEMV found in segregants selected for *sbm-1*

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Clustering of genes for resistance to potyviruses is well known in *Pisum sativum* L. (3, 4). Despite incorporation of the *sbm-1* gene into a number of commercial pea varieties serious pea seed-borne mosaic potyvirus (PSbMV) infestations continue to occur.

In order to adapt *sbm-1* resistance sources (1, 2) to European field pea growing conditions, three combining pea varieties (Birte, Miranda, Solara) were crossed in 1988 with PSbMV resistant lines carrying the *sbm-1* gene (x 78006-*sbm*, Dark Skin Perfection genetic background, Norwich gene bank JI1404; x 78125, Alaska genetic background, Norwich gene bank JI1408; Wisconsin 7105, which is the original resistance source derived from PI 193835, Nordic Gene Bank line 1781).

Plants visually free of virus-caused symptoms were selected in 1989 and 1990 (F₂, F₃) after exposure to heavy natural infection pressure in the field at Berlin. F₄ progenies derived from selected plants in F₃ were screened (DAS-ELISA, antisera to pea enation mosaic virus (PEMV), strain VfAn2 isolated in Germany and PSbMV, strain PsNL from The Netherlands, supplied by Loewe Biochemica GmbH, Otterfing near Munich) at Aschersleben for combined resistance after artificial inoculation with PEMV strain VfAn2 and PSbMV strain PsNL. Seeds from plants free of the viruses were harvested and planted in 1993 as F₅ single plant progenies in an aphid-tight gauze tent. The plants had been inoculated with a 1:1:1 mixture of inoculum from potyviruses PSbMV, BYMV (bean yellow mosaic potyvirus, type strain B25 from The Netherlands) and PEMV. All plants of the varieties Moni, Ruga and Erbi planted as susceptible controls died during this test due to the interference of the three viruses with natural fungal infections caused by *Fusarium*, *Rhizoctonia* and *Pythium* species. Seeds from F₅ plants free of virus symptoms were collected. After multiplication, seed of eleven selection lines will be available from the Norwich Germplasm Collection under the accession numbers JI 2990 through JI 3000.

These results demonstrate the occurrence of PSbMV and BYMV resistance in the selected material, which also is tolerant against PEMV, even though there was some variation in the expression of PEMV symptoms.

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