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Screening and evaluation of Brassica accessions for developing clubroot-resistant commercial canola varieties

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Background:

Clubroot, caused by the obligate parasite *Plasmodiophora brassicae*, is one of the most widespread soilborne diseases of cruciferous crops. Planting clubroot-resistant canola (*Brassica napus*) is the most effective disease management strategy. However, new strains of the pathogen have emerged that can overcome host resistance and cause severe infections. The identification of novel resistance resources is therefore an important breeding objective.

Objective:

The aim of this research was to identify *Brassica* accessions with high resistance to multiple pathotypes of *P. brassicae* and to use the identified germplasm for developing clubroot-resistant commercial canola varieties in Canada. The ultimate goal is to reduce yield losses caused by clubroot.

Methods:

Screening of 1085 *Brassica* accessions for clubroot resistance was conducted under greenhouse conditions. Pathogen inoculum consisted of five single-spore isolates representing *P. brassicae* pathotypes 2F, 3H, 5I, 6M and 8N, identified prior to the introduction of clubroot resistant canola in Canada, as well as 15 isolates representing 10 'new' pathotypes, including 5X, 5L, 3A, 2B, 3D, 5G, 8E, 5C, 8J and 5K. A clubroot index of disease (ID) was determined for each accession × isolate combination six weeks after inoculation.

Results:

Based on their reactions to all 20 isolates (mean ID across 20 isolates) of *P. brassicae*, 2.4% (5 of 205) of the *B. napus* accessions, 9.6% (17 of 178) of the B. rapa, 17.6% (36 of 205) of the *B. oleracea*, and 67.5% (83 of 123) of the *B. nigra* accessions tested were resistant or moderately resistant to clubroot. In contrast, none of the 232 *B. juncea* or 142 B. carinata accessions screened were found to be resistant or moderately resistant. The results of the clubroot testing suggest that resistance in the *Brassica* accessions was of the order *B. nigra* > *B. oleracea* > *B. rapa* > *B. napus* > *B. juncea* = *B. carinata*.

Conclusions:

This is one of the most comprehensive clubroot screening studies carried out in recent years. The accessions identified in this study could be used for the development of canola varieties with multiple resistance to both the 'old' and 'new' pathotypes of *P. brassicae*. The deployment of novel and diverse clubroot resistance (CR) genes will offer farmers the opportunity not only to rotate crops but also canola varieties with different CR genes as a clubroot management strategy. Ultimately, this research may improve resistance stewardship efforts and contribute to the sustainable long-term management of clubroot of canola.

References:

R. Fredua-Agyeman, S.-F. Hwang, S. E. Strelkov, Q. Zhou, V. P. Manolii and D. Feindel (2019). Germplasm screening and identification of Brassica accessions resistant to 'old' and 'new' pathotypes of *Plasmodiophora brassicae* in Alberta, Canada. *Plant Pathology*, 68: 708-718; https://doi.org/10.1111/ppa.12980

S. E. Strelkov, S-F Hwang, V. P. Manolii, T. Cao, R. Fredua-Agyeman, M. W. Harding, G. Peng, B. D. Gossen, M. R. McDonald, D. Feindel (2018). Virulence and pathotype classification of Plasmodiophora brassicae populations collected from clubroot resistant canola (*Brassica napus*) in Canada. *Canadian Journal of Plant Pathology*, 40 (2): 284-298; https://doi.org/10.1080/07060661.2018.1459851