IMPROVING RESISTANCE TO APHANOMYCES ROOT ROT IN PEAS VIA RECURRENT SELECTION

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Common root rot, incited by Aphanomyces eutieches Drech., is the most serious disease of peas in the upper midwestern and middle Atlantic United States. It was first identified in 1925 (3) but to date no cultivars with high levels of tolerance nor other economically effective means of control have been developed. Resistance appears to be quantitatively inherited with low heritability (5,6).

We have initiated a phenotypic recurrent selection breeding program for root rot tolerance. The base population involved a series of intercrosses among twelve pea lines: MN 494-A11 (4); MN 108 (1); NY 5; B275-191; WIS 7101 (2); 8221; 8615; 8617; Badger; a backcross derived line of 'Dark Skin Perfection' with afila foliage and resistance to Erysiphe polygony; and two lines with large root systems from the Lamprecht collection, 1073 and 1532.

Lines are evaluated in a root rot infested field nursery during the summer; seeds from superior lines are sown in the greenhouse in the fall and selected lines crossed in diallel; crosses are advanced to the F2 generation in the greenhouse in the spring, and then the cycle is repeated by growing the F2 lines in the root rot infested field nursery. One cycle can thus be completed per year. Approximately 190 F2 lines are evaluated each summer, and 20 lines are selected for intercrossing in the fall. Check plots of Dark Skin Perfection (very root rot susceptible) and MN 108 (one of the most root rot tolerant lines known) are grown along with the test entries in the summer nursery. Evaluation is based on percent survival, a root rot rating score, and production of dry seed. Selection is also practiced to maintain or increase the frequency of genes giving green wrinkled seed, lack of pigment, determinate growth, resistance to Erysiphe polygoni, afila foliage, and general desirable plant type.

The results to date are shown in Table 1.

Table 1. Performance of recurrent selection lines compared to MN 108 on Aphanomyces root rot infested soil. Arlington, Wisconsin, L985-1987. (MN 108 values set as 100%).

Year	Cycle	Bloom date	Percent survival	Root rot score[1]/	Yield per plot
1985	0	106	73	90	102
1986	1	91	90	104	134
1987	2	80	190	84	226

The lower the score the better the root rot tolerance.

Selected lines are becoming earlier in maturity, have greater survival, a lower root rot score, and improved yield per plot as compared to

earlier cycles of selection and to the performance of MN 108. Recurrent selection appears to be an effective breeding technique for improving tolerance to common root rot.

1. Davis, D. W., M. A. Shehata, and H. L. Bissonette. 1976. HortScience 11:434.
2. Gritton, E. T. and D. J. Hagedorn. 1971. Crop Sci. 11:941.
3. Jones, F. R. and C. Drechsler. 1925. J. Agr. Res. 30:293-325.
4. King, T. H., D. W. Davis, M. A. Shehata, and F. L. Pfleger. 1981. HortScience 16:100.
5. Marx, G. A., W. T. Schroeder, R. Provvidenti, and W. Mishanec. 1972. J. Amer. Soc. Hort. Sci. 97:619-621.
6. Shehata, M. A., D. W. Davis, and F. L. Pfleger. 1983. J. Amer. Soc. Hort. Sci. 108:1080-1085.

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