ADDITIONAL MUTANTS DEFECTIVE IN NODULATION

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The availability of both bacterial and plant mutants defective in nodulation and fixation is essential to studying the molecular basis of nitrogen fixing symbioses. To obtain host mutants, seeds of Pisum sativum cv 'Sparkle' were treated with gamma radiation or EMS. M2 populations were screened with Rhizobium leguminosarum strain 128C53 for nodulation defective plants, and selections which were stable and fertile to M3 are being characterized. We found well nodulated Ineffective mutants which have little or no nitrogenase (C_2H_2) activity. There are 29 selections with few or no nodules; four of these have shortened roots and/or shoots. F1 and F2 progeny from reciprocal crosses among mutants are being examined to determine allelism.

Six mutants, five obtained by EMS and one by gamma radiation, are allelic with the sym-5 gene of our first reported non-nod mutant (2). The reason for the high frequency of mutation at this locus is unknown.

Three new non-nodulating lines have single gene recessive mutations at unique loci. All the F1 plants from crosses between the mutants and Sparkle or 'Rondo' nodulate, and segregation of the progenies approximates 3:1 non:non-nod. Crosses among selections E69, R25, R72, and sym-2 ('Afghanistan' [3]) and sym-5 lines yield F1 nodulating plants. The new loci are designated sym-7, sym-8, and sym-9. Two mutants, one from EMS and one from gamma radiation, are allelic at sym-8. None of these mutants exhibits strain specificity in infectivity tests with nine strains of R. leguminosarum including four Middle Eastern strains. The non-nodulating phenotypes were not temperature dependent in an experiment comparing plants grown at a 25C/20C day/night regime or plants whose roots were kept at 9C with plants grown at the normal 20C/15C regime.

Two mutants with few nodules and abnormal roots are monogenic recessives, based on crosses with Sparkle or 'Trapper'. R50 has shortened internodes and shortened lower lateral roots. The leaves are pale with raised veins. Very few (0-5) white nodules are found near the crown of the roots. E151 appears normal in shoot growth, but the lower lateral roots are variable in length, averaging approximately one-half that of Sparkle. The number of pale pink or white nodules varies (0-30). These low nodulation phenotypes are always associated with shortened roots in segregating F2 populations.

Jacobsen (I) found two nodulation defective EMS-induced mutants of Rondo: K5 and K24.We are crossing these selections with our mutant lines to determine if they are allelic.

1. Jacobsen, E. 1984. Plant and Soil 82:427-438.
2. Kneen, B. E. 1984. J. Heredity 75:238-240.
3. Kneen, B. E., T. A. LaRue, and N. Weeden. 1984. PNL 16:31-34.

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