General and Specific Combining Ability for Creeping-Roots in Alfalfa, Medicago sativa L.

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Heinrichs and co-workers (4, 5, 6, 8) have conducted research which has stimulated interest in breeding alfalfas with creeping-roots that would be adapted to different alfalfa areas. Their work and that of Adams (1) was conducted in areas with limited rainfall, a short-growing season, and extremely rigorous winters. The present work was conducted in an area characterized by a more favorable climate for alfalfa, and consequently, the spreading-root character may be expressed sooner and more vigorously.

The purpose of this paper is to report (a) the relative importance of general and specific combining ability in the development and expression of root-spreading, (b) heritability of root-spreading, and (c) the correlation between plant vigor and early root-spread. Rapid development of root-spreading would be particularly important in maintaining satisfactory stands on those areas where imperfect drainage and alternate freezing and thawing contribute to stand loss through heaving. Creeping-rooted alfalfa also should contribute to increased effective stand-longevity under some other conditions where stand loss is gradual. Early expression of root-spreading might be of value where alfalfa is seeded at the final cultivation of corn grown in wide rows.

REVIEW OF LITERATURE

Heinrichs (4), from breeding experiments, concluded that inheritance of creeping-root in alfalfa was quantitative and that complementary factors were involved. Later work at Swift Current, Saskatchewan, (8) indicated that the genotypic variance for creeping roots was predominantly additive but constituted only about 20% of the total phenotypic variance for this character. Other studies (1) also indicated that environment had a pronounced effect on creeping-root development.

Heinrichs and Morley (6), Jones and Hanson (7) in North Carolina, Adams (1) in South Dakota, and Gray and Anderson (9) in New York reported that some nonadditive gene effects were involved in the inheritance of creeping-roots. The North Carolina study (7) involved F2 pop-