The inheritance of seed coat impermeability characters in *trifolium subterraneum* l.

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Persistence of a subterranean clover pasture is determined by seed production during the growing season and by subsequent conservation of seed. In subterranean clover, seed coat impermeability is the most effective mechanism for controlling germination (1). Although the importance of developing cultivars with suitable hard seed levels for particular environments has generally been recognized, precise estimates of the genetic components of variation in hardseededness characters, which would facilitate this, are not available. Therefore, an investigation of the inheritance of initial hardseededness levels and rate of breakdown of hardseededness was undertaken.

Methods

Ten genotypes of T. subterraneum were selfed and crossed in all possible combinations. Parents and F_1 hybrids were grown as single spaced plants in two successive years. Seed was collected 70 days after flowering, oven-dried and tested for imbibition after 24h at 20T. Breakdown of hardseededness at 60/15?C was monitored at 4-week intervals for 24 weeks. Analyses of the data were carried out by means of techniques developed by Hayman (2) and Jinks (3, 4).

Results and Discussion

The inheritance of initial hardseededness and its rate of breakdown is complex. For initial hardseededness, genotypic differences were significant only in 1978 ($p<0.05$). In this case the regression of array covariance (Wr) on array variance (Vr) was significantly less than unity. The disturbance to the Wr, Vr relationship was of a general type associated with most, if not all, parents. The distribution of array points suggests that many of the genes determining high initial levels of hardseededness are dominant.

The Wr, Vr graphs of breakdown of hardseededness indicated a marked difference between years with respect of dominance relationships. There were marked changes in the locations of array points on these graphs between years. The influence of environment was predominant and overrode genetic effects. Although the diallel analysis identified superior crosses which would not have been detected on the basis of parental performance alone, the lack of consistency over the two years in which the diallel population was grown indicates that extensive replication would be needed for results to be confidently predicted.

The narrow-sense heritability for initial hardseededness was estimated to be 0.19 while that for breakdown was 0.35 (1977) and 0.55(1978). These values indicate that the potential for response to selection for a specific rate of hard seed breakdown is substantially greater than that for initial hardseededness. This is not likely to be a major problem, however, as rate of hard seed breakdown is the more important selection criterion.

The low heritability of initial hardseededness determined here supports the current breeding strategy of the National Subterranean Clover Programme of delaying selection for hardseededness until the F_4 seed generation. Improvement in the breeding population can still be made in earlier generations by selecting for characters with higher heritability, such as flowering time (5).

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