Selection and Evaluation of White Clover Clones. I. Basis for Selection and a Comparison of Two Methods of Propagation for Advanced Evaluations

Pryce B. Gibson, George Beinhart, J. E. Halpin, and E. A. Hollowell

PROGRESS in plant breeding depends on effective selection and evaluation of individual plants. Usually in breeding white clover, *Trifolium repens* L., and other cross-pollinated forage crops, many plants are selected from source nurseries or from other heterogeneous populations. These selections are evaluated or characterized by various techniques before a few are chosen to be tested as parents of experimental varieties. The identification of one or more specific characteristics that can be readily used as the basis for making better selections increases the efficiency of the improvement program. Experience with white clover plants in breeding nurseries has indicated that forage value is affected by foliage density, amount and time of flowering, number and size of stolons, length of internodes, and frequency of stolon branching. These associations have been confirmed by Gibson (3), Knight (6, 7), and Ronningen (10).

White clover plants selected in a breeding program are highly heterozygous, because a series of *S* alleles enforces a high degree of cross pollination in seed production. Although the plants are hybrids, the genotypes can be easily maintained by vegetative propagation. Consequently, white clover is well adapted to the polycross method of breeding (4). In this method of plant breeding, as in other methods, progeny testing accounts for much of the expense and time involved in developing superior varieties. Therefore, increasing the efficacy of clonal evaluations can best be approached by developing methods or techniques that require less time and labor or by testing fewer progenies.

Most of the methods and techniques used in breeding white clover were developed for other crops. Although these crops are similar in breeding behavior, white clover differs from most in that it is stoloniferous and is used almost exclusively as a grazing crop growing in association with a grass. These differences must be considered when applying classic methods and techniques to white clover improvement.

Atwood and Garber (2) investigated the problems involved in evaluating white clover clones. They found that the growth habit of a spaced plant was not closely correlated with its performance in sod and concluded that the sod-forming ability of a plant cannot be predicted from its performance as a spaced individual and that some test of it in sod is probably necessary in a breeding program. Myers and Garber (9), working with Kentucky bluegrass, arrived at a similar conclusion. Their work indicates that the most critical measure of the value of a forage plant is obtained by studying it in association with the crop with which it will be used.

White clover plants in a space-planted nursery frequently develop distinctive growth patterns by the end of the first summer after establishment. Some plants are characterized by a canopy of widely scattered leaves, low frequency of stolon branching, and a tendency for the center to be void of leaves (Figure 1). This plant type is designated "viney" in this paper. Plants of a contrasting type (Figure 2), designated "nonviney", are characterized by a more uniform and denser leaf canopy, frequent stolon branching, and a tendency for the continued production of leaves in the center of the plant. Such leaf production is associated with stolon branching. Plants of the nonviney type are obviously superior in a space-planted nursery. This superiority may not exist in a pasture where growing conditions are radically different and the stolons of adjacent viney plants may interweave and thus compensate for the type of growth they exhibit as spaced plants.

The investigation herein reported was undertaken to determine the validity of selecting white clover plants in a space-planted nursery on the basis of plant type and to compare two methods of propagation for evaluating plants.

![Figure 1](image1.png) A viney type white clover plant in space-planted nursery, Clemson, S.C., July 1958.

![Figure 2](image2.png) A nonviney type white clover plant in space-planted nursery, Clemson, S.C., July 1958.