Fall Regrowth Response of Ranger and Vernal Alfalfa as Related to Generations of Increase and Area of Seed Production

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The benefits of a plant breeding program are not realized until seed of the new and improved variety is available in quantities large enough to satisfy the total farmer demand. It is equally important that seed supplies of a newly released variety be built up as rapidly as possible in order that the consuming farmer can take advantage of the superior variety shortly after it is released by the plant breeder. In an attempt to accomplish this, the production of foundation, registered, and certified seed of superior grass and legume varieties has migrated to the most efficient seed producing areas.

The new seed areas are located primarily in the western United States. They represent a vastly different plant environment for alfalfa varieties adapted to the northern half of the humid areas. Yet, seed that the consuming farmer obtains should be essentially the same in genetic make-up as that released by the plant breeder. In a seed increase system of the magnitude necessary for adequate alfalfa seed supplies, there is always the possibility of shifts in gene frequencies for certain characteristics during the seed production sequence which, if multiplied, may result in the loss of superior varietal performance.

Reports by Smith (4) and Smith and Graber (7) have shown that measurable changes in plant types and winter hardiness occurred when Ranger was increased in southern latitudes. Subsequently, Smith (6) has shown that the proportion of plant types and level of winter hardiness of Vernal could be increased or decreased depending upon whether the seed was produced north or south of the variety's area of adaptation. Laude et al. (3) have described differences in the flowering response of the parental clones of Pilgrim Ladino clover of sufficient magnitude as to affect materially the performance of composition of the subsequent seed increases.

It seemed desirable, therefore, that seed lots of breeder, foundation, registered, and certified Ranger and Vernal be further evaluated in an attempt to determine the magnitude of change in these varieties and whether these varietal changes were related to generation of increase or geographic area of seed production.

EXPERIMENTAL PROCEDURE

The 183 seed lots of Ranger and 98 seed lots of Vernal used were collected by the state seed certifying agencies. The breeder seed lots were obtained from the experiment stations originating the varieties. The seed lots of the 2 varieties were seeded in separate experiments in mid-May, 1958, in rows 1 foot apart and in a randomized block design of 4 replications. The spaced-plant method described by Smith (5) was used. Approximately a month after seeding, the plants were thinned to a single plant at 1-foot intervals within the rows. The average population for the Vernal lots was 20 plants per row and for the Ranger lots 16. The Ranger plants were left undisturbed until September 20 at which time each plant was uniformly trimmed of top growth back to the crown. A heavy infestation of grassy weeds necessitated clipping the Vernal plots in mid-July. An application of 2 pounds per acre of Dalapon was made immediately following the clipping to eliminate the weed competition. The Vernal plants were then allowed to grow undisturbed until September 20 at which time each plant was uniformly trimmed back to the crown.

The amount of fall regrowth was determined by measuring the height of the terminal bud above the soil surface on the tallest stem undisturbed from the natural direction of growth of each plant. Measurements of the Vernal plants were started October 15 and of the Ranger plants October 20. This was prior to the occurrence of any frost.

In the spring of 1956, 25 of the 98 Vernal lots were established in 5 X 26-foot broadcast plots without a companion crop in a randomized complete block design of 4 replications. The plots were mowed twice during 1956 and 3 times during 1957. Hay yields were obtained only on the first 2 cuttings in 1956. The third cutting of 1958 was not included in the data reported because of a heavy grassy weed infestation. No winter killing or thinning of the stands was noted in any of the plots during these tests.

EXPERIMENTAL RESULTS

Ranger

The average plant height measurements for the Ranger lots produced within each state are presented in Table 1. The differences among the means of all the foundation lots (12.0 cm.), of all the registered lots (12.2 cm.), and of all the certified lots (12.8 cm.) illustrate the gradual change toward a taller fall regrowth response with successive generations of increase. It was equally evident from samples produced in Arizona and California that this change toward taller-growing varietal populations was accelerated when the seed increases were made in southerly areas. On