Influence of Area of Seed Production on the Performance of Ranger Alfalfa

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New and improved varieties of alfalfa have been and are being developed for the northern areas of the United States. In the northeast central and northeastern states, alfalfa seed production has not been consistent nor generally successful. Therefore, the National Foundation Seed Project (3) was developed to facilitate the seed increase of new varieties having wide adaptation. The basic stocks of seed of accepted varieties under this plan are made available for the production of certified seed either in or outside the area of adaptation. Although the environmental influences of the various areas of certified seed production on the performance of a new variety have not been fully determined or explained, it is known that some changes do occur when seed of a northern variety is produced in a southern latitude of the United States.

Smith and Graber (6) have compared the performance in Wisconsin of several Ranger alfalfa seed lots. They have shown that seed produced from one generation of increase in southern latitudes of the United States gave stands which produced on the average taller plants following early fall cutting when compared with plants derived from the seed of one generation of increase in the north. Some loss in winter-hardiness was observed also in the plants derived from the southern produced seed. These tendencies were more apparent in plants derived from seed of two generations of increase in southern latitudes. Differences in bacterial wilt susceptibility among the regional seed productions were not noted. Under New York conditions, Murphy and Kohli (5) in a preliminary report state that no significant differences of importance were found among several seed increases of Ranger from Nebraska, Montana, and Arizona with respect to yield, disease reaction, recovery, stand, and vigor except for a lot of second generation Arizona seed not eligible for certification. Battle (1) in studies with Atlantic alfalfa found no significant changes in bacterial wilt reaction that could be ascribed to advance in generation or to area of seed production, but seed from surviving plants in aging stands carried more resistance.

This paper contains further information regarding the performance of plant populations of Ranger alfalfa which were derived from seed produced in several states within and outside the principal region of adaptation of the variety.

MATERIALS AND METHODS

Sixteen regional productions of Ranger were seeded May 15, 1953 in rows 1 foot apart in 4 replications with a randomized complete block design. Check strains included Rhizoma, Narragansett, Buffalo, Caliverde, and Arizona Common. One month after seeding, the plants were thinned to 3 to 5 inches apart leaving an average population of 34 plants per row. The area was kept free of weeds and of new alfalfa seedlings from hard seeds. The foliage was kept free of damaging insects. In this manner, uniform conditions for growth were provided.

Each plant was cut back uniformly to the crown on Sept. 10. Thus, the succeeding growth was produced under the shortening days and cooler nights of autumn. Although the environmental influences of the various areas of certified seed production on the performance of a new variety have not been fully determined or explained, it is known that some changes do occur when seed of a northern variety is produced in a southern latitude of the United States.

Earlier, several regional productions of Ranger were seeded in plots in the spring of 1949 at Madison and at Marshfield, Wis. Check strains included New Mexico Common at Madison, and Grimton, Buffalo, and New Mexico Common at Marshfield. These plots were arranged in a randomized complete block design with 4 replications at Madison and with 3 replications at Marshfield. Observations made in the plot trial at Madison concerning autumnal growth in the seedling year, winterkilling during the first winter, and the first cutting hay yields in June, 1950 were reported earlier (6). Subsequently, hay yields were determined from 3 cuttings in 1950 and in 1951. Hay yields were not measured in the plot trial at Marshfield. Excellent stands prevailed since no winterkilling had occurred. Therefore, in the fall of 1950, the plots were cut closely and uniformly on Sept. 8 so that comparative observations could be made on the growth made during the shortening days and cooler nights of autumn. On Oct. 7, the height of each individual plant enclosed within a 2-square foot quadrant thrown at random 4 times in each plot in the 3 replications was measured. The stems of each plant were pulled upright and together, and the height of the tallest stem was measured in inches. An average of 164 plants per seed lot was measured.

Differentials in Autumn Stem Growth and Winter Injury in Spaced Populations

The plant height data obtained in the fall of 1953 from the spaced populations at Madison were separated into four groups: short plants, 0 to 2.9 inches; medium, 3.0 to 5.9 inches; tall, 6.0 to 8.9 inches; and the extra tall, 9.0 inches and taller. The percentage of plants in each height group for each seed lot was determined. These percentages were transformed to arc sin $\sqrt{p/(1-p)}$ for statistical analysis.

Statistical analyses were then made by determining the percentage of plants in each height group for each seed lot, as well as on the average height of the fall growth and the average percentage of winter injury for each seed lot. No significant differences in performance were found among the plant populations derived from seed lots of Ranger of the same class of seed produced in the same state or pro-