Effect of Bromegrass Variety on Yield and Composition of a Brome-Alfalfa Mixture

R. R. Kalton and C. P. Wilsie

STRAIN evaluation plays a vital part in all crop breeding programs. To the bromegrass breeder, it presents some rather special problems. The ideal is to evaluate under cultural conditions that closely resemble farm practice. Pure stands, whether planted broadcast or in rows either closely or widely spaced, are easiest to handle and do reflect strain differences. Alternate row seedings of grass and legume likewise may be used for testing and in addition simplify botanical separations. They approach the farm practice of mixed seedings. It may be questionable, however, whether such procedures always yield the type of information actually desired—the predicted relative performance of strains in solid stands in mixture with a legume. Neither can they be expected to result in accurate information on the changing composition of such a mixture over a period of years.

The present investigation was initiated to determine the effect of bromegrass variety on the yield and composition of a brome-alfalfa mixture in a solid seeding, and to relate the results to the problems of strain evaluation. Objectives of this study were threefold: (1) to determine the changing composition of the mixture over several years, as affected by strain of bromegrass and rate of planting of alfalfa; (2) to compare six varieties of bromegrass from an agronomic standpoint; and (3) to evaluate the relationships among the bromegrass and alfalfa portions and the total yields of the mixtures, since the degree of association would have an important bearing on testing of bromegrass strains in a breeding program.

REVIEW OF LITERATURE

Comparisons of agronomic potentialities of different bromegrass strains have been made by a number of investigators (1, 2, 4, 6, 7, 8 and 10). Generally, differences among varieties in forage yield were greatest in pure stands and less when tested in legume mixtures—usually with alfalfa. Varieties and strains of southern origin usually have proved superior to those of northern or Canadian origin in the Corn Belt region and in other areas of similar latitude, under all methods of testing. Farther north, differences between the two types have been less apparent. Extensive tests by Knowles and White (6) at 9 locations in Western Canada showed essentially no differences in hardiness or hay productivity. In all variety studies, higher and more sustained yields were obtained in mixed seedings with a legume than in pure bromegrass stands.

Other differences between the northern and southern and seedling growth. Elderkin (2) studied the performance of Lincoln, a southern type, and Parkland, a northern type, with different rates of seeding alone and in mixture with several varieties of alfalfa. Even though adjusted for germination capacity, Lincoln seedlings three to four times as many seedlings as Parkland five months after planting. Hawk and Welch (7) in house tests obtained evidence that three southern strains were more tolerant to Pythium root rot than Canadian strains. These findings all may have a bearing on effects of bromegrass variety on yield and composition of alfalfa mixtures at subsequent harvests.

Wilsie (10) summarized results of extensive legume experiments at the Iowa Station. He tested total yields and yields of grass portions of various mixtures favored southern over northern strains. Yields of alfalfa portions were not affected by bromegrass variety, but in the second year of harvest there was a significant difference of alfalfa with Canadian bromegrass than with southern strains. On the basis of one year of data Elderkin (2) found yield of the alfalfa portion to vary inversely with yield and aggressiveness of the bromegrass variety. Total yield of the hay mixture was significantly affected by bromegrass variety, in yield or aggressiveness between northern and southern strains of bromegrass in alfalfa mixtures with Parkland (6) in Canada. Percentage of alfalfa in the mixture was similar for a number of bromegrass strains at both first and second cuttings in Canada, except it was higher for Parkland and some strains from Russia. Second cuttings were higher in percentage of alfalfa than were first cuttings. It was noted that certain southern strains were most aggressive, lower in percentage of alfalfa in mixtures than were aggressive strains. Thomas et al. (8) obtained similar results. Tests of Fischer, Martin, Canadian, and Parkland bromegrass in mixture with Ladak alfalfa. In the second year percentage of alfalfa in the forage mixture was 49, 46, 49, and 51%, respectively, for the varieties. Nothing could be found in the literature to the year by year effect of different varieties on the composition of bromegrass mixtures.

Problems and results in evaluation of other grass species also have been reported. Hanson et al. (4) noted that it was advantageous to test bluegrass association with white clover. In an experiment over four years they found that differences between years and varieties were as great as the differences between the species tested as pure stands.