Effect of Time and Height of Cutting and Nitrogen Fertilization on the Persistence of the Legume and Production of Orchard Grass-Ladino and Bromegrass-Ladino Associations

V. G. Sprague and R. J. Garber

Maintenance of the desired proportion of legumes in pastures or meadows is a major problem throughout the Northeastern United States as well as in many other regions. With the introduction and extensive use of Ladino clover, Trifolium repens L., in association with the larger grasses such as orchard grass, Dactylis glomerata L., bromegrass, Bromus inermis Leyss., and timothy, Phleum pratense L., the problem of determining management treatments that promote the growth and persistence of Ladino clover has become important. Ladino clover associations are usually ready to be grazed in the spring at about the same time that Kentucky bluegrass-white clover pastures are most productive. This coincidence has led to the practice of harvesting the first crop from the "larger grass"—Ladino clover fields for silage or hay. Sometimes the Ladino clover persisted, but more often it has thinned out. The experiments reported here were designed to obtain information on persistence of the legume and production as affected by time of harvesting the first crop, height of cut, and nitrogen fertilization.

Experimental Treatments and Procedure

Orchard grass-Ladino clover and bromegrass-Ladino clover associations were seeded in May, 1943 without a companion crop, on limed and fertilized Hagerstown silt loam soil. The areas had been plowed and fallowed during 1942 and seeded to a cover crop of domestic ryegrass. In April, 1943 only a thin stand of ryegrass had survived the winter and the field was disked and harrowed for seeding. In early May, orchard grass seed and Ladino clover seed were broadcast over half of the area at rates of 7 pounds and 2 pounds per acre, respectively, and the remaining half was similarly seeded to bromegrass and Ladino clover at rates of 10 pounds and 2 pounds, respectively. Annual weed growth was removed by clipping several times during the summer. In the middle of November, 1943 both associations were top-dressed with 200 pounds per acre of P2O5 and 186 pounds per acre of K2O. Although good stands of the grasses were obtained, the stand of Ladino clover was only fair owing perhaps in part to a dry spell in September. (Only 0.4 of an inch of rain fell during that month.)

The two grass-clover associations were laid out in plots 5 by 14 feet in size, using a split-plot design with time of cutting as the main plots, height to which the herbage was cut as the first subplots, and nitrogen fertilization as second subplots. In the bromegrass-Ladino series four replications of each treatment were used. In the orchard grass-Ladino association about one-half of the experimental area had been used for a Kentucky bluegrass strain test prior to 1942 whereas the other half had been used as a Sudan grass nursery. For some unknown reason the clover obtained on this latter area was much greater than the area formerly in Kentucky bluegrass. Thus it was possible to divide the orchard grass-Ladino area approximately equally into areas based upon density of the clover stands. These two areas were designated as "orchard grass-good Ladino" and "orchard grass-thin Ladino". On each of these areas four replications of each treatment were used.

The management treatments on all areas included the main variables, time of harvest and height of cut. Times of harvesting the first crop included (1) when the grass heads were expanded (designated as "early head"), (2) when the flowering of the grasses was complete but before it had fully dried out (designated as "early bloom"), and (3) when the grass heads were completely out of the boot but before it had fully dried out (designated as "full bloom"). Subsequently, throughout the season these plots were cut when the herbage reached a height of about 8 inches. Supercuts three times of cutting the first crop were several inches above this height. After the herbage was cut back. Different plots in the "early head" series were cut to 1 inch, to 2 inches, and to 3 inches above the "early bloom" level. The "early head" and the "full bloom" series plots were cut to 2 inches and to 3 inches.

In addition to the main treatments indicated above, the bromegrass-Ladino series and the "orchard grass thin Ladino" series included supplementary cutting treatments: (1) cut throughout the season when 5 inches high to 1 inch, and (2) cut to 2 inches high to 1 inch. In addition to the yearly application of nitrogen, phosphorus and potassium were applied to all plots in 1943 and 1945 at rates of 40 pounds per acre of K2O.

Soil tests by the method of Morgan as modified by Brown and Robinson were made at the beginning of the experiment in 1944, 1945, and 1946 at rates of 40 pounds per acre of nitrogen in ammonium nitrate was made each year. The nitrogen treatment was superimposed in a modified split plot plan, with the main treatments as the four main time-of-cutting treatments: (1) a Sudan grass nursery. For some unknown reason the clover obtained on this latter area was much greater than the area formerly in Kentucky bluegrass. Thus it was possible to divide the orchard grass-Ladino area approximately equally into areas based upon density of the clover stands. These two areas were designated as "orchard grass-good Ladino" and "orchard grass-thin Ladino". On each of these areas four replications of each treatment were used.

The management treatments on all areas included the main variables, time of harvest and height of cut. Times of harvesting the first crop included (1) when the grass heads were expanded (designated as "early head"), (2) when the flowering of the grasses was complete but before it had fully dried out (designated as "early bloom"), and (3) when the grass heads were completely out of the boot but before it had fully dried out (designated as "full bloom"). Subsequently, throughout the season these plots were cut when the herbage reached a height of about 8 inches. Supercuts three times of cutting the first crop were several inches above this height. After the herbage was cut back. Different plots in the "early head" series were cut to 1 inch, to 2 inches, and to 3 inches above the "early bloom" level. The "early head" and the "full bloom" series plots were cut to 2 inches and to 3 inches.

In addition to the main treatments indicated above, the bromegrass-Ladino series and the "orchard grass thin Ladino" series included supplementary cutting treatments: (1) cut throughout the season when 5 inches high to 1 inch, and (2) cut to 2 inches high to 1 inch. In addition to the yearly application of nitrogen, phosphorus and potassium were applied to all plots in 1943 and 1945 at rates of 40 pounds per acre of K2O.

Soil tests by the method of Morgan as modified by Brown and Robinson were made at the beginning of the experiment in 1944, 1945, and 1946 at rates of 40 pounds per acre of nitrogen in ammonium nitrate was made each year. The nitrogen treatment was superimposed in a modified split plot plan, with the main treatments as the four main time-of-cutting treatments: (1) a Sudan grass nursery. For some unknown reason the clover obtained on this latter area was much greater than the area formerly in Kentucky bluegrass. Thus it was possible to divide the orchard grass-Ladino area approximately equally into areas based upon density of the clover stands. These two areas were designated as "orchard grass-good Ladino" and "orchard grass-thin Ladino". On each of these areas four replications of each treatment were used.

The management treatments on all areas included the main variables, time of harvest and height of cut. Times of harvesting the first crop included (1) when the grass heads were expanded (designated as "early head"), (2) when the flowering of the grasses was complete but before it had fully dried out (designated as "early bloom"), and (3) when the grass heads were completely out of the boot but before it had fully dried out (designated as "full bloom"). Subsequently, throughout the season these plots were cut when the herbage reached a height of about 8 inches. Supercuts three times of cutting the first crop were several inches above this height. After the herbage was cut back. Different plots in the "early head" series were cut to 1 inch, to 2 inches, and to 3 inches above the "early bloom" level. The "early head" and the "full bloom" series plots were cut to 2 inches and to 3 inches.

In addition to the main treatments indicated above, the bromegrass-Ladino series and the "orchard grass thin Ladino" series included supplementary cutting treatments: (1) cut throughout the season when 5 inches high to 1 inch, and (2) cut to 2 inches high to 1 inch. In addition to the yearly application of nitrogen, phosphorus and potassium were applied to all plots in 1943 and 1945 at rates of 40 pounds per acre of K2O.

Soil tests by the method of Morgan as modified by Brown and Robinson were made at the beginning of the experiment in 1944, 1945, and 1946 at rates of 40 pounds per acre of nitrogen in ammonium nitrate was made each year. The nitrogen treatment was superimposed in a modified split plot plan, with the main treatments as the four main time-of-cutting treatments: (1) a Sudan grass nursery. For some unknown reason the clover obtained on this latter area was much greater than the area formerly in Kentucky bluegrass. Thus it was possible to divide the orchard grass-Ladino area approximately equally into areas based upon density of the clover stands. These two areas were designated as "orchard grass-good Ladino" and "orchard grass-thin Ladino". On each of these areas four replications of each treatment were used.

The management treatments on all areas included the main variables, time of harvest and height of cut. Times of harvesting the first crop included (1) when the grass heads were expanded (designated as "early head"), (2) when the flowering of the grasses was complete but before it had fully dried out (designated as "early bloom"), and (3) when the grass heads were completely out of the boot but before it had fully dried out (designated as "full bloom"). Subsequently, throughout the season these plots were cut when the herbage reached a height of about 8 inches. Supercuts three times of cutting the first crop were several inches above this height. After the herbage was cut back. Different plots in the "early head" series were cut to 1 inch, to 2 inches, and to 3 inches above the "early bloom" level. The "early head" and the "full bloom" series plots were cut to 2 inches and to 3 inches.

In addition to the main treatments indicated above, the bromegrass-Ladino series and the "orchard grass thin Ladino" series included supplementary cutting treatments: (1) cut throughout the season when 5 inches high to 1 inch, and (2) cut to 2 inches high to 1 inch. In addition to the yearly application of nitrogen, phosphorus and potassium were applied to all plots in 1943 and 1945 at rates of 40 pounds per acre of K2O.

Soil tests by the method of Morgan as modified by Brown and Robinson were made at the beginning of the experiment in 1944, 1945, and 1946 at rates of 40 pounds per acre of nitrogen in ammonium nitrate was made each year. The nitrogen treatment was superimposed in a modified split plot plan, with the main treatments as the four main time-of-cutting treatments: (1) a Sudan grass nursery. For some unknown reason the clover obtained on this latter area was much greater than the area formerly in Kentucky bluegrass. Thus it was possible to divide the orchard grass-Ladino area approximately equally into areas based upon density of the clover stands. These two areas were designated as "orchard grass-good Ladino" and "orchard grass-thin Ladino". On each of these areas four replications of each treatment were used.