WHITE CLOVER FOR WISCONSIN PASTURES[1]

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White clover has been described as the "key to the international competitive advantage of New Zealand's pastoral industries". World wide, it is recognized for its high forage quality, ability to support high levels of intake by livestock, and capacity to fix nitrogen. White clover is often thought of as the ideal pasture plant because when animals graze it they consume only leaves and flowers. Growing points on the stolons (prostrate stems) remain intact and are the sites of regrowth after grazing and in the spring.

Professor Henry Ahlgren and his students studied white clover in Wisconsin 50 years ago, but there has been very little research on white clover in the northcentral states since then. Much of the reason for the decline in interest is that frigid winters and hot, dry periods during the summer are responsible for unpredictable persistence and productivity of white clover in this region. Because the original taproot of white clover survives only 1 to 2 years (Brock and Albrecht, unpublished research), the plant depends on stolon growth and survival to maintain its presence in a pasture. These horizontal stems lie on the soil surface and are subject to winter extremes, trampling, and summer drought and heat. After the taproot dies, smaller roots originating at nodes on the stolons must compete with grasses for moisture in the upper six inches of soil. Thus, stolons begin to die back and productivity is diminished during dry periods. Although natural reseeding also occurs, long-term survival of stolons maximizes yield of white clover.

Intentionally sown or volunteer, white clover in some years can make up 20% or more of the forage production in many Wisconsin pastures (Albrecht and Woodfield, unpublished observations). Unfortunately the naturalized white clover that is so common in the state is usually not productive, especially during dry or hot periods of the summer. We considered the question: are there differences in performance between naturalized populations of white clover and varieties currently available throughout the world? This was the incentive for us to test the performance of a wide range of Wisconsin white clover populations, white clover varieties and experimental lines.

In 1989, white clover ecotypes (naturalized populations) were collected from 30 sites in southern Wisconsin. The chosen sites were all permanent pastures with incomplete winter snow cover and variable grazing intensity ranging from abandoned, ungrazed pastures to intensively grazed sheep pastures. In May 1995, populations of each of these ecotype collections were transplanted into a pasture at the Lancaster Agricultural Research Station in southwestern Wisconsin along with four Ladino controls (California Ladino, Will, SRVR, and Tillman II), two non-Ladino controls (Grasslands Huia and Kopu II) and 97 other varieties and experimental lines. Each plot was 40 inches long and contained 10 plants transplanted into an existing Kentucky bluegrass/orchardgrass mixed sward with five replicates. Beef cattle were used to rotationally graze the plots from April to October each year from 1995 to 1997. Data were

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collected several times during each season to document growth characteristics and performance of each white clover entry, but only representative data from a core of the entries in 1997 are shown in Table 1 and discussed below.

Wisconsin ecotypes generally had smaller leaf size and higher stolon densities but were less vigorous than the traditionally grown Ladinos (Table 1). Four medium-large leafed and one large leafed ecotype performed at least as well as the California Ladino. These ecotypes represent an important gene pool for future improvement of white clover persistence under grazing in the northern USA. But most of the Wisconsin ecotypes, although persistent, were not very productive as indicated by low vigor scores. The data in Table 1 and our observations, especially in mid- to late summer, demonstrate that the best commercial varieties performed better than Wisconsin ecotypes in this trial.

Of the control varieties, Tillman II, SRVR, Will, and Kopu II have consistently performed better than California Ladino and Huia, with Kopu II the best variety in the third year of this trial (Table 1). Kopu II was selected for persistence, stolon density and productivity after four years of rotational grazing by sheep in New Zealand. Seed multiplication is in progress now and limited amounts of seed will be available for on-farm testing in Wisconsin in 2000 and commercial release is expected in 2001. Although white clover does not perform well in droughty sites, our results suggest that newer, adapted varieties do deserve another look in Wisconsin pastures with moderately to poorly drained soils.

Table 1. Mean (and range) leaf size, stolon density, flowering intensity and vigor of Wisconsin white clover ecotypes and six control varieties during 1997.

Line	Leaf size (Huia=100)	Stolon density (No. / ft^2)	Flowering (0 to 5)	Mean Vigor (Calif. Lad.=100)
Wisconsin ecotypes	107 (83-145)	169 (96-276)	3.3 (2.4-4.8)	80 (61-117)
Grasslands Huia	100	183	1.0	86
Kopu II	155	217	2.6	137
Will	152	173	3.8	110
California Ladino	162	84	4.2	100
SRVR	159	139	4.2	121
Tillman II	170	158	4.4	120