# WINTER-HARDINESS AND PASTURE PRODUCTIVITY OF SOME WHITE CLOVER CULTIVARS IN NEW YORK

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**ABSTRACT**

California Ladino (Ladino) the recommended white clover (*Trifolium repens* L.) cultivar, was compared to 'Milkanova', 'Ranger', and 'Will' from 1994 to 1996 on a dairy farm in New York. Each cultivar was represented by clones of 40 different mother plants in four blocks. Within each block for each cultivar, individuals from ten different mother plants were planted in seven 1m rows. To compare the cultivars, stolon density, growing point density, stolon starch and sugar concentrations, and plants/m were measured in autumn and spring. During the growing season rows were visually rated and aboveground biomass was sampled to estimate yield. Stolon density, growing point density, and starch and sugar concentrations did not differ from Ladino for any of the cultivars in 1994/95 or 1995/96. Compared to Ladino, Milkanova produced more biomass toward the end of the 1995 drought, and Ranger had higher visual rankings for the 1995 grazing season.

**KEYWORDS**

Genetic-improvement, rotational-stocking, total sugars

**INTRODUCTION**

Plant breeding has improved the genetics of white clover by an average of six percent per decade over the last 60 years (Woodfield and Caradus, 1994). This study investigated whether some newer cultivars of white clover would perform better than the currently recommended cultivar in upstate New York. In the northeastern U.S.A. white clover must be able to survive long periods of below freezing temperatures and freeze-thaw events in winter in order to persist over the years. Winter survival and spring growth is often associated with high stolon density and with origin of cultivar in a cold climate (Colins et al., 1991; Harris et al., 1983; Haycock and Ollerenshaw, 1982). Intermediate and small white clovers generally have higher stolon densities than large or ladino types (Caradus et al., 1989). California Ladino, the currently recommended white clover cultivar, is a large type originating in Italy. The hypothesis tested here was that cultivars with higher stolon densities orginating in colder climates, and/or performing well in trials in North America, will survive the winter, and perform better than Ladino. Milkanova, Ranger, and Will were compared to Ladino.

**MATERIALS AND METHODS**

The experiment was conducted on a commercial dairy farm in New York where orchardgrass (*Dactylis glomerata* L.) and white clover pastures were rotationally-stocked. The experimental design was randomized with four complete blocks. During the previous growing season, naturalized white clover was removed from the orchardgrass sward with 2, 4-D (2, 4-dicholorphenoxyacetic acid). Blocks were located within different paddocks. Each of the four cultivars was represented by clones from 40 different mother plants. For each cultivar, in each block, a clone from each of ten mother plants was planted in a 1m row. The meter row was repeated seven times within each block to allow for destructive sampling. Clones were planted on 15, 16, 17, and 20 June 1994 into the established orchardgrass sward. In autumn of 1994 and 1995 and spring of 1995 stolon density, growing point density, and plant number/m were measured on a sample of plants. In autumn and spring of both years, stolon starch and total sugars concentration was determined using a microfuge-tube version of Smith's procedures as modified by J.J. Volenec (personal communication). During the growing season of 1995 and 1996, the cultivars were rotationally-grazed by dairy cattle and rows and were visually rated before grazing events. Aboveground biomass was sampled two times during the grazing season to estimate yield.

**RESULTS AND DISCUSSION**

In autumn of 1994 and 1995 and spring of 1995, stolon and growing point density, number plants/m, and stolon starch and total sugars concentration did not differ between the three experimental cultivars and Ladino ($p > 0.05$; Fig. 1). Data suggest that a larger sample size might have revealed some differences in stolon or growing point density. After the mild winter of 1994/95, average plant survival into the spring was 92%. Total sugars appeared to increase in autumn 1994 in Ladino and Ranger, following a pattern one would expect to be correlated with winter survival (Boller and Nösberger, 1983). However total sugar concentrations of Milkanova and Will did not appear to follow such a pattern (Fig. 1).

Spring, summer, and the 1995 season visual scores of Milkanova and Will did not differ from Ladino (Fig. 2). However, toward the end of a drought period (before the August and 28 September to 2 October grazing events), Milkanova scores were significantly higher than Ladino ( 3.3 versus 2.6; Fig. 2 ). This was in agreement with the aboveground dry matter sample that was harvested before the 28 September to 2 October grazing event. At that harvest, Milkanova produced significantly more aboveground dry matter (4.5 g/0.01 $m^2$) than Ladino (2.9 g / 0.01 $m^2$). By contrast, visual scores averaged over the 1995 season indicate that Milkanova did not differ from Ladino, but Ranger performed significantly better over the whole 1995 season than Ladino (Fig. 2). Following a more severe winter of 1995/96, the visual scores and aboveground dry matter production of the three cultivars did not differ significantly from Ladino before the 28 June to 1 July grazing event and on 2 October 1996.

Comparison of these cultivars over more years and in more locations would help to determine whether one of the proposed cultivars is superior to Ladino. The data suggest there are cultivars with potential for improved performance in New York. During and after the drought period of 1995 and in previous years, all white clover cultivars in the study area were infected with *Fusarium spp*., crown and root rots, and some unidentified viruses. At another location, the four cultivars of described here and seven others were seeded with orchardgrass. Aboveground dry matter and visual scores were compared to Ladino. In September of the second year (1996) virus infestations were severe and dry matter production of all of the cultivars was significantly reduced except for Olwen. Breeding for resistance to the native pests would be benefical. None of these cultivars was clearly superior to California Ladino for all traits. However, a potential for genetic improvement was observed here as has been found by others (Woodfield and Caradus, 1994). Therefore, it would probably be best to select for an improved white clover cultivar under the specific climatic, edaphic, pest, and management conditions the plant will experience in New York, and with the species of grass with which it must co-exist.

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**Figure 1**

The concentration of total sugars in the four white clover cultivars in September, October, and November, 1994 and April, May, 1995.

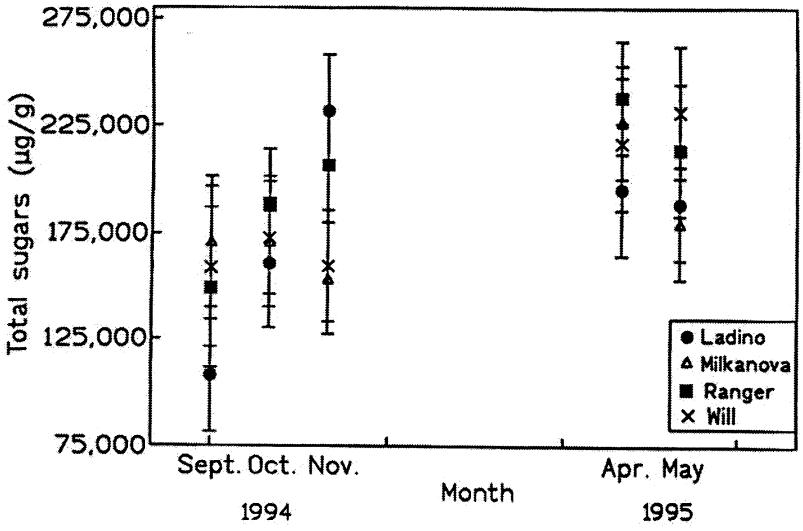


**Figure 2**

The average spring, summer, late drought, autumn, and 1995 season visual scores for the four white clover cultivars. Values marked by * are significantly different ($p < 0.05$) from the Ladino value at that time.