CYNODON DACTYLON CONTROL IN CONSERVATION TILLAGE SYSTEMS

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ABSTRACT

Bermudagrass (*Cynodon dactylon* L. PERS.) is the most important weed in Uruguay. With the development of conservation tillage systems, chemical control of bermudagrass becomes essential. The objective of this research was to evaluate, in a long term integrated program, bermudagrass chemical control during the first year of a pasture. Application of glyphosate and no-tillage seeding of the pasture took place during fall. A 70% reduction of underground part of the weed was detected. The chemical control, together with a conservation tillage system and an adequate pasture management allowed an important reduction in bermudagrass level for the first year pasture. As a result, this management practice should be used for the beginning of conservation tillage systems.

KEYWORDS

Bermudagrass, *Cynodon dactylon*, no-tillage, weed control, glyphosate.

INTRODUCTION

Bermudagrass is the most important weed under Uruguayan conditions. The major impact of this weed results in: an increase of tillage requirements, a decrease in crop yields and forage quality and a lower pasture persistence. The objective of this experiment was to evaluate within a long term integrated control program, the evolution of bermudagrass after chemical control with glyphosate in a no tillage system.

MATERIALS AND METHODS

The experiment was conducted in 1994 and 1995 near Montevideo, Uruguay (Lat 34°S; Long 54°W; average annual precipitation, 800 mm). The experimental area occupied 15 has. The soil type was a mollisol. Characteristics of the A horizon (0-20 cm) were: pH (H_2O), 5.5-6.0; organic carbon percentage, 2.61; cation exchange capacity, 12-25 meq $100g^{-1}$. Previous crop was a perennial pasture dominated by bermudagrass. Glyphosate (1.8 kg ai ha^{-1}) was applied before planting in the fall of 1994. A check plot without herbicide was maintained. Herbicide application was achieved with a tractor-mounted sprayer with Tee-Jet nozzles 110-03, delivering 180 L ha^{-1} at 200 kPa. Climatic conditions during chemical application were: average temperature, 19°C.; minimum, 14°C, maximum, 25°C; wind velocity, less than 10.8 km h^{-1}; relative humidity 60%, minimum 53%, maximum 83%. Ten days after herbicide application a no till-drill was used to plant wheat (*Triticum aestivum*) cv Estanzuela Federal at a rate of 100 kg ha^{-1} underseeded with red clover (*Trifolium pratense*) cv LE 116 at 10 kg ha^{-1}. Ammonium phosphate (18-46-0) at a rate of 100 kg ha^{-1} was banded at planting. Bermudagrass biomass initial level was evaluated prior to herbicide application, and in September, January and April (Civetta and Sanz, 1995). A 0.5 by 0.5 m square was used to select sampling areas. Within these areas, bermudagrass aerial part was cut and removed together with the underground part to a 0.3 m depth. Samples were washed gently over a 0.75 by 0.75 cm sieve. Samples were then oven dried for 16 hours at 90 °C. During September sampling date, bermudagrass nodes were counted in 100 g of fresh rhizomes. The pasture was grazed in November, and prior to January and April sampling dates. Because of that, data from the last two dates were collected only from the underground part of the bermudagrass. Red clover population was evaluated in January. A 0.5 by 0.5 m square was used as sampling area. The experimental design was a completely randomized design with sampling dates as repeated measures. Statistical analysis was by analysis of variance. Means separation was performed by LSD (least significant difference) at a 5 % level of probability.

RESULTS AND DISCUSSION

At the beginning of the experiment, in April of 1994, bermudagrass total biomass production was 10220 kg DM ha^{-1}; corresponding 3487 kg ha^{-1} to aerial part and 6733 kg ha^{-1} to the underground part. In the check plot, without glyphosate, a significant decrease in total weed biomass was observed in both September and January sampling dates (Figure 1). This was probably due to winter climatic conditions related with low temperatures, hydric excess and pasture competence. In April of 1995, bermudagrass underground biomass production was significantly higher than in January due to summer growth. The decrease in biomass production observed in the check treatment one year after the beginning of the experiment is a consequence of pasture management (Rios and Giménez, 1991).

When glyphosate was applied, September evaluation showed a significant decrease in bermudagrass rhizome nodes from 1482 to 985/100 g of fresh matter. Bermudagrass biomass production was 2125 kg DM ha^{-1} for the same sampling date. This reduction was significantly higher than in the check plot (3120 kg DM ha^{-1}). A decrease in underground bermudagrass biomass was observed in January. One year after glyphosate application, underground biomass levels were 2505 kg DM ha^{-1} and 695 kg DM ha^{-1} for the check and glyphosate treatments respectively. This represented a 30 and 72 % reduction from initial bermudagrass levels. Bermudagrass growth affected red clover establishment and survival. Red clover plant population was 32 pl m^{-2} in the check plot and 68 pl m^{-2} when chemical control was applied. Bermudagrass competence determined taller and thicker red clover stems. The lower canopy stratus showed a high percentage of chlorotic and senescent leaves. In the present experiment, the different management practices: chemical control before direct seeding, and an adequate establishment and management of the pasture reduced bermudagrass biomass levels in the first year pasture. As a result, this management practice should be used for first year crop after pasture in conservation tillage systems. Pasture persistence will rely on tolerable bermudagrass levels (Rios, 1996). A long term control program, with the inclusion of grass killing herbicides, and an adequate pasture management should be adopted to avoid bermudagrass interference.

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Figure 1
Bermudagrass biomass production during the experimental period.