Fall grazing management affects burdock populations in pastures

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Grazing management can affect the prevalence of burdock in pastures. According to a study by UW-Madison researchers, shorter forage heights left in the fall can lead to higher burdock populations in the following growing season.

Managed grazing can prevent weed establishment, as it is difficult for weeds to compete with a thick cover of healthy, established forages. But managed pastures are not immune to weed infestations, and herbicides are not always a viable weed control option. Common burdock (*Arctium minus*) is a widespread weed that was identified as a pasture problem in a 2006 producer survey. Pasture conditions present at the time of its germination in March through early April in Wisconsin can be key to its control.

Weed scientist Mark Renz and Agroecology researcher Marie Schmidt at the UW-Madison ran experiments to see if clipping pastures to different heights in the fall and the following grazing season influenced the establishment of burdock rosettes. They hypothesized that fewer burdocks would become established in plots where the residual, or grass left behind after clipping, was taller and would block sunlight reaching the ground. The researchers also compared forage quality and quantity between treatments in this one-year study funded by GLCI, SARE and CERES.

This research was carried out at two sites in southern Wisconsin. Experimental plots were located at the Arlington Agricultural Research Station and the Franbrook Research Farm in New Glarus. Pasture species common in the Arlington pastures were perennial ryegrass and tall fescue; meadow fescue, perennial ryegrass, orchardgrass and Kentucky bluegrass made up the Franbrook pastures. Slow early growth and yellow leaves showed low fertility at Arlington, so ammonium nitrate fertilizer was applied at a rate of 50 lbs N/acre in late May and again in early July. The Franbrook pastures received no fertilization.

In November 2008, the researchers clipped pasture plots to mimic grazing to five different residual heights: two inches, four inches, six inches, eight inches and an unclipped area. Clipping treatments were re-initiated in May at Franbrook and June at Arlington, and continued through August. Treatments consisted of clipping pastures, removing clipped biomass and leaving the residual pasture grasses at the height assigned to each plot. During the grazing season, these simulated grazing events were based on plant growth and timed as close as possible to managed grazing of pastures near the study sites. The duration of the rest period between clippings therefore varied throughout the season.

Interception of light

In order for burdock to germinate in pastures, light needs to reach the ground. The researchers measured the amount of light being intercepted by foliage and thus not reaching the ground. In April 2009, before grass or weed growth had started, residual heights affected how much light reached the ground in pastures at both research farms. At Arlington, forages in the two-inch and four-inch treatments intercepted 41 percent less light, on average, than forages in the six-inch, eight-inch and unclipped treatments. At Franbrook, forages in the four-inch treatment intercepted an average of 34 percent less light than the six-inch, eight-inch and unclipped treatments.

However, most of these differences diminished just before clipping resumed in May at Franbrook and June at Arlington. No differences in light interception were measured at that point at Franbrook, and at Arlington the only significant difference was found in the four-inch treatment, with 17 percent less light intercepted when compared to the unclipped plots. This confirmed that the height of the residual left after fall grazing affects the amount of light that reaches the ground in early spring, but most or all of this difference diminishes by the time of the first grazing event. Throughout the grazing season, immediately after a clipping, the pastures clipped to a lower height intercepted less light than the pastures with a taller residual, but rapid regrowth quickly diminished those differences. No burdock germination was observed after June 15, 2009.

Students Emma Pelton (left) and Marie Schmidt (right) measure burdock rosette density.

Density of burdock rosettes

The researchers measured weed density by placing a 2.3 foot by 2.3 foot square in each plot and counting burdock rosettes within the square. Weed densities varied across treatments. At Arlington, reduced burdock density was observed with the six-inch and eight-inch treatments compared to the two-inch and four-inch treatments. Fewer burdocks emerged in the unclipped plots compared to the plots clipped to four inches. Although similar trends were seen at Franbrook, the differences were not statistically significant. Weed densities were higher at Arlington than at Franbrook, and the lower, more variable burdock germination at Franbrook likely contributed to the lack of significant differences. The greater diversity of plant species at Franbrook may have contributed to better weed suppression than at Arlington; other research has shown such a relationship.

Another explanation could be that pasture growth in the early grazing season at Arlington was one month behind other pastures in the area due to low fertility, and this could have led its higher weed populations, although more research is needed to verify this.

Light and burdock density

At Arlington, researchers found a significant relationship between more light reaching the ground at shorter residual heights and higher burdock density. Using a linear least squares regression analysis on the data to look at the relationship between variables, the researchers found that when 30 percent of the light was intercepted (typical at the two-inch and four-inch heights), 0.46 burdock plants per square foot were predicted; increasing the light intercepted to 75 percent (typical at six-inch and greater) decreased predicted burdock density to 0.17 plants per square foot. This relationship was not as clear at Franbrook, showing that it can be affected by site-specific factors.

The data from this project shows that the four-inch treatment had the highest level of burdock seed emergence, rather than the shortest (two-inch) residual. This unexpected result could have come about because, as the researchers noted, the burdock seedlings were injured by clipping more in the two-inch than the four-inch residual treatment. Whether that damage would also occur with grazing to two inches is unknown.

Forage yield and quality

Grazing to residual heights of six to eight inches can potentially reduce forage quantity. In this study, however, decreased forage yields were only observed in the fall of 2008 when the interval between the last grazing event and the first clipping event of this project was lengthened to ensure ample forage growth, and at the first spring clipping event at Franbrook. During the 2009 growing season, the two-inch treatment at Franbrook was the only treatment to produce significantly more biomass at the first clipping. Arlington forage yields did not differ over the 2009 season.

The researchers measured Relative Forage Quality (RFQ) at the first and third clipping events. The recommended RFQ is based on the type of animal, how much dry matter an animal consumes and animal body weight. For example, target RFQ values are 120 for a cow-calf beef pair and 150 for a milking dairy cow. At the first clipping, both farms had RFQ values between 138 and 169, with an average of 152.5, that did not differ between treatments. At the third clipping, forage quality differed between treatments at Franbrook, with RFQ values ranging from 110 in the eight-inch treatment to 138 for the two-inch treatment. RFQ did not vary significantly between treatments at the third clipping at Arlington and ranged from 131 to 138. The researchers believe that the shorter residuals induced the grass to send out new leaves with higher RFQ values, while the taller residual heights likely resulted in more stem tissue with lower RFQ values. Forage species composition and other site-specific variables explain the differences observed at Arlington and Franbrook.

Conclusion

This study demonstrates that retaining a six- to eight-inch residual height in the fall through the start of the following grazing season can decrease burdock establishment by an average of 82 percent compared to shorter residual heights. While these results are specific to common burdock, other biennial pasture weeds such as bull thistle and common mullein may react similarly.

Future research is needed to determine if these results hold up under actual grazing conditions. Livestock may preferentially avoid or eat burdock and don't graze to uniform heights, which would alter the results, and the soil disturbance caused by hoof action could also be an important factor influencing burdock germination.

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