Use of Surveys, Field Demonstrations, and Time Lapse Photography for Delivery of Forage Extension Information

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Introduction

It is often difficult to extend research information to forage producers in a format that they can understand and utilize. Over the last 10 years, University of Kentucky forage extension specialists have developed several effective extension tools to determine and show the effect of harvest and grazing height on *Dactylis glomerata* (L.) stand persistence and regrowth. *D. glomerata* is a widely planted forage species for hay and pasture in the USA based on its high productivity, forage quality and palatability (Lacefield et al, 2013).

Survey of *D. glomerata* Stand Decline

Dr. Garry Lacefield and others conducted a survey of forage specialists, farmers and other experts from across the USA in 2001on *D. glomerata* stand longevity (Fig.1). There had been a growing perception among producers that *D. glomerata* stand longevity had declined in recent years, but there was no detailed documentation on the accuracy of this perception. Dr. Lacefield's group asked a series of questions, two of which are shown as follows: Do you believe your *D. glomerata* stands have declined faster than expected? Yes - 74% and No - 26%. What factors do you believe have contributed to the decline of *D. glomerata* in your area (1= most important and 5=least important)? (Fig. 2)

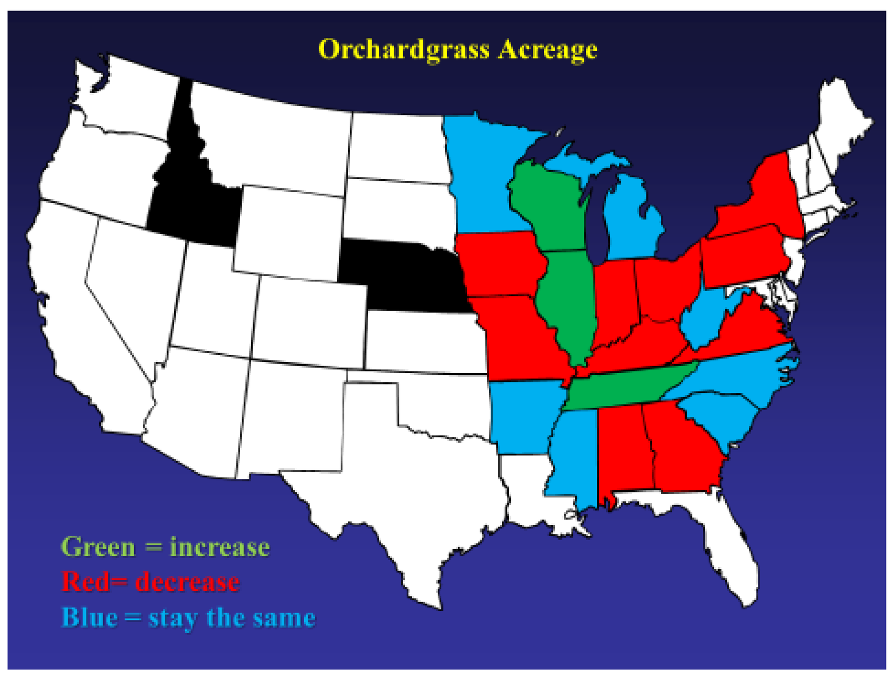

Figure 1 (above). Relative acres of *D. glomerata.*
Figure 2 (below). Factors contributing to decline of Orchardgrass.

Survey respondents identified lower fertility, severe weather conditions, insects, and diseases as factors contributing to stand loss, but they felt that the number one reason for shorter stand life was low cutting and grazing heights. Low cutting heights were mainly attributable to the increased use of disc mowers which allow producers to easily harvest at 2.5 to 5 cm and lower. Low grazing heights were due to overgrazing and the fact that other common pasture grass species in the USA (*Lolium arundinacea, Lolium perenne,* and *Poa pratensis*) can tolerant closer grazing heights. Low cutting and grazing heights are suitable for alfalfa and similar taprooted legumes because regrowth is initiated from stored root carbohydrates, but low cutting heights can decrease stand persistence for bunchgrasses like *D. glomerata*. This species has a more upright growth habit and low cutting removes all the leaves needed for photosynthesis and removes the base of tillers where carbohydrates are stored for regrowth.

Field Demonstrations

Based on the results of this survey, an Asbury University student, Leah Saylor, conducted a field research/demonstration experiment on a *D. glomerata* hay field at the University of Kentucky in 2011. Ms. Saylor laid out 1.5 x 6.1 m plots within this field with treatments consisting of three cutting heights (1.25, 5, and 10 cm) and four fertilizer rates (0N, 0K; 0N, 112 kg/ha K; 66 kg/ha N, 0K; 66 kg/ha N,112 kg/ha K) in all combinations. The fertility treatments were applied in three split applications for a total of 198 kg/ha N and 336 kg/ha K in the highest treatment. Soil test P was in the very high range for this field, therefore no additional P was applied. The results indicated that low cutting heights significantly reduced stand longevity (Fig. 3) and increased weed infestation (Fig 4), regardless of the addition of fertilizer treatments. The data and photographs (Fig. 5) from this simple field demonstration have helped to convince many *D. glomerata* hay producers that low cutting heights are deleterious to stand persistence and weed infestation.

Figure 3. Stand persistence after fifth harvest.
LSD (0.05) = 8%

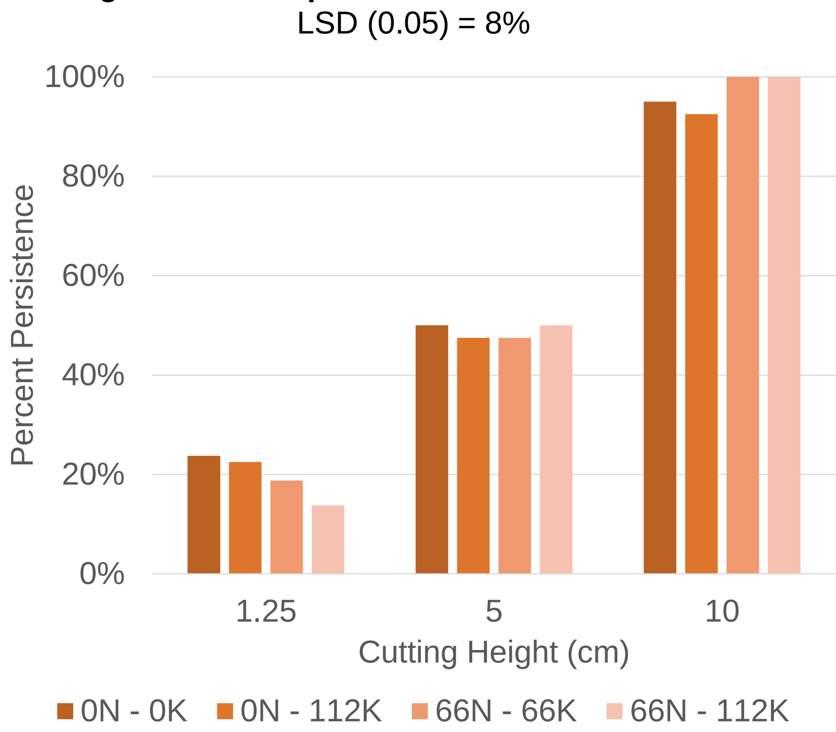

Figure 4. Weed percentage after fourth harvest.
[LSD (0.05) = 13%]

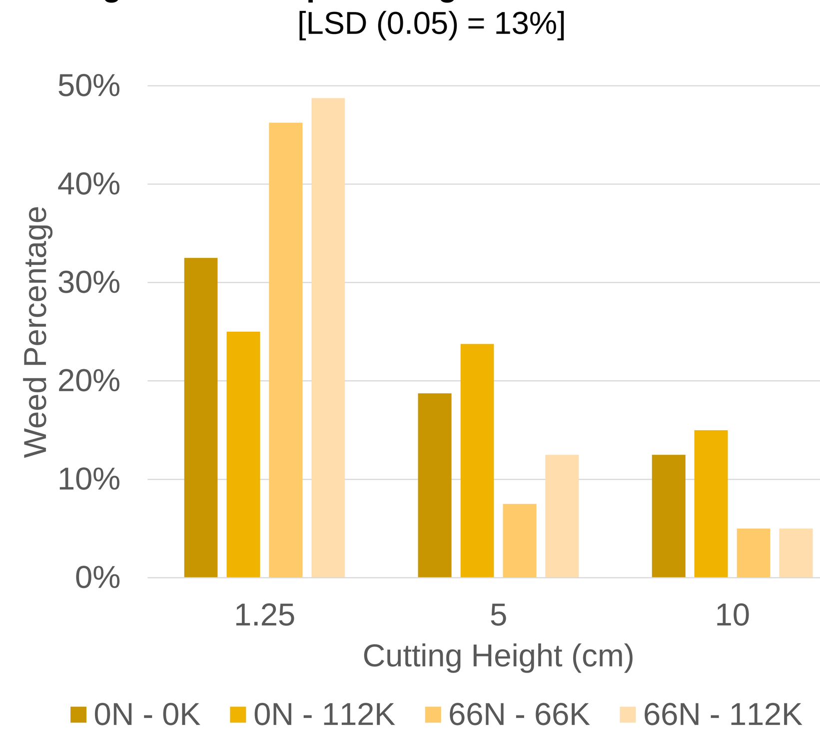

Figure 5. The plot on the left received 66 kg/ha N and 112 kg/ha K and was cut at 1.25 cm. The plot on the right received no nitrogen or potassium but was cut at a 10 cm cutting height all season. Photo was taken in mid October; 3 weeks after the 4th harvest.

Time Lapse Photography

For researchers, extension personnel and experienced producers, the deleterious effect of overgrazing *D. glomerata* are well known, but many producers continue to use close and frequent grazing as a standard management practice. Some common forage grasses will survive this grazing method, even though forage regrowth and yield will be reduced. A common strategy among forage extension specialists has been to highlight research data showing the negative response of overgrazing *D. glomerata*, but often producers cannot translate research tables and figures into impact on their pastures. Therefore, the University of Kentucky has been developing a series of time lapse videos to graphically show the response of various grass species to low cutting heights and short rest intervals (to simulate close, frequent grazing). These videos have become one of our most effective teaching tools over the last 5 years, since producers easily translate the enhanced regrowth under recommended grazing practices to the regrowth they would like to have in their pastures. These videos and others can be downloaded from the University of Kentucky forage website under the "Decision Aid" section.
www.uky.edu/Ag/Forages.

Figure 6 a-c. Orchardgrass (*D. glomerata*) re-growth after 1 month of simulated continuous grazing (left) and rotational grazing (right) on day 1, 3 and 6 respectively.

The best camera/lighting system for time lapse photography continues to evolve at the University of Kentucky, but the system currently being used employs a Nikon model D5200 camera. It is a digital single lens reflex camera with an AF-S DX NIKKOR 18-55mm f/3.5-5.5 VR lens attached and comes equipped with a built in interval timing shooting option. The videos online currently have an image taken every twenty minutes which allows growth to be captured with a reasonable video length. To simulate natural summer growing conditions the day/night cycle is 16h light/8h dark. The dark period is not shown in the finished videos for obvious reasons. Plants are maintained in a greenhouse under ideal growing conditions until the time lapse is initiated. They are then transported to the lab where temperatures average 21^{o}C and ideal soil moisture status is maintained. The D5200 camera also has a manually controlled aperture, shutter speed and lens focus setting which is essential when shooting time lapse photography. Light flicker caused by the internal light meter constantly refocusing will be reduced using manual controls. The use of an AC power adapter insures that battery replacements will not be required during the session. Optional items are a lens hood to reduce light glare and a sturdy tripod to reduce camera shake when the image is taken and when bystanders walk by. For lighting six fluorescent bulbs are utilized with three of them were 48" plant and aquarium bulbs (40watts t12) and three 48" standard room fluorescents (40watts t12). We also used six LED bulbs on a track system and two 60watt lamps. Using the mixture of bulbs and camera angles gives a great balance of light to reduce flicker in the finished time lapse videos and to cover the complete light spectrum.

Conclusions

Surveys can provide a useful indicator of the most important needs for forage research and extension. Field research/demonstrations are helpful for extension personnel in discussing the benefit of recommended management practices. Time lapse photography is one of the most effective methods to bring about "practice change" in the forage management of producers. It is common for producers to say after watching a time lapse video of forage regrowth "I never imagined that rotational grazing could make that much difference for pasture regrowth."

References

Lacefield, D. D. and D. M. Ball. 2013. Orchardgrass. Cir. 13-01. Oregon Orchardgrass Commission, Portland, Oregon.

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