Southeast Dairy Producer's Check-Off Program

Research Summary

Establishment, Compatibility, and On-farm Performance of Alfalfa-Bermudagrass Mixtures

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Implications

With good management, productive mixtures of alfalfa and bermudagrass can be obtained in Florida. If bermudagrass is actively growing at time of planting alfalfa, controlling grass competition using a low rate of glyphosate (pre-plant) or by clipping the grass to a short stubble (around 2 inches just before planting) will aid alfalfa establishment. Alfalfa stands will survive longer with less frequent harvesting (4-6 weeks). Two productive years of alfalfa-bermudagrass mixtures is a reasonable expectation, but if nitrogen fertilizer or dairy manure is applied it will benefit the grass more than the legume and may reduce the length of alfalfa stand life. The more alfalfa in the mixture the higher the crude protein and digestibility, and the lower the neutral detergent fiber. Variety selection, defoliation management, and amount of N added to the system are all important decisions that will affect the productivity and nutritive value of alfalfa-bermudagrass mixtures and the stand life of alfalfa.

Methods

1. Three studies were conducted. The goals of the first study were a) to determine the effect of pre-planting grass height and pre-planting application of a low rate of glyphosate on subsequent alfalfa establishment, and b) to evaluate whether applying nitrogen to the bermudagrass-alfalfa mixture affected alfalfa persistence and productivity in an existing field of Tifton 85 bermudagrass. The project took place at the Plant Science Research and Education Unit at Citra. The treatments during the alfalfa establishment phase were all combinations of two levels of glyphosate application before planting in the fall (0 and 12 oz/acre applied on November 4, 2020) with two Tifton 85 mowing heights prior to planting (2 and 6 inches). In order to determine initial establishment success and if varying degrees of grass competition affect alfalfa seedling survival, the alfalfa seedling density was assessed monthly for four months after planting (December through March). The first hay harvest occurred at the 25% bloom stage of alfalfa. From that point forward, harvests occurred monthly at a mowing height of 4-5 inches. Plots were harvested in 2020 and 2021, and samples were taken for analysis of in vitro digestibility, crude protein, and neutral detergent fiber NDF.

2. The second study assessed alfalfa productivity, persistence, and nutritive value responses to defoliation management (frequency and cutting height) when grown with bermudagrass. This project was conducted at the Plant Science Research Unit at Citra. Plots of Bulldog 805 and UF2015-AP alfalfa-bermudagrass mixtures were planted in November 2018 and harvested in 2019 and 2020. There were eighteen treatments in the experiment including all combinations of the two alfalfa varieties mentioned above, three cutting frequencies (2, 4, and 6 wk), and three cutting heights (2, 4, and 6 inches). The study was replicated three times in a randomized complete block design for a total of 54 plots. Responses measured in 2019 and 2020 were alfalfa and bermudagrass yield and proportion in the mixture, mixture nutritive value (crude protein, digestibility, NDF, and ADF), and alfalfa stand density and ground cover.

3. The third study assessed on-farm performance of two alfalfa varieties when overseeded into Tifton 85 at North Florida Holsteins Dairy Farm in Bell, FL. In 2020, we tested a total of four treatments replicated three times in a randomized complete block design. Treatments were alfalfa varieties, Bulldog 805 and Alfagraze 600RR, and two nitrogen fertilizer application rates, 0 or 50 lb/acre, applied twice during summer (June and August). This nitrogen treatment was tested because during summer we expect alfalfa contribution to be less. At each sampling, we clipped a strip of 3 x 15 feet from each plot. A subsample was weighed and dried to determine dry matter concentration and calculate total yield. This subsample was later ground and analyzed for crude protein, in vitro organic matter digestibility, and NDF. A second subsample was separated into alfalfa, bermudagrass, and weed fractions to determine the proportion of each in the sample, a measure of alfalfa persistence. In 2021, we compared three different types of alfalfa including Bulldog 805, Baralfa X42, and a UF breeding line.

Results

Shorter cutting heights of 2-4 inches increase yield of alfalfa-bermudagrass mixtures (Figure 1) without negative effects on alfalfa stand life (compared with 6 inches) if intervals between cuttings are 4-6 weeks (Figure 2). Longer cutting intervals (4-6 weeks) will provide longer alfalfa stand life than frequent harvests (2-3 weeks).Potential value of a low-rate glyphosate application and close clipping of bermudagrass before planting the alfalfa is directly linked to planting date and condition of bermudagrass. The more vigorous the bermudagrass at time of planting, the more important they will be. In our study, the bermudagrass was nearly dormant, and glyphosate application and close clipping had little effect. Applying nitrogen (or dairy effluent) to an alfalfa-bermudagrass mixture will benefit bermudagrass more than alfalfa and increase first-year mixture yields. By Year 2, however, the additional nitrogen will decrease alfalfa performance. By not applying nitrogen fertilizer to bermudagrass-alfalfa mixtures, there is more alfalfa over time and this results in greater crude protein and digestibility and less neutral detergent fiber. Alfalfa varieties Bulldog 805 and Alfagraze 600RR perform similarly in Year 1, but Bulldog 805 alfalfa stands are better in Year 2 than Alfagraze 600RR. The alfalfa variety, Baralfa X42, performed well in limited evaluation on farm.

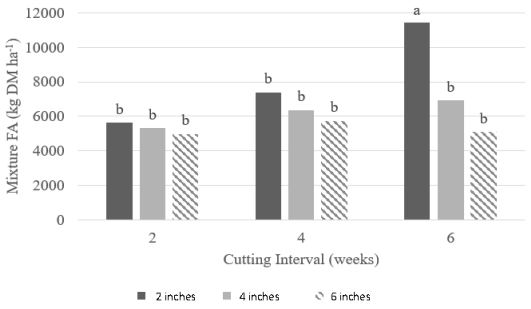

Figure 1. Total forage yield of alfalfa-bermudagrass mixtures when harvested every 2, 4, or 6 weeks at either 2, 4, or 6-inch stubble heights. A kg/ha is approximately the same as a lb/acre. Bars with the same letters above them are considered not different from each other

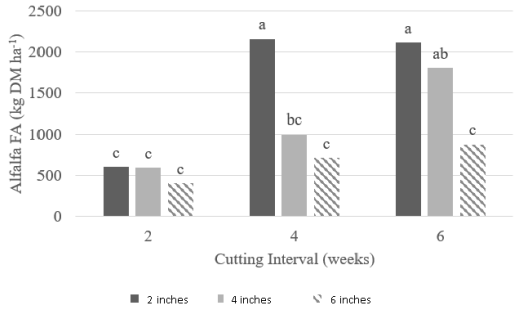

Figure 2. Yield of alfalfa when growing in bermudagrass mixtures and harvested every 2, 4, or 6 weeks at either 2, 4, or 6-inch stubble heights. A kg/ha is approximately the same as a lb/acre. Bars with the same letters above them are considered not different from each other

References of Published Work

Abstracts

- Harling, J.F., C.H.L. de Souza, E.F. Rios, J.C.B. Dubeux, Jr., and L.E. Sollenberger. 2020. Harvest height and frequency for alfalfa-bermudagrass mixtures in Florida. ASA/CSSA/SSSA Annual Meeting, Virtual Meeting.
- Harling Jr., J.F., L.E. Sollenberger, E.F. Rios, and J.C.B. Dubeux, Jr.2021. Managing bermudagrass competition to overseeded alfalfa. ASA/CSSA/SSSA National Meeting. Salt Lake City, Utah.

Refereed Journal Articles

- Harling, J.F., Jr., E.F. Rios, C.H. de Souza, L.E. Sollenberger, J.C.B. Dubeux, Jr, and M.O. Wallau. 2023. Defoliation management affects performance of alfalfa-bermudagrass mixtures in the southeastern USA. Agronomy Journal (in press).
- Harling, J.F., Jr., L.E. Sollenberger, E.F. Rios, J.C.B. Dubeux, Jr.,and M.O. Wallau. 2022. Managing bermudagrass competition to overseeded alfalfa. Agrosystems Geosciences and Environment. 5, e20279. https://doi.org/10.1002/agg2.20279