

Yield Comparison of Alfalfa and Meadow Bromegrass

2020 and 2021 Harvests

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Abstract

Alfalfa (*Medicago sativa* L.) HarvXtra cultivar 'NexGrow 6409' and meadow bromegrass (*Bromus biebersteinii* Roem. & Schult) cultivar 'Cache' were planted as four replicated 0.74-ha monoculture stands in August 2019, and sampled in 2020 and 2021. Stands were assessed for yield and growth stage at biweekly intervals during summer months. Growth stage was assessed using mean stage by weight distribution of at least 40 stems of alfalfa as described by Fick and Muller (1989). Forty stems of the grass, meadow brome, were also assessed by weight distribution of growth stage (Moore et al., 1991). At each sampling, each replication was also assessed for yield using a Farmworks® F100 rising plate meter (RPM). To calibrate the RPM, three 0.1-m² quadrats were clipped to a 7.6-cm height after recording the RPM value. Calibration samples were oven-dried at 60°C to constant weight and a linear regression of forage dry weight on RPM value was used to develop annual calibration curves for each species. For yield assessment, at least 30 readings with a rising plate meter were taken along a diagonal transect within one-third of each rectangular stand on each sampling data and then averaged. Stems clipped to a 0.76-cm height were collected along the opposite transect of each stand subsection, immediately frozen and stored at -20°C until freeze-dried for forage nutritive value assessment. Stands were fully harvested to 0.76 cm and removed around the one-tenth bloom stage of alfalfa every 6 weeks, initiating regrowth cycles. Before each full harvest, stems of alfalfa and meadow brome were cut at 7.6 cm, leaves and stems were separated, frozen, freeze-dried, and milled. Whole plant and separated leaf and stem samples collected in both years will be analyzed for neutral detergent fiber as well as non-fiber carbohydrate components using both calibrated near infrared spectroscopy and laboratory chemical analyses.

Introduction

A very high concentration of non-fiber carbohydrate (NFC) has been observed in perennial legumes grown in the high-altitude West, on average about 46% of the dry matter composition compared with values closer to 25% in other climates.

This study was performed to compare the harvest yields of alfalfa (ALF; *Medicago sativa* L.) with meadow brome (MBG; *Bromus biebersteinii* Roem. & Schult.) from 2020 and 2021.

Methods

- We used an alfalfa cultivar NexGrow HarvXtra (reduced lignin) 6409 with Roundup Ready and low-lignin technology, and the meadow brome cultivar Cache.
- Samples were taken at 14-day intervals. Samples included three 0.1 m² samples clipped to a height of 7.5 cm used to calibrate a non-destructive rising plate meter (RPM). The RPM was used to estimate forage dry matter along a diagonal pasture transect. Samples of the whole plant were clipped to grazing height, stored on ice in the field, frozen and freeze-dried for determination of the nutritive value of the forage. Pastures were harvested 3 times at 42-day intervals, and stem and leaf samples of both species were taken prior to each harvest.

Results



- The four top charts demonstrate the dry matter accumulation alfalfa and meadow brome for the 2020 and 2021 sampling dates. All forage was harvested following the third and sixth harvests (marked by solid blue lines), and accumulation of dry matter due to regrowth following these harvests can be seen in 2020. In 2021, the soil was unusually dry in the spring, and irrigation was delayed until after the first harvest. Regrowth was so insignificant that the fourth sampling date was skipped, regrowth was reduced by water stress for the remainder of the year.
- The four lower charts demonstrate the stages of growth from vegetative (blue) through reproductive (gold). Most of the dry matter of meadow brome was invested in stems and seed heads for the first three sampling dates, but growth was largely vegetative with some stem elongation following the first harvest. The first three growth stages of alfalfa are vegetative (leaves and branches), the next three are flower formation, and the last two are pod formation and maturation. There were no data in 2020 for the 5th sampling date and none in 2021 for the 4th sampling date. In 2020, alfalfa reached greater maturity at the first harvest, but in 2021, plants were more mature at the second and third harvests.



Meadow brome grass



Alfalfa

Conclusion

Our yield data demonstrate that the dry matter yield of alfalfa is more evenly distributed across the growing season than meadow brome. Yield of alfalfa was maintained better than that of meadow brome during the dry summer of 2021.

The mean stage by weight data demonstrate that drought resulted in the grass remaining almost entirely in the vegetative and stem elongation stages of growth following the first harvest. However, for alfalfa, drought appears to have driven alfalfa to mature more quickly so that more plants reached the pod stage of reproduction before the second and third harvests.

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