Grazing termination dates of summer-dormant Flecha tall fescue

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Introduction

Summer-dormant, Mediterranean-type tall fescue (*Festuca arundiancea* Schreb.) has potential to replace summer-active, Continental-type tall fescue and traditional, annual small grain graze-out systems in the Southern Great Plains region of the USA. This region is characterized by severe water deficits accompanied by extreme heat in summer, and by relatively mild, rainy winters (Malinowski *et al.* 2009). Although the climate of the southern Great Plains is different from the Mediterranean climate, the temperature and precipitation patterns during summer are historically similar. However, in the past decade, the bimodal precipitation pattern with peaks in May and September has become highly unpredictable, resulting in delayed planting of small grains in autumn and lack of winter forage for grazing livestock (Malinowski *et al.* 2009). As a perennial forage crop, summer-dormant tall fescue provides a source of forage during the winter months when warm-season grasses are dormant, reducing pasture establishment costs, soil erosion, and the time and labor associated with annual forage systems (Kindiger and Conley 2002; Beck *et al.* 2008; Islam *et al.* 2011).

Replacing summer-active with summer-dormant cool-season grasses can provide some resilience in the forage systems to extreme seasonal precipitation and temperature patterns (Clark and Harris 2009; Malinowski *et al.* 2005). These conditions, combined with relatively mild winters, allow summer-dormant tall fescue to be better adapted and more persistent in the southern Great Plains than traditional, summer-active types of tall fescue and other cool-season perennial grasses (Hopkins and Bhamidimarri, 2009; Malinowski *et al.* 2009). However there are no best-management practices that address the timing of grazing cessation as it relates to summer-dormant tall fescue stand persistence and animal production. The objectives of this study were to determine the effects of four grazing termination dates on endophyte-free 'Flecha' summer-dormant tall fescue forage production, animal production (average daily gain [ADG], gain, and grazing days), and tall fescue persistence (% stand and root mass).

Methods

Paddocks (0.1 ha each) were planted on 19 September 2010 at 17 kg pure live seed /ha of monoculture summer-dormant tall fescue. Tall fescue was planted according to guidelines outlined by Butler *et al.* (2008), whereby annual grass weeds were sprayed with glyphosate in the spring to prevent seed production, followed by a second application of glyphosate after rainfall to control emerged grass weeds prior to planting tall fescue in the autumn. Soil type was a Weatherford fine sandy loam (Fine-loamy, siliceous, active, thermic Ultic Haplustalfs). Prior to planting in September, 45 kg P_2O_5, 112 kg K_2O, and 112 kg N/ha were applied. Paddocks were not grazed during the establishment season to avoid the confounding effects of grazing on persistence.

In both grazing season (2011-12, 2012-13), paddocks were continuously stocked with a variable stocking rate using ewes (*Ovis aries*; 41 ± 3.4 kg initial body weight), and grazing began on all treatments on 11 January 2012 and 30 November 2012. In both seasons (2011-12, 2012-13), grazing ceased on the terminations date of 3 May, 16 May, 31 May, and 9 June. Stocking rates were adjusted every 28-d based on forage mass (FM) with put-and-takes ewes. Forage mass was measured every 28 d during the grazing season. After grazing termination and after plants entered dormancy in mid-summer (July), FM, root mass, and percent tall fescue stand measurements were taken to estimate storage organ mass and overall health/status of the paddocks prior to recovery/green-up the following autumn.

Percent stand measurements were determined by counting the live plants within 100 - 10 x 10 cm squares of a 1 m^2 quadrat. As late spring temperatures increase and soil moisture is reduced, summer-dormant tall fescue prioritizes photosynthate to increased root and stem base masses and to storage as nonstructural carbohydrates as opposed to new above-ground growth (Thornton *et al.* 2000). Severe defoliation prior to prolonged stress such as drought may limit the persistence of cool-season grasses. Nonstructural carbohydrate reserves are used for respiration during dormancy and for subsequent regrowth under favorable growing conditions (Richards 1993), therefore, fewer carbohydrate reserves may result in less vigorous regrowth and potential stand failure.

Results

Precipitation during the growing season from September through June was approximately 59% below average during the establishment season (2010-11), similar to the 30-yr average (900 mm) in the 2011-12 season, and 27%

below average during the 2012-13 season. In the first grazing season, FM decreased (both P<0.001) as the grazing season progressed. However, at their respective times of termination, there were no differences in FM between the grazing termination date treatments (average 840 kg DM/ha). There were fewer grazing days per hectare (P=0.01) on 16 May (4470 d/ha) than the other termination dates (average 5656 d/ha), which was probably due to the lesser FM on 16 May. There was a tendency (P=0.09) towards greater FM in July associated with the earliest (3 May) grazing termination date (2580 kg DM/ha), however there was no difference (P=0.55) in root mass (average 1150 g DM/m) between termination dates. At July dormancy, tall fescue stand was greatest (P =0.05) for the earliest termination date (3 May; 79%) and least in 16 May and 6 June (44 and 47%, respectively), while stand on 31 May was intermediate (65%). When measured in November 2012 prior to grazing initiation in season 2, stand was reduced (P=0.04) across all treatments to 57% compared to 69% in July.

Conclusion

After one year, data show a reduction in percent stand and a tendency towards less forage mass and root mass associated with grazing termination dates later than 3 May, which may indicate the need to cease grazing at this time of year in order to maintain stand persistence. This research will be conducted for an additional year with the anticipation of gaining more information on the grazing management of summer-dormant tall fescue in the Southern Great Plains.

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