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Review: Cool-season annual grasses or grass–clover management options for extending the fall–winter–early spring grazing season for beef cattle[1]

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ABSTRACT

Cool-season annual forages may supply seasonal forage for grazing and reduce needs for stored forages and concentrate supplements for beef cattle producers in the southeastern United States. Opportunity exists to use small grains that vary in their individual growth distribution to extend grazing during the fall–winter–early spring seasons. Small grains adapted to the region include cereal rye (*Secale cereale* L.), wheat (*Triticum aestivum* L.), oats (*Avena sativa* L.), and triticale (*Triticosecale* Wittm.). These species have a bimodal forage DM production trait during the autumn and early winter months and can be grown in monocultures or mixtures. Fall forage production potential of these species has been primarily dependent on planting method, seeding date, soil fertility or fertilization, and variety selection. Small grain varieties may also be grown in combination with annual ryegrass (*Lolium multiflorum* Lam.), clovers, or both to extend the seasons of grazing for fall or winter-calving cows or stockers. Annual ryegrass and legumes in the Southeast include cold-tolerant and rust-resistant diploid and tetraploid varieties of ryegrass, and adapted true clover (*Trifolium* sp.) varieties. Autumn-planted ryegrass or clovers including crimson (*Trifolium incarnatum* L.), arrowleaf (*Trifolium vesiculosum* Savi), ball (*Trifolium nigrescens* Viv.), and red clover (*Trifolium pratense* L.) provide minimal to nonexistent forage mass for grazing during the fall. Naturally reseeding ryegrass or clovers may provide earlier forage mass compared with small grains; however, DM is usually not adequate for stocking until late-January to mid-February, and it extends through May. Tetraploid varieties of ryegrass, when seeded into a prepared seedbed, can provide adequate forage mass for fall grazing similar to small grains. Earliness of forage mass for stocking among clovers ranges from crimson (earliest) to arrowleaf and ball (mid to late) to white and red (late to early summer). These cool-season forage systems provide suckling calf ADG that may approach or exceed 1.5 kg/d and stocker cattle ADG of more than 1 kg/d. Management strategies for sustainable cow-calf production include the strategic use of cool-season forages, assessment of fertilization demands and timing, and assessment of stocking rate to optimize forage utilization and desired animal performance.

Key words: annual ryegrass, small grain, clovers, beef cattle, the Southeast

INTRODUCTION

The southeastern region of the United States (**US**) is characterized by relatively mild climatic conditions in the winter, which make this area suitable to grow cool-season forages for grazing beef cattle. The 13 southeastern states (AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, and VA) are located in 6 of the southern-most USDA Plant Hardiness Zones, which include rainfall and temperature gradients that define the vegetational zones for these states (USDA/ARS, 1990). In the northern-most part of this area, tall fescue (*Lolium arundinaceum* Schreb.), a cool-season perennial, is the dominant pasture. In the southern part of this hardiness zone, warm-season perennial grasses such as bermudagrass [*Cynodon dactylon* (L.) Pers.] and bahiagrass (*Paspalum notatum* Fluegge) are the primary permanent pastures. For warm-season perennial grass pastures, cool-season annual grasses and legumes may provide forage production in the fall–winter–spring seasons to extend the year-long grazing season. Management of cool-season annual forages such as small grains, ryegrass (*Lolium multiflorum* Lam.), and clovers (*Trifolium* sp.) can provide high-quality forage production for cow-calf and stocker operations. Benson (2010) suggested the primary cost-cutting forage strategies for cow-calf operations in the Southeast included (a) N-fertilization; (b) changing forage varieties; (c) reducing the need for stored forages; (d) reducing forage losses and feeding costs of har-

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Table 1. Cool-season annual grass and clover relative adaptation, cold tolerance, disease resistance, and nutritive value in the southeastern United States[1]

Forage species	Adaptation	Growth distribution	Cold tolerance	Disease tolerance	Nutritive value
Small grains					
Barley	P/F	Early	F	P/F	G
Oat	G	Mid	P/F	F/G	E
Rye	E	Early	E	G	G
Triticale	G	Mid	G	G	G
Wheat	E	Mid	E	G	G
Annual ryegrass	G	Mid to late	G	E	E
Annual clovers—major					
Arrowleaf	G	Late	G	G	E
Ball	G	Mid	G	F	E
Crimson	E	Early	G	G	E
Red[2]	E	Late	G	G	E
Annual clovers—minor					
Berseem	F	Mid	P	F	G
Persian	F	Mid	G	F	G
Subterranean	G	Mid	F	G	E

[1]For forage adaptation in the Southeast, cold and disease tolerance, and nutritive value, P = poor, F = fair, G = good, E = excellent. Growth distribution of each forage type is characterized as early, mid, or late forage DM production potential.

[2]Red clover is a perennial clover species but is often planted and used as an annual in the Coastal Plain region.

vested forages; and (e) reducing forage risk management. Troxel et al. (2014) observed that strategic use of cool-season grasses (tall fescue and annuals) and clovers to extend the grazing season resulted in a 90% calf crop and targeted weaning weights of 250 kg for winter-calving cows. They concluded that by implementing research-based forage-animal management practices, grazing could be extended to ≥300 d with acceptable cow-calf performance when cool-season forages are used as part of a systems approach in Arkansas. Beck et al. (2016) reported replicated research using cool-season annuals and grazing management to extend the grazing season for cow-calf systems in southern Arkansas.

The objectives of this literature review were to (a) evaluate management options to extend the fall–winter grazing period in the southeastern US using small grains, ryegrass, clovers, or all 3 that are adapted to the vegetational zones and (b) assess stocking strategies for these species to provide sustainable cow-calf and stocker production.

SMALL GRAINS AND SMALL GRAIN–RYEGRASS MIXTURES

Adaptation to the Southeast US

Small grains such as cereal rye (*Secale cereale* L.), wheat (*Triticum aestivum* L.), triticale (*Triticosecale* Wittm.), and oat (*Avena sativa* L.) are well-adapted to the growing conditions found in the southeastern region (Table 1). Many adapted areas for small grains in the southeastern US have soils that are infertile and with low pH. Acid soil conditions restrict production of clovers, annual ryegrass (Hillard et al., 1992, 1993), and small grains to a greater extent than they do warm-season perennial grasses. Aluminum toxicity is the primary causal agent for reduced forage production on acidic soils by affecting root length of growth (Nelson and Keisling, 1980). Kim et al. (2001) reported that cereal grain rye showed a greater level of tolerance to aluminum concentration compared with triticale and wheat. Triticale, a combination of rye and wheat, exhibited increased tolerance to aluminum concentration in the more recent plant breeding lines, and many lines approached or exceeded the tolerance shown by rye. Variety development of these species has led, in part, to improved forage DM production potential under soil conditions typically found in the Southeast region.

Small grains are widely used as cover crops following row crop production and serve as a major forage crop for grazing livestock. Small grains have a bimodal forage growth distribution and are known for their early season DM production relative to annual ryegrass and clovers (Figure 1). The time to the first grazing event for small grains is dependent on planting date and method, fertility, and climatic conditions. Forage DM production is typically available earlier when planted into a prepared seedbed compared with when it is sod-seeded into warm-season perennial grasses. The planting recommendation in most states in the Southeast for cool-season annual species is mid to late September for a prepared seedbed and early to late October for sod-seeded situations, depending on