GROWTH HABIT OF RHIZOMA PEANUT CULTIVARS AFFECTS ESTABLISHMENT AND SPREAD WHEN STRIP PLANTED IN BAHIAGRASS SOD


Abstract

Planting of rhizoma peanut (RP; *Arachis glabrata* Benth.) into clean-tilled strips within bahiagrass (*Paspalum notatum* Flügge) pastures may provide an economical way to increase sward nutritive value, decrease dependence on N fertilizer for grass-based pasture systems, and promote the formation of sustainable, mixed-species swards in Florida. Recently-released cultivars and germplasms of RP range in growth habit from decumbent to upright, which will likely affect their ability to spread in grass pastures and their response to grazing management strategies. In 2011, an experiment was conducted at the UF/IFAS Beef Research Unit in Gainesville, FL to quantify rate of establishment, spread, and grazing tolerance of RP cultivars within the context of strip planting. The experiment was a randomized complete block design with a split-plot arrangement of treatments. Treatments included two defoliation regimes, haying or grazing every 28 d, and four RP entries, Arblick, Ecoturf, Florigraze, and UF-Peace (UFP). Total sprout emergence (sprouts/ft²) was measured weekly beginning 3 wk after planting until defoliation was initiated on 15 June. Percentage of RP cover and frequency of occurrence were quantified prior to each defoliation event. Spread was measured at the end of the season in October. Total sprout emergence was greatest for Florigraze compared with all other entries. Across the season, percentage cover and frequency of Florigraze were greater (40% cover and 80% frequency) than UFP (17% cover and 43% frequency) and Arblick (21% cover and 47% frequency), but were not different from Ecoturf (28% cover and 62% frequency). Rate of spread was greatest for Florigraze and Ecoturf (12 and 13 in, respectively) compared with Arblick (6 in) and UFP (2 in). Management of RP did not affect cover and frequency as much as did RP genotype. However, spread potential was reduced by grazing (4 in) compared with haying (12 in) treatments. Results of this experiment suggest that strip planting may be a viable option for establishing RP–grass associations in the southeastern USA. A second year of this study was conducted in 2012 to further quantify differences among genotypes and their ability to spread into grass pastures.

Introduction: In the USA Gulf Coast Region, warm-season perennial grasses such as bahiagrass and bermudagrass [*Cynodon dactylon* (L.) Pers.] form the basis for grazing systems (Ball et al., 2007). Fluctuating costs of inputs to these systems, especially fuel and fertilizer, have made incorporation of legumes increasingly necessary for pasture-based livestock production. Legumes are high in nutritive value and fix N₂, decreasing the need for commercial N fertilizer, an input that has become too expensive for some producers. Rhizoma peanut is a warm-season legume.
perennial legume that is well adapted to the region and has potential for incorporation into grazing systems. Unlike most warm-climate legumes, RP has well-documented persistence and ability to spread in grass pastures (Ortega-S. et al., 1992). Some existing pastures have persisted for 30 years (L.E. Sollenberger, personal communication, 2011).

High cost of establishment of pure stands of RP (~ $550/acre) has made it uneconomical for use in livestock enterprises with relatively low return, e.g., beef cow-calf systems, and limited its use primarily to a high value hay crop for horses or dairy cattle. Lower-cost, alternative establishment strategies are needed if RP is to make significant contributions to grazing systems for livestock. One approach for lower-cost incorporation of RP into grass pastures is strip planting. Because RP is a long-lived perennial with ability to move laterally via an extensive rhizome system, it has potential to spread into the surrounding grass areas over time and form a mixed pasture. Recently-released cultivars of RP range in growth habit from decumbent to upright, and these differences likely will affect their ability to spread in grass pastures (Quesenberry et al., 2010). Plants with varying growth habits also will likely respond differently to a range of grazing management strategies. No research has evaluated responses of RP cultivars with varying growth habits to strip planting or to grazing management. The success of the strip-planting approach is dependent upon selecting RP genotypes that spread vigorously in grass pastures and tolerate grazing. Therefore, the objectives of the research are to quantify the ground cover and rate of spread of RP entries following strip planting into bahiagrass pastures and to quantify the effects of defoliation management during the establishment year.

Materials and Methods: A 2-yr experiment was conducted at the University of Florida Beef Research Unit in Gainesville, FL (29.72°N, 82.35°W) during 2011 and 2012 (new area planted each year). Only 2011 data will be presented in this paper. The site was chosen because of the presence of well-established ‘Pensacola’ bahiagrass on a relatively well-drained soil. Soils at the site consist of a Pomona fine sand (sandy, siliceous, hyperthermic Ultic Alaquods) and Plummer fine sand (loamy, siliceous, subactive, thermic Grossaneric Palequults). Triple superphosphate and muriate of potash were applied according to soil test recommendations after first sprout emergence was observed.

In October 2010, four, 98- x 13 ft wide strips of bahiagrass were sprayed with glyphosate at a rate of 3 lb ai/acre using a CO2-pressurized backpack sprayer. Prior to planting of RP in March 2011, the sprayed strips were plowed with a moldboard plow and heavily disked to ensure a clean-tilled planting area. Rhizomes of RP entries were harvested from existing planting stock nursery areas and planted by hand in furrows at a rate of 80 bushels/acre. Furrows were 20-in apart and there were eight furrows in the planted strip. Strips were sprayed with imazapic postemergence at a rate of 0.06 lb ai/acre to control grass, broadleaf weeds, and sedges on 11 May and 5 July 2011.

Treatments were replicated three times in a split-plot arrangement, with main plots allocated in a randomized, complete block design. Defoliation management regime served as the main plot (2 defoliation treatments), and RP entry as the sub-plot (4 entries) for a total of 24 experimental units. Each plot was 16-ft long and consisted of a 13-ft wide planted RP strip bordered by two, 3-ft wide strips of bahiagrass. Entries included Arblick, Ecoturf, Florigraze, and UF Peace. Two defoliation treatments were selected based on preliminary results from a
current strip-planting study with Florigraze RP (Castillo et al., 2013). Plots were defoliated every 28 d under hay production or rotational stocking management to a 4- or 6-in bahiagrass stubble height, respectively. Experimental units under hay production were cut using a sickle bar mower. For grazed treatments, four to six yearling beef heifers were assigned to an experimental unit, and grazing was monitored until a 6-in bahiagrass stubble height was reached. Animals had access to both the bahiagrass bounding the planted strip and the RP within the strip. Response variables included sproutgrass emergence until 10 wk after first emergence. Grass herbage harvested, RP cover, and frequency of occurrence in the planted strip were measured monthly prior to a defoliation event. Spread of RP into bahiagrass strips was evaluated at the end of the growing season.

Results and Discussion: Total sprout emergence (Table 1) was greatest for Florigraze (10 sprouts per ft²) compared with all other entries. Ecoturf had the second greatest total sprout emergence (6 sprouts per ft²); however, UF Peace had lower total emergence than Ecoturf. Ground cover and frequency of peanut occurrence (Table 1) were greater for Florigraze (40% cover and 80% frequency) and Ecoturf (28% cover and 62% frequency) than UFP (17% cover and 43% frequency) and Arblick (21% cover and 47% frequency). Florigraze and Ecoturf had the greatest rate of spread into bahiagrass strips (~ 1 ft each) compared with Arblick (6 in) and UFP (2 in). Defoliation management of RP did not affect cover and frequency as much as did RP genotype. However, spread potential (Table 1) was reduced by grazing (4 in) compared with haying (1 ft) treatments. Hayed treatments had greater mean total herbage harvested per month from June to August compared to grazed treatments (1025 lb/acre vs. 670 lb/acre). In September, grazed treatments had a greater total herbage harvested compared to hayed (1205 lb/acre vs. 535 lb/acre). No differences were observed in defoliation treatments in October. Total herbage mass harvested did not differ among treatments and averaged 3750 lb/acre across the entire season.

In conclusion, Florigraze and Ecoturf had the greatest total sprout emergence. This resulted in greater cover, frequency, and spread into bahiagrass during the establishment year. Defoliation during the year of establishment did not affect rhizoma peanut cover or frequency, but for three of four peanut entries spread was reduced by grazing vs. cutting for hay. Results suggest that strip planting may be a viable option for establishing RP–grass associations in the southeastern USA. However, there appear to be differences in performance among peanut entries under strip-planting management, so selection of genotypes is likely to be important. The experiment is currently in progress for a second year in 2012.

Literature Cited:


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<th>Genotype</th>
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<sup>a,b,c</sup> Within a column, means without common superscripts differ ($P < 0.05$).