

## The Annual Cultivated Peanut (*Arachis hypogaea* L.) as a Potential Forage Crop for Livestock in the Southeastern U.S.<sup>1</sup>

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The annual cultivated peanut, widely grown in the Southeastern U.S., may have potential as a forage legume for this region.

### Why the annual peanut?

High-quality forage legumes that can be grown during the warm season in the lower SE U.S. are scarce. Alfalfa (*Medicago sativa* L.) does not perform well in this region. Established, perennial rhizome peanut (*Arachis glabrata* Benth.) performs well in this region; however, it is propagated from rhizomes, and it is slow to establish—often requiring two to three years to obtain a good stand. The cultivated annual peanut (*Arachis hypogaea* L.) is well adapted to this area, and it is widely grown for its pods (seeds, nuts). Annual peanut is readily established by seed and thus can produce a forage crop in the first year.

The annual peanut is grown for both forage and seed in other parts of the world (Larbi et al. 1999). In the SE U.S., farmers often harvest the residue peanut vines for hay after pod (seed) harvest. This hay,

however, is proportionally high in stems because of leaf shatter during pod harvest. The hay is also high in ash content because of soil that adheres to the stems and leaves when the peanut is harvested. Also, there is an inherent liability in feeding annual peanut vine-residue hay to livestock because most fungicides used in peanut production are not cleared for the feeding of crop residue. These fungicides are commonly used in peanut production to inhibit the development of a common foliar disease, late leaf spot, which is caused by a fungus (*Cercosporidium personatum*) (Gorbet et al. 1994; Hill 2002). While annual peanut vine-residue hay is often fed to livestock, this practice is essentially illegal according to the fungicide label.

Annual peanut cultivars with good late-leaf-spot resistance may allow the production of a quality, high yielding forage crop without the use of fungicides. Previous Florida research has obtained forage yields of up to 3.7 tons per acre using disease-resistant peanut lines without the use of fungicides (Gorbet et al. 1994). In that study, the forage was harvested 75

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1. This document is AN255, one of a series of the Department of Animal Science, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Original publication date December 2010. Visit the EDIS website at <http://edis.ifas.ufl.edu>.

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to 85 days after planting, and then the pods were harvested at maturity. Defoliation of the canopy, however, resulted in decreased pod yields. A recent study conducted in Georgia reported an average pod yield loss of 41% upon clipping the forage canopy to a height of 5 inches about 60 days prior to pod harvest (135 days after planting; Gates, R, N., unpublished research results).

With the elimination of the quota system for U. S. peanut production and the resulting decrease in peanut prices, there has been interest in growing the annual peanut strictly as a forage crop. Since the pods are not harvested if grown strictly for forage, the peanut plant may be able to self-seed (reseed), and the plants would emerge the next growing season to produce a subsequent forage crop. Thus it would be possible to obtain several years of forage from one planting. Anecdotal evidence suggests that this may be possible as annual peanut will readily volunteer the next spring from seed left after harvest during the previous fall.

### **Forage production trial**

To measure potential forage yields and to determine the feasibility of obtaining several years of forage production from a single planting, a three-year, small plot study was conducted to evaluate forage production from 16 selections (genotypes) of the annual peanut without irrigation. This study was conducted at the North Florida Research and Education Center (NFREC) in Marianna. All selections had resistance to late leaf spot. The plots were planted in May of the first year, and for the subsequent second and third years, plants emerged in March from seed (self-seeded) from the previous years' crop. Forage was clipped in early August for year 1 and during late July for years 2 and 3. Forage dry matter (DM) yield varied from 3,140 lb to 4,180 lb per acre. Average forage DM yield was highest for year 1 (4,570 lb per ac), then declined by 27% for year 2, and declined another 6% by year 3. All genotypes evaluated decreased in forage DM yield over the 3 years. The yield decrease may have been due to weather conditions and disease pressure. Rainfall amounts were similar to the 30 year average for all 3 years; however, rainfall during July was highest for year 1 and lowest for year 3. Even though

selections and cultivars with known disease resistance were used in the study, they were not totally resistant to late leaf spot. Some late leaf spot was noticed, but it was not quantified. Weed pressure appeared greater in year 2 and 3 than year 1, even though the same weed control protocol was followed each year. Other factors associated with continuous cropping of peanut, such as increased nematode pressure, may have also been responsible.

There was not sufficient regrowth for a second cutting within any year of the forage production study for any of the selections evaluated. Gorbet et al. (1994) obtained two cuttings from each of 10 selections with total forage DM yields of up to 7,410 lb per acre. This compares favorably with seasonal forage DM yields of 6,000 to 10,000 lb per acre typically obtained for perennial peanut (Hill 2002). However, the yield from the second cutting averaged just 1,780 lb per acre representing about 25% of the total for each selection (Gorbet et al. 1994). It should be pointed out that the pods were harvested at maturity in the study of Gorbet et al. (1994), and the first clipping was done 75 or 85 days after planting. In the forage-only study mentioned above, forage clipping was not until after seed set of the peanut plant, which normally occurs about 100 days after planting.

The results of the NFREC forage production study indicate that it is possible to obtain multiple years of forage production from a single planting of the annual peanut. Only a single cutting, however, could be taken per year, and yields were less than what can be expected from established perennial peanut stands. In addition, forage yield decreased progressively each year in the self-seeded (reseeded) crop.

### **Nutritional value of annual peanut forage**

Nutritive value of dried, fresh annual peanut forage and annual peanut hay and haylage is summarized in Table 1. The limited analyses to date of the annual peanut forage indicate very good nutritional value, similar to that of alfalfa and perennial peanut forages (NRC 2000; Myer et al. 2010). Recent research, however, indicates that

annual peanut forage may retain less digestible nutrients than perennial peanut through the haying process and subsequent storage (Eckert 2008). Concentrations of fiber (as measured by acid detergent fiber [ADF] and neutral detergent fiber [NDF]) were both found to be greater in the hay than in fresh cuttings from the same fields probably because of leaf shatter during hay making. Conversely, perennial peanut showed only a nominal increase in fiber due to the haying process.

### Feeding value of annual peanut forage for livestock

*In vitro* organic matter digestibility (IVOMD) of annual peanut forage is also summarized in Table 1. *In vitro* digestibility is a laboratory procedure that simulates digestibility by an animal. Recent research has indicated that fresh, dried annual peanut forage had *in vitro* digestibility similar to or even greater than fresh perennial peanut forage; however, the *in vitro* values of annual peanut hay tended to be lower than that of perennial peanut hay (Eckert 2008; Foster 2008).

Limited research has been conducted on the utilization of annual peanut hay by ruminant livestock (cattle, sheep, goats). Two recent experiments were conducted by the University of Florida, NFREC Marianna, and the Department of Animal Science to evaluate perennial peanut, annual peanut, soybean, cowpea, and pigeonpea hays or haylages fed to lambs. Perennial peanut and annual peanut stored either as hay or haylage were the most promising forage legumes evaluated as they resulted in the greatest improvements of intake, digestibility, and protein retention by the lambs (Foster 2008).

### Annual peanut as forage for grazing by beef cattle

Annual peanut was evaluated in a two-year study at NFREC Marianna as a possible high-quality pasture forage crop for grazing by early weaned beef calves (400 to 500 lbs; 5 to 6 mo. of age). A 10-acre field was used that was originally planted to annual peanut 3 years prior to the start of the grazing study. For the first 3 years, the forage was harvested for hay, and then the 2-year grazing study was initiated. The

peanut was allowed to reseed each year, and the peanut plants emerged in March of each year. Therefore, the two years of the grazing study represent the fourth and fifth year of forage crops from the original planting.

The peanut field was rotationally grazed each year starting mid-July (year 1) or early August (year 2). The relatively late start was to ensure the peanut had set seed for the next year's forage crop. The grazing season lasted 88 days for year 1 and 55 days for year 2 due to differences in rainfall. Estimated average forage DM yield was 5,525 lb per acre and 4,075 lb per acre for years 1 and 2, respectively. At the start of each year, forage quantity and nutritional quality were high; however, both declined as grazing season progressed (nutritional quality from 20% and 19% crude protein for year 1 and 2, respectively, to 15% and 16%; and *in vitro* digestibility from 72% and 71% to 61% and 64%). The cattle received no supplemental feeding while grazing; water and a complete cattle mineral mixture were provided free choice.

Total cattle weight gain per acre averaged 128 lbs per acre per year. Estimated costs for establishing and maintaining the annual peanut for pasture would be more than the value of calf weight gain. Even though some establishment costs can be spread out over at least 2 years, the cost still would be about \$150 to \$200 per acre per year (Hewitt 2006).

Results from the grazing study indicated that the annual peanut initially was an excellent forage crop for grazing by the early weaned beef calves, but the lack of regrowth and declining forage quality resulted in poor cattle growth performance late in the grazing periods. Therefore, the relatively short grazing season and lack of regrowth after grazing in a rotational grazing system would limit its value as a forage crop for grazing at this time.

### Implications

There are two approaches to using the annual peanut as a forage crop—harvest the forage prior to pod harvest and then harvest the pods, or grow it strictly as a forage crop. At this time, the value of the forage is not enough to overcome the lost pod yield if harvested prior to pod harvest. Planting it strictly as a

forage crop and allowing it to reseed is probably not economically justifiable even when the planting costs can be spread over several years. However, plant breeders have noted much variation among annual peanut genotypes. This could be exploited via plant breeding to produce high yielding, persistent, seeded annual peanut cultivars that can be used for grazing alone or harvested for hay/haylage alone for several years from a single planting.

### Related EDIS publications:

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**Table 1.** Composition of annual peanut forage<sup>a</sup>, dry matter basis.

	Crude protein	NDF <sup>b</sup>	ADF <sup>c</sup>	IVOMD <sup>d</sup>
Dried fresh forage	15–22	32–38	26–30	70–80
Hay	12–18	44–50	32–40	64–72
Haylage <sup>e</sup>	14–20	38–44	28–36	64–74
Residue hay <sup>f</sup>	8–14	44–54	34–46	50–64

<sup>a</sup>Information sources: Eckert 2008; Foster 2008; Hill 2002; Myer, unpublished data; and Dairy One forage analyses data base (accessed May 2010).

<sup>b</sup>NDF, neutral detergent fiber—a measure of insoluble and soluble fiber.

<sup>c</sup>ADF, acid detergent fiber—a measure of insoluble fiber.

<sup>d</sup>IVOMD, *in vitro* organic matter digestibility—a lab procedure that simulates digestion by the animal; the higher the number, the better the digestibility.

<sup>e</sup>Baled at about 45% moisture and the bales were wrapped in plastic.

<sup>f</sup>Residual vines that are baled after the pods are harvested. Note: fungicides used in peanut production are not cleared for feeding of the crop residue; the residue peanut vine hay typically contains 8 to 16% ash.