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Rhizoma Peanut

A New Forage Option for Louisiana

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Introduction

Forage-based livestock production systems are an important part of Louisiana agriculture. The gross value of farm grown hay was estimated at over $44 million in 1997 (Louisiana Summary, 1997). However, this figure reflects only a small percent of the total forage value to Louisiana producers, since most of the forage production is utilized directly by the ruminant livestock industry through grazing. Unfortunately, much of the summer forage grown in Louisiana is of poor quality, particularly the late-summer grass production. The development of a high quality, perennial summer forage, with late summer or early fall production, has been a long standing objective of Louisiana forage researchers. Such a forage could substantially increase animal performance during this period and reduce the need for supplemental feeding. If this forage were a legume, the need for additional nitrogen inputs would be reduced, thereby lowering producion costs and benefitting the environment. Rhizoma peanut (*Arachis glabrata* Benth.), a legume, has the potential to fill this summer forage deficit and provide producers quality high-value hay with little nitrogen input.

What is rhizoma peanut?

Rhizoma peanut, a wild relative of the common peanut (*Arachis hypogea* L.), is a warm-season perennial legume that reproduces and spreads primarily by underground stems known as rhizomes. Stands are established by sprigging rhizomes since seed production is minimal. All varieties have four leaflets per leaf, fine stems, orange to yellow flowers, and form very thick rhizomatous mats 4 - 6 inches below the soil surface. Its primary usefulness is forage production for livestock, although some varieties may be used for ornamental or conservation purposes. Rhizoma peanut is adapted to the extreme southeastern United States and has a long history of research and development in Florida. The Louisiana Agricultural Experiment Station has been conducting research on rhizoma peanut in Louisiana since 1989 (Caldwell et al., 1990) and considerable information is available for our unique growing conditions.

What about varieties?

Rhizoma peanut occurs naturally in the countries of Brazil and Paraguay between 10^0 to 30^0 south latitude (Valls and Simpson, 1993) and was introduced into the United States from South America (Gregory et al., 1973). The two most common forage cultivars, 'Florigraze' and 'Arbrook', were released by the USDA and the University of Florida (Prine et al., 1986; Prine et al., 1990). All of the varieties grown in the United States are either plant introductions or naturally occurring seedlings that were isolated and increased.

Arbrook and Florigraze are the only two released varieties recommended for forage production. Arbrook is much more upright, has a thicker stem, and is somewhat lower in quality than Florigraze. Arbrook has a more distinctive tap-root than Florigraze, does not spread by rhizome as vigorously, and is more susceptible to damage from low winter temperatures and excessive grazing. Numerous experimental lines and plant introductions have been evaluated in Louisiana (Venuto et al., 1997; Venuto et al., 1995), but none has proven significantly superior to Florigraze. Given the difficulty in breeding this crop and producing viable seed, it is unlikely that a superior forage type will be developed in the near future.

Where should it be grown?

Rhizoma peanut is native to warm, humid climates, with little or no winter. It is very drought tolerant, but does not tolerate wet soil conditions. It should be grown primarily in the southern half of Louisiana on well-drained soils. It has persisted for several years as far north as Winnsboro, but productivity this far north has not been determined. While it is adapted to infertile well-drained sandy soils, rhizoma peanut can also be grown on more fertile clay soils as long as they are not flooded or water-logged for extended periods of time.

Who should consider growing it?

Rhizoma peanut is NOT an easy plant to establish! It can take several years to establish a stand, and it is generally the third year before a full stand is obtained. Its value is primarily for high quality summer forage and premium hay production for the dairy or horse market. If you do not need this extra quality forage in your livestock operation, the investment in rhizoma peanut is probably not justified. If you cannot set aside acreage to establish this crop, up to 2-3 non-productive years, you should not attempt to grow it. Rhizoma peanut should be considered a long-term investment with few short-term dividends. However, once established, rhizoma peanut is very persistent and will maintain long-term productive stands (Romero et al., 1987).

Establishment

Due to the cost of establishment, risk of failure, and typically slow establishment rate, rhizoma peanut is often initially established in a relatively small area with irrigation. An established stand can provide enough rhizomes to plant 20 acres for each acre of well-managed nursery area. Rhizome quality for stand establishment is affected by both management during the preceding growing season

and handling immediately following harvest. When forage is not harvested in the summer before digging, rhizomes build up energy reserves that better enable them to survive more adverse establishment conditions.

Rhizomes should be dug and transplanted in Louisiana during February or early March, before they break dormancy. Rhizomes that have initiated growth will begin to deplete stored energy reserves and be at a disadvantage, compared with dormant rhizomes, when transplanted. Rice et al. (1996) concluded that rhizomes with pre-plant total nonstructural carbohydrates greater than 26% and at least 2.1% nitrogen provided maximum establishment performance. However, the extent to which the chemical composition of the rhizomes affected stand establishment was correlated with rainfall. If rhizomes are obtained from Florida, or winter temperatures are mild, rhizomes may break dormancy as early as January, necessitating an earlier planting date. Rhizomes planted in late spring may be at greater risk for moisture stress in some years. Harvested rhizomes should be planted immediately so that they do not dry out. If not planted immediately, try to keep rhizomes cool and moist. Rhizomes can be dug with a bermudagrass sprig digger, but no matter how it is done, keep rhizome damage to a minimum. Fall establishment, after the plants become dormant, may be possible but more research is needed before this option can be recommended.

Rhizome planting rate should be at least 40 bushels per acre. A higher rate, up to 80 bushels per acre, will insure greater success, but availability of rhizomes and the need to transport them over long distances may tempt producers to plant at lower rates. However, it is imperative that proper site preparation and weed control be maintained no matter what rhizome planting rate is used.

Poor seedbed preparation is a primary cause of prolonged establishment or stand failure. The site selected for production should be prepared as much in advance as possible. Competition from undesirable species must be minimized! Existing vegetation, such as bermudagrass or bahiagrass, must be destroyed as completely as possible. Complete tillage should follow chemical control of existing plants to incorporate residue and further weaken hard to kill perennial plants. Subsequent light tillage operations will eliminate any surviving plants and destroy new weed seedlings. For early

spring planting, the site should be well prepared by early November. Rhizomes can be broadcast, covered by about an inch of soil by light discing, and roller packed to insure good soil contact with the rhizomes. A bermudagrass sprigger may be used, but should also be followed by roller packing.

The slow growth rate of the rhizoma peanut after establishment may be due in part to the seasonal variations in weather that occur in the Gulf Coast region, including periodic dry spells. Drought stress following establishment can result in rhizome and sprout losses, further slowing establishment (Williams, 1993). Researchers in Florida concluded that winter planting dates produced almost twice as many sprouts as did summer planting, and that plowed ground produced the highest number of sprouts when compared with disced or sod seedbeds (Williams, 1993).

Soil fertility requirements necessary to encourage rapid establishment and growth of rhizoma peanut have not been fully determined. Preliminary fertilizer recommendations for the establishment and growth of rhizoma peanut have been developed in Florida (Prine and French, 1993) with K, P, Mg, and S considered most important. Application of lime resulted in a yield decrease, and there was a positive correlation of yield with extractable soil Al, which may indicate an establishment advantage in acidic soils (Niles et al., 1990). Research in Louisiana (Mooso et al., 1995) indicated no response of forage production to P, Mg, S, or B application. A response to K fertilization was observed although it was not consistent with application rate. Forage yields were negatively correlated with soil pH, again indicating that a high pH may be detrimental to establishment and growth of rhizoma peanut.

Weed control can be critical to stand establishment. Tall upright-growing weeds should be mowed as needed to provide light to the lower growing rhizoma peanuts. Grazing for short periods may also be an effective means of maintaining an open canopy. Depending upon the changing legal specifications, Poast, Fusilade, and Basagran may be used during establishment. Individual herbicide label recommendations must be consulted for information regarding rates of herbicide application for establishment. However, grazing must be deferred for one year after application.

Maintaining an Established Stand

Fertility

The rhizoma peanut is well adapted to low fertility soils and is highly efficient at nutrient uptake. Available information indicates that nitrogen fixation by effectively nodulated rhizoma peanut is sufficient to support growth up to the production potential of the plant. Since stands are established from rhizomes, the appropriate bacteria for nodulation and efficient nitrogen fixation are normally transferred with the planting material for new stands. At least for the initial years of rhizoma peanut stands, lack of requirements for nutrient application provides a substantial opportunity to reduce production costs. In fact, some depletion of excessive levels of previously applied nutrients could improve the competitive advantage of rhizoma peanut in relation to more aggressive-growing, nutrient-demanding weeds. Periodic soil testing and monitoring of yields is needed to determine when potassium, phosphorus, or one of the minor elements has been depleted enough to limit production. This nutrient depletion to a sufficient extent to limit production will be most probable from hay fields with repeated removal of forage. Grazed stands will be subject to nutrient recycling and are less vulnerable to nutrient depletion.

Weed Control

Chemical weed control options for established rhizoma peanut fields are limited. Herbicides used during establishment cannot be used when the forage is to be grazed or harvested as hay. However, wick applications with Roundup can be applied to control taller invading weed species. Invasion of rhizoma peanut stands by bermudagrass may be more problematic with time. A strategy for periodically controlling weeds can include herbicide application in the growing season prior to a rhizome harvest season for planting material. Herbage growth cannot be harvested for feed during the herbicide treatment year, thereby complying with herbicide label restrictions. Not harvesting forage also allows rhizoma peanut stands

an opportunity to spread and thicken, contributing to the production of high yields of vigorous rhizome planting material in the subsequent year. Another option is available for management of rhizoma peanut in mixed pasture stands with warm-season grasses. In early spring, prior to peanut shoot emergence, most herbicides labeled for grass pastures can be used with no damage to the rhizoma peanut stand. Even during the growing season, 2,4-D can be applied according to label specifications to mixed grass pastures or hayfields without damaging the associated rhizoma peanut.

Insects and Disease

Lack of a major pest has been a real benefit to production and profitability for this crop. However, as acreage of other crops has increased in new areas, pests have followed. Thus, even though insect and disease problems have not been encountered, stands should be monitored for development of any such problems.

Harvest Management

Hay Harvest

Although the highest forage quality can be obtained with frequent harvest, two or three cuttings a year appear to be appropriate in Louisiana. Depending upon conditions, regrowth during the initial 4 weeks following harvest may be slow resulting in low, dense growth of almost all leaves. At this stage, forage quality is very high, but the clipped forage is often not long enough to rake and pick up with a baler. Thus, harvest, even for maximum forage quality, must be delayed long enough for length of the clipped material to be processed by hay equipment. Most growth of rhizoma peanut in Louisiana occurs over the 16-week period of May through August. Therefore, either two harvests at 8-week growth periods or perhaps three harvests at 5- to 6-week growth periods are possible, depending primarily upon rainfall.

Grazing

Due to establishment costs and the high quality of the product, rhizoma peanut is not an economical pasture or hay crop for mature beef cows. Such utilization is an inefficient use of this high quality forage. Young growing animals, such as stockers or replacement heifers, could more efficiently use the high quality forage. High producing dairy cows could also efficiently use rhizoma peanut pastures. The continuous stocking method of harvesting high quality pasture often results in loss of many dollars worth of feed from trampling, bedding, etc. As grazing management increases so does harvest efficiency. Strip grazing, as is sometimes done for short periods each day with high producing dairy cows, can be an efficient method of grazing this crop. In Florida, it was found that grazed rhizoma peanut was more productive when either stubble following grazing was relatively high or when extended regrowth periods between grazing periods were allowed (Ortega et al., 1992). For greatest production, with the high proportion of forage removal typical of strip grazing by dairy cows, about 8 weeks of regrowth would be needed. Systems based on regrowth periods as short as 7 days could also attain high levels of productivity when approximately 30% of the rhizoma peanut forage remains as stubble following the grazing period.

Creep grazing appears to have potential for use in beef cow-calf production. Preliminary efforts with creep grazing revealed that young calves are not attracted to the crop initially. It is, therefore, critical to have creep grazed fields, and especially the access for calves, located where the cows spend considerable time, such as near water and shade. Young calves using a rhizoma peanut creep with areas of common bermudagrass were observed to graze only the grass for several days. After allowing the cows to graze the area for a day, the calves immediately began grazing the rhizoma peanut. Thus, some additional management will be needed to effectively harvest rhizoma peanut by creep grazing.

Yield and Quality

A considerable benefit of rhizoma peanut hay for the horse market has been product consistency. The most immature, high protein growth cannot be effectively harvested for hay. Sufficient growth for acceptable hay yields typically results in hay of 14% to 16% crude protein. This is an appropriate level of protein for the horse market. Premium alfalfa hay will range from slightly below this level of crude protein to more than 20%. This large range in crude protein, as well as occasional dust and mold problems, has been associated with digestive disorders of horses consuming alfalfa hay. Neither dust nor mold has been associated with premium quality rhizoma peanut hay that has been properly harvested and stored. To avoid mold or dust problems, peanut hay should be baled at moisture contents less than 20%. In Florida, a Perennial Peanut Producers Association has been very effective in developing production and marketing approaches for this crop. To develop product credibility, they initially expended considerable effort to insure that only premium quality rhizoma peanut hay was marketed to the local horse industry. Rhizoma peanut maintains its quality well with age, typically decreasing only modestly in protein and digestibility from 4 to 6 or even 8 weeks of age (tables 1 and 2). Rain, even after cutting, is not readily absorbed due to the waxy forage surface. Although discoloring the exposed surface, rhizoma peanut hay is sometimes only slightly damaged by rain. These older or rain damaged hays may look like and even approach the value of premium quality rhizoma peanut hay. However, the initial effort to market these slightly lower quality products primarily to the dairy industry and provide only the premium product to the horse market has contributed to the demand for rhizoma peanut hay by the Florida horse industry. As illustrated in Table 3, forage yields can vary with management and weather conditions. Rainfall can be the primary factor associated with yields even though rhizoma peanut is extremely drought tolerant.

Table 1. Crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), and total digestible nutrients (TDN) of Florigraze rhizoma peanut harvested at 30- and 60-day intervals (Redfearn et al., 1998) compared with a typical high quality alfalfa (Allen et al., 1979)

Harvest Interval	CP	NDF	ADF	TDN
		%		
60-day	16.2	52.1	37.6	58.5
30-day	21.2	44.0	32.2	64.2
Alfalfa	20.0	44.0	35.0	64.0

Table 2. Crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF), and in vitro true digestibility (IVTD) for five rhizoma peanut genotypes, 'Arbrook', 'Florigraze', 423, 575, and 616, harvested at 6-week intervals at Olive Branch and Idlewild Research Station, Louisiana, during 1996

	Olive Branch				Idlewild			
Variety/line	CP	NDF	ADF	IVTD	CP	NDF	ADF	IVTD
				%				
Arbrook	15.4	44.5	34.8	78.1	11.0	45.7	35.4	76.0
Florigraze	18.0	42.3	32.6	79.6	15.5	44.0	31.6	78.5
423	15.8	42.4	33.4	79.3	14.7	43.3	31.9	79.1
575	17.2	43.1	32.8	80.6	12.9	45.4	32.8	78.3
616	14.7	45.2	34.3	79.3	13.4	46.0	33.4	78.9
Mean	16.2	43.5	33.6	79.4	13.5	44.9	33.0	78.2

Table 3. Total annual rhizoma peanut forage dry matter yields at the Rosepine and Southeast Research Stations in 1997 and 1998 for four 30-d and two 60-d harvests

Location	1997		1998*	
	30-d Harvest	60-d Harvest	30-d Harvest	60-d Harvest
	pounds/acre			
Rosepine	6980	9040	4190	3740
Southeast	9680	9160	6915	9196

* Severe drought from late spring throughout the growing season reduced production from all warm-season forages during 1998.

Conclusions

Rhizoma peanut is a crop that should be grown by producers only if they have the patience and economic situation to warrant the high cost of establishment and lack of early production. It is possible to produce excellent quality summer forage and the opportunity exists to exploit the premium hay market in Louisiana. These opportunities will require entrepreneurial marketing efforts and good forage management skills.

References

Allen, M., R. Bracy, C.R. Montgomery, B. Nelson, and L. Mason. 1979. Comparison of alfalfa varieties for forage production and quality. Annual Progress Report. Southeast Research Station, Franklinton, LA.

Caldwell, A.G., D.R. Morris, R.E. Joost, W.M. Elkins, and D.L. Freisner. 1990. Perennial peanut, a summer legume for Louisiana. LA Agric. 34(2):14-18.

Gregory, W.C., M.P. Gregory, A. Krapovickas, B.W. Smith, and J.A. Yarbrough. 1973. Structure and genetic resources of peanuts. p. 47-133. *In* C.T. Wilson (ed.) Peanut - culture and uses. American Peanut Res. and Education Soc., Stillwater, Oklahoma.

Louisiana Summary. 1997. Agricultural and natural resources. LSU Agric. Cntr. Pub. 2382.

Mooso, G.D., W.D. Pitman, and D.G. Morrison. 1995. Rhizoma peanut responses to fertilizer treatments on a Louisiana Coastal Plain soil. J. Plant Nutr. 18:2273-2279.

Niles, W.L., E.C. French, P.E. Hildebrand, G. Kidder, and G.M. Prine. 1990. Establishment of Florigraze rhizoma peanut (*Arachis glabrata* Benth.) as affected by lime, phosphorous, potassium, magnesium, and sulfur. Soil Crop Sci. Soc. Florida Proc. 49:207-210.

Ortega-S., J.A., L.E. Sollenberger, K.H. Quesenberry, J.A. Cornell, and C.S. Jones, Jr. 1992. Productivity and persistence of rhizoma peanut pastures under different grazing managements. Agron. J. 84:799-804.

Prine, G.M., L.S. Dunavin, R.J. Glennon, and R.D. Roush. 1990. Registration of 'Arbrook' rhizoma peanut. Crop Sci. 30:743-744.

Prine, G.M., L.S. Dunavin, P. Mislevy, K.J. McVeigh, and R.L.Stanley. 1986. Registration of 'Florigraze' rhizoma peanut. Crop Sci. 26:1084-1085.

Prine, G.M., and E.C. French. 1993. Development of rhizoma peanut for forage in lower south, USA. p. 2133-2134. *In* M.J. Baker et al. (ed.) Proc. Int. Grassl. Congr., 17th, 13-16 Feb., Palmerston North, New Zealand. New Zealand Grassl. Association, Palmerston North, New Zealand.

Redfearn, D.D., B.C. Venuto, and W.D. Pitman. 1998. Forage quality response of rhizoma perennial peanut to harvest frequency. *In* Agronomy Abstracts. ASA, Madison, WI.

Rice, R.W., L.E. Sollenberger, K.H. Quesenberry, G.M. Prine, and E. C. French. 1996. Establishment of rhizoma perennial peanut with varied rhizome nitrogen and carbohydrate concentrations. Agron. J. 88:61-66.

Romero, F., H.H. Van Horn, G.M. Prine, and E.C. French. 1987. Effect of cutting interval upon yield, composition and digestibility of Florida 77 alfalfa and Florigraze rhizoma peanut. J. Anim. Sci. 65:786-796.

Valls, J.F.M., and C.E. Simpson. 1993. Taxonomy, natural distribution, and attributes of *Arachis*. p. 1 - 18. *In* P.C. Kerridge and B. Hardy (ed.) Biology and Agronomy of Forage Arachis. CIAT, Cali, Columbia.

Venuto, B.C., G.C. Cuomo, and W.M. Elkins. 1995. Performance of rhizomatous perennial peanut in southern Louisiana. p. 54-63. *In* M.W. Alison (ed.) Proc. Louisiana Association of Agronomists. 29-30 Mar. 1995. LA Agric. Ctr., Baton Rouge, LA.

Venuto, B.C., W.M. Elkins, R.W. Hintz, and R.L. Reed. 1997. Comparison of seed-derived lines from 'Florigraze' rhizoma perennial peanut. Crop Sci. 37:1098-1102.

Williams, M.J. 1993. Planting date and preplant tillage effects on emergence and survival of rhizoma perennial peanut. Crop Sci. 33:132-136.

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