Limpograss Cultivars for Florida: Past, Present, and Future

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INTRODUCTION

Limpograss (*Hemarthria altissima* [Poir.] Stapf and C. E. Hubb) is a stoloniferous perennial tropical grass of the tribe Andropogonea of the family Poaceae. The grass is native to southern Africa, but has not been used widely as a planted pasture grass in its native region. Limpograss produces few seed and is thus vegetatively propagated. It spreads rapidly from prostrate stolons which root easily at the nodes producing new shoots, but it does not have under-ground rhizomes.

LIMPOGRASS ADAPTATION

The limpograsses are found in their native habitat along stream banks and on other wet or seasonally wet soil types. In Florida, they are best adapted to the flatwoods type soils (Spodosols). These soils often have a water table near or above the soil surface for extended periods during the summer months. Some research has indicated that limpograsses are susceptible to sting nematodes, and are thus not well suited for production on the well drained sandy soils of the central ridge of Florida.

The lines of limpograss which have been evaluated also appear to be well adapted to tropical areas with high rainfall. The grass has shown good production in subtropical and even mild temperate areas in the U.S., South America, and New Zealand to latitudes of 35°S (Rumball, 1989). Limpograss has been shown to be adapted to moderately acid soils. In Florida it is generally recommended to lime soils to pH 5.5 or higher, but limpograss has been reported to produce well in Columbia on an Ultisol of pH 4.5 (Tergas, et al., 1982).

In general, the limpograsses are more productive under cool temperatures (less than 60°F) than other tropical forage grasses. Most introductions evaluated have more frost tolerance than stargrasses (*Cynodon nlemfuensis* Vanderyst) or bahiagrass (*Paspalum notatum* Flugge). It is equal or superior in winter hardiness to all other tropical grasses except those species with deep rhizomes. Some of the original limpograss introductions survived winters as cold as 0° F at Coffeeville, MS.

LIMPOGRASS IN FLORIDA

Limpograss was introduced into Florida in 1964 from plant collections made by Dr. A.J. Oakes of the USDA Plant Introduction Service (Oakes, 1964). There were four original plant introductions numbered 299039, 299993, 299994, and 299995. The first of these did not prove to be agronomically useful, but the remaining three showed potential for expanded utilization. The common name of "limpograss" was suggested by Wilms, et al., (1970) in recognition that the original plant introductions were collected in the Limpopo River valley region of Eastern Transvaal in South Africa. Other names which have been used by producers include altagrass and hemarthria(grass).

The three original plant introductions were planted at various locations in Florida, including Gainesville, the Soil Conservation Service Plant Materials Center at Arcadia, and the Agricultural Research Center at Ona. Considerable vegetative planting material of these first introductions was distributed to cooperators of soil and water conservation districts for "on farm" testing prior to any official cultivar release action. These lines were given the common names Redalta, Greenalta, and Bigalta,

REDALTA, GREENALTA, AND BIGALTA

Since large quantities of 299993, 299994, and 299995 had been distributed and were being used by growers in selected environments, these lines were released in 1978 as the cultivars 'Redalta', 'Greenalta',

and 'Bigalta', respectively (Quesenberry et al., 1978, 1979). It was estimated that acreages of the three cultivars at the time of release in order from most to least were Bigalta, Redalta, and Greenalta. However, only limited acreages had been planted of any cultivar.

When these cultivars were released, researchers recognized that each had a limitation which restricted its use. The digestibility of Redalta was known to be lower than the other two limpograsses, and more similar to bahiagrass. Additionally, problems with animal acceptance of mature or frosted Redalta had been observed. Research had shown Greenalta to be only slightly higher in digestibility than Redalta and generally lower in dry matter yield than either Redalta or Bigalta.

Bigalta had been shown by Schank et al. (1973) to have high *in vitro* organic matter digestibility compared to other tropical grasses of similar maturity. Bigalta also exhibited high yield potential, but in some grazing experiments, had not persisted well under heavy continuous grazing. The release circular recommended that Bigalta should be rotationally grazed, due primarily to low forage quality. Bigalta, although high in *in vitro* organic matter digestibility (IVOMD) (Schank et al., 1973), showed poor stand persistence in continously grazed pastures.

EVALUATION OF NEW GERMPLASM

A larger group of limpograss plant introductions was collected in the early 1970's and placed into an intensive evaluation program in 1974. This evaluation followed the four phase scheme for evaluation of forages outlined by Quesenberry et al (1977). In phase 1, over 70 plant introductions were tested in replicated small plots. From this evaluation, 15 superior lines were selected in 1976 and established simultaneously in small plots for evaluation under a mowing management (phase 2 evaluation), and in a companion experiment for evaluation by mob grazing (phase 3 evaluation). Mob grazing is an experimental technique where forages are established in small plots in a paddock and subjected to grazing by a large number of animals (mob) for one to two days. This technique exposes the potential new cultivars to the rigors of trampling, pulling, treading, and dung and urine deposits, while allowing researchers to estimate yield and persistence on small areas. Since research had shown that Bigalta was susceptible to overgrazing with subsequent loss of stand, emphasis was placed on selection of genotypes that demonstrated persistence under grazing, as well as good yield and forage quality.

FLORALTA

One introduction, P.I. 364888, was the top yielding line in the original phase 1 experiment, the highest yielding in the phase 2 mowing experiment, and among the most persistent lines under grazing in the phase 3 mob grazing experiment. After the 1978 growing season, this line was vegetatively propagated and planted for additional management and fertility response experiments. This introduction was given the name 'Floralta' and was officially released to producers in 1984 (Quesenberry et al., 1984). Planting material was distributed at Gainesville and Ona in 1984 and 1985. Since that time numerous producers have established fields for production and sale of planting material, as well as personal use.

It is currently estimated that over 100,000 acres of limpograss (predominately Floralta) are in production in Florida. This cultivar has performed particularly well in southern Florida, and has also shown good potential in Puerto Rico, Venezuela, Ecuador, Mexico, and several other Latin American locations. The results discussed in the balance of this paper were primarily with utilization of Floralta.

FLORALTA PRODUCTION

Planting

Floralta limpograss vegetative propagation is accomplished by scattering mature stems on a weed-free prepared seedbed, covering the planting material with 3-5 cm of soil by discing, and rolling the soil to insure good soil-planting material contact (Ruelke et al, 1979). Commercial ranches in Florida have mechanized the planting process using a haybind type mower, a large round baler, and a mechanized planting wagon with a hydraulic lift that unwinds round bales and distributes the stems behind the wagon. Using this system of

mechanized planting up to 20 ha per day can be planted. Although vegetative establishment has been considered a limitation, well-established stands ready for grazing can be obtained in 3-4 months which may be quicker than with most seed-planted pasture grasses.

Fertilization

Good soil fertility at establishment is needed to promote rooting and minimize weed competition. Soil should be tested and lime applied if pH is below 5.5. If P and K test low or very low these elements should be applied at recommended rates. Once vegetative sprigs initiate roots and new shoots N fertilizer should be applied to stimulate new shoot and stolon growth. A suggested fertility plan would be 50-100 kg ha^{-1} N and 40-60 kg ha^{-1} P and K (Christiansen et al., 1988)

FLORALTA UTILIZATION

Floralta limpograss yields well year round and research has shown total seasonal animal gains similar to bahiagrass on continuously stocked pastures (Sollenberger et al., 1988). Continuous grazing may not be the best method to utilize Floralta production as demonstrated by subsequent research which showed superior animal gain ha^{-1} on rotationally grazed Floralta limpograss compared to Pensacola bahiagrass (Sollenberger et al., 1989). These results have led some producers to conclude that Floralta is best utilized as a specialty pasture. With this approach it can be managed to provide grazing in periods when other tropical grasses are less productive. Examples of this type management in Florida would be management for early spring and late fall production.

Early Spring Utilization

Early spring management in Florida is determined by seasonal rainfall and temperature. Nitrogen fertilizer should be applied to stimulate growth after hard frost danger is past. Adequate rainfall is necessary to move N into the soil profile for plant utilization. Six to 10 weeks after fertilizer application in mid February to mid March Floralta limpograss produced 2,500 - 3,000 kg ha^{-1} dry matter (DM) with crude protein (CP) concentration of 7-9% (Ruelke and Quesenberry, 1983). These results demonstrated that Floralta limpograss could provide good yields of moderate quality forage in early spring. Other tropical grasses are more frost susceptible and less productive in the cool spring season.

Late Fall Utilization

Floralta limpograss has shown superior yield in late fall and winter in Florida compared to other tropical grasses such as 'Pensacola' bahiagrass or stargrass. Ruelke and Quesenberry (1983) evaluated the fall production potential of Floralta in Gainesville in 1981. Previous summer growth was removed to a height of approximately 8 cm on 4 August, 1981 and 75 kg ha^{-1} of N was applied as 15-5-10 fertilizer. Dry matter yields were taken at 2 week intervals beginning 4 weeks after the initial staging and continuing until 1 February 1982. Under this management, Floralta reached a yield plateau of approximately 10,000 kg ha^{-1} by about 1 October with only minimal dry matter accumulation until frost which occurred in early December.

The objective of early spring or late fall management is to provide forage in a period of reduced growth of other tropical grasses. Floralta limpograss should be grazed closely or harvested for hay before fertilization for early spring or late fall-winter production and then fertilized with 75-100 kg ha^{-1} N. Livestock should be removed and the limpograss allowed to accumulate for 3-4 weeks. With this type of management and fertilization, good quality forage may be produced from Floralta during times when many other summer growing grasses have reduced production.

Some ranches have used Floralta to provide almost the entire winter diet for dry pregnant beef cows. Others have used young rotationally grazed Floralta as the forage component of the diet for replacement heifers during the winter. Producers who attempt these types of utilization will need to monitor crude protein content of the available Floralta forage since research has shown that limpograsses may tend to be lower in crude protein content at comparable fertility and maturity than other tropical grasses. Crude protein content of mature "stockpiled" Floralta forage usually will meet the nutritional needs of dry pregnant cows with limited protein supplementation. Although limpograss may be low in CP under deferred grazing management, it tends to maintain higher levels of digestibility with maturity than other tropical grasses.

Hay Ammoniation and Supplementation

One alternative to overcome the limitation of low crude protein in stockpiled limpograss is ammoniation of limpograss hay. In one study in Florida, ammoniation increased hay CP from 3 to 10% and IVOMD from 46 to 62% in nontreated vs ammoniated limpograss hay. This resulted in a doubling in average daily gain of steers fed the ammoniated hay compared to nontreated hay and a reduction in cost per pound of gain from $0.75 for nontreated to $0.48 for treated (Brown, 1991).

The comparison of feeding nontreated limpograss hay and molasses vs ammoniated hay is also important to consider. In other work by Brown (1991) steers fed ammoniated hay had a greater daily gain and a less expensive cost of gain than steers fed nontreated hay plus molasses. This indicates that cattle fed ammoniated Floralta hay perform at least as well as cattle fed nontreated hay plus molasses. Cattle can also be fed additional energy and protein with ammoniated limpograss. Brown (1991) showed that steers fed ammoniated stargrass hay plus ad libitum molasses plus 0.45 kg day^{-1} of cottonseed meal gained 0.55 kg day^{-1} at a cost of $1.21 per kg of gain. Similar results should be expected with low quality limpograss hay and supplementation.

Limpograss Legume Associations

Another method to improve overall diet crude protein of cattle grazing limpograss is incorporation of a suitable forage legume. Since limpograss is adapted to seasonally wet soils, legumes considered for association must also be adapted to these conditions. One tropical forage legume which is well adapted to wet soil is aeschynomene a.k.a american jointvetch (*Aeschynomene americana* L.). Research at the Beef Research Unit in Gainesville has demonstrated that this legume can be productive in association with Floralta limpograss (Sollenberger et al., 1987a, 1987b). These authors showed that with proper grazing management aeschynomene can be successfully established in a previously established sod of Floralta limpograss. For good establishment, Floralta should be grazed moderately close (7-10 cm) prior to seeding the legume. After the legume germinates moderate grazing to control grass competition with the emerging legume should continue until cattle begin to consume legume. Cattle should then be removed until the legume reaches 20 to 40 cm and then grazing can resume. Using this type management, the authors were able to obtain grass legume associations of nearly 20% legume. These swards resulted in livestock diets consumed having a CP greater than 7% and IVOMD of 60 to 62%. During a 3-year trial, gains of yearling steers grazing an aeschynomene-limpograss pasture averaged 0.70 kg d^{-1} compared to 0.39 kg d^{-1} for steers grazing N-fertilized limpograss (Rusland et al., 1988).

FUTURE LIMPOGRASS RESEARCH

Current research with Floralta limpograss is focused on winter supplementation of mature limpograss forage with various protein and energy sources. Additional research in central and south Florida on optimum times for application of late fall or early spring fertilization in these areas may be needed.

At present, no plant breeding and selection research is being conducted. The possibility of combining the desirable persistence of Floralta with the higher digestibility of Bigalta through hybridization and selection remains as a potential objective. Additional selection for production in the cool winter season might also be feasible. Pursuit of these research objectives will require some redirection of current research efforts.

SUMMARY

Limpograss is a forage grass that is well adapted to the tropics and subtropics. It is best adapted to seasonally wet or flooded soils. Limpograss is vegetatively propagated, but mechanized methods have been developed for planting large areas. The cultivar Floralta, released in 1984, is the best adapted limpograss for persistence and high yield under pasture grazing management. Many producers have found that Floralta fits best for specialty uses in a total forage production program. One such specialty use is for deferred grazing in late fall and winter. Another use may be management for early spring growth by additional N fertilization in late winter. Both of these options may be more desirable in south than north Florida. Mature limpograss is often low in CP. This low CP concentration may be overcome by hay ammoniation which can increase both CP and IVOMD. Limpograss can also form good associations with tropical forage legumes adapted to wet soils. One

such association that has worked well in Florida is limpograss-aeschynomene. Total forage CP of limpograss-aeschynomene associations with at least 20% aeschynomene would usually be 8% or higher.

Producers need to evaluate how Floralta limpograss production may fit into their livestock enterprise.

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