

EXECUTIVE SUMMARY

USGA Green Section Research

Projects: Genetic Enhancement of Paspalum for Recreational Turf Development of Minimal Input Best Management Practices for Paspalum.

Principal Investigator: R.R. Duncan Phone: 770/228-7326
University of Georgia Fax: 770/229-3215
1109 Experiment Street Email: rduncan@gaes.griffin.peachnet.edu
Griffin, Ga. 30223-1797

Summary:

Sea Isle 1 (fairways/tees) and Sea Isle 2000 (greens) has been approved for release by the University of Georgia. The Georgia Seed Development Commission will licence the two paspalum cultivar worldwide. The operational manual for managing this grass has been written - publication of the book should occur by February 2000. A paspalum web page is being developed. A series of articles addressing comprehensive packaging of alternative water use issues will be published in the RECORD. Confront[®] + MSMA can be used to prevent encroachment of paspalum into bermuda. Prograss[®] + Cutlass[®] can be used to minimize bermudagrass encroachment into paspalum.

1999 Annual Report - USGA

Principal Investigator: R.R. Duncan
UGA - Griffin

Projects: Breeding and Management Projects on Paspalum
\$50,000 annually

BREEDING

Sea Isle 2000 (greens type, evaluated as AP-10) and Sea Isle 1 (fairway/tee/sports type, evaluated as Fwy-1) were approved for release in July 1999. The bidding and licensing process by the Georgia Seed Development Commission will hopefully be completed by December 1999, with multiple world wide licensees. The book "Seashore Paspalum - the Environmental Turfgrass" was submitted to Ann Arbor Press during June 1999 and is scheduled for availability by February 2000. All licensees will be required to furnish a copy of the book to everyone who buys the grass. A paspalum web page is under development and hopefully will be up by January 2000.

Concerning DNA profiling, the data have been analyzed and general cultivar fingerprints are available. Based on the currently available data, more SSR marker development will be needed to develop definitive fingerprints that would be useable for PVP/patenting.

I am continuing collaborative work with private seed companies on hybrid seed production. I initially used either seawater or tap water for germination studies with little difference observed between the two water sources. Currently, I am germinating seed lots of specific crosses with half sea water: half tap water, transferring the young seedlings to individual small pots, and will eventually plant them in space plantings next summer in order to impose mowing stresses on them. I have about 12 specific paired crosses from Hubbard, OR. (Pure Seed Testing) and additional miscellaneous crosses from Arden Baltensperger at Las Cruces, NM. I hope to have at least 500 potential hybrids to plant by next May. If promising selections come out of this group of material, I eventually will need to have some cytological work done on those selections to verify the crosses.

Based on salinity tolerance screening (Geungjoo Lee - graduate student) and Kris Braman's insect screening, the following selections are being elevated in status for larger area evaluations and increase in the greenhouse during the winter months:

1) 561-79

A selection out of Argentina. Fine-textured. Possible fairway/tee/sports ecotype. Has the best overall insect resistance to multiple pests that we have found so far in the collection. I have sent this ecotype to Exuma, Bahamas (Greg Norman course called Emerald Bay) where armyworms have been feeding voraciously on the Durban

Country Club paspalum source. Should be an excellent "real world" test.

2) HI 101/HI36

Both are fine-textured types suitable for fairway/tees. Both are selections out of Hawaii - HI 101 from Oahu; HI36 from Kauai. Both have the best set of traits demonstrating the highest level of salinity tolerance found to date.

Additional accessions were collected in Antigua, Bahamas, and Belize this year. That material is currently in the Glenn Dale, MD. quarantine facility for 18 months. Additional collections were made in South Carolina (Charleston area), North Carolina (coastal areas, outer banks), and Hawaii (Kauai). My best source of acid soil tolerant germplasm is from selections made on Kauai.

Plans for 2000:

- 1) To investigate the low light intensity tolerance mechanism in paspalum. Have recruited a Ph. D. level candidate (Ryan Gross) from Michigan State, with tentative starting date of March, 2000.
- 2) Searching for another potential greens - type paspalum. Thus far, nothing in the breeding program has surpassed the overall performance of Sea Isle 2000. Will continue to use reel mowers to select for improved fairway types that mow properly during July/August period (old Adalayd types take up extra silica and are extremely difficult to mow during this time frame).

Salinity tolerance mechanisms (Geungjoo Lee - graduate student) are being investigated. Components under consideration: high inherent growth rate (roots, crown, shoot), maintenance of high growth rate with increasing salinity levels, low leaf firing at high salinity levels, compatible organic solutes (glycine-betaine/trigonelline/proline/sugar alcohols), water status (water potential, relative water content) in shoots, photosynthesis parameters (chlorophyll content, chlorophyll fluorescence, spectral reflectance), and inorganic ion sensitivity (K, Na).

MANAGEMENT

The operational manual for managing seashore paspalum turf is embedded in the paspalum book. "Bullet points" will be spun off this resource onto the paspalum web page for quick reference. A series of articles that deal with water issues are being co-written with Bob Carrow and USGA agronomists for publication in the USGA Green Section RECORD (see publications section).

Collaboration with B.J. Johnson: encroachment studies.

Two-year studies have been completed. Bermudagrass (common, Tifeagle, Tifway)

suppression in paspalum (Sea Isle 1, Sea Isle 2000, K-3) investigations have revealed multiple applications of Prograss[®] + Cutlass[®] during the spring and summer were more effective than summer applications alone. Rates and timing were critical to maximizing injury on the bermudas while minimizing injury to the paspalums. Paspalum suppression in bermudagrass was effective using Confront[®] + MSMA and again, rates and timing were critical. The data are being statistically analyzed and two papers will be written during the winter. Additional studies will be implemented during the spring 2000. The direction/objectives for these new studies will be determined in March 2000. One area that needs research is crabgrass and goosegrass control in paspalum turf.

Initial herbicide studies with new chemistry (Plateau[®]) will be initiated with Tim Murphy during 2000. Other new products will be evaluated when they become available.

Collaboration with Kris Braman: insect resistance.

Southern and tawny mole cricket evaluations have been conducted in the field at Tifton (in conjunction with Wayne Hanna) and in the greenhouse. Sixty-nine paspalums and bermudagrasses were evaluated, with 'TifSport' hybride bermudagrass and 561-79 (Argentina selection) showing the highest tolerance level.

Twenty-one paspalums and 12 zoysiagrasses were compared with tall fescue, common bermudagrass, and common centipedegrass for potential resistance to fall armyworm. Paspalums exhibiting high antibiosis levels include 561-79, Temple 2, PI-509021, and PI-509022 (all Argentina selections).

Greenhouse and field evaluations have been conducted on 56 paspalums (28), centipedegrass (6), zoysiagrass (10), bermudagrass (11) and St Augustinegrass (1) cultivars for two-lined spittlebugs. Again, the Argentina selections exhibited a high level of tolerance.

Twenty-nine paspalums and zoysiagrasses will be evaluated for Japanese beetle white grub resistance in a screen house from June to September 2000 (second year). Newly collected paspalum ecotypes will be included during the second year of this study.

A fertilizer use x water use study was initiated with L.M. Shuman and Keith Ingram during June 1999 under mini-rain-out shelters. This was the establishment year and Sea Isle 1 has been slow to grow in (these were original herbicide fate facilities and soil tests are being conducted to see if residual herbicide problems exist). These plots have mini - lysimeters and catch basins. Data collection will begin next summer. The plots are being topdressed with sand going into the winter months to facilitate grow-in.

Studies in collaboration with R.N. Carrow will be found in his annual report.

Additional possible management studies during 2000.

- (1) The Sea Isle 2000 green has been expanded and fine-tuning of management protocols at 1/8 - inch mowing height will be investigated, using growth regulators/verticutting/rolling options to better control speeds of ball roll on the greens.
- (2) Use of high soluble nitrate sources (CaNO₃) and micronutrient packages to maintain dark green color, especially in low maintenance rough areas.
- (3) Divot recovery studies.

Studies have been initiated with Domy Adriano and Tracy Punshon at the Savannah River facility regarding bioremediation (rhizofiltration and phytoaccumulation) capabilities of seashore paspalum. Both radioactive and non radioactive contaminants are being investigated.

Publications

1. Book: **SEASHORE PASPALUM - THE ENVIRONMENTAL TURFGRASS.**
Submitted to Ann Arbor Press in June. Currently at press, but have not received the galley proofs yet.
2. Satellite articles for USGA Green Section RECORD:
 - a. R.N. Carrow, R.R. Duncan, and M. Huck. 1999. Treating the cause, not the symptoms. Irrigation water treatment for better infiltration. RECORD - Nov/Dec issue.
 - b. R.R. Duncan, R.N. Carrow, and M. Huck. 2000. Effective use of seawater irrigation on turfgrass. RECORD - Jan/Feb issue.
 - c. M. Huck, R.R. Duncan, R.N. Carrow. 2000. Influence of effluent water quality on turfgrass management. RECORD - in revision.

Planned for 2000

- d. Practical guidelines for effective leaching of total salts and sodiu.
- e. Understanding water quality and soil tests for salt affected sites.
- f. Signed the contract for the book (Carrow/Duncan): **EFFICIENT TURFGRASS WATER CONSERVATION STRATEGIES.**

Articles: Strategies for turfgrass water conservation and quality maintenance
Wastewater use for turfgrasses: potential problems and solutions.

3. R.R. Duncan and R.N. Carrow, 2000. Seashore Paspalum - The Environmental Turfgrass. Ann Arbor Press, Chelsea, MI. (Projected 300 pages).
4. R.R. Duncan, 2000. Collection of *Paspalum vaginatum* Swartz for turf, forage, and bioremediation purposes. Diversity (special issue for turfgrasses). (in press).
5. R.N. Carrow, R.R. Duncan, and M. Huck, 1999. Treating the cause, not the symptoms. Irrigation water treatment for better infiltration. USGA Green Section RECORD. Nov/Dec issue.
6. R.R. Ducan, R.N. Carrow, and Mike Huck, 2000. USGA Green Section RECORD. Jan/Feb issue.
7. R.R. Duncan and R.N. Carrow, 1999. Establishment and grow-in of paspalum golf course turf. Golf Course Management May: 58-62.
8. L.E. Trenholm, R.R. Duncan, and R.N. Carrow, 1999. Wear tolerance, shoot performance, and spectral reflectance of seashore paspalum and bermudagrass. Crop Sci. 39:1147-1152.
9. L.E. Trenholm, R.R. Duncan, and R.N. Carrow, 1999/ Relationship of multi-spectral radiometry data to qualitative data in turfgrass research. Crop Sci. 39:763-769.
10. L.E. Trenholm, 1999. Wear tolerance of seashore paspalum (*Paspalum vaginatum* Swartz) and hybrid bermudagrass (*Cynodon dactylon* x *C. transvallensis* Burtt-Davy): mechanism and fertility influence. Ph.D. Dissertation. University of Georgia. 164 p.
11. L.E. Trenholm, R.N. Carrow, and R.R. Duncan, 1999. Mechanisms of wear tolerance in seashore paspalum and bermudagrass. Crop Sci. 39: in press.
12. L.E. Trenholm, R.N. Carrow, and R.R. Duncan, 2000. Wear tolerance, growth, and quality of seashore paspalum in response to nitrogen and potassium. Crop Sci. (in review).
13. L.E. Trenholm, R.R. Duncan, R.N. Carrow, and G.H. Snyder, 2000. The influence of silica on growth, quality, and wear tolerance of seashore paspalum. Crop Sci. (in review).
14. R.R. Duncan and R.N. Carrow, 1999. Turfgrass molecular genetic improvement for abiotic/edaphic stress resistance. Ad. Agron. 67:233-306.

15. G. Lee, R.R. Duncan, and R.N. Carrow, 2000. Salinity tolerance of seashore paspalum ecotypes: physiological responses of shoot growth. Crop Sci. (In preparation).
16. S.K. Braman, R.R. Duncan, and M.C. Engelke. 2000. Evaluation of turfgrass selections for resistance to fall armyworms (Lepidoptera: Noctuidae). Hort. Sci. (in review).
17. S.K. Braman, R.R. Duncan, W.W. Hanna, and W.G. Hudson, 2000. Evaluation of turfgrasses for resistance to mole crickets (Orthoptera: Gryllotalpidae). Hort. Sci. (in review).
18. R.R. Duncan. 2000. Collection of *Paspalum vaginatum* Wwartz for turf, forage, and bioremediation purposes. Diversity (in press).

Additional site evaluations:

Nellis Air Force Base, NV. Golf course (Danny Fielder)
University of Nevada - Las Vegas (Dale Devitt)
Arvida, Seabrook Beach, FL. (S. Greer)
Dauphine Island, AL. (M. Healy)

Presentations:

Arkansas State Turf Conference - Little Rock
GCSAA - Two day salt workshop
Charleston, S.C. - Golf course architects
Rancho Santa Fe, Ca. - San Diego area superintendants
Louisville, Ky. - Kentucky superintendants
Auburn Turf Conference
USGA Regional meetings: Las Vegas, Nv.
Hawaii

Additional funding:

Georgia Turfgrass Foundation Trust	\$ 4,000.
UGA Research Foundation	\$22,000.
TPI	\$ 4,360.