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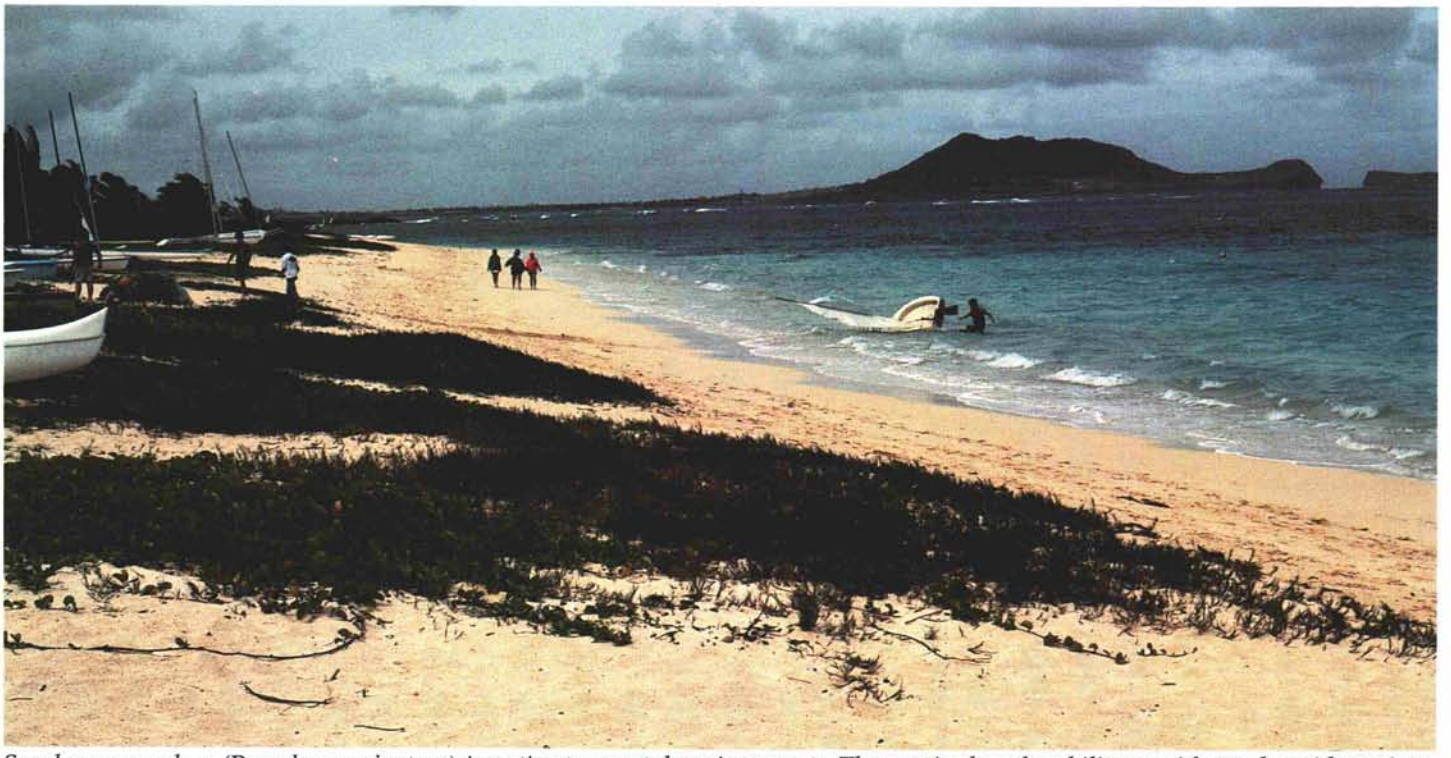
The Environmentally Sound Turfgrass of the Future

Seashore paspalum can withstand the test.

by DR. RONALD R. DUNCAN



Seashore paspalum (Paspalum vaginatum) *is native to coastal environments. The species has the ability to withstand a wide variety of harsh conditions, ranging from salt spray to severe drought.*

SEASHORE PASPALUM. This name gives one the impression that this turfgrass is or should be grown only on seaside golf courses or recreational areas. Indeed, this grass is native to coastal environments, where salt water limits plant growth and survival. It can be found on sand dunes located immediately back from the wave action. This indigenous species is subjected to periodic salt spray, high wave inundation during storms, prolonged cloudy, rainy days, severe drought, minimal nutrients, and ocean salt water. However, the potential for seashore paspalum goes well beyond the limited niche of a seashore area.

Environmental Compatibility

Seashore paspalum has the *potential* to be one of the most environmentally compatible turfgrasses for the year 2000 and beyond: a) It will require minimal pesticide applications. b) It will require approximately 25-35% the annual fertilizer that is currently applied to bentgrass greens and 20-40% the fertilizer required for hybrid bermudas. c) It has a phenomenal adaptability range of pH (4.0 to 9.8). d) Seashore paspalum also has potential as a bioremediant, withstanding factory-contaminated effluent, while naturally cleaning up the environment. e) It can be irrigated with sewage plant effluent (recycled water) or combinations of ocean water and recycled water. Some ecotypes are known to withstand up to 14,000 ppm of sodium chloride. Consequently, it is one of the most salt-tolerant turf species available. f) It has acid soil stress tolerance down to pH 4.0. g) It is as drought-resistant as bermudagrass and centipedegrass. h) The grass is not affected by soil type, having the capability to root rapidly in sandy soils, mucks or bogs, and high bulk density, heavy clay soils. i) It can withstand periodic inundation from heavy rains or high tides without losing stand density. j) Seashore paspalum has moderate shade tolerance (maximum

up to 35% light reduction), which is important in those environments with tree-dominated fairways, tees, greens, or roughs, and in areas where prolonged rainy seasons (monsoons) reduce light over extended periods of time.

Origin

Grasses in the genus *Paspalum* are notorious for adaptation to extremely harsh environments. *Paspalum dilatatum*, or dallisgrass, is a persistent bunch-type weedy species that plagues tropical and subtropical environments. *Paspalum notatum*, or bahiagrass, is a bunch-type forage grass and stoloniferous turfgrass for use in southern tropical regions. *Paspalum vaginatum*, or seashore paspalum (also called saltwater, couch, siltgrass, or sand knotgrass) is a stoloniferous/rhizomatous prostrate-growing turfgrass for wet, salt-affected ecological zones. It is predominately found between 35°N-S latitudes in the Americas, many islands of the Caribbean-Atlantic-Pacific rim areas, and the Mediterranean-African coastal areas. South Africa may be a dual center of origin with the Americas, particularly Argentina-Brazil and Georgia. A companion species is *Paspalum distichum* (knotgrass, freshwater couch, or eternity grass), which is found in freshwater swamps in the tropics and subtropics. *Distichum* is also stoloniferous/rhizomatous, but can generally be found further inland than its saltwater counterpart.

Morphology

The genus *Paspalum* includes more than 400 species that are as diverse morphologically as the stress environments in which they evolved. Most are quite complex genetically, being tetraploids (four sets of the basic chromosome number) and apomictic (true breeding types with limited within-cultivar diversity). Seashore paspalum is a sexual diploid with 20 chromosomes, but it is self-incompatible, meaning that it will not produce a high percentage of viable seed unless crossed with other *P. vaginatums* from completely different genetic backgrounds.

Seashore paspalum produces a two-pronged, V-shaped spike inflorescence that ranges from 10mm to 70mm in length. This inflorescence is similar in appearance to *Cynodon transvaalensis*; however, *Cynodon dactylon* or *C. dactylon* x *transvaalensis* bermuda hybrids have 3 to 5 spikes. Another distinguishing trait for the paspalums is the extreme hairiness, or pubescence, around the leaf sheath collar and occasionally on the edge of the leaf blade. On mornings with a heavy dew on the grass, seashore paspalum can be readily distinguished from bermudas by the amount of water retained on the leaf blades. Less moisture will accumulate on seashore paspalum than on the bermudas, and the visual appearance is distinctly different.

Texture

Seashore paspalum ranges from very coarse, rapidly growing types that look like St. Augustine grass to extremely fine-textured "Tifdwarf" or "Tifgreen" bermuda-types. Of course, the finer-textured types receive major research emphasis for golf course usage. Collection trips and evaluation/developmental studies also search for slower growing, highly dense types for greens and tees. These finer-textured types have been found on greens and tees that were maintained at ⅛- to ¼-inch mowing heights.

U.S. Distribution

The oldest known natural source of seashore paspalum in North America can be found on Sea Island, Georgia. The first golf course there was built in 1925, and the finer-textured type established itself on fairways closest to the inland marshes and on those fairways subjected to periodic high-tide inundation. The Hawaiian source of seashore paspalum originated from Sea Island. During the mid-1960s, a cultivar of seashore paspalum ("Adelaide") was introduced into southern California by Pacific Sod from Adelaide, Australia. All Australian seashore paspalums originated from South Africa, being introduced during 1935 via normal quarantine regulation channels. The Australian source was dispersed throughout Southern California and Arizona, from Texas along the Gulf Coast region to Florida, and finally along the Atlantic coastal areas of Florida, Georgia, South Carolina, and the Outer Banks of North Carolina. Most of the Florida sources of seashore paspalum originated from the Australian source, but Sea Island ecotypes can be found dispersed throughout that state.

Limitations

The main reason that seashore paspalum was not widely dispersed

Seashore paspalum can withstand up to 35 percent light reduction. This feature is important in areas with long rainy seasons and reduced solar radiation.

throughout the southern coastal U.S. during the 1970s and 1980s was the lack of any management protocol. Most golf courses that tried to establish and maintain seashore paspalum treated it the same as hybrid bermudas. They applied too much fertilizer (especially nitrogen) and irrigation water. Seashore paspalum produced mainly shallow-rooted stolons that scalped easily, built up serious thatch problems, had limited traffic tolerance, and was cosmetically unappealing. Neither the golf course superintendents nor the golfers were happy with the grass. Superintendents who stopped trying to *fight* the grass as a weed and started managing it with centipede-like management strategy (i.e., reduced maintenance) are the ones who still have seashore paspalum on their courses and are pleased with its performance. Seashore paspalum is extremely competitive with other grasses, including the dwarf bermudas, as long as they are managed properly. Also, superintendents who have used the dense, dark-green, fine-textured seashore paspalum ecotypes (rather than the intermediate-textured Adelaide) have had very good success. This is the case with courses in Hawaii that are currently managing seashore paspalum on *problem* fairways and greens.

A major adaptation limitation is the lack of winter hardiness. Most of the early research on this grass was based on the Australian source, which was killed at 17°F. Subsequent evaluations of ecotypes collected from various areas of the world have shown several ecotypes that survived a -3°F blast (non-hardened) of cold air plus continuous soil freezing conditions for three weeks in an Appalachian mountain research location during January 1994 (many bermudas died from exposure). A cold-shock and recovery strategy is being used to identify additional winter-hardy types; evidently, the genetic diversity for improving cold tolerance is available in the species.

Another area of concern for this grass is resistance to insects and diseases. Mole crickets and fall armyworms plague most warm-season grasses in the southern U.S. Genetic diversity for resistance has been found for both insects among the ecotypes of seashore paspalum collected thus far. Monostands of seashore paspalum may require minimal insecticide applications at peak insect population development, but genetic resistance will be a viable option. Other insect problems may develop as the acreage of seashore paspalum monostands increases on golf courses or on recreational areas.

Dr. Ron Duncan (right) shows members of the USGA Turfgrass Research Committee selections of seashore paspalum from around the world.

Curvularia, dollar spot, and pythium blight have been observed on seashore paspalum. However, all were located in very specific ecological niches and were neither widespread nor spreading to other areas. In fact, the fungal colonization appeared to be localized, almost to the point of a symbiotic (mutually beneficial) relationship between the fungi and seashore paspalum. Much more research must be conducted using monostands of this grass to understand the pathogen relationships and to eventually develop a disease management protocol.

New Research

The United States Golf Association initiated funding of a breeding program on seashore paspalum at the University of Georgia during 1993. Initial objectives included collection of ecotypes and initial evaluation of fine-textured, turf-type paspalums. The University of Georgia program started with five genotypes in 1992, but now has more than 300 ecotypes from many parts of the world in collection. Eighteen ecotypes currently are being evaluated under green conditions. Irrigation and nitrogen use studies on fairways, as well as judicious herbicide application strategies, will begin in 1995. Overseeding studies began during 1994 involving tall fescue, perennial ryegrass, *Poa trivialis*, and creeping bentgrass. Seashore paspalum is a warm-season grass and parallels bermudagrass and zoysiagrass as to winter dormancy. In general, seashore paspalum goes dormant about two or three weeks later than other warm-season species, but takes about two or three weeks longer in the spring to green up. However, ecotypes vary in their dormancy and green-up responses.

Mole cricket, fall armyworm, and spittlebug research is continuing to identify the most resistant ecotypes. Other insect resistance studies (such as cutworms and white grubs) will be initiated when research funds become available. Genetic analysis by several molecular marker techniques of the ecotypes is underway to provide definitive genetic fingerprint data on all ecotypes in the collection and for eventual new releases.

This grass truly has a very promising future, as pesticide application regulations increase and mandated use of nonpotable or recycled water is implemented on recreational turf. The grass is not a utopian grass (for there is no such thing), but it definitely has a role to fill and will offer an environmentally sound alternative to some of the major turfgrass species being used today.

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