Asian golf growth taxes bermudagrass's flexibility

Clouds, weeds and insects weaken a tough species.

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Dynamic developments in the turf industry have occurred mainly in the temperate climates of North America, Australia and Europe. Yet in the past 15 years, remarkable growth in golf's popularity has transformed the Asian turf industry, creating new management challenges in new climates.

For example, the number of golf courses in Japan has grown from 200 in 1960 to more than 2,000. These courses have 2.6 million club members and 12 million occasional players, and these players are driving up the price of golf.

When the average golf club membership in Japan reached $327,000 in 1990, players started to look elsewhere for affordable golf. Destinations included tropical countries with year-round golfing opportunities, such as Thailand, Indonesia, the Philippines, Singapore, Malaysia and islands of the Western Pacific.

Photos courtesy of Greg Wiecko

During the rainy season, clouds in Guam often darken the sky too much for vigorous bermudagrass growth.

KEY POINTS

- Tropical regions may be too cloudy for some bermudagrass cultivars.
- Asian golfers have expanded the sport into tropical regions faster than regional turfgrass cultural techniques can evolve.
- Weed, pest and disease control in turfgrass all require more research in the tropics.

Species use

A scarcity of high-quality turfgrasses for hot and humid tropical climates has forced turf managers to adopt existing species, varieties and hybrids. The vast majority of courses in the tropical Pacific Rim have Tifway bermudagrass on fairways and Tifgreen bermudagrass on greens.

Culture of bermudagrass (*Cynodon* species and hybrids) in tropical climates faces several limitations. Perhaps unexpectedly, bermudagrass often receives insufficient solar radiation in the tropics, particularly during the rainy season.

Reduced density and increased weed infestation are common problems. If grown without adequate light, bermudagrass thins out, alters its growth habit from horizontal to more vertical, becomes more vulnerable to insects, diseases and weed infestation, and is more susceptible to wear from foot and vehicle traffic.

Research on light inadequacy for bermudagrass has occurred on the island of Guam (13 degrees north of the equator) in the Western Pacific. Guam's climate and light conditions resemble those found in other hot and humid Asian countries. Temperature is uniform throughout the year and ranges from mid-70s F at night to around 90 in the daytime. Day length ranges from 11 to 13 hours year round, and days are always cloudy.

Average cloud coverage ranges from 50 percent in the dry season to 85 percent in the rainy season. In most temperate locations, daylight is longer, such persistent cloud coverage is uncommon and bermudagrass is dormant or approaches dormancy when daylight is shorter than 12 hours.

Guam

On Guam, around noon, solar radiation from a clear sky ranges from 1,000 to 1,200 watts per square meter, depending on the time of the year. Passing clouds reduce this value to 100-150 watts per square meter, on average. These are detrimental light conditions for bermudagrass. On Guam, a dense tree canopy decreases solar radiation to as low as 80 watts per square meter, and 200 watts when the canopy is somewhat transparent.

Both common and Tifway bermudagrass planted on roughs and fairways under trees with dense canopies are unable to survive. When planted under relatively transparent palm trees, they show clear symptoms of light deficiency. There is some evidence, however, that some turfgrasses are less sensitive to reduced-light conditions.

Tif Eagle, tested on Guam since July 1998, manifests substantially higher density on greens than Tifgreen and Tifdwarf. During the rainy season, Tif Eagle is the only hybrid that, under intense fertilization (1 pound nitrogen per 1,000 square feet per month), can be mowed at ⅛ inch and still maintain superb density and uniformity. Tifdwarf performs better than Tifgreen; however, neither can be mowed shorter than 3/16 inch or even ¼ inch.

Paspalum

Improved varieties of seashore paspalum (*Paspalum vaginatum*) for both greens and fairways have recently drawn more attention as alternatives to bermudagrass. Superintendents are still reluctant to convert fairways from bermudagrass to seashore paspalum because management of these two species is quite different, and the presence of both on the golf course is usually inconvenient. Selection of seashore paspalum in place of bermudagrass is simpler on newly constructed golf courses.

Weeds

A second major management concern is weed control. Weeds invade turf under all climatic conditions. Broadleaf weeds are relatively easy to eliminate with selective herbicides and adequate cultural practices. But in the tropics, both cultural and chemical weed-control strategies appear more challenging than in the temperate regions.

Poor density makes bermudagrass

less competitive with weeds in the cloudy tropics. In the temperate climates, grassy annual weeds such as crabgrass (*Digitaria* species) and goosegrass (*Eleusine indica*) are controlled with spring applications of pre-emergence herbicides during a several-week period of massive seed germination. Weeds not controlled in spring may be eliminated with post-emergence herbicides later in the summer. If this fails, the first winter frost will effectively eliminate all weeds that are not controlled by herbicides, and a modified weed-control program can be implemented the next year.

In tropical climates, crabgrass, goosegrass and other annual weeds are not eliminated by winterkill and generally behave like perennial plants. Their stems and roots are tougher than in temperate climates, and their resistance to post-emergence herbicides is usually higher because of the vigor of their tillers and stolons. In warm and humid climates, seeds germinate year-round, especially under irrigation, although the onset of rainy season results in more seedlings.

In the tropics, mature crabgrass is typically controlled with two or three full-rate weekly applications of monosodium methane arsenate (MSMA) at 2 pounds active ingredient per acre. Goosegrass is typically controlled by applying 2 pounds MSMA per acre mixed with metribuzin at 0.125 pound per acre in two weekly intervals.

Emerging weeds can be controlled with various post-emergence herbicides, because only a few weed seeds will germinate after pre-emergence herbicide application.

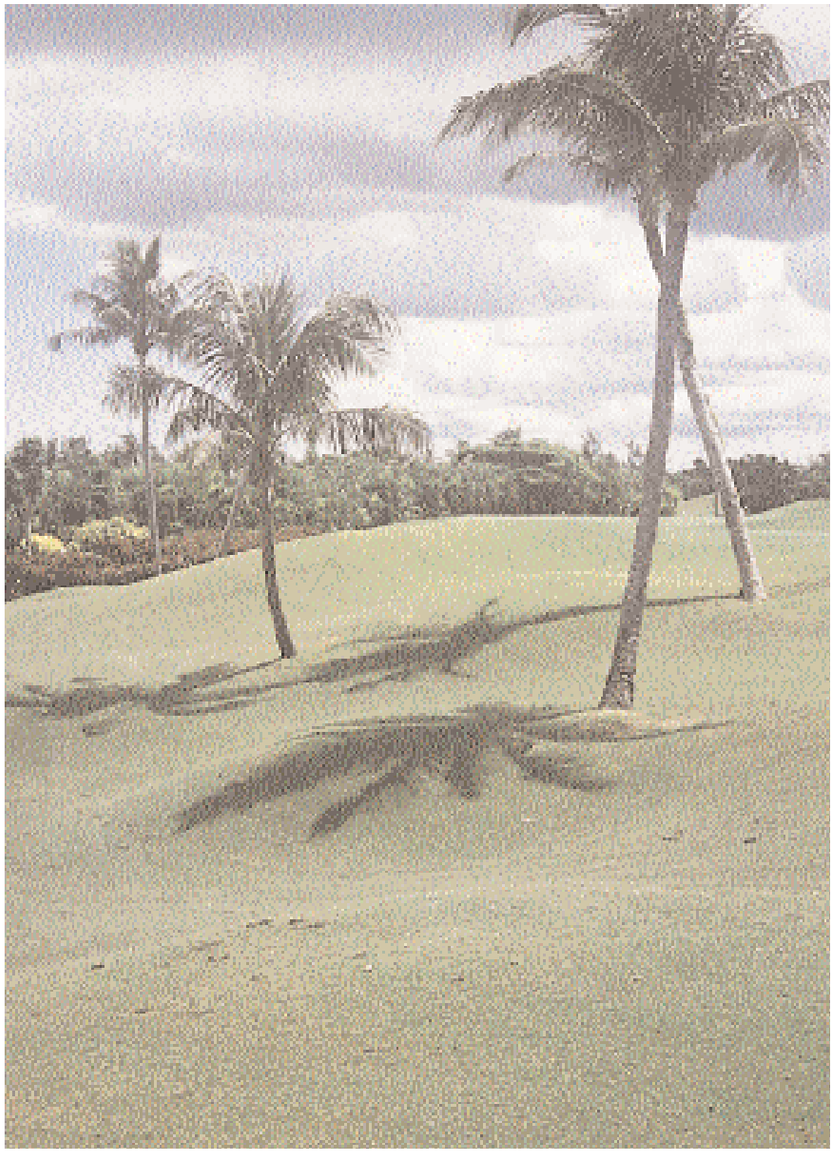
Use more chemicals?

Pre-emergence herbicides must be applied many times a year in a tropical climate. There are economic and environmental limitations to this practice however.

In the humid tropics, the longevity of herbicides in the soil is substantially shorter than in temperate climates. Uniform and high soil temperatures elevate microbial activity and enhance the breakdown of herbicide molecules.

In addition, high rainfall — commonly exceeding 100 inches per year with frequent storms that can produce 10 inches per day — produces substantial runoff and possibly herbicide leaching into deeper soil layers. A higher rate or frequency of application is an option, but it is costly and potentially unsound for the environment.

In addition to using more herbicides, it is also necessary to use



Under cloudy tropical skies, even palm trees — particularly if planted in groups — can cast enough shade to disrupt bermudagrass growth.

increased amounts of other pesticides because turfgrass diseases and insects can often complete many more life cycles per year in humid climates than in temperate regions. Guam and many other Pacific islands follow U.S. pesticide standards that limit the amount of active ingredients that can be applied yearly. Turf managers often meet those limits in the first few months of the year and afterward switch to other, less-effective products in order to comply with regulations.

Restrictions in some other countries are stringent, but they create a moral dilemma: potentially polluting to obtain better turf vs. protecting the natural environment.

Future directions

The economic growth of China, Japan and other countries of the western Pacific Rim will most likely foster construction of more golf courses in the hot and humid climates of Southeast Asia. The dominance of cultivars and cultural practices imported from U.S. mainland climates will likely diminish in the next decade or two in Asia. New turfgrass species such as seashore paspalum or improved varieties of bermudagrasses such as Tif Eagle are needed specifically for tropical golf courses.

Turf researchers are confronting the issues and intensifying their efforts in tropical regions to assure the needed improvements.

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Seashore paspalum cultivars may provide the answer on golf courses where it's too cloudy for bermudagrass.