a true, tight putting surface; at best in summer season; cool season purple color objectionable to some.

(7) Old Orchard — Lighter green than all others except Cohansey; best in spring and fall, weakest in summer performance.

(8) Metropolitan — The early symbol of a very grainy putting surface; no longer recommended for greens.

(9) Pennlu — Did not perform up to expectation; forms heavy thatch, excessive grain; results in a fluffy, puffy surface.

(10) Velvets — Refer to (4) under seeded; same general traits for vegetative and seeded velvet bentgrasses.

(11) Nimisila — Dark green in color; upright in growth; good texture; becoming more widely used; good reports; appears also to be doing quite well in southern areas of bentgrass adaptation.

Other selections have been released by individual Experiment Stations such as Pennpar by Penn State, and Evansville by Purdue, which will become better known as new greens are established to these bentgrasses. Because these creeping selections are available only as vegetative stock, trueness to type depends greatly on integrity of the growers. It is most important to purchase planting stock only from growers in whom you have extreme confidence, for only if it is free of contamination will you be assured that you are getting the proper planting material, the selection of your choice.

Popular Bermudagrass Strains: Requirements and Peculiarities

by JAMES B. MONCRIEF, Southeastern Agronomist, USGA Green Section

Common, bermudagrass, **Cynodon dactylon** (L.), at one time was used exclusively on southern putting greens. It is believed to have been introduced into the United States at about 1751, but common bermudagrass is rarely used on greens now and has been replaced with new selections. However when used, it requires a light topdressing at four week intervals to present a puttable surface.

Each spring the greens have to be reseeded due to the poor quality of the turf during the transition period. This factor alone caused intensive research for better bermuda strains for use on greens.

Everglades

Everglades is a medium green bermudagrass selected at Bayshore Golf Club, Miami Beach, Fla., by Dr. Roy Bair, of the Florida Agricultural Experiment Station, in 1945. It is supposed to be a natural cross between a native Florida turf-type bermudagrass and species from South Africa supplied by the USGA Green Section at that time.

Everglades holds its green color during cool weather better than Tifgreen, but it does not produce a superior putting surface. A tour of courses during January in Southeast Florida showed scuffing on Everglades to be worse than on Tifgreen.

It is used mostly in South Florida, and it is seldom used on new greens today.

Bayshore

Bayshore (Gene Tift) was selected at the Bayshore Golf Club, Miami Beach, in 1945 by Dr. Bair and is believed to have originated in the same manner as the Everglades selection.

It is light green in color, and is best adapted to the Southeast Florida area. However, it is gradually being replaced by Tifgreen or Tifdwarf.

Numerous variations are appearing in Bayshore greens. So far none of these has shown much promise. Under growing conditions of drought and unbalanced nutrients in the soil, seed heads can be numerous, but in most cases they can be reduced by good use of water and nitrogen. Two pounds nitrogen per 1,000 square feet per month in most cases is sufficient in a 3-1-2 to a 4-1-2 ratio.

Tiffine

Tiffine is a F_1 hybrid of **Cynodon dactylon** and **C transvaalensis** from the East Lake Country

Club, in Atlanta, Ga. It is light green color, has a finer texture, and is more disease resistant than common bermuda. It is no longer being planted on new greens now. In fact, established Tiffine greens are being replaced with newer selections. The plant is male sterile and sheds no pollen, and therefore it cannot be used for breeding purpose. It was released in 1953 at the Georgia Coastal Plain Experiment Station. It grew best in eastern Georgia and South Carolina but is being replaced with newer selections, in this area, also.

It prevented Tifgreen from encroaching into the bent plots at the Athens Country Club for seven years. It is being tested further as a possible barrier to keep bermudas from encroaching into bent greens.

Texturf 1 F

Texturf 1 F was selected at College Station, Texas and was taken from a golf course in the Dallas-Fort Worth, vicinity. It is a vegetative selection, and has to be increased by this method. It was released in 1957 by the Texas Agricultural Experiment Station. Certified stolons are available.

It is fine textured, light green in color, and produces a dense turf if properly maintained. It makes a good spring recovery in the area where it was selected, but as most bermudagrasses, it is subject to leaf spot disease. This limits it to dry climates for best results, but the lack of extensive root system makes it more susceptible to drought than common bermudagrass. It produces relatively few seed heads and does best in the area where it was selected.

Tifgreen

Tifgreen was tested as Tifton 328. It is a F_1 hybrid triploid between a superior selection from the fourth green at Charlotte Country Club, Charlotte, N.C., and **Cynodon transvaalensis** from East Lake Country Club, Atlanta, Ga. The cross was made at the Georgia Coastal Plain Experiment Station, Tifton, Ga., and was released in 1956.

Tifgreen at this time is probably more widely used on greens throughout the world than any other bermudagrass. It is medium green in color and can produce a superior putting surface if managed properly. It is cold-hardy for a bermudagrass but it has been found to be subject to diseases even though it was originally released as a highly disease-resistant strain. As with most plants, its resistance to disease is reduced unless properly maintained.

It is sensitive to 2,4-D, Atrazine, Simazine, and similar herbicides. The closer it is mowed, the less 2,4-D need be used. Eight ounces of 2,4-D, per acre can cause discoloration if mishandled. Four ounces per acre repeated at 10- to 14-day intervals does less harm. Weed problems can be reduced greatly with proper management.

Tifgreen does best when it is cut to a height of one quarter inch. Unless there is close supervision, continuous 3/16" mowing is not suggested, especially during July and August.

Fertilizer for greens should provide nitrogen (N), phosphorus (P_2O_5), and potash (K_2O) in the ratio of 3-1-2. Use two pounds of nitrogen per 1,000 square feet per month in hot weather and one pound per month during cool months when the greens have been overseeded with cool season grasses. This program will provide about 18 pounds of nitrogen per 1,000 square feet per year. If a 3-1-2 ratio is used at this rate, 6 pounds of P_2O_5 and 12 pounds of K_2O will be applied. These nutrients do not leach readily and may be applied in spring and fall when weather is cool.

Some superintendents add a little potash during the summer. Amounts up to one half pound of Muriate of Potash (60 per cent K_2O) per 1,000 square feet may be applied to bermudagrass greens during the summer if it is watered in promptly.

The greens should be cut lightly with a vertical mower once each week and topdessed five- to six-week intervals with 1/5 yard per 1,000 square feet. This is also referred to as "dusting" the green. Aerate monthly to help keep thatch problems to a minimum.

Tifgreen is being replaced with Tifdwarf in the South where bermudagrass is used. Bent is replacing bermudagrass in the upper South where a continual loss of bermuda is experienced in the spring.

Tifdwarf

Tidwarf was selected from greens in South Carolina and Georgia originally planted to Tifgreen. It is considered a mutation. It is a darker green color than Tifgreen and most other bermudagrasses. It was released in 1965 from the Georgia Coastal Plain Experiment Station, and is gaining in popularity and use. In the South during 1967, it was used in 85 to 90 per cent of the new green plantings.

Tifdwarf maintenance is very similar to Tifgreen, except that daily mowing is necessary for a superior putting surface. It also needs a slight increase in fertilization—1½ to 2½ pounds of nitrogen per 1,000 square feet per month, depending upon the soil on which the green is constructed. It can be mowed constantly at 3/16 inch and has been maintained even at lower height with excellent results. If mowed at one quarter to 5/16 inch, the Tifdwarf displays a mottled appearance. At this higher height of cut, the mottled color looks very much like Tifgreen. Less effect from grain has been observed so far with less amounts of topdressing required. Overlapping of topdressing soil can retard growth or give a striped pattern on the greens.

When it has seed heads, it has only about half as many as Tifgreen, and this can be reduced readily with proper fertilization and irrigation.

All research compares it with Tifgreen as a standard. Tifdwarf is as cold-tolerant as Tifgreen but takes on a purplish cast when the weather is cool and so should be overseeded for winter play. It is very similar to Tifgreen in susceptibility to herbicides.

Insects, mainly sod webworms, have been a problem when insecticides are not used carefully. In addition, close surveillance for diseases on a preventive program is suggested. Tidwarf has not been in use long enough to observe affliction by "Spring Dead Spot". Since Tifdwarf is a bermudagrass, there is no reason to believe it will not react the same as Tifgreen. Tifdwarf is by no means the end of the search, for new selections always are being screened. Breeding for superior grasses also continues.

Species for Overseeding

by DICK TARLETON, Superintendent, Broadwater Beach Hotel Golf Courses, Biloxi, Miss.

In the Deep South most of the putting greens are of Tifgreen bermudagrass or the newer Tifdwarf. In order to have an attractive putting surface, they must be overseeded for winter play while the bermudagrass is dormant. Few people realize that as far south as the gulf coast we play on northern grass greens for six months of the year.

Until just a few years ago, just about the only winter grass in use was domestic, or annual ryegrass. With the advent of the fine-leaved hybrid bermudagrasses, superintendents began to look for finer-textured grasses for overseeding. They also wanted grasses that did not go out as suddenly as rye, leaving them with our famous, or infamous, spring transition period. Probably a lot of the transition troubles that we blamed on ryegrass were more likely due to poor management of our bermudagrass.

One of the first attempts at improvement was a mixture of red top and seaside bentgrass. In most cases the results were very disappointing. In 1961, I tried this mixture on one green, and it was probably the poorest winter green in the South. However, we planted a second green with 25 pounds of Pennlawn red fescue per 1,000 square feet, and it was far superior to our other 16 greens, which were planted in ryegrass. The best winter greens I ever had were of Pennlawn fescue in the winter of 1962-63. They were also the most expensive. I now feel that I was very lucky because, we have learned as a result of more recent tests that fescues, when planted alone, do not perform too well.

Quite a bit of research has been done with different species in overseeding within the past eight years. Some of the most comprehensive work was done by the Milwaukee Sewerage Commission, under the direction of Charley Wilson and the late O. J. Noer. I was fortunate enough to have one of these trials in the winter of 1964-65. The grasses evaluated, both alone and in mixture, were: Poa trivialis, domestic ryegrass, Kentucky bluegrass, Pennlawn fescue, and seaside and penncross bents. The biggest and most pleasant surprise was the performance of Poa trivialis. It has a pleasing color, tolerates extremely low temperatures, performs well in combination with all the other grasses tested, and helps to mask the ever-present Poa annua.

What is the best mixture? This is like asking how far is up? One of our universities recommends 15 pounds of Pennlawn fescue and four pounds of Poa trivialis per 1,000 square feet. Some Green Section agronomists say five to seven pounds of Poa trivialis and two pounds of