Cool Season Grasses for Winter Turf on Bermuda Putting Greens

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Many golf courses in the warm climate regions of the Mid-Atlantic area and in Southern States are using the fine leaved improved bermudagrasses for summer turf on their putting greens. Cool season grasses must be used with bermudagrass putting greens to furnish a good putting turf for two to seven months of the year. Grasses selected for winter putting turf on bermudagrass greens must provide pleasing color, good density, good putting surface and good wear resistance while bermudagrasses are dormant.

The acute problem in managing the Bermuda-cool season turf is the transition of Bermuda to cool season grass in the fall and back to Bermuda in the spring. The spring transition period is especially critical in that the high seeding rates that are essential to give satisfactory winter turf, delay the development of Bermuda in the spring. Also the cool season grasses may die in the spring before Bermuda has developed.

Satisfactory establishment of grass for winter turf is contingent upon a knowledge of the behavior of cool season grasses in relation to time of seeding and date of seeding under various environmental conditions.

During the past two years experiments were conducted at The James River Country Club, Newport News, Virginia, to evaluate various grasses for winter turf.

METHODS

Experiments during the last two years show that there are large differences in the winter season turf quality of cool season grasses seeded on bermudagrass greens. Seeding rates and time of seeding also influence quality during the winter season.

Tifgreen (328) Bermuda was established at The James River Country Club in July 1959. Nine cool season grasses and a mixture were overseeded on replicated 8 x 10 ft. plots at two dates, September 15 and October 1 of the same year.

Before overseeding the area was vertically mowed twice. There was little thatch on the new bermudagrass sod and enough soil was turned up by vertical mowing to cover the seed; hence, soil topdressing was not used. Nitrogen from

Table 1. Turf Densities of Cool Season Grasses Overseeded on September 16 and October 6, 1959 at different rates on Tifgreen Bermuda.

		September 16 Seeding						October 6 Seeding				
Grass	Rate/M	Oct. 4	Oct. 25	Jan. 21	Apr. 19	May 11	June 15	Oct. 25	Jan. 31	Apr. 19	May 11	June 15
Red Top	3		35	5	70	83	28	40	02	73	85	33
Red Top	6		37	5	73	83	37	47	15	77	83	55
Seaside	3		43	37	81	85	50	43	52	77	90	35
Seaside	6		40	43	78	88	43	38	62	82	93	45
Pennlawn	12		57	43	85	92	50	57	58	90	92	62
Pennlawn	24		80	55	85	89	53	88	77	93	97	62
Com. ryegrass	25		37	45	68	75	20	75	78	85	87	17
	50		53	72	82	77	15	85	87	92	85	13

a natural organic source was applied to supply 0.7 lbs. of N per 1000 square feet at time of seeding.

The experiment established in the fall of 1960 was similar to the 1959 study. Six grasses at two rates, and six grasses and 2 mixtures at one rate were overseeded on September 15 and October 4. Before overseeding in 1960, the area was vertically mowed twice and ¼ cu. yd. of topsoil was applied per 1000 square feet after seeding. Nitrogen rate was increased from the previous year to 1.5 lbs. of N per 1000 square feet. The 1960 experiment was put on the same area as the 1959 study. Only one half of each of the previous year's plot was overseeded. The other 40 square feet was not disturbed to determine the summer persistence of the cool season grasses sown in 1959.

During both years the treatments were arranged in split block designs and replicated three times. The newly seeded areas were kept moist until the grass was established and then mowed at a one-fourth inch height.

RESULTS AND DISCUSSION

The highest rate of overseeding gave the best turf density, Tables 1 and 2, and color during October and March. However, turf density and color from April to June did not differ between high and low rates of overseeding. Grasses seeded at a low rate gave a good cover by spring because of a favorable environment and large plants developed during this season. The data shows that lighter seeding rates could be used where there is only spring play.

Overseedings made in early October produced better turf than seedings made in mid-September; however, the differences were not large for the 1960 seeding. Tables 1 and 2. Better turf for early seeding in 1960 than for 1959 may be attributed to higher seeding rates, higher nitrogen fertilization, and a somewhat milder winter during the second year. Such grasses as common ryegrass and Pennlawn performed better during the winter months of both years when overseeded in October.

During both years the early October overseedings provided cool-season grass coverage much sooner after seeding than the September overseedings. This may be attributed to the fact that cool season grasses germinate better and develop faster under cooler soil temperatures in October as compared to September. These data show that more successful overseedings may be associated with declining soil temperatures.

Common ryegrass, which is now generally used for winter turf, germinated rapidly and maintained a relatively high turf density from October to May during both years. In late spring the density was reduced very drastically, in 1960 it went from 85% in May to 13% in June, Table 3; and in 1961 from 70% in early June to 12% in late June, Table 4. The abrupt loss of common ryegrass before bermudagrass growth caused poor turf density, off coloring and objectionable bumpy putting surface. Such poor spring transition makes common ryegrass rather undesirable for winter turf on bermudagrass greens.

Common S-23 and Tetrone perennial ryegrasses were similar to common ryegrass in that they germinated quickly to develop a turf but all ryegrasses caused poor spring transition periods. One of the biggest objections of using perennial ryegrasses is the very tough spring growth which makes clean clipping impossible and gives an off-color.

The **Agrostis** species (redtop and bentgrass, as a whole were slow to start and were inferior in fall and winter to other grasses seeded in this test. Redtop and Highland colonial bent were the poorest while Seaside gave a better winter turf density than other bentgrasses (Table 3 and 4). Penncross was rated in between (Table 3). The second season Seaside provided better density, but its color was only fair to poor during the coldest winter months. This may be attributed to the fall of 1960.

Poa trivialis was the only bluegrass used in these tests that germinated rapidly enough to produce sufficient density and color to be suitable for winter turf The chief drawbacks of using **Poa trivialis** for overseeding bermudagrass were its off-color, deterioration of sod coverage, and uniformity due to disease in April and June.
fact that Seaside was seeded heavier the second year. All **Agrostis** studied in this test provided excellent transition periods both springs.

Pennlawn creeping red fescue gave good density and excellent color, (dark green) throughout the entire season in the first year. Excellent turf was also obtained during the second year. The stiff upright growth of creeping red fescue gave a uniform putting surface with excellent wear resistance. Its persistence in the spring and its fine texture gave a spring transition period so gradual to bermudagrass that it was hardly evident. These results indicate that Pennlawn is an excellent grass for winter turf. The behavior of Pennlawn in these experiments was confirmed under playing conditions by Mr. T. K. Baldwin, Greens Chairman of the Longwood Golf Club, Farmville, Virginia. Mr. Baldwin reports that his club had without question the best winter coverage on his bermudagrass greens after overseeding 20 pounds of Pennlawn per 1000 square feet in the

Table 2. Turf Densities of Cool Season Grasses Overseeded on September 15 and October 4, 1960 at different rates on Tifgreen Bermuda.

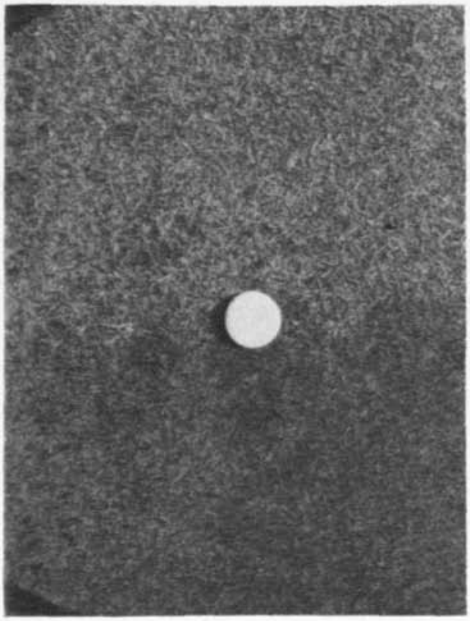
		September 15 Seeding						October 4 Seeding					
Grass	Rate/M	Oct. 4	Oct. 25	Jan. 11	Apr. 25	June 2	June 21	Oct. 4	Oct. 25	Jan. 11	Apr. 15	June 2	June 21
Redtop	5	25	73	45	88	85	22		32	40	87	77	23
Redtop	10	50	85	62	92	83	22		68	59	88	79	32
Seaside	5	37	83	79	92	84	57		63	73	91	83	56
Seaside	10	35	78	83	93	87	45		72	75	88	86	57
Pennlawn	18	57	87	73	96	90	62		78	75	97	92	53
Pennlawn	36	58	97	85	96	90	57		85	88	95	92	53
Com. ryegrass	30	78	83	68	94	72	6		82	70	87	62	6
Com. ryegrass	60	82	92	70	86	68	6		92	90	86	62	5

Table 3. Average Turf Cover and color ratings of cool Season Grasses Overseeded on Tifgreen Bermuda on October 6, 1959

Dates of Observations

		October 25		January 31		April 10		May 11		June 15	
Grass	Rate/M	Density*	Color**	Density	Color	Density	Color	Density	Color	Density	Color
Highland bent	6	43	2	33	3	82	2	88	2	47	2
Astoria bent	6	47	2	57	4	90	2	90	2	40	1
Penncross bent	6	50	2	55	4	83	2	92	1	43	2
Seaside bent	6	38	2	62	3	82	2	93	1	45	2
Per. ryegrass	50	90	3	90	3	90	5	90	2	47	5
Redtop	6	47	2	15	5	77	2	83	2	55	3
Pennlawn creeping red fescue	24	88	1	77	2	93	1	97	1	62	2
Merion Ky. bluegrass	12	28	2	28	4	88	1	95	1	65	1
Common ryegrass	50	85	3	87	1	92	4	85	3	13	3
Common ryegrass + Redtop	28 (9:1)	70	3	78	1	93	4	87	3	20	3

*—Percentage of color
**—1 is best color, 5 is poorest color



An April view of the fine texture of Pennlawn creeping red fescue overseeded on 328 Bermuda as compared to the coarser textured common ryegrass.

Common ryegrass and Pennlawn creeping red fescue mixture produced a quicker cover in the late fall than the fescue alone, but turf density and color were poorer during the spring transition period than for Pennlawn creeping red fescue. The biggest disadvantage was that the larger leaves of the ryegrass in the mixture did not blend well with the fine leaved bermudas and the ryegrass influence caused a poorer spring transition than the fescue when overseeded alone.

SUMMARY

Experiments evaluating cool season grasses for winter turf on bermudagrass putting greens were conducted for two years at Newport News, Virginia. In these tests the highest rates of overseeding gave better turf density and color during the period from October to March. Little difference was found in the spring between the high and low seeding rates.

Better winter turf quality was obtained when overseedings were made in early October than in mid-September. This may

Table 4. **Average Turf Cover and color ratings of cool Season Grasses Overseeded on Tifgreen Bermuda on October 6, 1960**

Dates of Observation

Grass	Rate/M	October 25 Density	October 25 Color	January 11 Density	January 11 Color	April 25 Density	April 25 Color	June 1 Density	June 1 Color	June 21 Density	June 21 Color
Highland bent	10	33	1	78	3	89	3	82	2	47	2
S—23 perennial rye grass	60	85	2	95	2	93	2	80	2	13	4
Park Ky. blue grass	20	80	1	67	3	90	3	88	1	55	1
Tetrone perennial rye grass	60	83	2	48	4	81	3	63	3	13	3
Rainier creeping red fescue	36	88	1	82	2	81	4	78	2	45	3
Seaside bent	10	72	1	75	3	88	4	86	2	57	2
Perennial rye grass	60	92	2	91	3	77	5	67	4	9	2
Redtop	10	68	1	59	4	88	2	79	2	32	3
Pennlawn creeping red fescue	36	85	1	88	1	95	2	92	1	53	1
Merion Ky. Blue grass	20	20	1	85	2	93	3	92	1	61	1
Poa trivialis	20	83	1	89	1	92	5	63	3	38	5
Com. ryegrass	60	92	2	90	3	86	4	62	5	5	5
Com. rye + Pennlawn	60 (2/3-1/3)	83	2	92	2	94	2	82	3	38	3

be attributed to the fact that cool season grasses germinate better and develop faster under cooler soil temperatures in October as compared to September.

The abrupt loss of ryegrass before bermudagrass growth causes poor spring transition and makes ryegrass rather undesirable for winter turf on bermudagrass greens.

Pennlawn creeping red fescue has given excellent winter putting green turf quality during both years of testing. Its persistance in the spring and its fine texture also gave an almost unnoticeable transition to bermudagrass.

The chief drawback of using **Poa trivialis** for winter turf on bermudagrass was its susceptibility to disease in the spring. The bentgrasses were inferior in the fall and the winter due to slow development in the fall.

Winter Scene of the Bermuda winter putting turf study at Newport News, Virginia.

WHAT SEEDS ARE AND DO

By VICTOR R. BOSWELL

Extracted from "The Yearbook of Agriculture—1961." This yearbook deals with many facets of a subject which holds an appeal for all of us. It is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. The price is $2.

Seeds are many things. Above all else they are a way of survival for their species. They are a way by which embryonic life can be almost suspended and then revived to new development, even years after the parents are dead and gone.

Seeds protect and sustain life. They are highly organized fortresses, well stocked with special supplies of food against long siege.

Seeds are vehicles for the spread of new life from place to place by the elements and by animals and people.

Seeds are food for man and animals and other living things.

Seeds are raw material for the fashioning of myriad products by people.

Seeds are wealth. They are beauty.

They are a symbol—a symbol of beginnings. They are carriers of aid, of friendship, of good will.

Seeds are a source of wonder. They are objects of earnest inquiry in man's ceaseless search for understanding of living things.

Seeds of unwanted kinds are as enemies; they are a source of trouble.

Seeds are many things, but everything about seeds—their numbers and forms and structures—has a bearing on their main purpose: to insure continuing life. Seeds are containers of embryonic plants, the embryos of a new generation.

* * *

Viable Seeds Probably Are Never Completely Inactive

Vital processes go on as a seed awaits conditions favorable for germination and plant growth. If we knew how to arrest or suspend all these processes completely, it would be possible theoretically to retain viability indefinitely. We do not know how to do this.

Activity within the seed may be so low that we cannot measure it by any known method. In time, however, if the seed does not encounter conditons that will permit it to grow, unidentified substances become exhausted or they deteriorate; germinating power is lost, and the seed dies. Warmth and moisture hasten the exhausing life processes and shorten the life of the seed. Dryness and cold slow down activities, conserve vital substances, and protect the delicately balanced systems within the seed.

* * *

Unwanted Plants Make Seeds

It seems that undesirable or unwanted plants generally are more prolific seed producers than most of the crop plants that we strive to grow. One investigator estimated that one large tumbling pigweed produces more than 10 million seeds. Many kinds produce 100 thousand to 200 thousand seeds per plant.

Weeds are the pests they are partly because they produce so many seeds. More than that, though: The seed and the plants that grow from them have a remarkable capacity for survival. Reproductiveness and survival value have evolved to a high level by natural selection. Seeds of many weeds are such potent survivors and successful travelers that their species have become nuisances over much of the world.

Farmers and gardners must contend with weeds that arise from seeds. They appear to come suddenly from nowhere— or everywhere. They arrive unnoticed by air, by water, by animals, and by man's devices.

Earlier arrivals have accumulated in the soil and lie there waiting for the husbandman to stir them up to the surface, where they seemingly explode into growth. One investigator recovered 10 thousand to 30 thousand viable weed seeds in patches of soil about a yard square and 10 inches deep. Various kinds of seeds kept dormant a long time by their respective mechanisms persistently produce successive waves of noisome seedlings each time the soil is cultivated.

Weeds thus continue to appear although the grower has not allowed a parent plant to produce seed on the site for years. Survival value! Many weed seeds will survive in the soil 20 years and some for longer than 70 years.

* * *

Many seeds are so small that their beautiful features escape us. Many others, although large enough to see easily, are such common, everyday objects that we do not really see them. They are, however, worth our careful observation.

The first and most obvious beauty in most true seeds is in the perfection of their simple forms. Their outlines or silhouettes exhibit endless variations in the curve of beauty. In their entirety we

COMING EVENTS

September 20-21
Missouri Second Lawn and Turf Conference
University of Missouri
Columbia, Mo.

September 26
St. Louis Field Day
Westwood Country Club
Clayton, Mo.

September 27-28-29
Northwest Turf Association Conference
Washington State University
Pullman, Washington

October 2-3
Utah-Idaho Turf Conference
Idaho Falls Golf Club
Idaho Falls, Idaho

October 5-6
Rocky Mountain Turfgrass Conference
Colorado State University
Fort Collins, Colorado

October 9-10
New Mexico Turfgrass Conference
New Mexico State University
University Park, N. M.

October 18-19-20
Central Plains Turfgrass Conference
Kansas State University
Manhattan, Kansas

November 16-17
Arizona Turfgrass Conference
University of Arizona
Tucson, Arizona

November 27-30
1961 Annual Meetings of the American Society of Agronomy and the Soil Science and Crop Science Societies of America
Sheraton-Jefferson Hotel
St. Louis, Missouri

find wide ranges of proportion and different graceful and simple masses that are pleasing to look upon.

The sphere is a thing of beauty in itself, although quite unadorned. Artists have tried to produce nonspherical "abstract" forms that possess such grace and proportion as to call forth a satisfying emotional or intellectual response in the beholder. Some of the nicest of such forms lie all about us, unnoticed, in seeds. The commonest are such basic forms as the sphere, the teardrop, the ovoid and other variations of the spheroid.

Some of these curving shapes are flattened, elongated, or tapered in pleasing ways. Sometimes they are truncated or sculptured into somewhat rough and irregular form. They may bear prominent appendages, such as wings, hooks, bristles, or silky hairs. Most seeds show a smooth flow of line and surface that is perfection itself.

The details of the surface relief of many seeds are even more beautiful in design and precision than the mass of the seed as a whole. Often you can find minute surface characters of surprising kinds. Surfaces that appear plain and smooth to the unaided eye may be revealed under a good hand lens to have beautiful textures.

Surfaces may be grained or pebbled. They may have ridges like those of Doric columns. They may bear geometric patterns in tiny relief, forming hexagons, as in a comb of honey, or minute dimples may cover the surface. Irregular surface patterns of surprising beauty sometimes appear under the lens. Surfaces may be dull, or highly glossy or anywhere in between.

Last but not least in the beauty of seeds are their surface colors. They may be snow white or jet black. The color may be a single solid one, or two or more may be scattered about at random. Colors may form definite patterns that are distinctive and characteristic of the species and variety. The colors may be almost any hue of the rainbow—reds, pinks, yellows, greens, purples—and shades of ivory, tan, brown, steely blue, and purplish black.

Look for all you can see with the unaided eye. Then look at smaller seeds and the surfaces of large seeds with a good hand lens. You will be delighted with what you find.

There is still another beauty, a potential beauty in seeds, that can be seen only as the seed fulfills its ultimate purpose—the production of a new plant possessing its own beauty. This is perhaps the greatest of all: Beauty of general form; grace of stem; the shape, sheen, and color of the leaf; and finally the loveliness of the flower or the lusciousness of a fruit. The cycle is complete, and so we are back to the beauty of a seed.

* * *

From prehistoric times man has understood the role of seeds. Ancient languages, ancient cultures, and our own contain many words and concepts based on this understanding. The Bible contains several such examples, including the parable of the sower, the use of the word "seed" to mean offspring or progeny, and references to good and bad seed.

Our language contains both common and technical terms involving "seed," although the meanings are quite unrelated to the subject of plants.

The meanings recognize, however, some metaphoric connection in one way or another. "Seed is a noun, an adjective, and a verb."

Watermen speak of seed oysters, seed pearls, and seed fish. The optician speaks of seeds in glass. The chemist seeds a solution with a crystal to induce crystallization. We speak of the seed of an idea or a plan.

"SEEDS ARE EVER A POSITIVE AND CREATIVE FORCE. Seeds are the germ of life, a beginning and an end, the fruit of yesterday's harvest and the promise of tomorrow's. Without an ample store of seeds there can be no national treasure, or no future for a Nation."

—Secretary of Agriculture
Orville L. Freeman