

Factors in Producing Good Turf Quickly

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In developing a turf there are several reasons why it is advantageous to obtain a good stand of permanent grasses as rapidly as possible. Some of these include holding the soil against the forces of wind and rain, the need for a turf playing surface in a minimum of time, and the re-seeding of areas damaged by mechanical means, insects or diseases.

During the course of studying grasses and mixtures for golf courses and other turf areas, observations have been made over a number of years on the period of germination, emergence and initial growth of individual grasses, mixtures, and mixtures accompanied by nurse grasses. These were seeded at different times throughout the growing season.

By following proper agronomic practices in soil and seedbed preparation and using good quality seed of basic turf grasses, germination and emergence can be produced under satisfactory conditions in the field from a minimum of 4 days to a maximum of 11 days. Use of a nurse grass may not be needed except under special conditions such as on steep slopes.

The sandy loam soil of approximately pH 4-5 on which tests were conducted was treated as follows: Ground limestone at 50 pounds and 8-6-4 fertilizer at 20 pounds mixed with the upper 3 to 4 inches of soil to reduce the acidity and improve the fertility, and arsenate of lead at 10 pounds per 1,000 square feet mixed with the upper inch of soil for prevention against beetle grubs and worms. The soil was raked and rolled to provide a firm seedbed, then the upper $\frac{1}{4}$ inch lightly raked and loosened to provide the germinating layer. After the seed was broadcast, it was lightly raked with wooden rakes, and the area lightly rolled to firm the soil around the seeds. No artificial irrigation was provided on any of the seedings except for the plantings made in 1919 during the extended drought.

Rates of seeding of the basic grasses were made on the number of seeds per pound and size of plant produced for individual grasses or mixtures, i.e., velvet bent with 10,000,000 seeds per pound was seeded at the rate of one pound per 1,000 square feet; the red fescues with 600,000

seeds per pound were seeded at 5 pounds per 1,000 square feet. The results have given healthy, dense turf. Seeding excessive amounts of seed has resulted in overabundance of small grass plants competing for nutrients and moisture, producing a weakened, undernourished turf more susceptible to disease and drought.

Three kinds of grass, the bents, blue-grasses and fescues, are the basis of good golf turf in the Northern states. These are known as the basic lawn grasses and will stay in permanently when once established and given proper care. Except in special circumstances, the only use for seeding individual grasses is for putting-greens and bowling-greens where a uniform turf of the same texture is desired. Experiments indicate that for good fairway turf, mixtures of 2 or more of the basic grasses are superior throughout the season to plantings of individual grasses alone. A study of individual seedings offers a means of comparing the merits of each.

The table on page 62 gives data on the individual grasses and mixtures with respect to rate and rate of seeding, number of days before emergence and indicates initial growth by per cent of area covered and average height of plants.

The Kingston mixture referred to consisted of 50% by weight of Cheving's fescue or an improved strain such as Illahee or Trinity, 35% Kentucky bluegrass and 15% Astoria or Rhode Island Colonial bent.

Date on emergence presented in the table represent the time lapse from date of seeding until most of the seed had germinated and the plants emerged to a height of $\frac{1}{4}$ to $\frac{1}{2}$ inch.

Per cent stand represents the total area covered by the seedling turf. This was usually taken at the date of the first cutting, generally when the turf reached a height of one inch or more. This ranged from 18 to 31 days, depending on growing conditions.

Period of Emergence

The bent grasses, redbtop and fescues emerged from 4 to 6 days when they were seeded during the summer and early fall. The two nurse grasses, perennial ryegrass

and domestic ryegrass, emerged in 3 and 4 days, respectively. When these grasses were seeded in late spring, the date of emergence was later by two or three days. This indicates that the warm soil and warm rains of summer and early fall favorably influence germination and early growth. The same principle holds for the bluegrasses which do not germinate and emerge as rapidly as the bents and fescues. When seeded in summer or early fall, the period of emergence was from 7 to 8 days; in springtime, 9 days.

Initial upright growth measured 3 to 4 weeks after seeding showed perennial ryegrass and domestic ryegrass to make the most rapid growth. They obtained a height of 3 to 4 inches. The fescues obtained a height of 1¼ inches and the bents and bluegrass between ¾ and 1 inch in that period.

Growing conditions during the fall of 1946 were ideal. The ryegrass in all the commercial mixtures emerged in 4 days followed by the basic grasses 2 days later. Emergence for the Kingston mixture was the same as for the commercial mixtures, with the exception of mixture D which apparently contained old seed that prolonged emergence to 10 days.

Emergence dates for the Kingston mixture varied with planting dates. Seeding in early fall emerged in about 6 days while spring seedings were prolonged to 8 and 11 days before emergence to ½ inch.

Comparison of individual seedings and seed mixtures of the same grasses indi-

cated that emergence dates were quite similar. For example, Colonial bent seeded alone or in a mixture germinated and emerged in 4 to 6 days when seeded in summer or early fall. Likewise, the fescue strains, Chewings, Illahee and Trinity emerged in 6 days in pure seedings or in mixtures.

The per cent stand from the rate of seeding used indicated that a 95% stand was obtained from Astoria, Rhode Island and Seaside bent and the fescues at the end of 4 to 5 weeks, but that Highland and the bluegrasses were slower to produce a dense turf. B-27 Kentucky blue appeared superior to commercial Kentucky blue in that respect. The addition of the ryegrasses to the Kingston mixture did not appear to increase the stand or density of the turf in that period.

Nurse Grasses Available

Tests showed that the addition of nurse grasses to seed mixtures of the basic lawn grasses does not have any apparent advantage provided the seedbed is properly prepared, moisture available and the area comparatively level. Nurse grasses such as perennial ryegrass and domestic ryegrass germinate and grow rapidly, but while doing so, provide competition with the basic turf grasses for nutrients and moisture. The loose, coarse texture of these nurse grasses not only detracts the appearance of the fairway or lawn, but these grasses are difficult to cut on a fairway or lawn. Experiments have indicated that if a nurse grass is needed, domestic

Table 1—Relative period of emergence and initial growth of turf grasses under field conditions. R.L. Agricultural Experiment Station—1946-1949

Seed Planted	Pounds per 1,000 sq. ft.	Date of planting and number of days to emergence (¾ to ½" height)							Av. Ht. in in.		Av. % stand	
		8/21/46	9/19/46	7/24/47	5/20/48	5/14/49	8/25/49	3 to 4 wks. from planting	4 to 5 wks. from planting			
Rhode Island Colonial bent.....	2	6	4	5	8	9	5	1		95		
Astoria Colonial bent.....	2		4		8	9	5	1		95		
Highland Colonial bent.....	2					9	8	1		83		
Seaside bent.....	2		4		8	9	6	1		95		
Piper velvet bent.....	1		6		9	11	6		¾	90		
Kentucky bluegrass.....	3	7	8	7	9		8	1		75		
Kentucky bluegrass B-27.....	3		8		9		8		¾	80		
Chewings fescue.....	5		6		8		6		1¼	95		
Illahae fescue.....	5		6		8		6		1¼	95		
Trinity fescue.....	5		6		8		6		1¼	95		
Creeping red fescue.....	5	7	6	5	8		6		1¼	93		
Perennial rye grass.....	1	6	3	4					3½	88		
Domestic rye grass.....	1			4					3	92		
Redtop.....	1	6	4	4					1¼	93		
Kingston Mixture.....	3	7	6	6	8	11	6		1½	95		
Kingston Mixture & PRG.....	3+1*	6	4-6	4					2	95		
Kingston Mixture & DRG.....	3+1*	6	4-6	4					2	95		
Commercial Mixtures, A, B, C.....	3		4-6						2	95		
Commercial Mixture D.....	2		10						1	87		

*Perennial and domestic were over-seeded at 1 pound/1,000 sq. ft. Number of days before first cutting. Aug. 21, 1946—24; Sept. 19, 1946—41; July 24, 1947—18; May 20, 1948—29; May 14, 1949—27; Aug. 25, 1949—31 days.

rye is preferable to the long-lived perennial ryegrass.

A suggested mixture of basic turf grasses and domestic ryegrass consists of the following: Cheewing's, Illahee or Trinity fescue, 40%; Kentucky bluegrass, 35%; Colonial bent, 15%; and domestic ryegrass, 10% by weight.

When conditions are adverse for good golf or lawn turf, such as poor or droughty soils, steep slopes and where maintenance of good turf may be neglected and the turf cut only occasionally or not at all, then perennial ryegrass has appeared to be useful. But where conditions are favorable for the basic turf grasses and where good turf is desired and given good maintenance, the use of perennial ryegrass is not necessary. Although redtop is often used in grass-seed mixtures, it is not considered as a permanent turf grass. There is very little difference, if any, in emergence of redtop and the bents such as Rhode Island and Astoria. In the past when redtop was much cheaper than the basic grasses, it was used to make low-cost mixtures. If a good strain of bent such as Astoria or Rhode Island is used in a mixture, the use of redtop appears questionable since it usually becomes stemmy, coarse-textured and soon dies out.

Mow Soon

It is suggested that seedling turf be mowed as soon as a bite can be obtained with the mower. This helps force lateral growth and improves density. Tests have indicated that unless grass is cut closely, rank top-growth is apt to smother the tender seedling turf. Close cutting allows more air to circulate through the new turf, and helps avoid diseases encouraged by stagnant air conditions. Particularly if nurse grasses are used in the mixture, cut them closely so they do not produce excess shade or too much competition with the basic grasses. Use a sharp mower and attach the catcher-basket if the turf gets high; it removes the long clippings which form mats and smother the tender young plants. Later the clippings may remain on the lawn to return nitrogen and other plant nutrients to the soil.

Initial growth 3 to 4 weeks after seeding was as follows: Ryegrasses 3 to 4 inches, fescues 1 $\frac{1}{4}$ inch, bents and bluegrass $\frac{3}{4}$ to 1 inch.

Time of emergence of basic grasses in mixtures was similar to emergence when planted alone.

Under satisfactory conditions a 95% stand was obtained from Astoria, Rhode Island, and Seaside bent and the fescues at the end of 4 to 5 weeks. The grasses were high enough to cut in from 3 to 6

weeks. Highland Colonial and the blue-grasses appeared slower to produce a dense turf. Merion (B-27), a new strain of Kentucky bluegrass, appeared superior to commercial bluegrass.

The addition of ryegrass to the Kingston mixture did not appear to increase the stand or density of the turf.

The mowing of seedling turf, especially if any ryegrasses or other nurse grass is used, is suggested when it reaches a height of about 1 $\frac{1}{2}$ inches. This will promote lateral rather than top growth.

Seedbed Management

The seedbed is the foundation of any turf area. Not only do the grass plants rely on the seedbed for anchorage, but nutrients and moisture as well. For these reasons and the expense involved making improvements in a poorly constructed seedbed after it is planted, care must be exercised in its preparation.

If any major changes in grade are necessary they should be made on the subsoil. The topsoil is removed; the subsoil loosened and graded to remove all ridges and depressions. The subsoil must be parallel to the finished grade. After the subgrade is prepared, no heavy objects that would cause excess compaction should be taken over the area.

The topsoil should be spread evenly over the subsoil to a depth of at least 6 inches. (1) Provide adequate surface drainage and avoid depressions in which water will stand or ice will form. (2) The topsoil must have no shallow or deep pockets, otherwise brown or green spots will show in the lawn where the topsoil is thin or heavy. (3) Uniform topsoil helps make uniform turf.

The wise person, when constructing any new building, removes the topsoil from the site and saves it in a pile nearby for use later. Six inches of good loamy topsoil after rolling is usually adequate unless the subsoil is gravelly and porous. Eight or 9 inches of topsoil when rolled will pack down over gravelly subsoil to about 6 inches. Over gravelly subsoils more topsoil will be needed and proportionately more organic matter to help hold moisture. Allow plenty of time for fills to settle or provide compaction before finally levelling and seeding. Loam will settle approximately 20 percent, or 1/5 of its original depth.

When organic matter is needed, any of the following may be applied and thoroughly mixed with the topsoil to a depth of 6 inches by use of tiller machines or heavy disc-harrows.

Native peat or commercial humus—1,000 to 1,500 lbs. per 1,000 square feet.

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NY-Conn. Turfmen in Brisk Meetings

By BILL BENGEEFIELD

New York-Connecticut Turf Improvement Assn., headed by Pres. A. R. Twombly, Pelham (N.Y.) CC, has been preparing for a season of effective work with meetings that have been featured by good attendance and keen, practical discussion.

In March, we met at the oldest golf course in the United States, St. Andrews GC, Ardsley, N.Y., and there to welcome us were W. Shaw, Chairman; A. Edgar, Supt. and J. Furnee, Manager.

Our speaker was Dr. P. Pirone, Pathologist, Bronx Botanical Gardens. He spoke on turf diseases and, since Dr. Pirone is one of the outstanding authorities on tree diseases, he also touched on this subject. The many questions put to him by the group was a good indication of the interest in trees.

E. Larkin spoke of the Metropolitan GA tournament to be held on May 20th and 21st. Following this, Joseph Flynn, Metropolis, led a roundtable discussion on the water shortage problem and how various clubs hope to solve it.

The April meeting was held at the beautiful Bonnie Briar CC and our hosts were F. Goode, Chairman; S. DiBuono, Pro-Gkpr. and D. Artese, Greenkeeper.

The speaker was Dr. John Cornman of Cornell University and N. Y. State College of Agriculture. He told of the work of the N. Y. State Turf Association and the progress of the State Turf Program. It is a young organization which is coming along fast.

The roundtable discussion was ably led by Doug Rankin, Westchester CC, and the topic—"Clover and its Control." Dominic Artese was a co-star on this topic as he reviewed his 30 years of clover control experience. It was a gem.

Our ranks continue to grow with the addition of three new members in March; James Galletley of the Whipoorwill Club; Joseph Gaillard, Rockrimmon CC; and Bruno Vadalla of Metropolis. In April, five new members were added: C. W. Birch, Chairman, Winged Foot GC; Victor DeLuca, American Agricultural Chemical Co.; John D. Laing, Pleasant Valley; Wm. Livingston, Silver Springs CC; and Henry Mattson of Armour Fertilizer Works.

Hoosier Pros Hold Spring School

Almost the entire membership of the Indiana PGA and numerous out-of-state pro and salesmen guests gathered for the association's spring meeting and dinner at Claypool Hotel, Indianapolis, April 17.

Tom Crane spoke on what a club should expect from its professional, advising the

pros to look at each opportunity and duty as if they were dues-paying members or public course patrons, then deciding what they'd expect. Fred Barks of National Cash Register gave the pros his practical advice to retailers which he'd presented in such a valuable way at the national PGA meeting. Bob Lysaght of MacGregor Golf told the pros what the design, manufacturing and repair problems were in a manufacturing plant and how the manufacturer worked in modernizing club production from the old bench-made operations.

Herb Graffis gave a summary of the National Golf Foundation's work and told how its printed, picture and personal promotion operations were planned and conducted to increase the pros' income by enlarging the golf market and putting the spotlight on the qualified and energetic professional.

Toney Penna, subbing for Craig Wood at the section's clinic, gave an excellent demonstration of playing details and handled a lively question and answer session in an interesting and instructive manner.

Club officials and newspapermen were guests at the merry dinner which concluded the hard day's work.

PRODUCING GOOD TURF

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Horticultural peat moss—3 bales per 1,000 square feet.

Well-rotted farm manure—1 cu. yd. per 1,000 square feet.

Lime is recommended for highly to moderately acid soils (4.5 to 6 pH). A normal application of limestone for strongly acid soils is 100 pounds per 1,000 square feet (2 tons per acre); for moderately acid soils, 50 pounds per 1,000 square feet (1 ton per acre). Mix the lime with the upper 4 or 5 inches of soil before seeding.

A fertilizer for turf should carry a relatively high percentage of nitrogen with enough phosphate and potash to provide for good vigor and health. In order that the fertilizer may have a prolonged and gradual effect, part of the nitrogen should be in a natural organic form such as Milorganite or cottonseed meal. Twenty to 30 pounds per 1,000 square feet of an 8-6-4 or 8-6-2 commercial lawn fertilizer, with approximately 40 percent of the nitrogen in the natural organic form, should be sufficient if mixed thoroughly with the upper 3 to 4 inches of topsoil a few days before seeding.

Arsenate of lead is suggested for prevention of injury to turf by Japanese beetle grubs, other grubs and worms. A few days prior to seeding rake it into the upper inch of soil at the rate of 7 to 10

pounds per 1,000 square feet. Grubs feed close to the surface and cut off the root systems of the grass so that the turf is killed and can be rolled back from the soil like a rug. Earthworms deposit masses of casts of excreted soil at the entrance of their burrows. These castings make turf bumpy and unsightly. Earthworms are no longer regarded as beneficial to turf areas; they are now considered detrimental.

After fertilizer, limestone or other materials have been incorporated into the soil, the surface will be loose. It should be smoothed with a drag and rolled with a heavy roller to provide a smooth, firm seedbed. The surface half inch of the seedbed should be loosened with a rake or light harrow to provide the germinating area for the grass seed.

Seeding, Watering and Mowing

The best seeding time is nature's time, that is, August 15 to September 30. This is the period of warm days, cool nights, little competition from weeds, a natural rainy season and fall growing season which help establish the turf plants before winter comes. After the winter months, the cool spring growing season prepares the young turf by aiding deep root growth and producing mature grass plants before the hot summer months which bring drought and weeds.

Some October seedings have made good growth and become established; occasionally they have been mowed once or twice before winter. If the area is comparatively flat so that seed will not wash away, if it does not germinate and come up in the fall, it should grow early in spring even before the soil is dry enough to work. Late seedings that germinate are often killed by having the roots dry out when they are pushed out of the ground by frost. This factor should be considered before a late fall seeding is made. If the seed remains in the soil it will come up next spring, but if it germinates in late fall, a considerable part of it may be winter-killed. Football fields are used until after Thanksgiving and it is often necessary to reseed in late November and December. In such cases it is better if germination does not occur and the seeds lie dormant until very early spring. Seeds of the basic grasses are hardy and cold will not kill them. By winter-seeding athletic fields where play has been heavy, even though the seed does not sprout, it will get an early growth in spring and provide good turf by the next football season. Incidentally, it is always a good plan to have a separate field or turf for spring sports and thus allow the turf on the football field to become re-established.

If seeding was not done in fall or winter, do it as early in springtime as pos-

sible. Seed before May 15 to avoid competition from weeds and prevent drought injury during the hot summer months. Sterilizing soil with chemicals and fertilizers solves the problem of weeds in spring-seeded turf and if there is plenty of water to keep the tender turf moist, a good stand of grass can be produced.

Seed when the soil is moist, the top sufficiently dry, and when the wind is not blowing. Divide the total amount of seed into 2 equal parts, sow one-half in one direction and the other at right angles to the first seeding. Going over the ground twice in 2 directions provides uniform distribution.

Cover the seed very lightly—about $\frac{1}{8}$ inch—by giving 2 rakings at right angles. The weight of a wooden rake is ordinarily sufficient when used with a light hand. Reach out with the rake, pull it gently toward you, lift the rake, reach out again and pull, etc. If the rake is pushed backward you may uncover the seed. If you bear down heavily, some seeds may be covered deeper than others, and uneven germination will result. Seed covered too deeply may never germinate. After the seed is covered, roll lightly in 2 directions. The ordinary water-ballast roller is sufficiently heavy with nearly all water removed. This light rolling presses the germinating layer to the firm seedbed, helps insure contact of seed with moist soil, and hastens germination.

Watering

Once the seed starts to germinate, the soil should not become dry. Sprinkle gently and thoroughly with a fine spray to insure germination and early growth of the tender grass seedlings. When the new grass is up, discontinue frequent and light watering. Instead, thorough soakings, according to weather conditions and personal judgment, are used to encourage the grass to become deeprooted. By no means should a water-logged condition develop, however, for it prevents the normal functioning of the soil by excluding air, rots tender roots; and favors diseases such as damping-off, seedling blight, and brownpatch.

Many seedings are made during the spring and summer with success, but more care must be given to these seedings. For example, seedings made during May and June of 1949 did not have a sufficient root system to survive the devastating drought that occurred during the summer. In many cases the seed did not germinate, and in other cases the seed germinated but did not get past the seedling stage. To overcome the lack of moisture, these newly-seeded turf areas had to be watered frequently over a long period of time. This adds to the time and expense of producing a satisfactory turf.

Only seed of good quality should be used in any seed mixture. Good quality grass seed under favorable conditions will germinate in a period of 4 to 8 days and produce healthy, vigorous seedlings.

Bare areas in a newly-seeded turf area are often due to poor seed that failed to germinate. Often seed mixtures of questionable quality are the source of weed seeds and once weeds become established they are usually difficult and expensive to eradicate.

Old seed is another source of trouble in seed mixtures. In comparison with new seed, old seed takes much longer to germinate, if it germinates at all.

Rates of Seeding

Consideration must be given to the rate of seeding. Seeding excessive amounts of seed, which is commonly done, produces an overabundance of little grass plants competing for moisture and nutrients. The results are a weakened turf, more susceptible to injury from disease and drought. An illustration is drawn by the following example: seeding the Kingston Mixture at a 3 lb. and also at a 5 lb. rate per 1,000 sq. ft., there will be approximately 39 and 76 seeds per square inch, respectively. Considering the fact that grass seedlings need room to develop a healthy root system and top growth, the seeding at the 3 lb. rate would allow for this development more readily than the 5 lb. rate.

It is readily seen that the basis for calculating the rate of seeding a grass mixture is on the number of seeds per pound of the grasses used in a mixture or an individual seeding. If this practice is followed the results will be a healthier more vigorous turf at less expense.

WORKMEN'S COMPENSATION

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reason, M.'s injury did not originate in a risk connected with or incidental to the employment, it did not arise out of his employment, and, hence, is not compensable."

All courts adhere to the general rule of law which the Illinois tribunal applied to this caddy's claim. To maintain a claim against his employer, the employee must show, to repeat the rule, that the accident grew out of his job and occurred in the course of his employment. The stroke of lightning did hit the caddy while he was going about his work, but it did not strike him because of the character of his work.

Injury Not on the Job

Take another enlightening episode. This occurred in Massachusetts.

A caddy was standing on the first tee of his employer's golf course, on the point of playing a round himself. Two other caddies were there for a like purpose.

One of the two, as a warm-up, took a practice swing with his club, without looking to see if anyone was behind him. It happened that there was, and that it was the first caddy, who was standing watching. The swing took this lad in the face, and practically butchered him.

He filed the usual claim for compensation against his employer owner of the golf course, under the Workman's Compensation Law. But he, too, drew a blank. The club was not responsible for his injury, because he had not been engaged in the performance of his job at the time. He was on his own, preparing to play for his own pleasure.

"His employment did not require him to be at the tee," the court remarked in deciding against him. "He was not engaged in any work, or aiding in any way the performance of the duties for which he was employed."

This iron-clad requirement of the law, that an employee must have been performing his particular duties at the time of an accident or his employer will not be compelled to compensate him for injuries, was exemplified in another occurrence in Massachusetts.

There, an attendant engaged primarily for work in the locker room of the clubhouse, was sent on an errand for a member of the golf club. Riding on a public highway on a bicycle, carrying a bundle of clothes which he was taking to a laundry for the member, he was hit by a vehicle and injured. A court refused to allow his claim against the club under the Workmen's Compensation Act, ruling that, while his injuries were received "in the course of his employment," they did not "arise out of" the employment.

"All persons upon streets are likewise exposed to such hazards of travel," the court said. "The travel was not a hazard peculiar to this man's work, but was a risk common to all persons, and so, it did not 'arise out of' his employment."

It is, of course, an essential element of a club's liability under the Workman's Compensation Law to its worker accidentally injured, that he must have been in fact and actually an employee of the club at the time. If the situation did not present the employer-employee relationship, a claim for compensation will be disallowed.

Caddy Hiring Factors

For instance, the Rice Lake Golf Club in Wisconsin followed the practice of many country golf courses not having sufficient patronage to warrant regular employment of a caddy master and a staff of caddies, of permitting neighborhood boys to gather for caddying and taking their chances of obtaining jobs from players. The caddies were selected by individual golfers and paid by them, and the