Plugs to Change Turf

differential fertilization proves helpful in establishing grasses

Vernon T. Stoutemyer

The studies reported in the following article were conducted by Zaki Mahdi, a graduate student in Ornamental Horticulture, working under the direction of Professor Vernon T. Stoutemyer.

U-3 Bermudagrass plugged into existing sod of Seaside bentgrass made striking growth in a series of experiments.

The experiments were conducted to compare the rates of spread of turf grasses propagated on bare soil; in sod of various species of grasses and also to develop methods of overcoming the strong competition of the established grasses.

The growth of any grass introduced by plugging—even of a highly aggressive type, such as U-3 bermudagrass—is greatly retarded by the competition of the existing turf.

Many of the improved strains of bermudagrass, zoysias, and bentgrasses can be propagated only by vegetative methods which usually require the plant area to be out of use for a certain interval. A simple method of changing the composition of turf is by plugging the desired grass into existing turf. However, the rate of spreading has been disappointing except in areas with thin turf.

The studies of rates of spreading and methods of overcoming competition by established grasses were made on experimental turf plots on a Yolo loam with the alkalinity-acidity reaction about pH 6.6—almost neutral.

A preliminary study was conducted on an experimental putting green area consisting of a mixture of Congressional and Old Orchard bents, which are both improved clonal strains of creeping bentgrass. The study area was fertilized at bimonthly intervals with ammonium sulphate at a rate to supply 15 pounds nitrogen per 1,000 square feet per year.

Two series of two blocks of five plots each were laid out in the test. One block was laid out on the turf and the second block was on adjacent bare soil. Each series of plots was divided into two sections. One section was plugged with propagation plugs of sod—4″ in diameter and about 1½″ thick—cut from well established turf of several different strains of bermudagrass, at 6″ distance from the centers of the plugs. The second section was plugged with the same strains at 18″ distance.

There was practically no spread of the plugs in the established lawn but growth was exceedingly rapid in the bare soil. After about six to eight weeks, the whole area was completely covered with the spread of the different strains.

Another experiment was conducted to determine the effect of the size of plugs and the effect of surface fertilization in overcoming the competition of the old turf. The test area had been seeded at the rate of two pounds of Seaside bentgrass seed per 1,000 square feet. The turf was maintained under putting green height of cut and fertilized once every two months with ammonium sulphate at a rate to apply 15 pounds nitrogen per 1,000 square feet per year.

In July, 1951, an experiment involving three levels of nitrogen fertilization, and two sizes of plugs—2″ and 4″—in a six by six factorial Latin square design was established on this turf. Three levels of nitrogen—5, 10, and 15 pounds by ammonium sulphate per 1,000 square feet per year were used.

In December, 1952, 18 months after the beginning of the experiment the rate of the spread of each plug was charted and measured. The results are shown in the table in the next column. The spread from the plugs showed that higher fertility levels had little effect in increasing spread of the 2″ plugs, but did have some influence with 4″ plugs. It was also noticed that increasing the nitrogen level from 10 to 15 pounds of nitrogen per year had more influence than raising the nitrogen level from five to 10 pounds per year. The spread from the 4″ plugs was significantly greater than from the 2″ plugs.

The failure to overcome competition between the plugged grasses and the established turf through surface fertilization led to another experiment in which the fertilizer was dropped at the bottom of some of the holes before setting the plugs.

In August, 1952, a common bermudagrass plot was selected as the site of this experiment. The turf had been established in 1949 and was kept at ¾″ height of cut and fertilized at the rate of five pounds of nitrogen per 1,000 square feet per year.

Part of the turf was sprayed with maleic hydrazide—MH—using the 40% sodium salt in a 0.25% aqueous solution, immediately before plugging, to provide a temporary inhibition of the old turf until the new plugs had a chance to establish roots. The spray was applied at the rate of 20 liters per 1,000 square feet of turf. In some plots, 30 grams of organic sewage sludge fertilizer containing 6% of nitrogen and 2% phosphorus as P_2O_5, were dropped in the holes before setting the plugs. The design of the experiment was a randomized complete block with nine replicates per treatment.

Three days after the spraying, the

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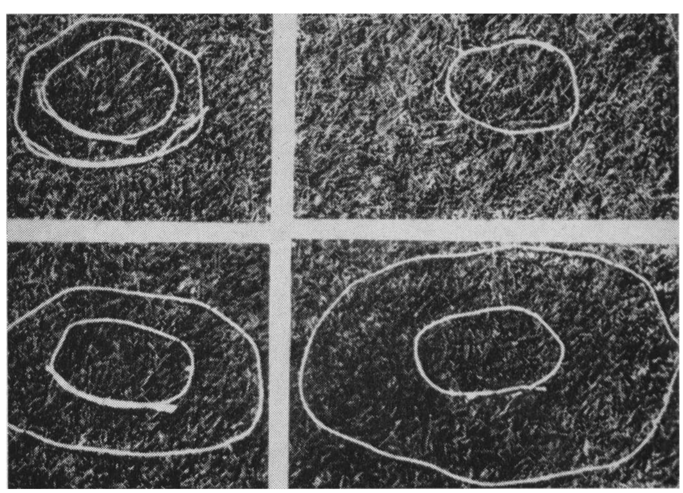
Summary of the Increase in Square Inches for Two Sizes of U-3 Bermudagrass Plugs in Seaside Bentgrass with Three Fertility Levels.

Lbs. Nitrogen per 1,000 sq. ft. per year	Mean Increase in Square Inches	
	2″ Plugs	4″ Plugs
15	8.71	70.19
10	7.41	17.44
5	1.00	8.68
Mean	5.70	22.10

Any difference, or cumulative difference greater than 7.89 indicates a significant increase over observations with lower values at 5% probability.



Spread from plugs of U-3 bermudagrass in common bermudagrass two months after setting. *Upper right:* Control—no spread. *Upper left:* Maleic hydrazide spray. *Lower left:* Organic fertilizer placed in holes before setting the plugs. *Lower right:* Maleic hydrazide spray followed by placing organic fertilizer in holes before setting plugs.

Reactors in Bovine Brucellosis

studies initiated to determine means of detection of carriers of organisms causing brucellosis

H. S. Cameron and J. W. Kendrick

Calf-hood vaccination is the principal successful weapon against bovine brucellosis in California.

The program of calf-hood vaccination with Strain 19—a vaccine developed by the United States Bureau of Animal Industry—has been successful; the number of abortions due to brucellosis has greatly decreased, as has the number of reactors to the blood test, in the limited amount of testing that has been done.

Were cattle only to be considered in the campaign against brucellosis, the solution would be relatively simple. The genus *Brucella* is capable, however, of infecting species other than the bovine, such as swine, goats and man. Thus, although the incidence of abortion in cattle by this organism has been markedly reduced, some vaccinated animals remain as carriers of infection for other species, the most important being man.

The important question is how the apparently normal carriers of infection can be detected. The blood agglutination test will detect infected animals if they have not been vaccinated as adults, or recently as calves. Vaccinated animals will react to the blood test in a manner similar to that in infected animals. When animals are vaccinated as calves they usually recover from the vaccination reaction, and subsequent reactions are likely to be the result of infection; a few carry a persistent reaction. Adult animals, on the other hand, when vaccinated are likely to remain as reactors. Then, if they acquire an infection, the reaction from the infection is obscured by the persistent vaccination reaction.

The problem is to distinguish between the vaccination reaction and that caused by infection. It is necessitated by the desirability of eliminating infected cattle from the herd. Vaccinated non-infected animals do not eliminate the organism from their secretions, whereas infected stock, vaccinated or unvaccinated, may shed the bacteria to spread infection to susceptible species. The organism can be detected in the secretions only by guinea pig inoculation, a procedure which takes at least five weeks and is, therefore, impractical.

One approach to the problem may lie in the dilution of serum at which the reaction takes place. This dilution is known as the blood titer. When blood serum is tested it is diluted to one part serum to 50 parts of saline, 1 to 100, and 1 to 200. A cow reacting at 1:50 is usually considered negative; if the reaction is at a higher dilution, it is considered either suspicious or positive. This interpretation has been based on investigations conducted before the widespread use of vaccines and when blood testing and elimination of reactors were the sole means of controlling the disease. In view of the widespread use of vaccines in many areas, perhaps the interpretation of the blood titer could be revised and blood reactors at 1:100 considered non-infected. To do this, it is necessary to reinvestigate the status of the 1:100 reactor with respect to the presence of *Brucella* in the secretions.

In addition to the blood test, the milk whey test, the whole milk plate test and the ring test, are used in brucellosis control under certain conditions. Some work has been done which suggests that the milk whey test may be of value in differentiating between the infected and the vaccinated animal. Possibly a combination of tests may assist in the problem.

The University of California with the co-operation of the United States Bureau of Animal Industry has undertaken an investigation to determine the role of these various tests, compare their efficiency in detecting infection, and ascertain if a significant number of vaccinated animals that are classified as reactors are actually infected with virulent *Brucella*.

Because of ordinances being introduced in certain areas requiring that market milk come from herds that are free from brucellosis as determined by the blood test, the project is of great importance to the dairyman. In milk sheds for such areas, vaccination as well as blood testing is employed in the control of the disease. With the widespread use of the vaccine, these areas are now experiencing a larger number of cows that are classified as suspicious because of an incomplete reaction at the 1:100 dilution. Conceivably these reactions are caused by the vaccine and the herd is non-infected. The project now underway will throw light on the problem.

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grasses showed some discoloration but the injury was temporary and the plants regained their regular color after about four to five weeks.

In October 1952—two months after plugging—the spread of U-3 bermudagrass was determined and the results are summarized in the table on this page.

Mean Increase in Area of U-3 Bermudagrass Plugs, Plugged in a Stand of Common Bermudagrass.

Treatment	Mean Increase in area (sq. in.)	Difference from previous value
MH* and fertilizer	35.27	....
Fertilizer and no MH	13.28	21.99
MH and no fertilizer	5.12	8.16
No MH and no fertilizer	0.71	4.41

* Maleic hydrazide.

Any difference, or cumulative difference greater than 9.38 indicates a significant increase at 5% probability over observations with lower values.

The most striking increases in spreading were obtained in the treatment where the plots were sprayed before the plugs were set followed by the placement of fertilizer at the bottom of the hole.

The differential fertilization, in which a good supply of nitrogen was made available to the introduced grasses—by placement at the roots of the grasses in the plugs—was highly successful. Nitrogen in an organic form had the advantage of availability over a longer period of time than would have been afforded had easily soluble inorganic sources of nitrogen been used. This treatment temporarily checked the growth of the existing turf during the critical period while the grass in the plugs is establishing new roots. The combination of differential local fertilization and spraying with maleic hydrazide resulted in a great spread of the plugs.

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