TURF CULTURE

Volume 2 NOVEMBER, 1940 Number 2

ARLINGTON TURF MEETING

The annual Arlington Turf Meeting, sponsored jointly by the Greenkeeping Superintendents Association and the United States Golf Association Green Section, was held this fall on Monday and Tuesday, September 16 and 17, with headquarters at the Hamilton Hotel in Washington, D. C. At 9 o'clock Monday morning the visitors assembled on the Turf Garden at the Arlington Experiment Farm for the annual review of the experimental work conducted there by the Green Section in collaboration with the Bureau of Plant Industry of the United States Department of Agriculture. The primary purpose of this meeting has been to make it possible for greenkeepers, green committee chairmen, and others interested in establishing and maintaining better turf to see first hand the results of these experiments and to discuss their special problems with the staff of the Green Section in the light of these results. This year there were 200 or more in attendance, some coming from points as far distant as Miami and Kansas City.

The visitors were first conducted in a group over the plots on the Turf Garden as well as those which are located in various other sections of the Arlington Farm. The nature and purpose of the experiments were described, and the significance of the results which were apparent at the time were discussed by

members of the Green Section staff. The plots were fully labeled so that it was possible for the visitors to go back at their leisure and look over the results of the experiments in which they were particularly interested.

Selected Strains of Grasses in Turf

On the Turf Garden the visitors were shown plots of many selected strains of the various turf grasses growing in turf. Each strain had been developed from a sample of turf selected because, for one reason or another, it had appeared to be particularly desirable. This single plant had been propagated vegetatively in the nursery until sufficient material was available for the vegetative planting of quadruplicate plots on the Turf Garden.

Bent Grasses

The plots of creeping and velvet bents have been maintained under putting green conditions. Two plots of each strain have been treated regularly for disease and two have not been treated in order to determine variations in disease resistance. Washington and Metropolitan strains were used for comparison purposes among the creeping bents and Piper and Kernwood among the velvet bents.

Among the treated plots, the strains of creeping bents showed much less contrast than did those of velvet bents so far as color, density, and texture were concerned. Among creeping bent plots which have not been treated with fungicides since they were planted in 1937, C-1, C-16, C-11, and C-9 showed

the most disease resistant turf. C-52 and C-19 were also resistant but to a lower degree. Later in the day when plots of some of these same strains were shown growing in a low pocketed area, it was seen that some of them which produced superior turf on the Turf Garden with its better air circulation did not do so well under such adverse conditions. In this area, the

The Greenkeeping Superintendents reviewing a portion of the series of plots established on the Arlington Turf Garden to test the value of various combinations of fertilizers in the maintenance of bent turf. The plots were marked with cards showing graphically the relative amounts of nitrogen, phosphoric acid, and potash which they had received, as well as with the names of the materials used and the pH of the surface 2 inches of soil at the time of the meeting.

plots of C-1, C-32, and C-27 were in best condition whereas Metropolitan, seaside, and the Colonial bents were particularly severely injured.

Among the velvet bents planted on the Turf Garden in 1937, V-8, V-26, and V-19 appeared to be superior in most respects to Piper and Kernwood, the turf being generally denser and more resistant to disease.

A series of Colonial bent plots which had been planted with seed from various sources was also observed, but except for highland bent, which was lighter and more bluegreen in color, the turf on all of these plots was almost indistinguishable.

Kentucky Bluegrass

Similar plots of Kentucky bluegrass strains were shown. These plots, which had been planted vegetatively, were compared with plots which had been seeded at the same time with good commercial seed and also with plots which had been planted vegetatively with random samples of old established bluegrass. These plots were maintained under lawn conditions and were not watered after the grass had become established. Variations were particularly striking in the 1937 series.

Considerable variation between the various plots was evident. Some strains have produced a turf which is much denser and more resistant to invasion by clover and weeds than is that of commercial bluegrass. Other strains have been decidedly resistant to disease, particularly leafspot, and still others have been particularly tolerant to being cut as low as ½ inch. Also there were striking variations in the color and texture of the grass among the strains growing in turf. Plantings made in 1940 showed that some strains fill in following vegetative planting much more quickly than random samples of bluegrass. In general, the outstanding strains are superior in most of these qualities.

Attention was drawn particularly to a plot of strain B-12, one-half of which has been cut at ½ inch, and the other half at 1¼ inches. Another plot of B-12 which had been grown from selfed and open-pollinated seed was contrasted with a

plot seeded with the best available commercial seed. This plot was not unlike plots of the same grass planted vegetatively and was superior in color, density, and texture to the turf resulting from commercial seed. The fact that seed from such strains as B-12 will produce turf which is decidedly better than that produced from commercial seed and not unlike that produced by vegetative planting of the parent plant indicates the possibility of propagating at least some of these superior selections on a large scale by means of seed.

Fescue

Vegetative plantings of numerous selected strains of fescue were also observed growing in plots comparable to the bluegrass plots. Like the latter, the fescue plots were located on an open and exposed area and were not watered after the stand had become established. Plots of Chewings fescue served as the standard of comparison.

The turf on most of the plots showed scars as a result of severe summer injury, but there were decided differences in the various strains, particularly as to ability to resist invasion with clover and weeds, as well as to color and density. The 1937 plot of Q-4 was marked and labeled as an example of a strain which is superior in most respects to Chewings fescue. Among the 1940 plots, the turf on one seeded with seed from Q-2 was much denser and generally superior to a plot seeded at the same time with Chewings fescue.

Other Grasses

Many other grasses were seen growing in turf, some of the most interesting of which were several species of *Zoysia* and various selections of Bermuda grass cut at different heights. The

dense, durable turf produced by *Zoysia matrella* cut at ¼ inch, ⅜ inch, and 1½ inches attracted considerable attention. In other areas the visitors were shown plots of turf of Buffalo grass which is used in the West, crested wheatgrass which is used in the dry areas of the Northwest, and St. Augustine grass, centipede grass, the two carpet grasses and others which are used in the South.

Soil Texture Plots

Plots were viewed which had been established 10 years ago, in the soil of which various materials such as manure, cottonseed hulls, buckwheat hulls, and peat moss were used to varying depths to improve the texture of the soil. Since their establishment, the levels of the plots have dropped varying amounts, depending on the material used and the depth to which it was incorporated in the soil. In most of the plots more than half of the original mixture has been lost. Plugs of these soil mixtures made to a depth of 8 inches had been placed on the most interesting plots to show the structure and texture of the soil to that depth.

Experiments With Disease Treatments

During the past season, more than 100 different chemicals have been tested extensively for their usefulness in connection with the control of turf diseases. In response to a recent renewed interest in the possibilities of copper compounds for the control of turf diseases, various copper preparations were again included this year among the materials tested. Large scale tests of all of these compounds have been made on bents

growing in sod nurseries on nearby golf courses. The visitors were shown small plots on the Turf Garden which indicated the nature of the large scale tests and some of the results.

The best control of dollarspot was obtained with mercury fungicides, although one of the newer organic non-mercury compounds showed considerable promise. Lime had no permanent effect. As did the tests many years ago, Bordeaux mixture with the normal amount of lime as well as with twice the normal amount of lime when applied daily gave little control of dollarspot and caused a decided yellowing of the turf. Copper sulfate alone burned the turf.

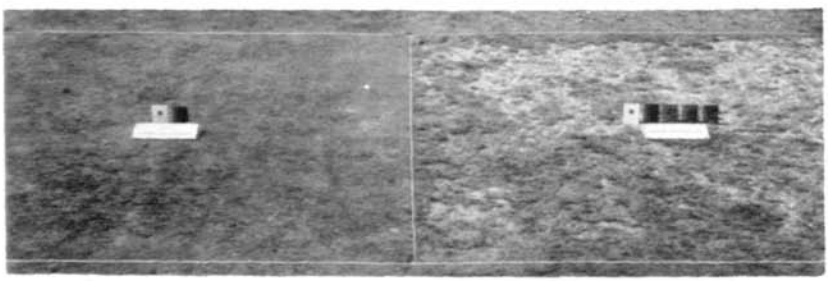
Turf Fertilizers

On the Turf Garden were seen 64 plots of bent turf to which various fertilizers and mixtures of fertilizers have been applied. These are the plots the results from which were discussed in the article on "Experiments with Fertilizers on Bent Turf" in the December, 1939, issue of Turf Culture. The unfertilized check plots were covered with a weedy, loose, open turf which had a starved appearance. Among the best plots at the time of the meeting were those which had been receiving combinations of ammonium phosphate and urea, and sulfate of ammonia and bonemeal, and the latter combination plus muriate of potash. The cottonseed meal and activated sludge plots were also in excellent condition.

The turf on excessively acid plots (pH 4.5 or less) was thin and had conspicuous large, bare areas, regardless of the type of fertilizer applied. At comparable levels of acidity, the plots which had received equal amounts of nitrogen and phosphoric

acid did not show as much turf injury as did the plots which had received four times as much phosphoric acid as nitrogen.

On the farm lawn the visitors saw two series of fertilizer tests, identical except that one had been watered and the other had not. There were no apparent contrasts in the watered series, all of the plots having been about equally overrun with crab-



Differences in the quality of bent turf resulting from the use of different fertilizer combinations for a period of 16 years at the Arlington Turf Garden. The plot on the left has received urea and ammonium phosphate in such a proportion as to supply equal quantities of nitrogen and phosphoric acid. It was one of the best plots in the series at the time of the meeting. The plot on the right has received ammonium phosphate alone at such a rate as to supply the same quantity of nitrogen as that supplied to the left-hand plot. Note the large bare areas and thin turf on the right-hand plot, which was one of the poorest in the entire series at the time of the meeting. This plot has received four times as much phosphoric acid and has developed a greater soil acidity than has the plot on the left, which received urea as well as ammonium phosphate.

grass and clover. The unwatered series presented decided contrasts between the plots which had received different combinations of nitrogen, phosphoric acid, and potash. Aside from the fact that the plots which had recently received their fall applications of inorganic fertilizers showed some burn due to high temperature at the time of application, the turf appeared as described in the results from this series of experiments discussed in the December, 1939, issue of TURF CULTURE in the article on "Experiments with Fertilizers on Bluegrass Turf."

The visitors were reminded that these contrasting plots had resulted entirely from the different fertilizer programs used. The plots had been started on an old lawn established on acid soil. No seed has ever been sown on the plots since the experiment was begun and no hand-weeding nor chemical control of weeds has been attempted on them. Those plots which had received nitrogen in combination with equal quantities of phosphoric acid showed a decided increase in turf grasses and a decrease in clover and weeds as compared with the unfertilized plots. Plots which had also received potash were not so good as corresponding plots without potash. On plots which had received lime in addition to these fertilizer elements there were still fewer turf weeds, but clover was decidedly encouraged.

Turf Nurseries

The visitors were shown the stock nurseries in which the strains of bents, bluegrasses, fescues, Bermuda and other grasses are propagated vegetatively for subsequent planting purposes. They were also shown the nursery in which the grass breeding program is conducted on bluegrasses and fescues. In this nursery, individual plants of these grasses, each produced from a single seed, are grown in rows for comparison with every fifth plant which is propagated vegetatively from the parent plant. All the plants in any one row originate from the same parent plant.

Attention was drawn particularly to the uniformity evident in both open- and self-pollinated lines among the bluegrasses. This uniformity among the progeny and the resemblance to the parent plant indicate the possibility of reproducing these

strains by seed with little effort. Among the fescues, on the other hand, there were decided differences in vigor among the seedlings, particularly in the self-pollinated lines.

Chemical Weed Control

Numerous series of experiments in connection with the chemical control of weeds in Kentucky bluegrass turf were seen on the farm lawn. In one series of plots treated last fall with three or more applications of arsenicals and other herbicides, plantain, chickweed, and in the case of arsenicals clover, had been eliminated and the turf was decidedly superior to that on the untreated plots.

Other plots on which summer treatments had been made were shown to the visitors. Severe injury to the turf grasses had resulted from the use of some of the herbicides, notably the arsenicals, and this was followed by the invasion of crabgrass, so that at the time of the meeting those plots were overrun with the crabgrass. Still other plots were seen which illustrated the burn from recent applications of herbicides; reduction of effectiveness of the herbicides caused by rains immediately following the applications; effect of recent applications on plantains; and results from treatments with arsenicals in which the injury to the turf grasses was reduced by subsequent applications of ferrous sulfate.

Another area was seen in which all of the vegetation and seeds in the top few inches of soil had been killed with tear gas (chloropicrin) and then seeded with Kentucky bluegrass. Two flats were also seen, one of which contained compost which had been treated with chloropicrin and the other untreated compost. Both flats had been maintained under conditions favorable for

the germination of seeds. In the untreated compost there was a generous sprinkling of weed seedlings whereas in the treated compost there were none, indicating that the chloropicrin had killed the weed seeds.

Vitamins and Hormones

Several 4- by 8-foot plots of creeping bent were seen which had been watered during the difficult month of August with a solution of vitamin B_1 three times a week. The turf on the plots which had received the same amount of water over the same period of time seemed to be equally as good in every way as that on the treated plots.

The visitors also saw a rather extensive series of plots which had been seeded in August with Kentucky bluegrass seed which had been treated with numerous different growth substances at different rates. As may be seen in the picture on page 112 there was no significant difference evident between the turf from any of the treated seed and that resulting from untreated seed.

Luncheon Program

After the luncheon which was served on the lawn at the Arlington Farm, there were reports from 17 districts on turf conditions in their section of the country. Plans for this part of the program were worked out by Ed Cale, Chairman of the Education Committee of the Greenkeeping Superintendents Association. Large charts had been prepared previously and as the reports were given they were recorded graphically on the charts under the headings of weed infestation, insect injury, and diseases of turf grasses, as well as temperature and rainfall figures

as compared with the normal for each district. These charts made it possible at a glance to get a comprehensive idea of turf conditions over those sections of the country represented.

These reports were followed by an interesting talk on the subject of "Forecasting Weather" by Kenneth S. Norquest of the United States Weather Bureau. He explained that the synoptic weather map is the basis of all weather forecasting systems today and then discussed the procedures which are followed in the construction of such maps. Data on present weather conditions are obtained from weather observations made simultaneously at about 750 stations in North America and on ships in the Pacific, Atlantic, Gulf of Mexico, and the Caribbean Sea. These observations which are made every 6 hours describe and measure the meteorological conditions at each place. They are then coded and transmitted to central stations or forecast centers where they are uncoded and the results charted to form an instantaneous picture of the weather over an extensive area of the Northern Hemisphere. Thus, a comprehensive weather map is produced.

However, in order to study and interpret such a surface weather map it is necessary to know conditions in the atmosphere above the earth, say to 50 or 60 thousand feet. For this purpose observations of wind direction and velocity at various levels up to 18,000 feet are now made every 6 hours at about 75 stations in the United States. In addition, observations of temperature and humidity from the surface of the earth to about 70,000 feet are made each day at about 30 stations. By charting and studying all of these observations and by observing and following the changes from day to day on the weather charts, it is possible for the forecaster to predict the weather for a day or two ahead. It is evident, therefore, that in spite of all the

improvements in the technique of map analysis and the greater knowledge of the physical processes of the weather, a great deal depends on the ability of the forecaster to properly interpret the facts which are revealed on the weather maps and charts.

Another interesting talk was that on the "Milky Diseases of Japanese Beetle Grubs" given by R. T. White of the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture. The nature of the disease was described and examples of its natural occurrence discussed. Experiments with the inoculation of the bacteria into soils were described and examples cited of such tests on several golf courses including West Chester Golf Course at West Chester, Pennsylvania; the Maplewood Country Club at Maplewood, New Jersey, and Northampton Country Club at Cape Charles, Virginia.

Such inoculations have usually resulted in satisfactory reductions in numbers of grubs. On the Maplewood course, for instance, the disease germs were introduced into the soil in October, 1938, when the average grub population was 36 to a square foot. The following June the population had been reduced to 13 to a square foot and 53 percent of these 13 were diseased. During the summer the number never exceeded 14 to a square foot and in October there were only 7 to a square foot and 30 percent of these were diseased. In the untreated areas at that time there was an average population of 51 to a square foot. In June, 1940, the treated areas were again examined. At that time four plugs, 1-foot square, were lifted and of these two contained no grubs, one contained one diseased grub and one contained two diseased grubs. Also, 50 percent of the grubs found 75 to 100 feet from the treated area were found to be infected.

A summary of the highlights of this discussion has been prepared by Mr. White and appears on page 84 of this issue. A review of other articles on this same subject will be found on page 121.

Establishment of New Bluegrass Turf

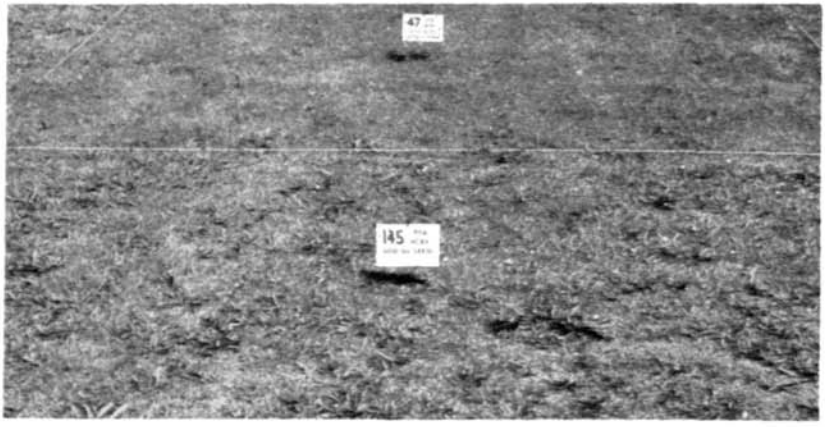
Following the luncheon and the talks, the visitors were conducted to another area where numerous series of demonstration plots have been set up by the National Capital Parks in collaboration with the Green Section. These plots told an interesting story in dollars and cents of the relative importance of seed and fertilizer in the establishment of new turf; illustrated comparative results from fall and spring seeding; and showed 1-year-old turf resulting from the use of various seed mixtures. The soil in the area on which these plots have been established was poor in all essential plant food elements, and was covered with a profusion of weeds which were merely plowed under immediately before seeding. The ground was never fallowed and the plots have not been watered nor weeded.

Relative Importance of Seed and Fertilizer

The fertilizer applied in all of the plots of this series was a 10-6-4 mixture and pure Kentucky bluegrass seed was used. Seed was sown at rates varying from 1 to 15 pounds to 1,000 square feet. The plots were seeded and fertilized in September, 1939. The best plots of the series were the ones which had received seed at the rate of 2 and 3 pounds to 1,000 square feet and fertilizer at the 40-pound rate. The total calculated cost of the fertilizer and seed used was $47 and $57 an acre respectively. Even the plot which had received seed at only the

1-pound rate but fertilizer at 40 pounds to 1,000 square feet showed a good stand of grass, although slightly more weedy than the $47 and $57 plots. This plot represented a cost of only $37 an acre.

Standing out in marked contrast with these plots which were heavily fertilized but seeded at low rates, were plots which



Relative importance of seed and fertilizer in establishing new bluegrass turf on poor soil. The dense, vigorously growing turf on the plot in the background was the result of combining an application of 10-6-4 fertilizer at the rate of 40 pounds to 1,000 square feet with seeding Kentucky bluegrass at the rate of 2 pounds to 1,000 square feet. The estimated cost of materials used in this practice was $47 an acre. Contrasted with this good plot is the thin, weedy turf on the plot in the foreground, which resulted from seeding at the rate of 15 pounds to 1,000 square feet with seed from the same source but not applying any fertilizer. This practice involves a cost of $145.

had been seeded at heavy rates. The plot, for instance, which had been seeded at the 15-pound rate but not fertilized had produced a very thin, weedy turf, although the cost for such a practice was $145 an acre. When this same seeding rate was accompanied by fertilizer at the 40-pound rate, the turf was not so good as it was on plots which had been seeded at the

2- or 3-pound rate. Earlier in the season the turf had looked good but disease had killed out much of the grass, and weeds had come in so that the final result was not so good as the result from seeding at lower rates, although the estimated cost was $173 an acre. Similar results were seen on the plot seeded at the 10-pound rate and heavily fertilized at a total cost of $125 an acre.

Fall and Spring Seedings

The above plots demonstrated the results obtained from seeding and fertilizing programs carried out in September and October. Similar programs were carried out the first of May on a corresponding series of plots. At the time of the meeting all of these latter plots were severely infested with crabgrass. In this series, however, the plots which had received the most fertilizer were covered with 100 percent crabgrass, whereas those which had been fertilized at low rates still had some bluegrass present.

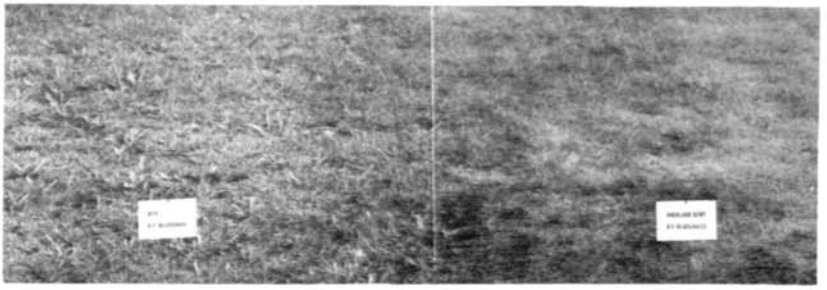
Seed Mixtures

Plots which had been seeded last fall with pure Kentucky bluegrass were compared with plots seeded at the same time with mixtures of Kentucky bluegrass and 10 to 60 percent Italian ryegrass in one series, 5 to 25 percent redtop in another, and 1 to 10 percent of Astoria, highland, and seaside bents in still other series. Some of the best turf was that on plots seeded with Kentucky bluegrass alone or in combination with small amounts of Astoria or highland bents.

The mixture containing 10 percent ryegrass had produced a spotted, shabby turf but the plot did not contain as many weeds as did the plots seeded with higher percentages of ryegrass. As

the percentage of ryegrass increased, the amount of weeds on the plots increased and the turf became progressively thinner.

Plots which had been seeded with mixtures in which the proportion of redtop was more than 10 percent had been badly diseased during the summer and weed invasion had followed in



Contrasting turf resulting from the use of two different seed mixtures. The plot on the left was seeded with a mixture of Kentucky bluegrass and ryegrass; the plot on the right, with a mixture of Kentucky bluegrass and highland bent. The picture was taken in September, 1 year after the plots were established. Note the abundance of weeds in the plot on the left, which was seeded with the ryegrass mixture, as compared with the dense stand of turf grasses and lack of weeds in the plot on the right. The right-hand plot was typical of those seeded with mixtures of Kentucky bluegrass and small amounts of Astoria, seaside, or highland bents.

the path of the disease. At the time of the meeting, therefore, the plots presented a thin weedy turf. The plots which had been seeded with 5 to 10 percent redtop had better turf than any of the other combinations in the redtop series.

Experimental Greens

The following morning the visitors went directly to the Capitol Golf and Country Club where they viewed and rated the experimental greens and were shown the weed-control and fertilizer plots on the tenth and thirteenth fairways respectively.

On the fifteenth green which has been under play for 2 years, C-15 was first choice with C-1 a close second and C-52 and C-17 in third and fourth places respectively. Later in the morning the seventeenth green which had been under play for 3 years was also rated. On it, C-36 which was not planted on the other green was first choice. C-1, C-17, and C-15 took second, third, and fourth places respectively.

Fairway Weed-Control and Fertilizer Tests

Weed-control plots were seen on the tenth fairway. Arsenate of lead had been applied at rates varying from 5 to 40 pounds to 1,000 square feet. Arsenic acid and arsenic trioxide were applied at the same time at rates which would furnish the same amount of arsenic. The crabgrass had been controlled in all of these plots. The arsenate of lead had been injurious to the bluegrass at rates of 10 or more pounds to 1,000 square feet. The other two chemicals had also been injurious when applied at comparably high rates. When superphosphate had been applied at the rate of 2 pounds of P_2O_5 to 1,000 square feet, however, less injury to the bluegrass resulted from the arsenate of lead treatment.

On the thirteenth fairway, numerous series of fertilizer plots were shown the visitors. Only a few of the results which were most interesting to them can be mentioned here. In a recent series of plots which had been fertilized with various combinations of an inorganic fertilizer on the basis of a 9-9-4 mixture, applied at an annual rate of 2½ pounds of nitrogen to 1,000 square feet, it was apparent that crabgrass was more abundant on those plots which had received potash in amounts exceeding that supplied by the unmodified 9-9-4 mixture.

On a 6-year-old series, fall fertilized plots presented better turf than did those fertilized in the spring. There were fewer weeds and less clover on the plots which had received inorganic mixtures than on those to which organic fertilizers had been applied. Clover definitely had been stimulated by a single application of lime over this period of time.

Among other plots which had been planned to illustrate the results obtained on this course by fertilizing with each of the principal elements alone and in various combinations, the greenkeepers' choice was a plot fertilized with nitrogen, phosphoric acid, and potash applied in a 12-6-4 mixture at rates sufficient to give 1 pound of nitrogen each spring and fall, without lime.

Recent plots established in 1938 indicated quicker results from complete mixtures in which the phosphoric acid was supplied in the form of treble superphosphate rather than superphosphate. The explanation offered was that perhaps the treble superphosphate had released the phosphoric acid more quickly than had the superphosphate.

After luncheon which was served in the clubhouse the visitors returned to the Arlington Farm by way of a residential area in which they stopped to see a successful planting of *Zoysia matrella* in turf. Following informal group discussions at the Arlington Turf Garden, the third annual Arlington Turf meeting was adjourned.

If the ground remains soggy for several days in good weather, something is probably wrong with the drainage. Fall is a good time to look into this and perfect the drainage where necessary, thereby avoiding much injury to the grass this next season.