Check Chemical Makeup through Clippings

How Much and What Is Cut From a Bermuda Green

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YIELD DATA and the chemical composition of clippings obtained from a Washington bent grass green at Brynwood CC, Milwaukee have been reported. Lester Verhaalen collected and weighed the clippings each time the green was mowed. A 5-lb. green weight sample was taken each week for dry weight determination and for chemical analysis in the laboratory of the Milwaukee Sewerage Commission. The samples were combined into composites, each representing a four-week period. The season's production of dry clippings was about 100 lbs. (96.7 lbs. actual) per 1000 sq. ft. of area. The plant food content was 4.83 per cent nitrogen, 1.80 per cent phosphoric acid, and 3.24 per cent potash.

Similar data had been reported by the Green Section of the USGA for bent grass. Their results were in substantial agreement with those obtained in Milwaukee.

There was no record of similar data for Bermuda grass greens. Information of this kind is valuable and can be most helpful in devising a sound fertilizer program. We decided to make a test.

The 14th green at the Memphis CC was selected as being most convenient. A data sheet upon which green weights could be recorded was prepared for posting alongside an accurate scale. The sheet had a 31-line column for each month so the weights could be entered on the line corresponding to the date of mowing. The date on which samples were collected was recorded on an adjoining column.

An outline of the green was made on cross section paper. Each major horizontal and vertical line represented 10 ft. The engineering staff of the Milwaukee Sewerage Commission used this diagram to make an exact computation of the area in the green, which was 4,340.3 sq. ft.

Separation of the foreign matter from each composite sample of air-dry clippings, dry weight determinations and the chemical analyses were made in the laboratory of the Sewerage Commission.

Fertilization affects the chemical composition of grass. The major effect is upon nitrogen. The amounts of phosphoric acid and potash do not fluctuate appreciably percentagewise, based on fertilizer applications.

Fertilization Spring and Summer

Fertilization of the 14th green during the spring and summer was as follows—indicated rates represent pounds per thousand square feet:

1. March 3, 1955 . . . 16 lbs. Milarsenite on the one-half of the green not overseeded with rye grass to control poa annua. The Milarsenite contained 3 per cent sodium arsenite and 97 per cent Milorganite.

2. March 10, 1955 . . . 40 lbs. Milorganite on the part of green overseeded with rye grass.

3. April 15, 1955 . . . 3½ lbs. ammonium nitrate — on part of green not overseeded with rye grass to clean up poa annua.

4. May 10, 1955 . . . 60 lbs. Milorganite — entire green fertilized.

5. June 6, 1955 . . . 40 lbs. Milorganite — entire green fertilized.

6. July 1, 1955 . . . 40 lbs. Milorganite — entire green fertilized.

7. August . . . 30 lbs. Milorganite — entire green fertilized.

8. The green was topdressed three times during the season using 1½ cu. yds. of topdressing material each time. The topdressing was treated with granular cyanamid at the rate of 15 lbs. per cu. yd.

Phosphate-Potash Before Seeding

Practice at Memphis CC is to use phosphate and potash in the fall before seeding to rye grass. All nitrogen applications stop about a month prior to seeding. The phosphate-potash mixture is applied a week or ten days before seeding. The rate for 20 per cent grade superphosphate has been 20 lbs. and for 60 per cent grade muriate of potash 10 lbs. per 1000 sq. ft.

Three weeks after germination of rye grass the first application of nitrogen is

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made. Milorganite is used at 25 lbs. per 1000 sq. ft. Additional Milorganite is applied during the fall and winter as needed. We think Milorganite is a good source of nitrogen for wintertime use in Memphis. With the changeable weather conditions it keeps a supply of nitrogen available for the rye grass. In this form of nitrogen, leaching is held to a minimum.

The fall before the experimental work started only 5 lbs. of muriate of potash and 10 lbs. of superphosphate per 1000 sq. ft. were put on the 14th green before seeding. The lower rates of phosphate and potash were used because soil tests indicated both these elements to be high. One hundred pounds per 1000 sq. ft. Milorganite were used on the green during the fall and winter.

Soil Sampled After Mowing

Another sample of soil was collected for testing in the fall of 1955 after mowing stopped. This seemed advisable as a check to be sure that the soil supply of phosphoric acid and potash had been ample for maximum growth. Results indicated that soil level of both elements had been satisfactory. The Truog Method was used. Results were as follows:

pH	6.8
Phosphorus	900 lbs.
Potash	550 lbs.
Calcium	11,000 lbs.
Magnesium	2,800 lbs.

Reaction was practically neutral. Levels of phosphorus, potash, calcium, and magnesium were high.

The following soil levels are considered good and adequate for all practical purposes: For phosphorus — 200 to 300 lbs., for potash — 300 to 400 lbs., for calcium — 4,000 to 5,000 lbs., and for magnesium — 1,000 to 1,200 lbs. per acre.

The quantity of clippings, dry weight, collected during the 18-week period was 120.19 lbs. per 1000 sq. ft.

Table I depicts the amounts for each of the 4-week periods and for the final 2-week period. Maximum production was during July and August.

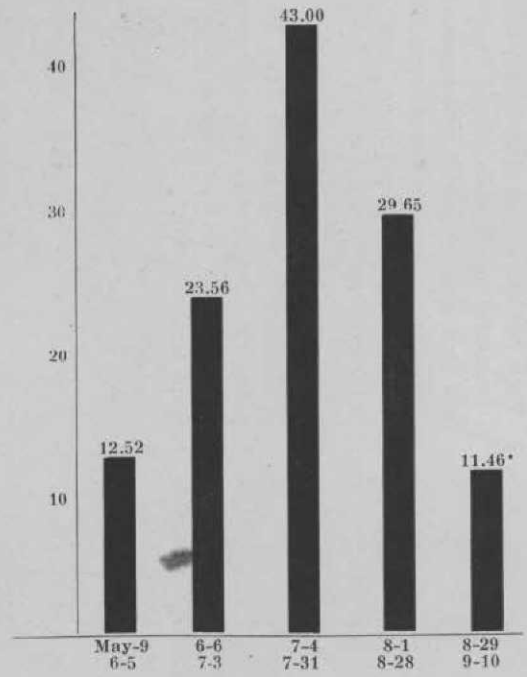
The clippings contained 4.62 per cent nitrogen, 1.35 per cent phosphoric acid, and 2.86 per cent potash on the dry basis. These figures are the average for the five periods. Nitrogen varied from 4.30 to 5.02 per cent, phosphoric acid from 1.19 to 1.53 per cent, and potash from 2.61 to 3.15 per cent.

Sulphur was determined also and reported as the trioxide. The average percentage amount was 1.18. The variation was from 0.73 per cent to 1.59 per cent.

The total amount of these four nutrient elements removed in the clippings by months only for the 18-week period is tabulated in Table II (p. 34). The figures include percentage content and pounds per thousand square feet.

TABLE I

Pounds per 1000 sq. ft. of Green Dry Weight of Bermuda Grass Clippings Summer 1955



*Two-week period—otherwise four-week periods.

Restoring Plant Food

In order to restore the average amount of each plant food element removed each month would require the following quantities of fertilizer: For nitrogen—27 lbs. of 6 per cent grade or 6.7 lbs. of 20 per cent grade nitrogenous fertilizer; for phosphoric acid—1.75 lbs. of 20 per cent grade superphosphate, or 8.75 lbs. of 4 per cent grade phosphate fertilizer; for potash—1.29 lbs. of 60 per cent grade muriate of potash; for sulphur—1.45 lbs. of 20 per cent grade ammonium sulphate, or 18 lbs. of 2.5 per cent grade of sulphur containing fertilizer.

By way of summary, a 100-lb. bag of 6-2-4 analysis fertilizer would provide

TABLE II

Analysis of Bermuda Grass Clippings
Major Plant Food Elements

Clipping Period	No. of Weeks	Nitrogen %	Nitrogen Lbs.	Phos. Acid %	Phos. Acid Lbs.	Potash %	Potash Lbs.	Sulphur—SO_3 %	Sulphur—SO_3 Lbs.
5-9 to 6-5	4	4.74	0.59	1.53	0.19	3.15	0.39	1.59	0.20
6-6 to 7-3	4	4.55	1.06	1.39	0.32	2.82	0.56	1.57	0.37
7-4 to 7-31	4	5.02	2.16	1.19	0.51	3.07	1.32	0.66	0.28
8-1 to 8-28	4	4.30	1.28	1.37	0.31	2.67	0.79	0.73	0.22
8-29 to 9-11	2	4.52	0.52	1.28	0.15	2.61	0.30	1.33	0.15
Averages		4.62		1.35		2.86		1.18	
Totals			5.62		1.48		3.36		1.22
Amount per month			1.34		0.35		0.80		0.29

enough of the three major plant food elements to restore the amounts removed in the clippings.

The clippings contained as much sulphur as phosphoric acid, for all practical purposes. The fact that plants need as much sulphur as phosphoric acid has been ignored up to now for obvious reasons. In the past sulphur requirements were satisfied automatically because mixed fertilizers have contained ammonium sulphate and ordinary grades of superphosphate, which are made by treating rock phosphate with sulphuric acid. These grades have a high content of calcium sulphate in the form of gypsum.

The triple or 45 per cent grade of phosphate does not contain sulphur in appreciable amount. It is made by using phosphoric acid instead of sulphuric acid. Unlike ammonium sulphate, the newer types of nitrogen fertilizer, such as ammonium phosphate, ammonium nitrate, urea, and the new synthetic organics of the urea-formaldehyde type do not furnish sulphur. The same is true of high analysis liquid fertilizers.

An acute shortage of sulphur is not likely in the foreseeable future, but it is an eventual possibility. Sulphur can be provided by using gypsum, a 20 per cent grade superphosphate, ammonium sulphate, or an activated sludge fertilizer.

In addition to the three major plant food elements, the laboratory made determinations of these supplementary elements: silicon, calcium, magnesium, iron, and aluminum. Results for the respective oxides are reported in Table III.

All the data as presented does not include the amount of plant food contained in the turf on the green. It ignores the requirements for root development, and anything lost as a result of fixation by the soil.

The similarity in the average precentage plant food content with the clippings from the bent grass in Milwaukee is rather striking. The nitrogen is about the same but the Bermuda grass clippings contain somewhat less phosphoric acid and potash. Both these elements have played a lesser role in Bermuda feeding programs than for bent grass in the North. Their excessive use emphasizes the natural tendency of Bermuda to become stubbly.

To produce the best type of Bermuda for putting greens the grass should receive minimum requirements of phosphate and potash and enough nitrogen to keep the grass leafy and vegetative.

TABLE III

Analysis of Bermuda Grass Clippings
Supplementary Plant Food Elements

Sample No.	Period Weeks	Dry Weight Pounds	Silica (S_1O_2) %	Silica (S_1O_2) Lbs.	Calcium (CaO) %	Calcium (CaO) Lbs.	Magnesium (Mgo) %	Magnesium (Mgo) Lbs.	Iron (Fe_2O_3) %	Iron (Fe_2O_3) Lbs.	Aluminum (Al_2O_3) %	Aluminum (Al_2O_3) Lbs.
1 and 2	8	36.08	1.69	0.61	0.93	0.34	0.43	0.16	0.17	0.06	0.14	0.05
3	4	43.00	1.57	0.68	0.74	0.32	0.32	0.14	0.14	0.06	0.21	0.09
4	4	29.65	1.96	0.58	1.19	0.35	0.32	0.14	0.31	0.09	0.41	0.12
5	2	11.46	2.29	0.26	0.56	0.06	0.57	0.07	0.16	0.02	0.17	0.02
Averages			1.88		0.86		0.41		0.20		0.23	
Totals		120.19		2.13		1.07		0.51		0.23		0.28