The A B C of Turf Culture

Conducting Experiments With Milorganite

By O. J. NOER

Experiments on New Greens

UNDER favorable conditions rapid development of dense turf on new greens depends upon the supply of plant food. Nitrogen, more than any other element, promotes the vigorous vegetative growth which results in quick formation of heavy uniform turf. Yet too much nitrogen may produce a coarse textured turf.

In a number of trials Milorganite proved to be an excellent source of nitrogen for new greens. Wherever possible all other fertilizers, including manure, were omitted. Soil of suitable physical condition was obtained by the use of sand or soil. Milorganite, at the rate of 50 to 60 pounds per 1,000 square feet of greens was spread uniformly over the surface and worked into the soil prior to planting the stolons. Manure and fertilizers were omitted from the soil and sand mixture used to cover the stolons, but some Milorganite was used in subsequent top-dressing. These consisted of a mixture of sand, soil and Milorganite.

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Editor's Note: Mr. Noer is now at the head of the Educational Bureau of the Milwaukee Sewerage Commission. During the past four years he has investigated the fertilizer value of Milorganite at the Soils Department, University of Wisconsin, under a fellowship established by the City of Milwaukee.

Excellent turf was quickly produced by this treatment, and the benefits from the Milorganite extended into the following season. In one trial, a green received the above treatment, and on an adjacent green manure was worked into the surface soil and subsequent top-dressings contained manure compost. The turf closed in on the Milorganite treated green first, and early the next spring the superior color of this green was easily visible at a distance of 80 rods.

The practice of imbedding manure in new greens serves no useful purpose. The plant food is placed beyond reach of the turf roots, and the large quantity of organic matter encourages worms. Uneven settling which often occurs may leave poor putting surfaces. The value of manure in the surface layer of soil is often over-emphasized. Soil of proper physical condition may be obtained by the sole use of sand or clay, although there are some instances where manure should be used. The manure may introduce weed and clover seeds, and encourage clover by virtue of the lime and potash it contains.

Experiments on Turf Nurseries

Very striking results were obtained with Milorganite on a number of turf nurseries where the stolons were planted broadcast. The Milorganite was spread over the surface and worked into the soil on a portion of the nursery prior to planting the stolons. These treated areas were the first to close in and were completely covered with turf long before the untreated areas.

Experiments on Established Fairways

Established fairways often require fertilization and are best improved by the use of nitrogen. Phosphate and potash encourage the growth of clover and should be used sparingly if clover is not desired. It is best to apply the fertilizer early in the spring. During the mid-summer dry weather often obtains and most fairway turf becomes dormant. It is difficult to improve turf by the use of fertilizers at this time.

Milorganite was compared with sulphate of ammonia as a source of nitrogen on an old established blue grass sod. These materials were applied early in the spring at the following rates: Milorganite 1,000 pounds per acre and sulphate of ammonia 200 and 400 pounds. Results from the sulphate were visible after the first rain. Growth was so rapid that frequent mowing was necessary, but as the season advanced it was evident that growth was not being sustained. The 400 pound rate of application maintained growth very well but the turf required very frequent mowing. While Milorganite did not produce such quick results, it soon imparted a good color to the turf and sustained uniform growth throughout the season. The turf did not require such frequent mowing.

Where quick response is desired a combination of Milorganite and sulphate of ammonia gives excellent results. The small amount of sulphate produces initial growth and the Milorganite then sustains the turf through the balance of the season. A mixture of 50 pounds sulphate of ammonia and about 750 pounds Milorganite have been effective.

Experiments on New Fairway Seedings

Good turf once established is easily maintained, but thin patchy turf is difficult to improve by subsequent reseeding or fertilization. The small grass seed contains very little stored plant food. Unless the tender young grass seedling obtains an abundance of plant food, development is checked and many seedlings often fail to survive because of unfavorable conditions for further growth. Fertilizers encourage early development of an extensive root system, promote vegetative growth and thus aid in the rapid establishment of heavy dense turf. With August seeding it is possible to obtain uniform heavy turf able to withstand adverse winter weather, and early the following Spring it is in surprisingly good playable condition. The cost of fertilizer, compared with the cost of seed and soil preparation is so small, and the difficulty of improving poor turf is so great that fertilizers should be more generally used. Fertilizers should be used even on the better soils. They hasten growth and consequently aid in quickly establishing good turf.

Prior to seeding, fertilizers can be worked into the surface layer of soil to a depth of several inches. This places the plant food in the soil zone where root development occurs, and since surface applications of some fertilizers do not readily penetrate into the soil, better results are obtained when the fertilizer is applied before seeding. Benefits from such applications extend over several seasons.

In a number of trials very striking results were obtained from the use of Milorganite and acid phosphate. No benefits were obtained from the use of potash in addition, although its use in limited quantities may prove beneficial on sands and mucks. The phosphate stimulated root development and insured a uniform stand of turf. The nitrogen of Milorganite then promoted rapid vegetative growth and an excellent turf resulted. Benefits extended into the succeeding season.

Fairway seeded in August, photographed following May. Center strip received 1200 pounds Milorganite and 250 pounds acid phosphate per acre. Note poor stand on unfertilized area in background and foreground

Milorganite was applied at the rate of 1,000 to 1,200 pounds per acre and acid phosphate at 250 to 300 pounds per acre. Uniform distribution was obtained by the use of a hopper type lime and fertilizer distributor. The contents of a bag of Milorganite was spread over the bottom of the hopper and the proportionate amount of acid phosphate was sprinkled over it. The two were then mixed by hand or with a shovel. Successive additions were made until the hopper was filled. Fertilizers were applied just prior to seeding and worked into the soil with a disc or Scotch chain barrow.

Results from the use of fertilizers were obtained in every case of Fall seeding. Turf was slow in establishing itself on the unfertilized areas, and was often patchy. Where the fertilizer was used dense heavy turf was obtained by October with August seedings. During severe winters the unfertilized turf was badly winter-killed, and where Milorganite and acid phosphate were used the turf came through the winter in excellent condition. The uniformly successful results indicate that fertilizers should be more generally used on new fairway seedings.

Milwaukee's new sewerage disposal plant is now in operation and will produce approximately 35,000 tons of dry fertilizer per annum. The plant is unique in that it represents the first successful attempt at large scale production of fertilizer from sewage. This is made possible by the use of the new "Activated Sludge" process which is the only one capable of converting the plant food elements contained in sewage into a high grade fertilizer.

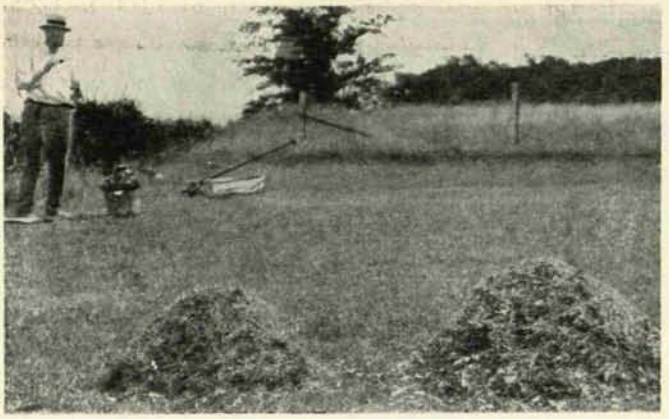
The necessity of obtaining reliable information regarding the fertilizer value of this new material was early realized, and accordingly a fellowship was established by the Commission at the University of Wisconsin. Investigations, conducted during the past four years have been concluded, and it now seems advisable to present briefly some of the most important results pertaining to the use of Milorganite on golf courses.

Nature and Composition of Milorganite

Milorganite is a dark brown granular material of uniform composition, absolutely free of weed seeds and harmful bacteria of all kinds. It has the following average composition:

Nitrogen (equivalent to ammonia)	6½%
Phosphoric Acid	2½%

While most of the nitrogen is not in a form which plants can use directly, soil processes convert the nitrogen into available forms gradually. Thus loss from leaching is avoided, and a uniform and continuous supply of nitrogen is assured. Milorganite is an absolutely safe material to use because it does not burn or injure the growing plant.



Two piles of grass clippings from equal areas of old established fairway. Pile on left cut from unfertilized area. Pile on right cut from area fertilized with Milorganite at rate of 1000 pounds per acre

A green planted with stolons early in August and photographed October 5. Note the thick and uniform stand of grass resuling from an application of 250 pounds of Milorganite which was worked into surface soil prior to planting

Experiments on Established Greens

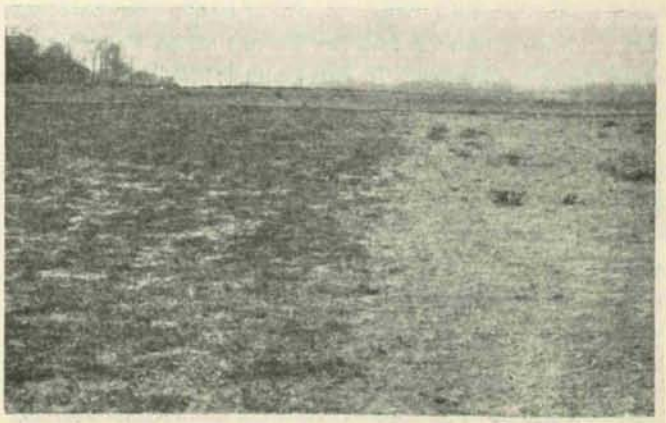
Nitrogen is generally the most critical element in turf culture, since it is responsible for active vegetative growth and dark green color. Established greens are in especial need of a uniform and continuous supply because they suffer constant losses. The amount of nitrogen removed in clippings during a season is considerable, and heavy watering results in further losses of soluble nitrogen due to leaching. Milorganite should be an ideal source of nitrogen for greens because its nitrogen is gradually converted into available forms as needed by the turf. This provides for a long feeding, and minimizes the danger of loss from leaching.

In preliminary experiments broadcast applications of Milorganite did not produce the desired results. Apparently the dense mat of turf particularly on creeping bent greens prevented the Milorganite from penetrating into the soil where its nitrogen is converted into available forms. To overcome this Milorganite was mixed with sand and soil top-dressing mixture, and after standing ten to fourteen days the mixture was applied to the green as a top-dressing. Excellent results were obtained because this method insured inoculation with the soil organism which convert the nitrogen into soluble forms. Later equally good results were obtained by scattering Milorganite uniformly over the surface of the green and then a top-dressing of sand and soil mixture was applied over it.

Applications of 35 pounds per 1,000 square feet of green produced excellent results, and maintained satisfactory growth over periods of at least six to seven weeks. It was found that three times this amount (100 pounds per 1,000 square feet) did not injure or burn the turf.

Whenever possible manure was omitted from the top-dressing mixture. Suitable mixtures were obtained by varying the proportion of sand or soil. Such mixtures containing Milorganite as the sole source of nitrogen proved fully as effective as where manure was used. Where local soil conditions permit, mixtures consisting of Milorganite, sand, and soil can be made and used immediately. Milorganite does not require long composting, because it is free of weed seeds and already possesses good mechanical condition. Manure requires long composting to kill weed seeds and to obtain a mechanical condition which permits screening. This requires more work and necessitates anticipating top-dressing requirements. Manure also contains considerable lime and potash. Both may encourage clover.

Milorganite sustained growth over a longer period than sulphate of ammonia, but was a little slower in producing initial results. It has little effect on the soil reaction. Where an acid soil is desired both materials can be used to advantage. The sulphate regulates the soil reaction and induces initial growth which is then sustained over a long period by the Milorganite. These two materials can be mixed and then incorporated with the sand and soil top-dressing. This method insures uniform distribution of the fertilizers in the top-dressing mixture and reduces the danger of injury from the sulphate of ammonia.



Turf nursery planted in September and photopraghed following May. Area fertilized at rate of 2000 pounds Milorganite per acre is clearly shown at left of picture. Unfertilized area at right required replanting