ing unless it is very pure, will only add to the weed population.

Next we must keep the seed bed damp at all times. This often requires handwatering several times a day if it is a little windy and dry. Some Supts. have used plastic coverings with very good results. If your damage is not severe enough to overseed you probably will only need to plug out the bad spots. If they look like they might make it by themselves you should guard against a disease attack by using your normal fungicides at half strength. An occasional light fertilization with liquid fertilizers will also be beneficial.

RECOMMENDATION:

Do your damndest to grow grass.

Information for this article was obtained from Dr. Mike Britton, Jim Holmes and a text book entitled "Introduction To Plant Physiology" by Curtis and Clark.

SPRING DINNER DANCE

On Saturday, April 14, the Midwest Association of Golf Course Supts. held its annual Spring Dinner Dance at the St. Andrews Country Club. Over 100 people attended the function in the newly constructed portion of the Clubhouse. The food and music as arranged by Bill Brady, and his Entertainment Committee, was out of this world. Amos Lapp and John Ebel and their wives were very gracious hosts.

Door prizes were awarded to the lucky people with the right tickets. They were: Mrs. John Ebel, Mrs. Frank Dinelli, Mrs. Frank Kohler, Mrs. Al Hinst and Mrs. Bob Duguid. Other prizes were won by Mrs. Pasco, Mrs. Wally Walmeldorf, Mrs. Russ Reed, Mrs. Ed Stewart, and Mrs. Frank Krueger. Still other door prizes were presented to Mrs. Carlson, Mrs. Warren Bidwell, Fay Lucas, and Mrs. George Dalman.

We would like to thank the various Distributors for their wonderful gifts for the door prizes.

MEMBERSHIP IN THE GCSAA

Class A Charter	23
Class AA	28
Class A	1387
Class B	187
Class C	30
Class D	41
Class E	165
Class F	74
	1935

THE ADEQUATE MAN

The need of the world is the adequate man, the man who is ready, who knows, and who can; the man who can rise to the need of the hour and meet it with courage and knowledge and power. The man with a mission, the man with grace to fill without flinching his God-given place; the man with a conscience; the man with a mind - kind enough to be strong, strong enough to be kind. The man who is master of what he must do, with the will and endurance to follow it through; the man who is fearless his pathway to plod, because he is consciously walking with God. The man with the wisdom to choose and decide with a justice unfailing, a sympathy wide; the man with a vision, the man with a plan - the need of the world is the adequate man.

LIME IN THE LIFE OF THE PLANT (Cont'd)

O. J. Noer

There are other notable examples where lime helped grass retain color during the early stages of drought notably at Brookline in Massachussetts where the benefit showed in June 1954 from an application made during the same month of 1934, exactly 20 years to the month. Just before the National Open Tournament a lime line was placed around each green to show spectators where to stop. The grass was better along the lime line in 1955, despite an overall application of lime after the striking results were noticed in 1954.

The use of lime to correct soil acidity is stressed most. Acid soils develop in humid regions where the annual rain fall is 20 inches, or more. As water percolates down through the soil it leaches calcium, magnesium, sodium and potassium in that order. Yet sea water contains sodium chloride mostly, 35,000 parts per million, or 3-1/2 percent. Calcium and magnesium are used to build shells by crustacea. Otherwise sea water would have a milky, opalascent appearance.

Carbonic acid in the percolating water is the principal solvent. The calcium becomes calcium bicarbonate. Its solubility is definite but low. When calcium, and the other bases are displaced from the exchange complex, hydrogen takes its place to produce an insoluble acid capable of releasing acid hydrogen.

Soil acidity is expressed as pH (potential hydrogen) with 7 as the neutral point. Figures below that denote increasing acidity. It is a geometric progression, so 6 is 10 times, 5 is 100 and 4 is 1,000 times more acid

than neutral. This is one reason why it takes much more lime to change pH 4 than is needed at pH 6.

Soil reaction has a direct effect upon plant population and an influence upon the availability of soil nutrient elements.

Alfalfa is a lime loving plant. It fails in moderate to strongly acid soil. A few plants require an acid medium, or special care. This class includes gardenias, rhododendrons and azaleas. All of them develop marked iron chlorosis on non-acid soil. Their power to assimilate iron seems to be feeble. Potato growers control scab by growing the crop in acid soil because the disease producing organism is helpless when reaction is below pH 5.5.

Among grasses blue grass is a lime lover, fescues and bent can make normal growth in moderate to slight acidity. They predominate in New England because soils there are acid mostly. Velvet bent withstands acidity best, among cool season grasses. When it takes over the soil is usually strongly acid. Centipede is the one grass that demands an acid soil for normal growth. Otherwise it turns yellow and will succumb unless soluble iron is used as a foliar spray. A good way to be rid of centipede is to make a generous application of lime.

The best reaction range for most soil nutrient elements is pH 6, 0 to 7, 2. Phosphorus availability is reduced by alkalinity and by acidity below pH 5.7, or there abouts. In acid soil phosphorus becomes difficultly soluble aluminum or iron phosphate. As acidity increases most of the basic elements become more soluable. Some of them may become toxic as a result. Copper toxicity as the result of the use of Bordeaux mixture to control disease during the acid era is a good example. Its toxicity can be stopped by applying a little lime hydrate. It precipitates the copper as a basic salt. Very finely ground limestone will do the same thing, but is a little slower acting.

On strongly acid soil the safest and best plan is to reduce acidity gradually by applying some lime twice or once a year. Benefit from the lime will be obtained even though the reaction change is slight. A very heavy application may disturb soil equilibrum, and may immobilize basic elements including trace elements such as copper, manganese, etc. For all practical purposes the best range of pH is 6.0 to 6.5. It is a desirable one for plants, and favors availability of soil nutrient elements.

Soil, reaction exerts an effect upon soil micro-organisms. A very slight to neutral reaction is best for them. Fungi tend to predominate in acid soil. Lime and soil reaction may affect turf grass diseases. They are caused by parasitic fungi for the most part. In 1927 Joe Valentine of Merion in Philadelphia questioned the Green Section ban on lime. He applied lime hydrate to half a Washington bent nursery. Three weeks later there was a bad attack of dollar spot. Although bad on the unlimed part of the nursery, not a spot appeared where he had applied the hydrate. A fungicide could not have been more effective. Frank Dinelli used ground limestone on one of two adjacent fairways at Northmore. The reaction was pH 5.5 to 5.7. That summer dollar spot was bad on the unlimed fairway but not on the limed one. So there are times when lime has a marked effect on disease. This does not mean that it can replace fungicide. However it could enhance their efficiency.

Thatch development is somewhat analogous to peat formation. Both consist of partially decomposed plant residues. Peat forms under waterlogged conditions. But moss peat forms in the presence of air on strongly acid bogs.

On the permanent pasture plots at Rothamstead in Britian it is necessary to use lime periodically to neutralize the organic acids formed in the plant residues so they will undergo decay.

Aside from mechanical methods, the prevention of thatch, and its control is a matter of making conditions favorable for the growth of cellulose decomposing organisms. They need a reaction near neutrality along with calcium to neutralize acid by products of their activity, some moisture and enough nitrogen for them and for the grass.

Hydrate at 2 to 5 pounds per 1,000 square feet, dusted over the surface of scalded greens in hot weather does wonders, no matter what the soil reaction. Frequently it is more beneficial than fungicide. Some ascribe benefits to the drying effect of hydrate. It may be a factor but the marked effect hardly seems that simple. Under hot anaerobic conditions some of the decomposition products may be toxic to the grass. In that case the calcium salt of the toxic organic substance is insoluble. Then they would lose their toxicity. This statement must be taken with reservations until put to test. However, Truog proved that lime counteracts the toxicity of organic acid compounds. Schreiner extracted many such compounds from soil. Their presence in greens as a result of anaerobic decomposition would lend credence to such a hypothesis.

The neutralization of an acid soil is based on the use of substances that contain a very weak decomposable acid, or a material in which water is the by product of the reaction. Ground limestone and lime hydrate fulfill these conditions. With limestone carbonic acid is the reaction by product. It becomes carbon dioxide gas and water. When lime hydrate reacts with an acid soil water is the only by product. Blast furnace slag can be used but it is only about half as efficient as limestone. Slag is calcium silicate. When it reacts with acid soil silicic acid is formed. Then this feeble acid dissociates into silica which is quartz sand.

There are two kinds of soil acids to deal with. One is the active soluble acid in the soil solution. The other is the residual or insoluble acid in the exchange complex consisting of humus and clay mostly. They are related because the active acidity is derived from the exchange complex. Otherwise 1 pound of lime hydrate would neutralize all the active acid in an acre to plow layer depth. In practice the exchange complex keeps generating more acid. So the problem is to saturate it with calcium.

The amount of lime to use depends upon the soil pH and the texture of the soil. It takes much more lime to change a clay from pH 4 to pH 5 because of its high exchange capacity, than to do the same thing to a sand or sandy loam. These factors, along with kind of grass, have been taken into account in compiling the table for the use of lime which is a part of the lime bulletin which will be made available to you at the conclusion of the meeting.

Our purpose tonight has been to emphasize the importance of lime, calcium and magnesium in the growth of plants. The use of lime is justified when soil is more than slightly acid, and otherwise when the levels of exchangeable calcium and magnesium are low, irrespective of reaction. Lime helps grass survive adversity. When its use promotes growth of tops or roots it is apt to be because of a soil defeciency in calcium or magnesium if dolomite was used.