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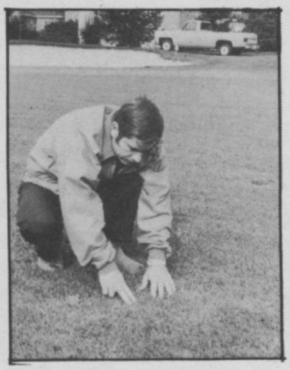

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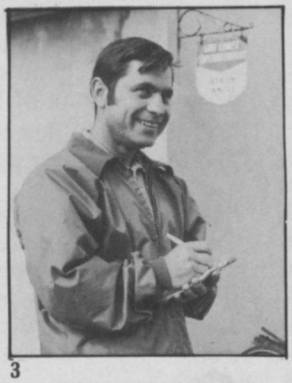

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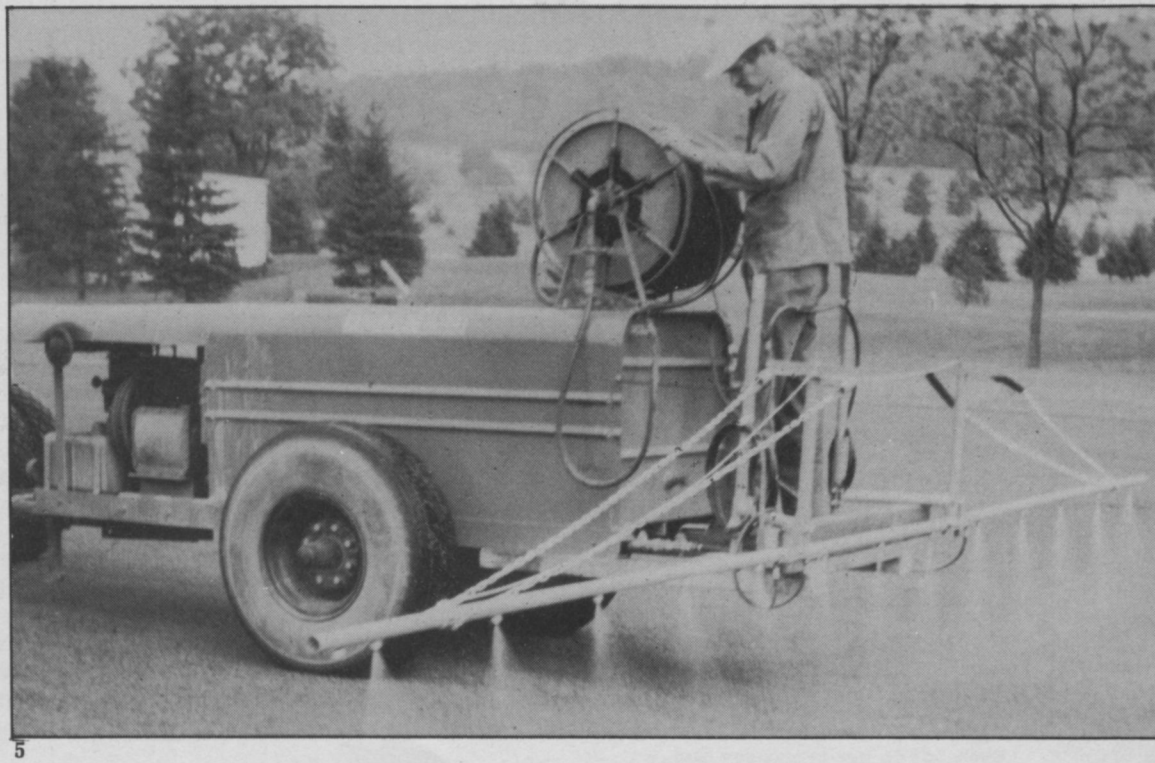
1. *Disease conference brings together Byron Knoll of Moselem Springs Golf Club and Neil Wenning (right), technical representative for a major chemical firm, as they check for Fusarium blight on treated area.* **2.** *Continuing checks are vital in disease prevention programs. Knoll is on his course every day looking for subtle changes in health of grass.* **3.** *Careful tests and accurate record keeping are essential in developing a successful disease control program says Knoll.* **4.** *Disease problem on Waynesborough fairway shows how Fusarium blight looks at initial stages. Small patches spread rapidly when disease pressure is heavy.* **5.** *Fungicide boom application at Moselem Springs shows how material is evenly applied for maximum disease control.*



5

five percent of our maintenance budget. It was a sound investment for this particular growing season."

Spot Treatments at Heidelberg

At the Heidelberg Country Club, Superintendent Harry Carlson has built his preventive program for Fusarium blight control around spot treatments. The Heidelberg Club in Bernville, Pa., has been developed with Merion blue grass on the fairways and Penn Cross bent grass on tees and greens. Carlson has been familiar with Merion for many years. His maintenance program features an annual renovation period beginning after Labor Day, with each nine holes of the Heidelberg course being closed in turn for five days for thatch removal, fertilizing, top dressing and other work.

"We get heavy play in October and November," notes Carlson. "We have a sizeable membership, plus various outings — and the course is open seven days a week. We have found that the annual renovation period is vital to keeping the turf in top shape."

Fusarium blight has turned up as a relatively new problem, according to Carlson, who recalls its initial appearance in the late 1960's. He has not been shooting for complete control. At Heidelberg he has been following a program of spot treatments with "Tersan" 1991 that follow several applications of "Tersan" LSR in the spring and are combined with heavy watering. This minimizes disease appearance and pressure. Carlson applies an inch of water every week — which, of course, is supplemented by rain.

"We spot treat areas with the fungicide where we have disease," says Carlson. "And we have been able to keep Fusarium pretty much under control, so golfers can almost always play summer rules. We recognize that as our course gets older (it was built in 1967) we may have to step up our disease control program."

New ideas in disease control are not likely to be overlooked at Heidelberg, even including rearranging the order or sequence of mowing of holes on the course to help minimize disease infection. In 1974, Carlson applied the fungicide in mid-June and again in early July. In 1975, he anticipates a third application to be scheduled in late July to avoid breakouts of the disease.

"We apply our chemicals with a 21-foot boom sprayer, and we do all our spraying in the morning when the dew is on the grass," says Carlson. "Our applicator is a farmer who does some crop spraying, too. Know-how is very important if you are going to keep disease under control."

Every year is somewhat different in Carlson's experience. The confidence he has gained in timing of disease control sprays will be useful in dealing with weather variations in his area in the future.

Three Years at Waynesborough

Work with Fusarium blight control started at the Waynesborough Country Club in Paoli, Pa., in 1971, when superintendent John Segui tested the fungicide at 2½ ounces per 1000 square feet. The rate was too low. The following year he boosted his rate to 6 ounces and gained limited control with applications being made in early July and in mid-August. Then in 1973, he added a third treatment in one area and observed good control of the disease in treated areas.

"We got our best control with three treatments last season," says Segui "in areas where we had treated in 1973 as well. Two years of successive treatments obviously produce better results. It was quite striking on a fairway that had a 20-foot untreated strip with disease carrying over from 1973."

The turf disease first appeared at the Waynesborough Club in 1970. Segui, whose experience dated from 1959 at other clubs, knew he had a problem — and in 1972 he set up a criss-cross block pattern for his fairway trials, so he could observe results at varying rates of application. The tests showed that "Tersan" 1991 provided the longest control.

"The initial treatment in 1973 stopped the disease cold," recalls Segui. "You could see the edge of our treatment clearly outlined. That's what helped convince our Greens Committee to move ahead with a larger program."

The 1974 program was featured by boom applications early and late in July and again in August, with spray patterns being criss-crossed on alternate applications to insure maximum control. Fusarium blight was checked everywhere, except on the two fairways with the heaviest disease infestation; here there were some signs of disease in early September. Progress of the program has been followed closely not only by superintendent Segui but also by all seven members of the Greens Committee, who began to ask that the fairways be widened when they realized that summer rules would be practical through the season. When the fairways were widened by close trimming of the grass, Segui noticed that Fusarium blight was in the rough, so he initiated the practice of hanging half of the boom in the rough during spray treatments. The disease had never been spotted when the grass had been taller.

"We'll be continuing our control efforts this coming season. I'm looking for improved results as we become more effective with our timing of applications."

Practical experience added to the recognized disease control potential of the fungicide will go a long way toward keeping Fusarium blight under control. That's the lesson at Moselem Springs, at Heidelberg, and at Waynesborough Country Clubs. Input from Dr. Herb Cole, Jr., plant pathologist at Penn State has been essential in all cases — the course experience of knowledgeable superintendents has been equally important in obtaining good control of a tough disease.

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Drive wheels are well back from the mower allowing the batwings to reach. In tight areas, just raise the retractable batwings.

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Front-wheel hydrostatic drive and four oversize high-flotation tires give unbelievable stability on uneven or sloping terrain.

Tackles mowing jobs head-on with up-front features

This one was designed from the turf up as a true grounds maintenance tractor with new up-front features and attachments to handle tough groundskeeping chores all year long. That's what makes the Front Runner GMT so different from scaled-down farm tractors designed primarily to pull implements. Its cockpit and attachments are up front where they belong for unrestricted visibility. Front-wheel hydrostatic drive provides sure-footed stability and one-lever control of instant forward/reverse and infinitely variable speeds to 11 mph. Articulated steering gives exceptional maneuverability to work easily in tight areas and around obstacles. Choose from 16 or 19.8 hp models.

Cut the grass before the tires flatten it with 48", 60" or giant 80" batwing mower heads. All are front-mounted and hydraulically operated. Mower heads float to follow ground contours, prevent scalping and allow a smooth, level mowing job. Vacuum Pickup attachment gathers clippings as you mow and deposits them into its own 20-bushel collection box — no need for a trailer. You won't find another mower with all the up-front features the Hesston Front Runner has to offer, and we're willing to prove it. Ask your Front Runner dealer for a demonstration.

For mowing, vacuum pickup, snow removal, earth moving, the Front Runner is the new look of leadership in grounds maintenance equipment.

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Government News·Business

EPA's Office of Research and Development (ORD) is undergoing major reorganization. The revised ORD will consist of four offices: Office of Monitoring and Technical Support; Office of Energy, Minerals and Industry; Office of Air, Land, and Water Use; and Office of Health and Ecological Effects. Each office will be headed by a Deputy Assistant Administrator. The program will be implemented by the 15 ORD laboratories. ORD previously had 24 field laboratories administered by four National Environmental Research Centers. "This new organizational structure streamlines and simplifies program planning and program implementation," said Dr. Wilson K. Talley, assistant administrator for research and development. "One of the key benefits of this realignment...is the shifting of more detailed program management activities to the field and the resultant freeing of headquarters staff to improve coordination both within EPA and with groups external to the agency." The new organization plans to be in full operation by July 1, 1975.

Agrico Chemical Company plans to construct a new ammonia plant at its Verdigris, Oklahoma, fertilizer complex. Construction of the new 425,000 tons-a-year plant is scheduled to start this year and should be in operation in 1977.

A triple damage patent infringement suit against Garden Pro, Inc., a Brownsville, Texas, garden care equipment manufacturer, has been filed by Weed Eaters, Inc. The suit asks triple monetary damages on profits made by Garden Pro as a result of alleged patent infringement and requests the court to provide injunctive relief by preventing Garden Pro from manufacturing and marketing its "Spin Trim" product.

U. S. Department of Labor will hold public hearing beginning June 23 on a proposed standard that would protect workers against excessive workplace noise exposures. OSHA announced the proposed standard on October 24, 1974, requesting public comments no later than December 9, 1974. To accomodate public requests for additional time, the deadlines were later extended to January 22 and then to March 21. Requests to appear at the hearing, to begin June 23, in the Department Auditorium, Constitutional Avenue between 12th and 14th Streets, NW, Washington, D. C., should be submitted to J. Arnoldus, OSHA Committee Management Office, Room 200-MNWA, 1726 M Street, NW, Washington, D. C. 20210.

President Gerald R. Ford recently issued a statement establishing his Administration's intention toward a metric conversion program in the United States. It reads as follows:

> "It is important that the United States develop a national plan to direct the voluntary conversion to the metric system as the standard of measurement. Accordingly, my Administration will soon submit the 'Metric Conversion Act of 1975', which will establish a United States Metric Board to plan and coordinate the predominant but not exclusive substitution of metric measurement units for customary measurement units in education, trade, commerce, and all other sectors of the economy. The legislation is designed to encourage efficiency and minimize overall costs.
>
> "The (American) National Metric Council and other similar groups have done much to smooth the way to metric conversion. Such continued efforts will be very important to its final realization."

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THE SEED LABEL

By JAMES CONVERSE, Proturf Division, O.M. Scott & Sons

IN CONSIDERING expenditures for turf there is often less concern about the purchase of seed than any other cost. Whether planting new areas, or overseeding, it is well to be completely informed about the seed we place in the ground. Unfortunately, the seed label is taken at face value and appears to be simple and straight-forward. But, it implies many things and fails to clarify others. Anyone who encounters frequent planting situations should be familiar enough with the label to analyze all possible unseen consequences.

The most imposing figures on any label are the percentages of each seed variety. But, we must constantly remind ourselves that a label reading 50% Kentucky bluegrass and 50% Highland bentgrass is not going to grow into 50% Kentucky bluegrass and 50% Highland. The label merely states that 50% of the **weight** of a package is Kentucky bluegrass and the remaining 50% is Highland bent. For it takes 9,072,000 seeds of Highland bent to make a pound and only 2,177,280 seeds of Kentucky bluegrass. Thus, this package which seems to be an apparent 50-50 mixture actually amounts to 81% Highland bentgrass and 19% Kentucky bluegrass.

To begin with, a mixture of 80% Kentucky bluegrass and 20% Highland bent is not compatible, but even if the buyer were aware he might consider the bent to be in modest, insignificant proportion. In reality this man will plant 1,814,400 bentgrass seeds and 1,714,824 Kentucky bluegrass seeds. The great variation in seed count per pound graphically illustrates why we must look beyond the percentages on the seed label. Percentages merely indicate the weight of each variety in the container. What we must learn, or have easy reference to, is the number of seeds in a pound of each variety.

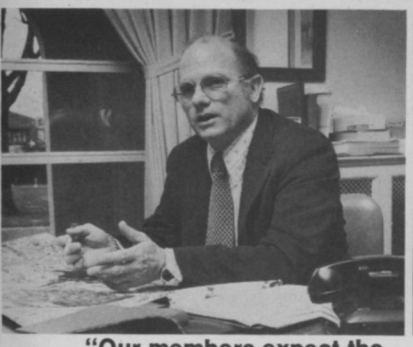
There are other figures on the seed label which appear insignificant, but require full understanding. For instance, **purity** is an indication of quantity and not the quality of a given variety. Even though seeds are pure, not all are capable of germination and growth.

Another seed label term is **germination.** This is the percentage of pure seed that is capable of beginning growth within a prescribed period of time. Unfortunately, not all seeds have the same strength, the same rate of growth, or the same survival rate. So, the percentage of germination merely indicates seeds that will start growth and not necessarily those that will end up as turf. To determine how many pure seeds will germinate, multiply the percentage of purity by the germination percentage. Example: the label says the purity of Kentucky bluegrass is 90%, the germination 80%. By multiplying the two we find that only 72% of the lot will be pure, live seeds. When we consider the mortality rate from various factors, the percentage of possible growing plants is again decreased.

Other terms that may appear on the seed label are **crop, weeds, noxious weeds** and **inert.** Each has a meaning, or significance, that will directly affect the quality of the final package. In most instances the percentages that represent these terms appear so trivial as to lack importance. But, they do play a major part in determining the final quality of mature turf.

(continued on page 45)

Take Away Spray Worries. Add Exhalt 800.



"Our members expect the course to be in top playing shape at all times. This year, I made no changes except for adding Exhalt 800 to our regular sprays. That change made a real difference. Hard-to-maintain places are in better condition; in fact, so are all greens and fairways. I'll continue using Exhalt 800. I'm convinced."

Robert DePencier, Golf Course Supt.
Westchester Country Club Rye, N.Y.

"Two years ago, I began testing Exhalt 800 with my fungicide sprays. The results were so conclusive —in a period of severe disease pressures on healthy turf—that I now include it in my regular spray applications. Our greens and fairways never looked better or played as well."

Ronald C. Boydston, Golf Course Supt.
Rockland Country Club Sparkill, N.Y.

Your pesticide keeps working longer, when you add Exhalt 800 Sticker Extender to the solution.

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There's another benefit as well. By giving you longer control periods with your pesticide, we help give you better control over your budget. No need to re-spray after an unexpected shower.

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Exhalt 800. The Sticker-Extender that gives you Protection-Plus. Minus worry.

Exhalt800™

Sticker-Extender

Crop Protection Division Kay-Fries Chemicals, Inc. Stony Point, N.Y. 10980

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Minerals and Management

Measuring the Nutritive Values of Gypsum

By DR. GUY TERWARI, U.S. Gypsum Co., Des Plaines, Ill.

"TURF" is a common word throughout Europe and U.S.A., and its origin lies in the Sanskrit word "darbhus" which means a tuft of grass. In general terms "turf" refers to a piece of the outermost layer of soil with the living matted vegetation. Historically, the concept of open yard, now generally known as lawn, originated in China as early as the 12th Century. Later, Victorian England imported this practice into the British Isles. Turf grass, like any other living organisms, is sensitive to the various environmental stresses, and responds to a good and sound management program including the provision of essential plant nutrients to enable it to carry out its vital metabolic processes.

Properties of Gypsum

Gypsum is a naturally occurring mineral in the earth's crust. From a chemical standpoint, gypsum ($CaSO_4 \cdot H_2O$) is calcium sulfate combined with two molecules of water.

In most of the naturally occurring deposits, it is found in combination with anhydrite ($CaSO_4$). Anhydrite is, primarily, calcium sulfate devoid of water molecules. Gypsum, in its pure form comprises 20.9% combined water, 46.6% sulfur trioxide and 32.5% lime as calcium oxide (CaO).

Although not very soluble in water, gypsum is 150 times more soluble than calcium carbonate. It is the most soluble mineral form of calcium. Solubility of gypsum, when applied to soil, depends on several factors, including the amount of available soil moisture and the extent of the contact between the gypsum and the soil particles.

Traditionally, gypsum has been used on plants in a fine powdered form. Gypsum, in this form, is highly soluble in soil solution. However, only gravity-type spreaders can be used to apply this material to large areas as its light and dusty nature is not suited to centrifugal or whirly-bird type spreaders. Coarse grind gypsum (20 percent passing 100 mesh) is somewhat superior to the powdered form in bulk handling and field spreading characteristics.

A new form of gypsum has recently been developed by United States Gypsum Company. It combines some of the major physical and chemical characteristics which are considered essential in relation to the use of gypsum in agriculture. It has a particle size range of 6x30 mesh, and is compatible for bulk-blending with other fertilizer materials. It can be bulk-blended and bulk-spread with conventional fertilizer spreaders. It has tailored solubility under normal field conditions as it becomes available to plants at a controlled rate. Controlled solubility makes it longer-lasting and prevents it from being prematurely leached out of the soils before plants are able to utilize it. It is non-segregating to a large extent and is non-caustic. Granular gypsum can also serve as carriers for micro-nutrients, pesticides and herbicides.

Gypsum, A Soil Conditioner

Soil is the medium for plant growth. Physical and chemical properties of soils profoundly affect plant growth and development as the plants depend upon soils for nutrients and water under a favorable soil physical environment. Soil structure and soil consistency are the main factors influencing the soil physical environment.

Soil structure refers to the arrangement of soil particles. A good soil structure is synonymous with the abundance of water stable aggregates or granules. A soil having a good soil structure is subject to minimum surface crusting, minimum soil erosion, and allows water and air to circulate through the soil system. A good soil structure can be promoted by the flocculation (forming large chunks) of the dispersed soil particles.

Various factors may cause soil structural degradation. Most important among these are the concentration of sodium ions, excessive cultivation, compaction, flooding, poor drainage, high clay content, low organic matter, etc.

Gypsum has long been used as a soil conditioner, and its primary role, in this regard, is related mainly to its flocculating action on the clay particles. From physico-chemical standpoint, clays are negatively charged particles. These particles, like any negatively charged particles attract positively charged ions, such as calcium, magnesium, potassium, sodium, ammonium and others. Sodium ions, when present in soils, in excess of 10-20 percent of the total cations, adversely affect the soil physical property. The detrimental effect of sodium ions is related to soil swelling, reduction in soil pore space and in increased hydration.

When gypsum is applied to such soils, the calcium ions from the dissolved gypsum replace the sodium ions on the soil particles and bring about the flocculation of the soil particles. Another mechanism by which the calcium ions influence the soil physical condition is to flocculate the clay particles in association with the oriented water molecules.

When the soils become dry, the particles are pulled together and, in the presence of calcium ions, this action causes flocculation of the dry particles.

Various synthetic soil conditioners, such as polyacrylamide bitumen emulsions, polyvinyl alcohols, polyvinyl acetates and others have also been tried as soil conditioning agents. The mode of action of these substances involves the formation of linkages between the soil

(continued)

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GYPSUM *(continued)*

particles which, in turn, is caused by the primary absorption. The synthetic soil conditioners are, however, expensive and thus economically prohibitive for large scale uses. Moreover, they lack nutritional values. Gypsum, on the other hand, is a much less costly product and is also an important source of two major plant nutrients, sulfur and calcium.

Gypsum, a Source of Calcium

Gypsum supplies calcium which is one of the major essential elements for plant growth and development. Calcium is required for maintaining the cellular protoplasmic organization, and is also responsible for the formation of calcium pectate which acts as a cementing agent for the cell walls. Calcium deficiency in plants is generally characterized by the failure of the terminal buds and the apical tips of the roots to develop. It influences the protein synthesis by its ability to regulate the uptake of nitrate nitrogen. Calcium affects the activity of certain enzyme systems. Calcium ions are involved in the movement of ions into the root cells by synthesizing and maintaining the root membranes.

A Source of Sulfur

Sulfur, like nitrogen, is a major essential element and acts as an agent of low energy bonding in the protein synthesis. Sulfur also influences the process involved in the hardening of protoplasm in cold or drought condition. Sulfur is similar to phosphorous in activities related to energy transfer within the plant system. Sulfur is needed for the synthesis of sulfur containing important amino acids; cystine, cysteine and methionine. It also acts as an activating agent for certain proteolytic enzymes, and is a constituent part of some vitamins, co-enzyme A and of glutathione. It is also found in oils of plants belonging to mustard and onion families.

Plants suffering from sulfur deficiencies are known to accumulate nitrates as well as amides. Plants take up sulfur in the form of SO_4 ions.

Time and Rate of Application

Rate of application depends upon a number of factors, such as the soil type, soil fertility status, organic matter content and the nature of the plant species.

Time of application would depend upon the objective and the management techniques employed in the establishment and maintenance of turf. When new turf is being established, the ideal thing to do would be to apply a generous amount of gypsum at the time of land preparation. For maintenance purposes, gypsum should be applied at any time of the year, but late fall and spring application would be more effective. Gypsum can also be applied in mixture with other lawn fertilizers.

From the foregoing, it is evident that the gypsum application can be a very productive tool in the establishment and maintenance of good turf. Its primary role is related to the improvement in soil physical property leading to improved soil structural condition, improved soil drainage, improved air and water circulation, increased water holding capacity and greater root penetration.

Plant roots need adequate quantities of oxygen to carry out their important metabolic processes. Greater root proliferation and greater root penetration also allows the plants to explore large volume of soil for plant nutrients and water. Enhanced root activity provides a greater amount of organic matter essential for a good soil structural condition.

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