Sulfur for Turfgrass

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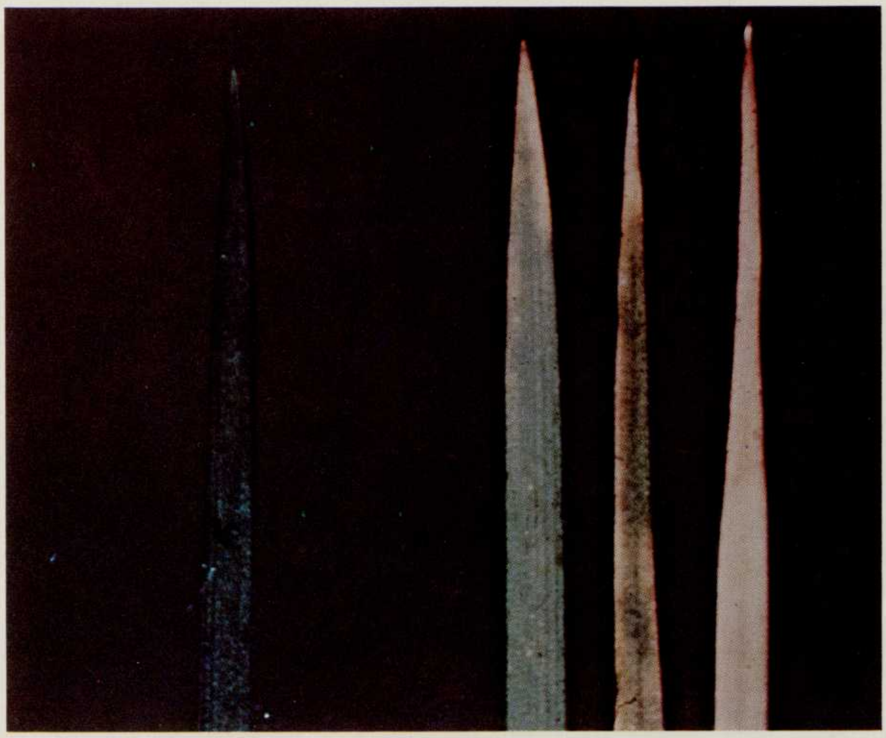

THE principal components of most turfgrass fertilizers are nitrogen phosphorus and potash, N-P-K. Over a period of time, the phosphorus content has been lowered gradually in deference to the tendency for this element to accumulate in the soil. Excess phosphorus is associated with an increase in *Poa annua* and with a nullifying effect on arsenic, which is a helpful chemical in reducing Poa populations.

On the other hand, the nitrogen content of mixed turfgrass fertilizers has been increased quite dramatically. Ureaforms have permitted this increase without increasing the chances of ugly burns. Fewer applications during a season are necessary due to the insolubility and the long-lasting effect of ureaform formulations.

During this period of developing fertilizers with higher nitrogen and lower phosphorus content, we have seen a growing recognition of the need for more potash in the mixes. The merits of adequate potash include greater winter hardiness, improved resistance to diseases, and imparting stiffness to grass blades, among others.

The need for potash seems to be closely associated with the quantity of nitrogen used. For maintenance, the quantity of potash needed usually is about one-half to two-thirds that of nitrogen. Where potash levels are low to very low, a 1:1 ratio may be used until balance is restored.

In developing a 16-4-12 fertilizer, for example, the general practice is to use potassium chloride, the less expensive form of potash, unless there have been specifications that require another potash carrier.

What are the other choices and why would they be specified? The first and most obvious alternate choice of a potash carrier would be potassium sulfate.

First, let us look at the nutrient content of the two materials.

	N-P-K-S
Potassium chloride	0-0-60-0
Potassium sulfate	0-0-53-18

Sulfur is the added ingredient.

The natural presence of sulfur in potassium sulfate makes this material a logical choice to supply potash

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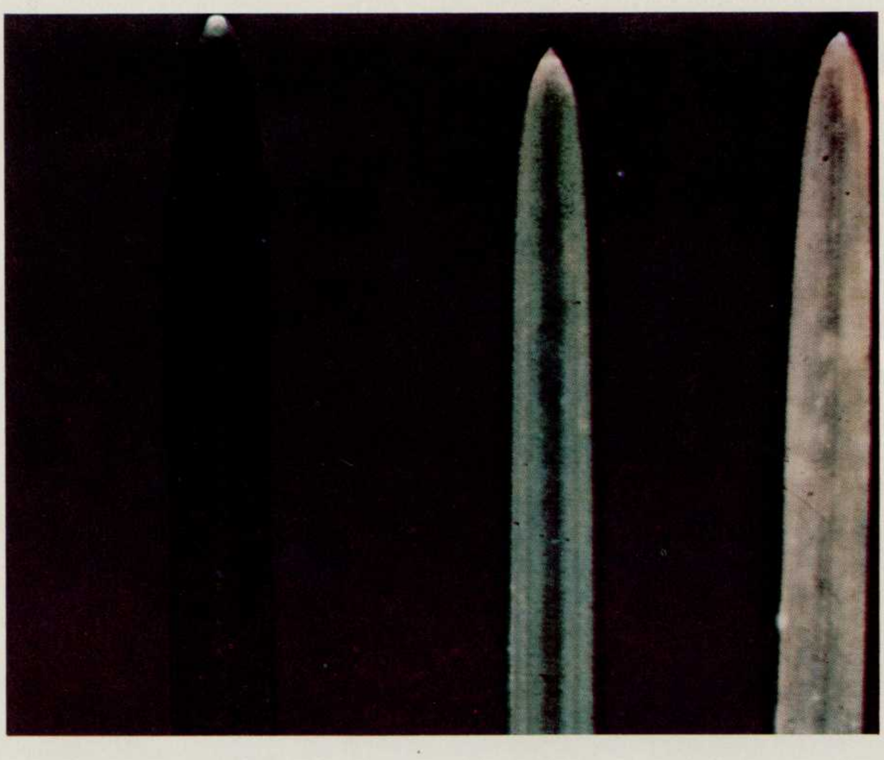

Right: Seaside bentgrass exhibiting a sulfur deficiency. Above: Sulfur deficiency in Merion Kentucky bluegrass.

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to turfgrasses. One big advantage of potassium sulfate is that the potash has less of a tendency to burn turf. It is somewhat less soluble and thus releases more slowly and lasts longer. The big plus is the presence of sulfur, a major plant food element that frequently is neglected and, without which, no living plant can thrive.

Why is sulfur important? In the absence of sulfur, a turfgrass exhibits a chlorosis that frequently occurs as an intense yellow color. In mild cases one may think of nitrogen deficiency or even iron deficiency.

On the positive side, we find that sulfur enhances color, density and growth. There seems to be a direct relationship with nitrogen. The turfgrass fertilized with the higher quantities of nitrogen show increased response to sulfur. It has been reported that when 12 pounds of nitrogen are used, there is a requirement for 8 pounds of potassium oxide and 3.45 pounds of sulfur. This is remarkably close to the proportions of potassium and sulfur in potassium sulfate. This example alone explains why potassium sulfate costs a bit more than potassium chloride and is worth much more.

Is the chlorine in potassium chloride bad? Chlorine is a plant food only in very small quantities. Beyond that it is a strong plant poison. It adds to the salt index which often is highly undesirable. With potassium chloride, the turf is more likely to be burned, whereas potassium sulfate has a high safety factor. Potassium chloride is more soluble and is more hygroscopic (attracts water) which creates caking in the bag.

In potassium sulfate, the sulfur is carried as the sulfate ion which can be taken directly into the plant. Sulfate ions are helpful when soils are compacted.

There are several additional advantages in having sulfur built into a potassium system which is used in balance with nitrogen and phosphorus. These include:

1. Sulfur aids in production of chlorophyll (green color) but it does not occur in this substance.

2. Sulfur is necessary for formation of several amino acids that are components of protein.

3. Sulfur activates several important enzymes.

4. Sulfur is important in the production of Vitamin B_1 (thiamin), biotia, coenzyme A, and glutathione.

5. Sulfur is associated with the building of protoplasm and is related to increased cold and drought resistance in some plants.

6. Sulfur is involved with an enzyme that is necessary to nitrogen fixation by microorganisms.

There are other vital functions in plant nutrition for which sulfur is required, some too technical to include here.

Remember, the need for sulfur fertilization is closely related to the amount of nitrogen fertilizer being applied.

The net effects of adequate sulfur in combination with N, P and K are several:

1. Better decomposition of residues (thatch)

2. Stimulation of soil microorganisms

3. improved color, density and composition of turfgrass

4. greater drought tolerance

5. improved winter hardiness

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6. significant reduction in diseases

It is important to point out that, in many instances, a potash fertilizer is priced mainly on its potassium content. When due credit is given for the sulfur content of a material such as potassium sulfate, the apparent price discrepancy in comparison to potassium chloride disappears. If sulfur had to be purchased and applied separately as a supplement to potassium chloride, for example, it would be less expensive to purchase and apply potassium sulfate in the first place.

Well-documented studies by Goss, Gould and others in the Pacific Northwest reveal some very convincing reasons for applying sulfur along with nitrogen, phosphorus and potassium. Adequate sulfur reduced *Fusarium* patch in turfgrass by 86 percent. The rates varied between 50 and 150 pounds of sulfur per acre. Fifty pounds of sulfur can be supplied with 300 pounds of potassium sulfate. This would also yield about 150 pounds of potassium oxide which usually is sufficient to balance 7 to 8 pounds of nitrogen to 1,000 sq. ft.

This property of controlling disease really should cause no great *(continued on page 60)*

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surprise because we have known this about sulfur for a long time. The surprising thing is that so many of us have forgotten it or have not put the knowledge to use.

Another turfgrass disease that has been checked and controlled to a large degree with sulfur is *Ophiobolus* patch.

When Merion Kentucky bluegrass is short of sulfur, it is much more susceptible to powdery mildew.

Dollarspot fungus in warm-season grasses in Florida was reduced by the use of sulfur in fertilizers.

This may be a bit hard for many to believe, but data from the Pacific N.W. show that adequate sulfur prevented *Poa annua* from infesting bentgrass turf. At the same time the blue-green algae was reduced significantly.

Perhaps some of the advantages found in using adequate sulfur come from the fact that turf is rendered more vigorous, an obvious sign of healthier grass. Healthy turf resists injuries and recovers faster when injury occurs.

Dr. J. D. Beaton, director of agricultural research for the Sulphur Institute in Washington, D. C., has accomplished a thorough review of the literature wherein there is an interaction between turfgrass and sulfur. We have previously named some of the advantages of keeping sulfur in balance with nitrogen, phosphorus and potash. But a statement of Dr. Beaton's seems particularly appropriate. "Sulfur deficiencies retard the growth of plants, including turfgrass," noted Beaton.

Merion bluegrass grown in sand culture showed a sulfur content of 0.15 percent in the leaves when grown in a complete nutrient culture. It rated only 0.04 percent when the solution was deficient in sulfur. Deficient leaves were yellow.

"Nitrogen and sulphur requirements are closely linked because both are required for protein synthesis," continued Dr. Beaton. "Plant protein contains about 17 percent nitrogen and 1 percent sulfur. Fertilization at high rates, particularly with nitrogen, will greatly increase the need for sulfur and may induce a serious sulfur deficiency."

From data submitted it was evident that a deficiency of sulfur restricted the crop response to nitrogen fertilization. Also, crop response to sulfur occurred only when nitrogen was applied. Maximum response to nitrogen occurred only when sulfur was applied. Turfgrass managers should find it difficult to ignore these signals.

Sulfur deficiency symptoms in grass can be confused with those of nitrogen, iron, and potash shortages so that visual detection may be unreliable. Here is one case where tissue (plant) anlaysis can be most helpful. Specific data on the influence of sulfur on turfgrasses are limited, but all the evidence points in one direction—that sulfur plays an important role in turfgrass management.

Goss reports that turfgrass growth appears to be improved with sulfur on soils that are deficient in phosphorus. This is of great importance to those managers who have succeeded in creating a phosphorus deficiency in their efforts to reduce infestations of annual bluegrass.

Under wet cool conditions in the spring turfgrasses in some areas (for example, western Washington) develop a yellowish mottled appearance which can be reduced or eliminated with sulfur fertilization.

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trimmings

FLAMMABLE FABRICS ACT also applies to artificial turf or grass, according to Secretary of Commerce, Maurice Stans. The Federal Trade Commission has ruled that the Standard for the Surface Flammability of Carpets and Rugs means artificial turf, too. But in making the decision the FTC said that if any producer can provide information about a product line to disqualify it from the flammability standards, he can petition for a determination.

MUD RATES FIRST in serious football injuries. Second is artificial turf followed by turfgrass. That's the report the medical committee told the NCAA. Dr. Samuel I. Fuenning, chairman of the committee, said it doesn't make any difference if football games are played on grass or artificial turf — players are still going to get hurt. The committee compiled injuries per game from 40 colleges and universities during the 1970 season. Results were 2.86 injuries per game on synthetic turf and 2.67 on turfgrass. More serious injuries occurred on mud than any other surface.

PARK & TURF DEGREE is now offered by the University of Nevada. It is a two year program designed to give the student a broad background in park and turf management. Specific professional courses are offered as well as on-the-job training during the summer after the first year.

"PESTICIDE TECHNOLOGY is complex and requires a multi-disciplined scientific, engineering and business effort. It is difficult for people who are **directly** involved, let alone those on the outside, to comprehend the total picture." A strong and extremely accurate statement by Kenneth L. Schulz, director of the Regulatory Division of Velsicol, in a speech before the American Public Health Association. Schulz also pointed out that the effort to develop biological or non-chemical means of pest control so far has produced little in the way of practical results for commercial use.

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When comparisons of nitrogen carriers were made on fescue, bent, and bluegrass turf at the University of British Columbia (200 lbs. of N per acre or 4½ lbs. per 1,000 sq. ft.), it was found that the ammonium sulfate increased turf density, created deeper green color, and lengthened the duration of response. The other carriers (no sulfur) were urea and ammonium nitrate. Response to nitrogen was poor.

Beaton has discussed several materials as sulfur carriers but none seem to be as adaptable to turfgrass management as potassium sulfate. The proportions of potassium to sulfur appear to be almost perfectly balanced when considering any level of nitrogen fertilization. True, not every soil under every turfgrass area will be sulfur deficient; but, as the use of nitrogen continues, we can expect to see a response to sulfur sooner or later.

Beaton has drawn on some 50 references for his exhaustive review of the role of sulfur in turfgrass fertilization. It leads this writer to sound the warning to every turfgrass manager. Look for possible need of sulfur on your turfgrass.

Army Engineers Test Underwater Tree Survival

Army engineers are testing survival of trees which must spend at least a part of the year standing in water.

Native trees, shrubs and grasses have been planted in an area where high and low water levels exist.

Purpose of the trials, by the U.S. Army Corp of Engineers, is to find vegetation which will survive near lake edges and similar areas, and thereby eliminate the bathtub ring effect of flood control lakes during low water periods. The vegetation would also offer more sanctuary for wildlife.

Trees and shrubs were planted in mid-December near Stockton, Calif. More than 1200 one and two year seedlings of eight varieties were used. These were specially located to provide for differences in soil, water depth, exposure, and wind.

Late next spring, the Army group will also broadcast seeds of a greater variety of trees and shrubs as well as selected grasses within the test plots.

A Case To Ponder

The fabled story about killing the goose that laid the golden egg has applications in today's modern business. It seems that before Champion Forge closed down, the union shop committee insisted that workers could produce no more than four forgings an hour. Management time studies indicated that ten should be made. The union held output to four an hour. A **piecework rate** on four an hour was established. Production then jumped to 16 an hour.

Now, no one has a job there.

"We used to make I-beam truck axles in our Cleveland plant, said Charles H. Smith Jr., Chairman, Sifco Industries Inc. in relating the above story to Walter J. Campbell, editor of INDUSTRY WEEK.

"Recently, we learned our former customer was planning to buy axles in Japan or Spain. We decided we would try to get the business for our plant in Brazil.

"Today, we are making those axles there for delivery to the U.S. We found we could buy the steel in Japan, ship it 12,000 miles to Brazil, unload and haul it 100 miles inland to our plant, produce the axles, pack for export, ship them 6,000 miles to the U.S., pay 10% duty, plus 10% import surcharge since Aug. 15, pay inland freight in the U.S., and deliver them to the customer cheaper than we could make them in Cleveland, 5 miles from our steel source. Actually, we now are using Brazilian steel because the mills there met the Japanese price."

Now there's a merry-go-round case of labor's influence on the market!