Turf & Sulfur

Sulfur has been recognized as one of the many elements required for plant growth for nearly 130 years. Deficiencies of this plant nutrient were identified as early as 1900 on certain soils in the Pacific Northwestern states. In Canada, this deficiency was first discovered in 1927 on some soils in Alberta. In spite of these early records of the need for sulfur, it has received only limited attention until quite recently.

Interest in sulfur as a plant nutrient has increased greatly in the past few years, partly because reports of sulfur deficiency throughout the world are becoming more frequent and extensive. The main reason for greater occurrence of sulfur deficiencies are:

1. Increased use of high analysis, essentially sulfur-free fertilizers.

2. Decreased use of sulfur as a fungicide and insecticide.

3. Increased crop yields which require larger amounts of all of the essential plant nutrients.

4. Increased consumption of low sulfur fuels and increased emphasis on control of air pollution.

5. Increased ability to identify soils low in sulfur.

ROLE IN THE PLANT

Sulfur is required by the plant for:

1. The synthesis of the amino acids cystine, cysteine, methionine and hence for protein elaboration.

2. The activation of certain proteolytic enzymes such as the papainases.

3. The synthesis of certain vitamins (biotin and thiamin or vitamin B1), glutathione and of coenzyme A.

4. The formation of the glucoside oils found in onions, garlic and crucuferous plants.

5. The formation of certain disulphide linkages which are associated with the structural characteristics of protoplasm. The concentration of phydril (-SH) groups in plant tissues has also been shown to be related to increased cold resistance in some species. Sulfur was recently shown to be present in the nitrogenase enzyme which is involved in the fixation of nitrogen by microorganisms. In certain situations free living nitrogen-fixing organisms in the soil and the nodule bacteria in legumes will make significant contributions to the nitrogen supply in soils.

Nitrogen and sulfur requirements are closely linked because both are required for protein synthesis. Plant protein contains about 1% S and 17% N. The need for sulfur fertilization often depends upon the supply on N and other nutrients and fertilizations at high rates with these elements may induce a sulfur deficiency.

Why is sulfur important? In the absence of sulfur, 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.

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.

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%.

This property of controlling disease really should cause no great surprise because we have known this about sulfur for a long time. The surprising thing is that so many of us 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. showed that the 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.■

Basics Of Calibration

By DR. STANLEY R. SWIER
Extension Specialist/Entomology
University of New Hampshire

Every now and then, everyone needs to review the basics. We all forget, especially when there is so much we need to know about our jobs. Before I came to the University of New Hampshire, I taught a course in Turf Pest Control at the Agricultural Technical Institute, Ohio

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State University. While teaching two-year turf grass majors, I developed a fact sheet on the basics of turf calibration. I would like to share this information with you. Improper calibration may be responsible for much of our poor pest control. It is also very costly. This information will help you measure the area of your green and fairways and help you quickly calibrate your equipment.

MEASURING GREENS:

1. Cut a piece of plywood 3 x 3', and with a proctractor and magic marker, draw 36 lines at 10 degree intervals from center to edge of board.
2. Drive a spike through center of board, and place board approximately in center of green.
3. With another man and a 100' tape, measure distance from center of board to edge of green (or collar) at 10 degree intervals. You'll have 36 measurements for each green.
4. Add these 36 figures together and divide the total by 36 to get the average radius of the green.
5. Area of the circle = πr^2.

MEASURING FAIRWAYS:

1. You'll need a rollatape, a Cushman, and about four hours of time to measure your fairways.
2. Drive across a fairway and measure this distance, and do this every 30 yards or so up the fairway. Add all these figures together and divide by the number of figures to get the average width.
3. Measure distance from start of fairway to front of green.
4. Multiply average width by length to get area.

CALIBRATION OF SMALL SPREADERS:

1. Check information on fertilizer bag for manufacturer's recommended setting, and begin at this setting.
2. Compute amount of material you want to apply per 1000 sq. ft. For example, a 20-0-0 material yields 1 lb. of actual N for every 5 lbs. of material applied.
3. Weight the amount of material that you have computed, and put this amount in the spreader.
4. Mark an area 20 x 50 feet with paint on blacktop or with stakes on grass.
5. Apply material at normal walking speed — if after covering the 1000 sq. ft. you have material remaining in spreader, increase setting by a little — and conversely if you ran out of material before finishing the 1000 sq. ft.
6. Write down spreader setting in your records for future reference.
7. NEVER fill a spreader on a green or tee — use a nearby cart path or area out of play. You may just break a bag or overfill your spreader.
8. When fertilizing greens and tees, don't fill your spreader completely full unless you can empty the contents on a green or nearby tee. If you can't empty the spreader, you'll just have to lift that extra-heavy spreader into the back of a Cushman, and there's also the chances that you may upset this top-heavy spreader while in transport.

CALIBRATION OF BIG SPREADERS:

1. Again, check information on bag for manufacturer's recommended setting, and set spreader at this setting.
2. With a big spreader, you have to know:
   a) spreading width of spreader (this varies with material)
   b) speed of tractor in feet per minute

$$3 \text{ mph} = \frac{3 \times 5280}{60} = 264 \text{ fpm}$$

$$4 \text{ mph} = 352 \text{ fpm}$$

3. choose your tractor speed (no more than 4 mph), measure the width of spread, and calculate the number of sq. ft. that will be covered in one minute. For example, 4 mph x 20 ft. spread = 7040 sq. ft.
4. Compute the amount of material that you want to spread on 7000 sq. ft., and then spread it. If it takes longer or shorter than one minute to empty the spreader, adjust the spreader opening accordingly.
5. Again, record this spreader setting for future reference.
6. Hint for computing your fairway fertilizer and fungicide requirement: if you have measured your fairways and have a total of 33 acres for example, base all calculations on 40 acres due to overlap and to overflow into rough. You won't be caught short at the end of the season if you give yourself a little fudge factor.

CALIBRATION OF HANDGUN:

1. Measure amount of water that is pumped through handgun in one minute.
2. At your normal spraying speed, time how long it takes you to spray 100 sq. ft. Repeat this twice and take the average.
3. Simple mathematics will determine how many acres (or 100 sq. ft.) that you can spray per tank.
4. Remember that every man will have a different spraying speed, thus calibration will vary from man to man.

CALIBRATION OF BOOM SPRAYER:

1. Fill sprayer one-half full or so of water (no fungicides yet), and set the operating pressure you desire. The lower the pressure, the less the mist and the more acreage per tank.
2. Collect the amount of water pumped through one of the nozzles in one minute. Repeat this at three nozzles along the boom and take average.
3. Plug this number into the following formula:

$$GPA = \frac{5940 \times GPM}{MPH \times W^*}$$

*where W is nozzle spacing (in boom spraying) or spray swath (in boomless spraying) in inches.

4. Another helpful hint here is to obtain a gallons-per-acre chart that lists all sizes of nozzles. Not only can you check your calibration, but when you change tip size, you don't have to calibrate again — just refer to the chart and work out a ratio. ■