

Professors on Plant Nutrition

Academics discuss everything from testing to frequency and formulations

By Peter Blais

Today's superintendents can select from a wide menu of plant-nutrition choices when deciding what will yield the healthiest turf. Still, course managers need to consider some basic

concepts before placing their turf-growing orders, such as:

- the major steps to follow and nutritional products needed;
- cultural practices that affect plant nutrition;
- factors determining how often to fertilize; and
- the various fertilizer formulations available for different purposes.

To sift through the major items superintendents need to digest when it comes to plant nutrition, *Golfdom* sought the opinions of four academics from across the country: Joseph Heckman, soil-fertility specialist at New Jersey's Rutgers University; Karl Danneberger, professor at The Ohio State University's Department of Horticulture and Crop Science and *Golfdom's* chief science editor; Richard

White, professor of turfgrass physiology and management at Texas A&M University; and Kent Kurtz, professor at California State Polytechnic University Pomona's Horticulture/Plant and Soil Science Department.

Testing

One of the first things most turf experts recommend is a soil test. These should be done routinely to provide a basis for the application of all nutrients except nitrogen. Appropriate nitrogen application levels can be determined by tissue analysis, experience or extension service recommendations, White says.

Kurtz believes soil tests in his region are best conducted in winter when things are slow but superintendents are still trying to keep turf healthy.

"Find out which nutrients are deficient," he recommends. "Don't worry about the ones in good quantity, but address the others. You don't have to test all 18 greens. If you have three or four that are typically a problem, test those and then test some of the better greens."

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Alleviating compaction promotes root development, which helps turf more readily absorb available nutrients. Hence, the turf is more healthy.

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Nutrients

Danneberger believes superintendents need to focus more on macronutrient levels of nutrients. These generally include nitrogen, phosphorus, potassium, calcium, magnesium and sulfur.

"The major elements are called macroelements for a reason," he says. "The plant needs them. Many of the disease problems on golf courses are because of low levels of nutrients."

On high-sand greens, superintendents should also look at the major microelements that need to be chelated, things like iron and manganese. "Some of the micropackages are valuable during summer stress on high-sand content greens," Danneberger says.

New sand greens often need more fertilizer,

because many of the products are leached out with water, Kurtz agrees. Superintendents compensate by applying extra water and fertilizer.

White suggests caution regarding indiscriminate applications of one particular macronutrient — phosphorus.

"If the soil test does not call for phosphorus applications, don't apply it," he warns. "It has a greater risk of environmental impact on surface waters. In sandy soils, there is the potential for movement into ground water."

One nutrient superintendents need to use more often is potassium, Kurtz says. Several products provide potassium and nitrogen while skipping phosphorus.

"Potassium nitrate is the one that comes to mind," Kurtz continues. "Some are soluble and are hot fertilizers, so [superintendents]

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have to be careful. But in the winter, it shouldn't be a problem if they put it down on dry grass and get it watered in right away."

Many fertilizers used in Southern California have micronutrient packages as part of the product. Iron, zinc and manganese are the most important ones [micronutrients], says Kurtz, who also recommends varying fertilizer types.

"It's like fighting a fungus problem," he says. "If you continually use the same fungicide, you build up a resistance. So you have to alternate things. We do the same thing with fertilizers."

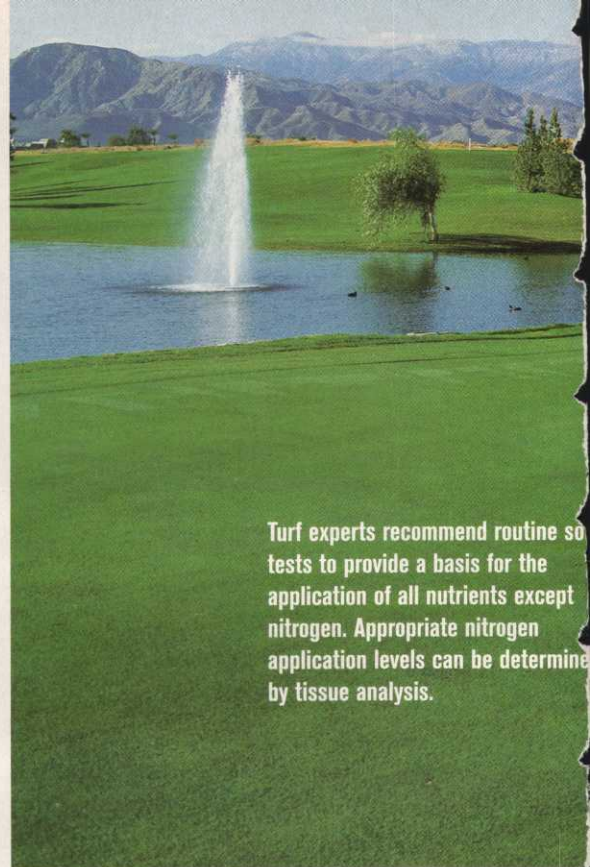
Kurtz also recommends keeping a close eye on the soil's pH. Some micronutrients are only available to plants when the pH is 6 or below. "With greens that are above 7, many times you have to use a product that is readily available, like iron. Some courses will actually use more iron applications because it keeps the turf green."

Kurtz notes that certain fertilizer products have different salt indexes. For example, ammonium nitrate and ammonium sulfate are fairly high in salt, while some organics are fairly low. Many slow-release fertilizers, like urea formaldehyde, are quite low with just a trace of salt.

"You don't want to put high-salt-index fertilizers on your greens in the summer unless you need them," he warns. "When you do the soil analysis, you should get the ECE [electrical conductivity] of the salts and the SAR [sodium absorption ratio]. If you have those results from the soil test, you ought to be able to manage those greens with materials that don't have high salts."

One of the benefits of a good soil-fertility program, Heckman says, is that it can minimize the need to use pesticides for take-all patch or summer-patch disease. "We have done a lot of work here looking at plant nutrition/disease interactions," he explains. "We can get pretty good control of summer patch by using ammonium nutrition. We can get good control of take-all disease with manganese fertilizer. Using nitrate nutrition on summer patch disease seems to exacerbate the problem."

Superintendents who use ammonium fertilizers, like ammonium sulfate, often worry about burn problems. "You can minimize the risk of burn with these fertilizers as long as you



Turf experts recommend routine soil tests to provide a basis for the application of all nutrients except nitrogen. Appropriate nitrogen application levels can be determined by tissue analysis.

irrigate and water them in after you have applied them," Heckman says.

Ammonium nutrition also lowers pH rapidly. "If you don't follow up with a good liming program, you can have a problem with excessively low pH," Heckman notes. "Whenever you use ammonium in combination with a good liming program, you still get good control of summer patch disease. Too low pH runs the risk of aluminum toxicity and influencing the availability of other nutrients like phosphorus."

Take-all patch is controllable without the use of fungicides, the Rutgers instructor notes.

"You can get very good control using manganese fertilizer," Heckman explains. "You put on about 2 pounds per acre in April before the disease starts. It's best to use it every year if you know you have a problem with take-all patch."

Cultural practices

Certain cultural practices can help plants more readily absorb available nutrients. For example, alleviating compaction promotes root development, White says.

"Anything that can be done to improve root development will help the plant's ability to absorb nutrients," the Texas A&M professor says. "Avoiding heavy irrigation following the application of nutrients or timing nutrient application to avoid heavy rainfall will reduce the movement of those nutrients off site. That

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MIKE KLEMM



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CAL STATE POLYTECH
UNIVERSITY

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makes them more available to the plant and improves fertilization efficiency."

Kurtz notes that increased use of reclaimed water has led to more salt problems, particularly on push-up greens. Increased salt adversely affects nutrition uptake and places grass under additional stress. On native greens, he suggests aerification through the spring and into the summer with a lot of leaching.

"If you're doing the leaching, your best grass comes out of the aerification holes," he says. "The areas between the holes tend to be a yellowish color because you didn't leach the salts there as much as where the holes are. The grass will come up green in the holes, so you need to get in there and spike or lightly verticut, and then leach the green again. Then you have to put an even distribution of fertilizer on to match everything. If the grass grows from the aerification holes, you will get a bumpy green. You have to try to stimulate the areas between the aerification holes."

Heckman has experimented with recycling

grass clippings and found that superintendents can cut fertilizer rates in half when clippings are left behind.

"You have a better color turf with half the nitrogen with Kentucky bluegrass," he says. "It also reduces the weed population. This would be helpful for any turf manager trying to go toward organics. The down side is you have to mow more frequently. But some of the mowers coming on the market today are better at recycling clippings, so you don't see as much residue. The other thing you can do to minimize clippings is use a controlled-released fertilizer."

Fertilization frequency

White recommends fertilizers be applied at least annually and every six months on new turfgrass. The heaviest applications should be in the fall.

With bentgrass greens during Texas summers, spoon-feeding small amounts of nitrogen at frequent intervals — as little as one-sixteenth of a pound per 1,000 square feet every week —

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seems the way to go. During more optimal growth periods, a half-pound per 1,000 square feet once a month seems a better strategy.

"In the summer, you don't want to be overstimulating [with too much fertilizer] because of disease," Kurtz agrees. "A good fall application or two is always helpful. Spring applications can be helpful and then cut back in the summer."

Danneberger cautions against overrelying on certain practices.

"People have taken a good practice, like foliar feeding or spoon-feeding during a stress period, and turned it into their entire program," he says. "That's not a good idea. Many have gone to spoon-feeding light rates frequently in the summer. Exactly how much of that nutrient is being taken up in those low amounts is always an interesting question. Sometimes there's a response, and sometimes there isn't."

Fertilizer formulations

Most superintendents use combinations of liquid and granular applications.

"In expansive areas, like fairways and roughs, granular applications would be more cost effective," White says. "Liquid fertilizers are usually done on greens when you're trying to spoon-feed with micronutrients."

In the fall and late spring, Danneberger recommends granular, slow-release and liquid fertilizers at high rates with adequate nitrogen levels. During summer, when superintendents are concerned about too much growth and how it affects ball speed, adding small amounts of nitrogen through spoon-feeding or foliar applications works well.

"It's tough to put granular down on a green with the right dispersion patterns to deliver extremely low rates," Danneberger concludes. "So they [superintendents] are almost tied into a liquid application. If it were up to me, I'd like to see granular applications during non-stress times and liquid/foliar/spoon-feeding during stress times." ■

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