(turfgrass talk)

Turf growth and temperatures

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One of the techniques I have found especially useful is the representation of temperature, and its influence on turfgrass growth, as a number between 0 and 1. This concept was developed by Wendy Gelernter and Larry Stowell at Pace Turf (www.paceturf.org) and is termed the "growth potential." The growth potential (GP) has many applications, and it is based on a simple principle — grasses can grow well when temperatures are close to an optimum for growth, but will grow more slowly or not at all as the temperature moves away from the optimum.

The growth depends on the location, of course, but in general, we can observe that grasses don't grow in the winter, and they grow especially well when the temperatures are warm in spring, summer and fall. The exceptions to that rule are cool-season grasses that suffer from heat stress when the temperatures get too hot. By expressing the temperature as a number between 0 and 1, we can get an idea of how much the grass has the potential to grow based on how close the actual temperature is to the optimum temperatures for growth. Figure 1 shows the relationship between temperature and GP for cool-season (C_3) and warm-season (C_4) grasses.

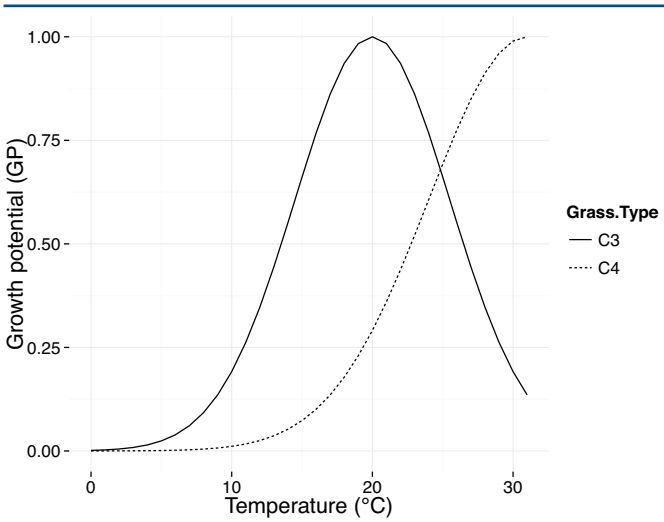
At first glance it might look complicated, but it is actually quite simple. There is a minimum value of 0 if the actual temperature is very different from the optimum growth temperature. A maximum value of 1 means the actual temperature is the same as the optimum growth temperature. The GP value, then, is simply a number that says how close the actual temperature is to the optimum temperature. Pace Turf has provided a climate appraisal form with equation embedded, allowing you to calculate the GP for your site: www.paceturf.org/PTRI/Documents/f_climate_metric_20131025.xls.

The GP is useful in many ways. One can use it to predict the optimum time for overseeding perennial ryegrass (C_3 grass) into bermudagrass or seashore paspalum (C_4 grasses) in autumn. One can use the GP to predict when C_4 grasses will start to grow well in the spring. One can consider when disruptive maintenance practices such as core aerification may be scheduled to minimize the recovery time by doing the work at a time when there is a high GP.

The GP can be used to estimate turfgrass nitrogen requirements. First, calculate the GP for a site. I like to do this on a monthly basis, generating a GP value for each month of the year. Then, think of how much nitrogen might be applied as a maximum amount in any one month. Turfgrass soils usually contain very little available nitrogen. So when nitrogen is applied as fertilizer, it stimulates turfgrass growth. And turfgrass managers always apply less nitrogen than the grass can use. Because of this, the nitrogen, together with the temperature, controls the growth rate of the grass, and these two factors that influence growth can be linked together using the GP.

For most types of mature turf, the maximum nitrogen that will be applied in a month will be somewhere in the range of 3 to 5 grams of nitrogen/square meter/month. Take that maximum monthly value, and multiply it by the GP for each month. That gives an estimate of how much nitrogen the grass may use, and how much nitrogen may be applied as fertilizer.

In China, where the climate varies so much from place to place, the GP model can be especially helpful in developing turfgrass management plans to guide the daily work on the golf course.



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