

can begin. Changes from one growth stage to another (i.e., from egg to larva, larva to pupa, pupa to adult, etc.) can take weeks in cool weather or can be completed in only days in warm to hot temperatures.

How to use degree days

Timing of events based on daily degree day number accumulations is actually very common. Degree days accumulations are used to determine when to deliver heating oil, how to size heating and air conditioning equipment in buildings, how to insulate housing, and many other applications.

The ability to predict heat driven conditions by temperature accumulation gives far more YTD accuracy than traditional calendar based or average date based methods.

For instance, if an insect larval stage is normally present on a host plant in June and that stage can be easily controlled at that time, then, in a warmer than normal year control applications made by a "normal" calendar might not be effective, because the insect could have entered a pupal stage which is not controlled with insecticides. The same may apply to a colder than normal year since the insect may still be in its egg stage, another hard to con-

trol growth stage.

Using degree days accumulations gives managers very precise timing for scouting and maximum efficiency for control of pests. Using degree day calculations or models ensures that there is a very high likelihood that the most vulnerable stage of a pest will be present. At environmental sensitive sites, degree day monitoring combined with timely scouting allows managers to use the control product or actions that produce the fewest unintended consequences and still provide effective control.

The use of degree day based prediction will increase. Any time heat is the prime determining factor in a process, degree days, or some derivative thereof, will be used to more accurately measure what effect the actual YTD weather has had on pests and hosts. As more research identifies the basic life processes of plants, animals, and fungi the use of degree day models will substantially increase plant manager's understanding of and efficiency at controlling pests while reducing the impact of operations on the environment and in the long run reducing cost.

FIELD TIPS

Insects Take Priority Over Weeds

When it comes to priorities, golf course superintendents rank insects above weeds for degree-day calculations. Advances in preemergent weed control have reduced concern over timing for some weeds. Yet, obtaining local readings of degree days from on-site weather stations is highly desirable.

Dan Dinelli, superintendent of North Shore Country Club in Northbrook, IL thinks soil temperature would help him more than air temperature. "Crabgrass germination in an open area is a lot different than a shaded one," he remarks. "A cloudy day should not result in the same degree

days as a sunny day. But, I still think a weather station capable of degree-day calculations is valuable."

Even though he has a weather station, Merrill Frank at Columbia Country Club in Cockeysville, MD still calls Data Transfer Network for degree days to reconcile his course readings. "I check primarily for white grubs and *Poa annua*," he adds.

Sean Remington at Chevy Chase Country Club also has a weather station, but he taps into UMD's Ag Online for degree days. "Black aeteniis is my main concern because it's life cycle is different from other major pests," reveals Remington.