Be A Budding Genius, Not A Blooming Idiot

James Fischer

The bloom. The nectar flow. The honey flow. Whatever you call it, you and your bees wait all year for it. But *when is it*? Many vague statements are made about blooming in beekeeping and gardening books, leaving the new beekeeper with no more than the advice to "super early".

Experienced beekeepers may be interested in varietal honeys, which requires knowing the blooming period for a number of different plants. While this is extra work, varietal honey can sell for double the price of generic honey.

But how does one predict blooms with any accuracy? Ouija board? Supercomputer? Maybe a call to Ms. Cleo, the telephone psychic? It is much easier than that. If you can do some simple math, you can track growing degree-days to predict the blooming of any number of local nectar sources with accuracy that is within a day or two.

The best part is that less effort is required each year. Once you have your figures from this year, you need only get the daily temperatures, add numbers, and do a few spot-checks to verify that blooming is "on schedule" in following years.

What's A Growing Degree-Day?

A growing degree-day is a measure of warmth on a particular day in terms of how it affects plant growth. The approach is well-known to sophisticated farmers, and has been verified many times by horiculturalists and the USDA.

How Does It Work?

Starting at the last frost, plants grow at very predictable rates, but still, the major limiting growth factor is temperature. Days that are warmer result in more growth. Cooler days produce less growth. By counting degree-days from last frost, you are measuring plant growth in terms of the total impact of temperature on plant growth.

Once you have measured a local plant species' growth in terms of degree-days from frost to bloom, you can then keep track of daily temperatures in the Spring of subsequent years, and know, from each year's actual daily highs and low temperatures, when your plants of interest will bloom that year.

Why Should A Beekeeper Care?

The calendar date on which a plant blooms is sure to vary widely from year to year, since weather conditions will certainly vary. By counting up degree-days, you are tracking the temperatures that influence plant growth, in units that will not vary from year to year. Doing so makes supering a consistent exercise, rather than a guessing game. It can also help you to plan hive deployments for pollination, and better-satisfy pollination clients who do not use these techniques themselves.

Tracking the Elusive Last Frost

The last frost is easy to find, but will come on a different day every year. Your TV meteorologist will announce it. Your local master gardeners and gardening clubs will celebrate it. For your purposes, you want to "start a running total" at the last frost, but to do so, you need to start tracking degree-days well before the last frost.

The last frost is important because it can kill developing buds. The buds that survive last frost will make fairly even progress towards blooming, so the last frost can be considered the "starting gun" for the blooming cycle.

Calculating Degree-Days

A growing degree-day is the average of the daily high and low temperatures, using a maximum high of 86, and a minimum low of 50, then subtracting 50 degrees. Let's walk through an example - If the high for the day was 60, and the low was 45, then the "average" is:

(High + Low) / 2 = Average
(60 + 50) / 2 = 55 degrees

Note that we replaced "45" with "50" before we did any math. Any "low" lower than 50 is replaced by 50 degrees. When you then subtract 50 from the average, you end up with 5.

55 – 50 = 5 (A 5 Degree-Day)

So, for that day, you had 5 growing degrees to jot down.

If the high for the day was 88, and the low was 45, then the degree-day average is:

(86 + 50) / 2 = 68 degrees

Note that we replaced "88" with "86" before we did any math. Any "high" higher than 86 is replaced by 86 degrees. We also replaced "45" with 50, as in the first example.

When we then subtract 50, we end up with 18 growing degrees that day.

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Date	Low	High	Degree Days	Total D-Ds
4/1	40	66	8	-
4/2	40	67	7	-
4/3	41	66	6	-
4/4	41	67	7	7
4/5	41	68	8	15
4/6	41	67	7	22

68 – 50 = 18 (An 18 Degree-Day)

Why do you throw out highs above 86, and lows below 50? The USDA found that plants do not do much growing when it is below 50, and days hotter than 86 do not make plants grow any faster than plants at 86 degrees.

Why do you subtract 50 at the end? Again, it is the number of degrees above 50 that matter to plants, so the "average" must be above 50 for any progress toward blooming to be made.

Getting The Temperatures

You can watch the weather reports and get the predicted highs and lows, sometimes for an entire week. For your purposes, the predicted temperatures are accurate enough, but you can also get exact data from any of the sources discussed in the January *Bee Culture* article "Whither Weather".

If your temperatures are generally different from those reported in the weather reports, you can buy a "high-low" thermometer, which uses tiny metal bars in a U-shaped thermometer tube to record each day's high and low. There are also electronic thermometers that will record highs and lows, and save you the trouble of remembering to look at a thermometer every evening.

Running Totals

Keeping a "running total" is easy. Once you calculate the degree-days for any one day, you simply add it to your "total to date". Where I live, the last frost tends to be around April 15th, so I would be wise to start writing down degree-days at the start of April. One wants to start tracking the degree-days a few weeks before the "typical" last frost, since it can come early.

My worksheet format is above. If the last frost happens on 4/3, I can add up degree-days starting with the next day, and keep a running total as the season progresses.

Watching For the Bloom

Now that you are adding up degree-days from the last frost, you need to know exactly when your local nectar plants of interest bloom. This is a good excuse to take the dogs for a walk, and get that exercise everyone has been suggesting. The good news is that if you do a good job this year, you will have much less walking to do next year. You will *know* when the blooms will appear within a day or two.

You may have no idea what to look for, so let's break this down:

First, you want to know what nectar plants are significant in your area. If you aren't sure, ask local experienced beekeepers. This is a good reason to attend the meetings of your local beekeeping association.

Second, you need to be able to identify the plants, which means a trip to the library to borrow a field guide book, or a visit to the eNature online field guides at www.enature.com I like the *Audubon Society Field Guides*, as they are small, sturdily bound with waterproof bindings, and have color photos. Get both the "*North American Trees*", and the "*Wildflowers*", and you are set.

Still can't tell a Tulip Poplar from a Maple? Identifying a plant or tree before it blooms is hard. Find someone who knows plants, like a master gardener or your agricultural extension agent, and ask them to show you. It is amazing how much expert help you can get for a few quarts of honey.

Third, you want to find plants that are near your home or apiary, and remember where they are. Consider tying some colored string to the plants once they are found, drawing a map, whatever it takes to jog your memory.

Once you have located a few examples of the plants you want to watch, you need to visit them on a regular basis, and examine the buds. If you have no idea how "budding" works, you may want to ask a gardener, or read a few gardening books. In general, the buds start out hard, become softer to the touch, and tend to "break open" just a bit before they bloom.

When you see the first blooms appear, you can look at the running total of degree-days from last frost, and write down a highly accurate number – the number of growing degree days from last frost until bloom. You can continue to track degree-days and find the number of degree-days from start of bloom to end of bloom.

In following years, you can simply "do the math", and predict your local bloom with high accuracy.

This knowledge is how growers of tulips for Easter and roses for Valentine's Day supply truckloads of cut flowers on tight schedules.

Except for an unexpected freeze (which would mean that you would start over, counting degree-days from the actual last frost) or a severe drought, which might slow the bloom more than usual, blooms are highly predictable in terms of growing degree-days.

It should be noted that no plant produces all of its blooms at once. For honey supering, one wants to track the earliest blooms, but growers of pollinated crops are more interested in predicting the "majority" of the bloom, rather than the start of bloom, since they would not want hives to be deployed until there were enough blooms for the bees to take an active and near-exclusive interest in the grower's crop. Plants are really nothing more than wind-up toys. If other conditions are "normal", temperature and sunlight is what winds them up. Growing degree-days are a very effective model for tracking progress towards bloom. BC

A wealth of information on important crops and growing degree days exists on the web. Simply type in "Growing Degree Days," using the quote marks and over a 1,000 sites will appear. To isolate this a bit, try "Growing Degree Days" and "Your state," or "crop" (i.e. apples), thus "Growing Degree Days" and "Apples" and "Washington," will narrow your choices considerably.

James Fischer tracks growing degree days, and supers on time, most of the time, near his home in the Blue Ridge Mountains of VA.