

Degree Day Calculations

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Since insects are cold-blooded animals, temperature plays a major role in their growth and development. There is a threshold temperature for each insect; entomologists find this threshold in laboratory and field experiments. No development occurs when temperatures are below that level. Insects have an optimum temperature range in which they will grow rapidly. Then, there is maximum temperature (termed upper cutoff) above which development stops. These values can be used in predicting insect activity and appearance of disease symptoms during the growing season.

The threshold and maximum temperatures for development of an insect are used to calculate the number of degree days for a specific day. One degree day results when the average temperature for a day is one degree over the threshold temperature. With codling moth (50 degrees F threshold temperature), on a day when the average temperature was 51 degrees F, one degree day accumulated. These daily accumulations can be added over a period of time and used to predicting insect development. Accumulation of degree day totals usually begins in one of two ways. It is common to start keeping track of degree days for many pests on a calendar date (January 1, for many). While this is simple, there is the disadvantage of having to keep up with temperatures long before any insect development will occur. The second method, used for other pests, starts from a specific biological event called a biofix. Often, this is the date of the first sustained capture of adult insects in traps. Use of a biofix starting point means keeping up with degree days over a shorter period of time and often provides a more accurate prediction.

With integrated pest management (IPM), degree day accumulations are used to predict important events in the life of an insect. Examples include egg laying, egg hatch, scale crawler movement, or appearance of symptoms. These biological events are in turn used to schedule particular activities such as scouting and synchronizing insecticide sprays. The easiest way to calculate degree days for a specific date is to add the daily high and low temperature and divide by two. Then, subtract the threshold temperature for the particular insect. For example, if the min/max thermometer indicates a low of 45 degrees F and a high of 75 degrees F, then the average temperature for the day was $(45+75)/2 = 60$ degrees F. If the threshold temperature was 50 degrees F, then 10 degree days would have accumulated. Check your thermometer and make this calculation each day. Add the daily value to the total from all the previous days. You can keep up with the progress toward your target number. Minimum and maximum temperatures should be recorded from a Min/Max thermometer about the same time each day, preferably in the mid morning or late afternoon. PestNet (www.mifruit.com) is also a good way to help predict degree day accumulations as well as pest life stages.