FLORIDA OLIVE COUNCIL, LAA

3324 W. University Ave., #160, Gainesville, FL 32607 www.floridaolivecouncil.org

Chill Hours – Definition and Discussion

General Overview: As the days become shorter and cooler in fall, olives and other fruit trees stop growing, store energy, lose their leaves and enter a state of dormancy. Once dormant, the tree will not resume normal growth, including flowering and fruit set, until it has experienced an amount of cold equal to its minimum "**chilling requirement**" followed by a certain amount of heat. (Additional factors that affect fruit set include age of tree, nutrition, availability of compatible pollen and weather during bloom.)

Fruit tree chilling requirements can vary widely from one variety to another. In general, excepting the coldest climates (see "Cold Climates" below), for best performance a variety's chilling requirement should approximately match the amount of chilling normally received where it is planted. Some highly productive varieties (cultivars), however, will produce well over a wide range of climates and chilling.

If a fruit tree is grown where winter cold is insufficient to satisfy the particular cultivar's chilling requirement, blooming and foliation will be delayed and erratic; fruit set and fruit quality will be poor. Conversely, if a tree is grown where winter cold satisfies its chilling requirement too soon, the end of dormancy and loss of hardiness caused by a warm spell could lead to late-winter freeze damage to the tree and/or a too-early bloom. Subsequent hard frosts could cause crop failure year after year.

Chilling that exceeds a fruit tree's minimum requirement can lead to a stronger bloom and, all else being equal, a heavier crop. A disadvantage of heavier crops is they require more thinning (pruning) for best fruit quality and size. Home fruit growers often prefer moderate crops and less thinning work; commercial growers need maximum crops. Heavy crops can also lead to alternate bearing (heavy crops alternating with very light crops).

A fruit variety's chilling requirement is a key determinant of where it will consistently produce satisfactory crops of fruit. So, how do we measure chilling?

CHILL HOURS

Depending on the method used, fruit tree chilling is expressed either in hours of defined cold temperatures or in other calculated units based on the occurrence of various temperatures. A simple and widely used method is the **Hours Below 45°F model** which equates chilling to the total number of hours below 45°F during the dormant period, autumn leaf fall to spring bud break. These hours are termed "**chill hours**".

Using this model, if a fruit tree were observed to bloom and fruit satisfactorily after winters of 600 or more chill hours, but inconsistently after winters of 500 chill hours and less, the variety would be regarded as having a chilling requirement of 600 hours. In terms of winter cold adaptation, this approach works reasonably well for matching most fruit varieties with suitable climates. It tends to be less reliable, however, for subtropical climates and varieties with very low chilling requirements - and is not especially useful for the coldest fruit tree climates.

How an olive actually accumulates winter chilling is more complex than represented by the easy-to-use 45°F model. Current research indicates fruit tree chilling:

- Does not occur below about 30-34°F
- Sometimes occurs also above 45°F to about 55°F
- Accumulates most effectively in the 35-50°F range
- Accumulates most effectively early in the dormant period
- Early dormancy can be reversed by temperatures above 60°F.

According to Dr. Louise Ferguson, UC (Davis), chill requirements for olive flowering are ten (10) weeks below 55 degrees F. Dr. N.S. Malik, USDA found that daily exposure to temperatures around 75 degrees for 4-5 hours could significantly inhibit flowering in cv. Arbequina.

There are various chilling calculation methods such as the 32-45°F model (Utah model). The *Low Chilling* model, *Mean Temperature* model and *Dynamic model* incorporate some or all of the findings above. To date, all models tend to give significantly different results for different climates. (Courtesy of Dave Wilson Nursery – Hickman, CA