MAIN PHENOLOGICAL STATES OF SWEET CHERRIES (*Prunus avium* L.) IN CHILE

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INTRODUCTION.

In agrochemical applications, as well as other sprays and cultural management of orchards certain stages are related to the development of the crop, and the responses are very limited in terms of time and according to the proposed objective. This instructive describes the main phenological stages of the cherry tree (*Prunus avium* L.), in order to have a common nomenclature in its seasonal development.

Why is it important to follow the phenology?

It's necessary to observe and register the dates of occurrence of the recognizable events in order to support management decisions like:

- Programming and carrying out treatments and/or tasks in the precise phenological moments during the present and future seasons.
- Establishing the cumulative thermal sum (degree days) between phenological events and managing to estimate with some certainty of dates of occurrence in the various agro-climatic areas.
- Establishing comparative guidelines between seasons, in order to understand the differential in the occurrence and duration of each phenological event, for example, differences between warm and cold springs.
- Diagnosing any alteration, which occurred and was associated with the physiological problems, due to management or applications carried out.

In literature, there are various descriptions of subdivisions of the seasonal cycle of the cherry tree; this wishes to adjust the phytosanitary reality and the management of the sweet cherry in the agro-economic reality of Chile.

It's worth clarifying that – as a document oriented to the cultivation of species for fruit production – the description and subdivisions of the cycle are primarily referred to in the development of the reproductive organs originated in the floral buds and that finish up as a fruit. However, some stages of vegetative bud development have been included due to its agronomical importance to the cherry cultivation.

It should also be noted that, due to the fact that various phenological stages occur simultaneously in a natural way within the spur, floral branches, tree and orchard, to establish the dates of occurrence of each one it's necessary to adopt an objective and quantifiable system convention to decide this date, trying to ensure that it corresponds to the one with the highest frequency or predominance of the stage. For this purpose, it has been decided that a defined percentage of buds, blooms or fruits that have reached the referred stage in most of the trees of the evaluated variety and on a certain rootstock should be fulfilled.

In this "established norm of the phenological stages for cherry cultivation in Chile" we have defined that the date for each phenological stage must be registered when **60 to 80% of this stage** has accumulated, subtracting then 20% in order to reach it. For example, we define full bloom when 6 to 8 of each 10 blooms have reached anthesis (petals unfolded for pollination). In this moment there will simultaneously be a certain proportion of set flowers that have shed the petals and a 20 to 40% of flowers that still have not opened and are still in white or green bud or open cluster.

Logically, in those cases where a certain graduation is described with respect to the progress of some states (e.g. 10% of blooming or 50% of leaf fall), the general 60 to 80% is modified to the accumulated percentage that the development stage indicates in its nomination, defining then sub-stages according to their agronomic importance for the crop.

Finally, it is emphasized that since no counts or measurements are made, "the state in which we encounter a plant" at any time is that of the predominant phenological state.

PHENOLOGICAL STATES OF THE CHERRY TREE.

STATE 0. DORMANT BUD. Closed buds in dormancy. Buds covered completely with protective scales, closed or brownish in color.


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STATE 1. SWOLLEN BUD. Thickened bud at least 20-30% of its volume with respect to the prior one. The winter scales begin to open, while the inner bracts begin their expansion and expose their initial red tip and final green tip.

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STATE 1.V. SUB STATE RED TIPS (VEGETATIVE BUDS). ·It's the sub stage of advanced swollen vegetative buds when they take on a reddish tone, right before the green tips emerge.


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STATE 2. **GLOBE STATE (floral buds).** Floral buds well-swollen have lost their scales and acquire a green coloring, before exposing their floral primordial.

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STATE 2.V. **GREEN TIPS (vegetative buds).** State with green bud tips from 1 to 5-6 mm,

before opening to "bursting".

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STATE 3. **OPEN CLUSTER.** When the green floral very swollen bud (GLOBE) opens or breaks open and leaves its floral primordia visible and countable.

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STATE 4. **WHITE BUD.** Brief state that occurs when the tips of the white petals appear above the green sepals of the developing flowers.


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STATE 5. **Beginning of bloom (10%).** When 10% of potential flowers appear.

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STATE 6. **FULL BLOOM.** When the open bloom predominates with the greatest proportion of receptive blooms for pollination of the plants and can last for days. Just like the other states, it corresponds to when 60 to 80% of blooms have reached this development.


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STATE 7. PETAL DROP. Senescent blooms that lose their attractiveness to pollinators, with some petals already dropped.

This state corresponds to the beginning of PHASE I OF FRUIT GROWTH, that is prolonged up to close to 15 mm diameter; fruit in cellular division, with the remains of fallen flowers and up to before the beginning of the hardening of the pit.

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STATE 8. JACKET DROP. The sepals or calyx, the petals or corolla and the stamens or androceum of the cherry flowers are born from the basal cylinder denominated "hypanthus", that belongs to the "collar or jacket" and aborts from its base from the time that the petals fall, but it stays attached to the newly set fruit, until it breaks and detaches with its growth.

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STATE 9. **FRUIT IN GROWTH.** The next state after jacket drop, with the fruit of a very green color which corresponds to the END OF PHASE 1 OF FRUIT GROWTH, before Phase 2 of its development, when the pit hardens.


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STATE 10. **BEGINNING OF PIT HARDENING.** It corresponds to the beginning of PHASE II OF FRUIT GROWTH, the period in which the hardening of the pit occurs, which is recognized by cutting the fruit transversally with a sharp blade, to acknowledge the hardening that advances from its distal end or the point of the fruitlet towards the pedicel , where it ends.
In this stage the speed of growth of the fruit slows down, for the occurrence of pit hardening due to endocarp lignification.
The time and duration of the hardening period is highly variable among the different varieties according to their ripening period within each zone.

STATE 11. **END OF PIT HARDENING.** It has been reported that until the end of pit hardening, fruit thinning techniques could have a favorable effect on the size.
At this stage the use of Gibberillic Acid begins to slow the ripening, increase firmness, size gain and greenness of pedicels in post-harvest.

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STATE 12. STRAW-YELLOW COLOR. The fruit changes from a light green color to yellow.

This state corresponds to PHASE III OF FRUIT GROWTH, which is cellular expansion and maturity, starting immediately at the end of pit hardening. In this state nearly 80% of fruit growth is generated in volume and weight, and it has a duration that is quite variable among the varieties, close to 30 days for Bing and Lapins in the central zone.


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STATE 13. SETTING. When the fruit turns from straw-yellow to pink or red, with a notorious increase in softness and sweetness. From this state the susceptibility to splitting, their attractiveness to birds and the ease for rotting increase. This state happens around the middle of Phase III.

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STATE 14. MATURITY. This state corresponds to a period of great importance since it belongs to the harvest, which summons the greatest expectations and need of human resources of the crop.

Within this period the following states are described, based upon the CTIFL color chart.

STATE 14.1 **COLOR 1. LIGHT COLOR RED UNRIPE 1.**

STATE 14.2 **COLOR 2. LIGHT RED UNRIPE 2.**

STATE 14.3 **COLOR 3. RED.**

STATE 14.4 **COLOR 4. DARK RED .**

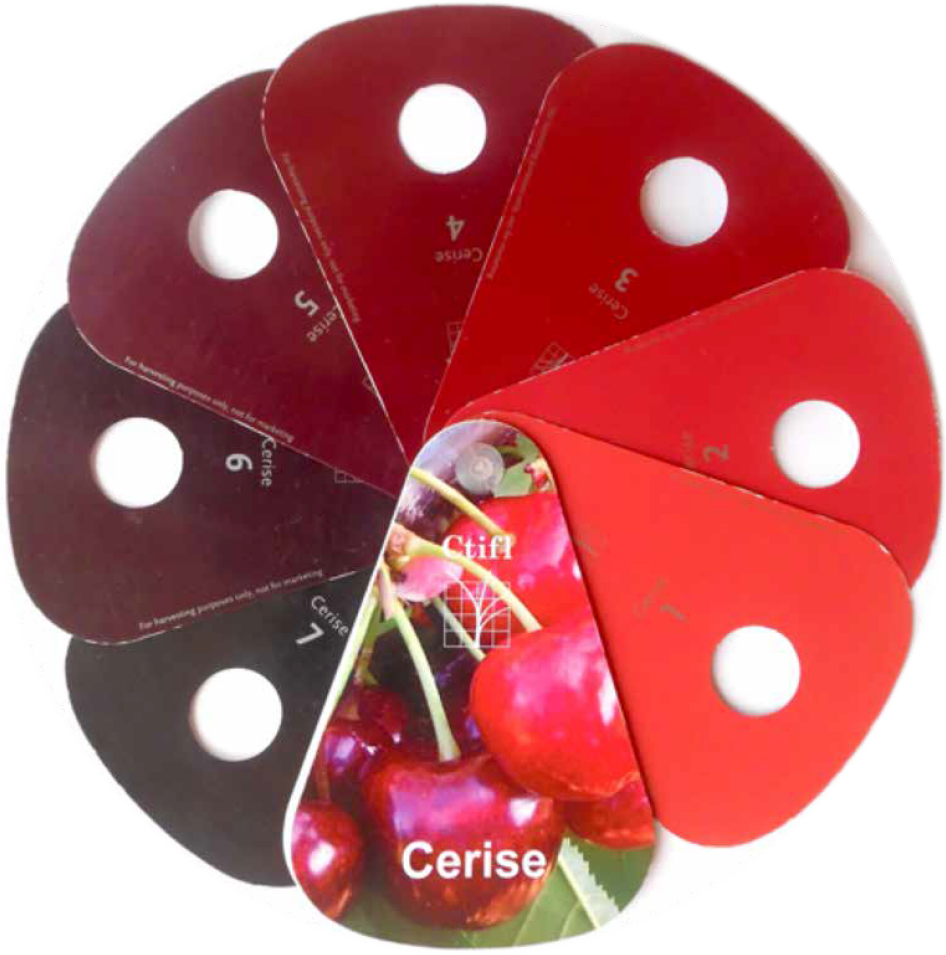
In the case of bicolor varieties like Rainier, this state corresponds to when over 50% of the surface reaches a red color.

ESTADO 14.5 **COLOR 5. MAHOGANY RED.**

ESTADO 14.6 **COLOR 6. DARK MAHOGANY.**

This color corresponds to the END of PHASE III of the fruit growth, characterized by a slowing of the growth and acquiring of maximum maturity for commercialization and optimum for immediate growth.

ESTADO 14.7 **COLOR 7. BLACK.**



Color evolution chart for cherries Le Centre Technique au Service de la Filiére Fruits et Légumes, Francia. Photo: Carlos Tapia T.

STATE 15. **POST HARVEST FROM THE TREE.** The period from the end of commercial harvest until the beginning of leaf fall.

STATE 16. **BEGINNING OF LEAF FALL.** Trees with their first 5 to 10% of leaves maturing and falling naturally.
For this process, the leaves that are completely yellow to red, that have totally lost their green coloring, are considered fallen.

STATE 17. **50% OF LEAF FALL.** Half of fallen leaves in 80% of the trees.
Beginning of physiological dormancy of the plants.

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STATE 18. **END OF LEAF FALL.** When almost the entirety (95%) of leaves have fallen,

initiating the 0 state of dormant bud (State 0 of this chart).

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