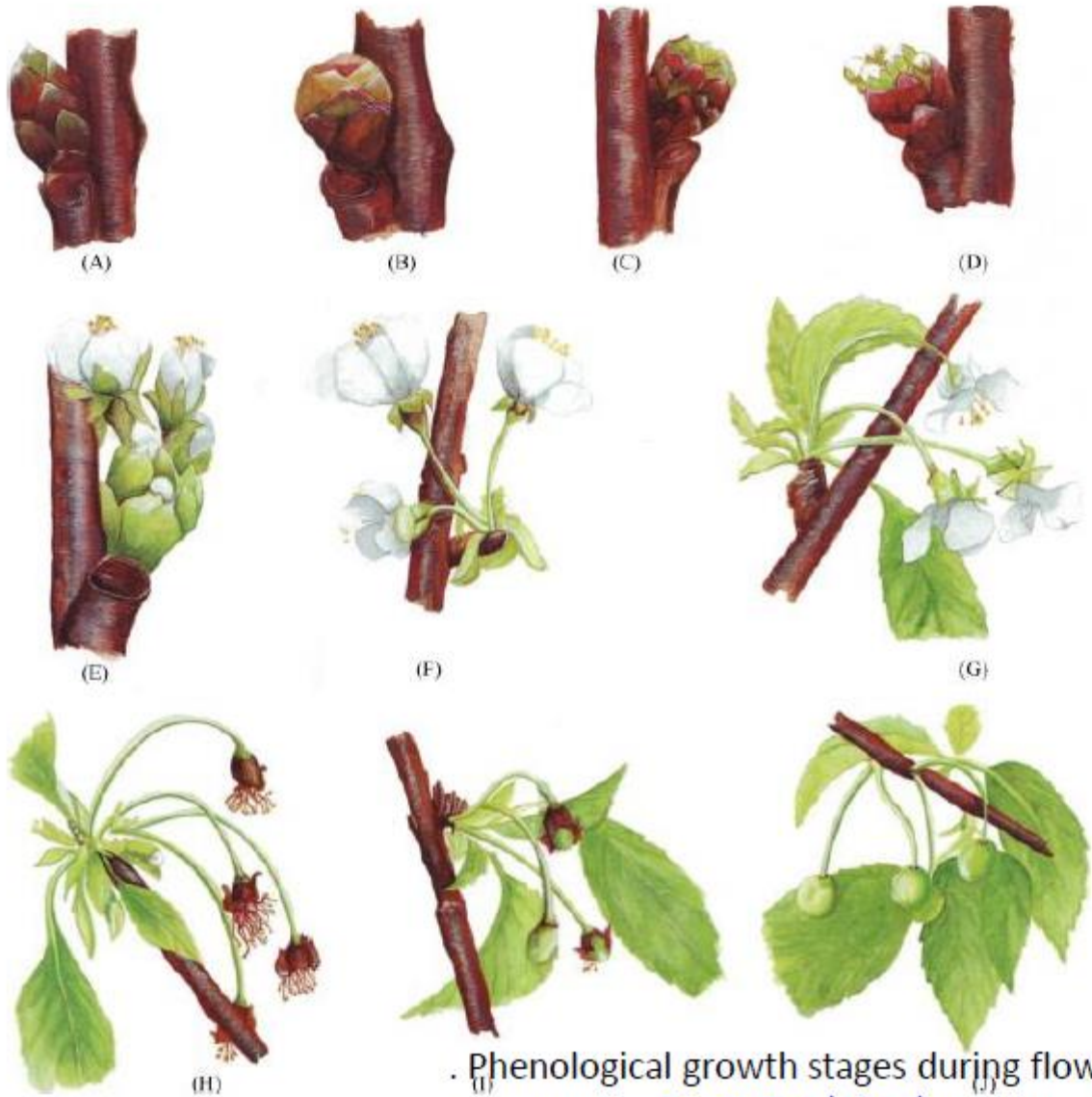


Beginning of flowering cherry (day of year) in Kyoto dating back till 705 AD, Menzel and Fabian, 2002



. Phenological growth stages during flowering of sweet cherry according to [Baggiolini \(1952\)](#). Modified from [Lichou et al. \(1990\)](#).



Porque é que a fenologia é importante?

A fenologia é útil no apoio à decisão dos fruticultores na medida em que permite (Velarde, 2006):

- Verificar a adaptabilidade das diferentes cultivares às condições climáticas de determinada região;
- Adaptar as diferentes técnicas culturais e posicionar determinados tratamentos ao longo do ciclo;
- Prever a época de colheita;
- Estimar a qualidade dos frutos; e,
- Avaliar a suscetibilidade que as diferentes cultivares estão sujeitas face às condições climáticas adversas e suscetibilidade de ataques de pragas e doenças.

# Phenological growth stages of sweet cherry according to the BBCH scale.

## BBCH code Description

### **Stage 0: bud development**

- 00 Dormancy
- 01 Beginning bud swelling
- 09 Green leaf tips visible

### **Stage 1: leaf development**

- 10 First leaves separating
- 19 First leaves fully expanded

### **Stage 3: shoot development**

- 31 Beginning of shoot growth
- 3. . . Stages continuous till. . .
- 39 90% of final shoots length

### **Stage 5: reproductive development or inflorescence emergence**

- 50 Dormancy, inflorescence bud closed
- 51 Inflorescence buds swelling
- 53 Bud burst
- 59 Balloon

### **Stage 6: flowering**

- 60 First flowers open
- 61 Beginning of flowering
- 64 40% of flowers open
- 65 Full flowering
- 67 Flower fading
- 69 End of flowering

### **Stage 7: fruit development**

- 71 Ovary growing
- 72 Sepals beginning to fall
- 77 70% of final fruit size
- 78 80% of final fruit size
- 79 90% of final fruit size

### **Stage 8: ripening or maturity**

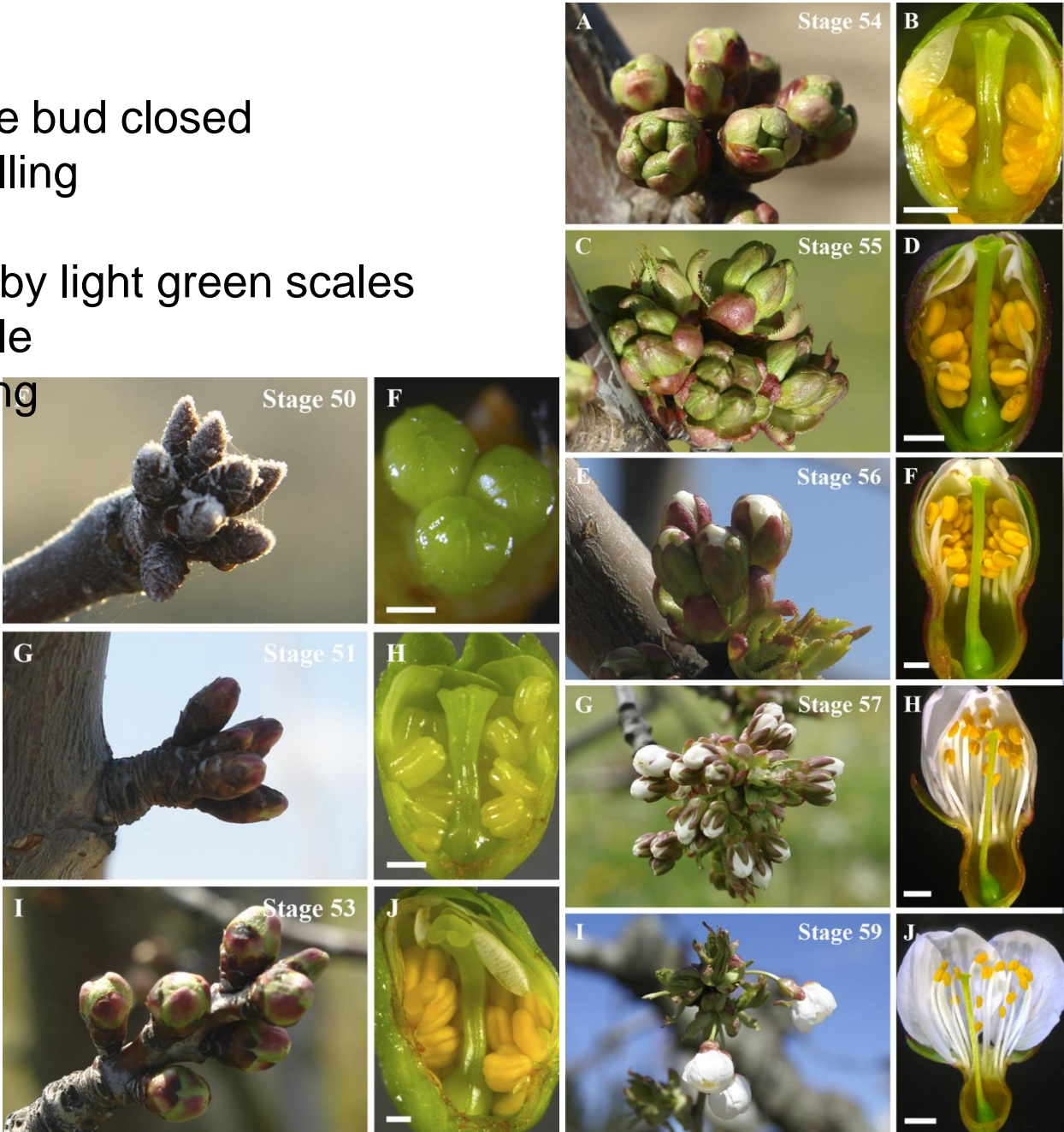
- 81 Beginning of fruit colouring
- 85 Colouring advanced
- 87 Fruit ripe for picking

### **Stage 9: senescence, beginning of dormancy**

- 91 Shoot growth completed; foliage still fully green
- 92 Leaves begin to discolour
- 93 Beginning of leaf fall
- 95 50% of leaves fallen
- 97 All leaves fallen

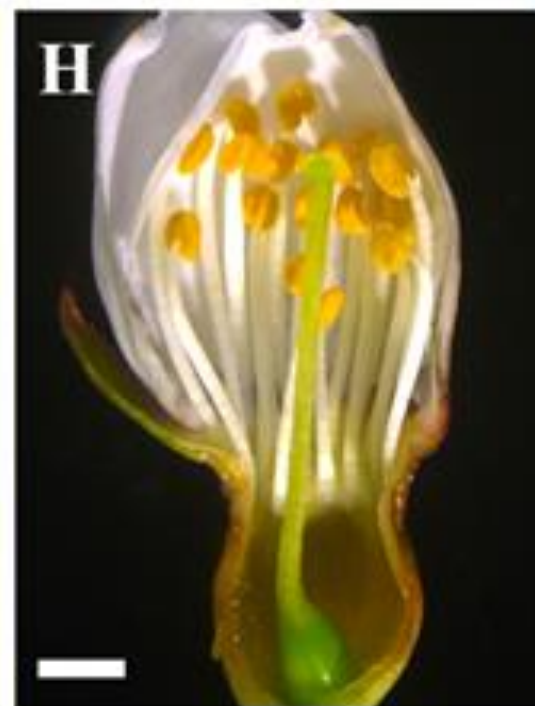
# Stage 5: reproductive development or inflorescence emergence

- 50 Dormancy, inflorescence bud closed
- 51 Inflorescence buds swelling
- 53 Bud burst
- 54 Inflorescence enclosed by light green scales
- 55 Single flower buds visible
- 56 Flower pedicel elongating
- 57 Sepals open
- 59 Balloon



BBCH - cerejeira



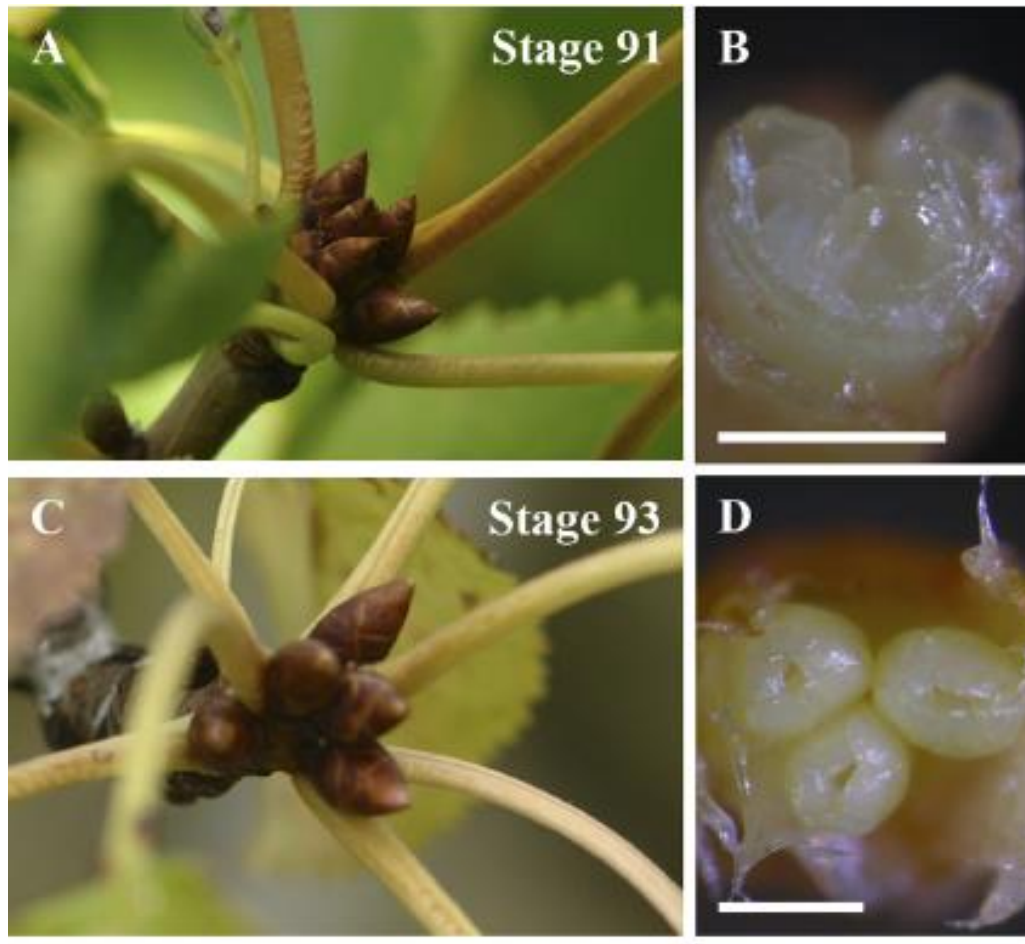




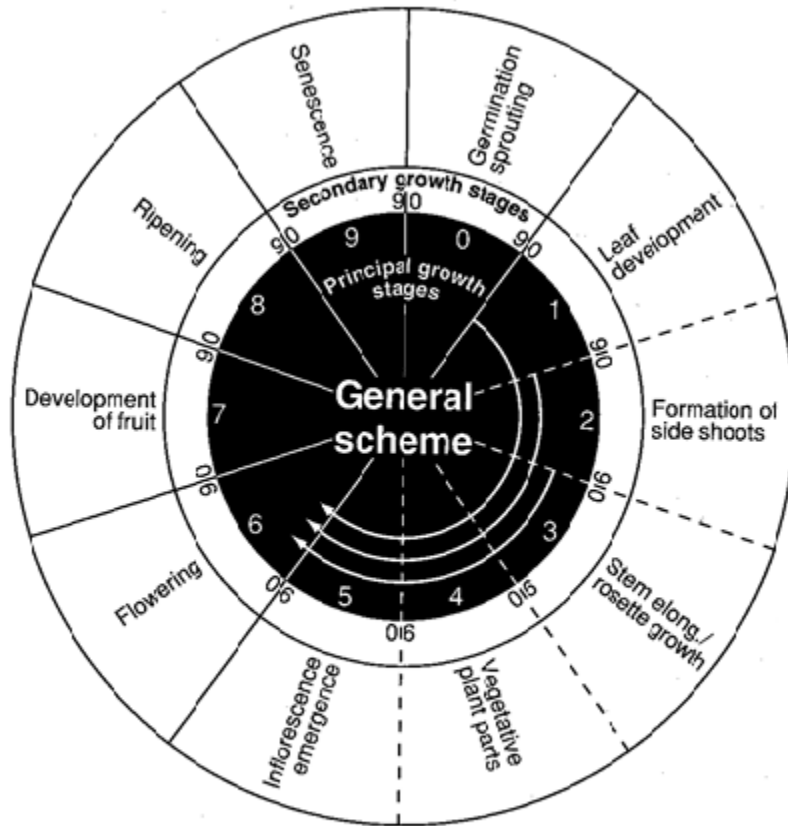


Principal growth Stage 9: senescence, beginning of dormancy

- 91 Shoot growth completed; foliage still fully green
  - 92 Leaves begin to discolour
  - 93 Beginning of leaf fall
  - 95 50% of leaves fallen
  - 97 All leaves fallen
- 



**BBCH** derives from **B**iologische **B**undesanstalt,  
**B**undessortenamt and **C**hemical industry.



Principal Growth Stages <sup>α</sup>	Description <sup>α</sup>
0 <sup>α</sup>	Germination /- sprouting /- bud development <sup>α</sup>
1 <sup>α</sup>	Leaf development (main shoot) <sup>α</sup>
2 <sup>α</sup>	Formation of side shoots /- <u>tillering</u> <sup>α</sup>
3 <sup>α</sup>	Stem elongation or rosette growth /- shoot development ( <u>main shoot</u> ) <sup>α</sup>
4 <sup>α</sup>	Development of harvestable vegetative plant parts or <u>vegetatively propagated organs</u> /- booting (main shoot) <sup>α</sup>
5 <sup>α</sup>	Inflorescence emergence (main shoot) /- Heading <sup>α</sup>
6 <sup>α</sup>	Flowering (main shoot) <sup>α</sup>
7 <sup>α</sup>	Development of fruit <sup>α</sup>
8 <sup>α</sup>	Ripening or maturity of fruit and seed <sup>α</sup>
9 <sup>α</sup>	Senescence beginning of dormancy <sup>α</sup>

α

**Phenological growth stages and Identification keys of pome fruit**(apple = *Malus domestica* Borkh., pear = *Pyrus communis* L.)

Code	Description
<b>Principal growth stage 0: Sprouting/Bud development</b>	
00	Dormancy: leaf buds and the thicker inflorescence buds clo and covered by dark brown scales
01	Beginning of leaf bud swelling: buds visibly swollen, bud scales elongated, with light coloured patches
03	End of leaf bud swelling: bud scales light coloured with some parts densely covered by hairs
07	Beginning of bud break: first green leaf tips just visible
09	Green leaf tips about 5 mm above bud scales

**Principal growth stage 1: Leaf development**

10	Mouse-ear stage: Green leaf tips 10 mm above the bud scales first leaves separating
11	First leaves unfolded (others still unfolding)
15	More leaves unfolded, not yet at full size
19	First leaves fully expanded

**Principal growth stage 3: Shoot development<sup>1</sup>**

31	Beginning of shoot growth: axes of developing shoots visible
32	Shoots about 20% of final length
33	Shoots about 30% of final length
34	Stages continuous till . . .
39	Shoots about 80% of final length

**Principal growth stage 5: Inflorescence emergence**

51	Inflorescence buds swelling: bud scales elongated, with light coloured patches
52	End of bud swelling: light coloured bud scales visible with parts densely covered by hairs
53	Bud burst: green leaf tips enclosing flowers visible
54	Mouse-ear stage: green leaf tips 10 mm above bud scales; first leaves separating
55	Flower buds visible (still closed)
56	Green bud stage: single flowers separating (still closed)
57	Pink bud stage: flower petals elongating; sepals slightly open petals just visible
59	Most flowers with petals forming a hollow ball

**Phenological growth stages and Identification keys of pome fruit**

Code	Description
<b>Principal growth stage 6: Flowering</b>	
60	First flowers open
61	Beginning of flowering: about 10% of flowers open
62	About 20% of flowers open
63	About 30% of flowers open
64	About 40% of flowers open
65	Full flowering: at least 50% of flowers open, first petals falling
67	Flowers fading: majority of petals fallen
69	End of flowering: all petals fallen

**Principal growth stage 7: Development of fruit**

71	Fruit size up to 10 mm; fruit fall after flowering
72	Fruit size up to 20 mm
73	Second fruit fall
74	Fruit diameter up to 40 mm; fruit erect (T-stage: underside of fruit and stalk forming a T)
75	Fruit about half final size
76	Fruit about 60% final size
77	Fruit about 70% final size
78	Fruit about 80% final size
79	Fruit about 90% final size

**Principal growth stage 8: Maturity of fruit and seed**

81	Beginning of ripening: first appearance of cultivar-specific colour
85	Advanced ripening: increase in intensity of cultivar-specific colour
87	Fruit ripe for picking
89	Fruit ripe for consumption: fruit have typical taste and firmness

**Principal growth stage 9: Senescence, beginning of dormancy**

91	Shoot growth completed; terminal bud developed; foliage still fully green
92	Leaves begin to discolour
93	Beginning of leaf fall
95	50% of leaves discoloured
97	All leaves fallen
99	Harvested product

# Estados fenológicos



00



01



10



55



56



59



60



65



67



72



89

0 – Desenvolvimento dos gomos

1 – Desenvolvimento das folhas

3 – Desenvolvimento dos ramos

5 – Desenvolvimento das flores

6 – Floração

7 – Desenvolvimento do fruto

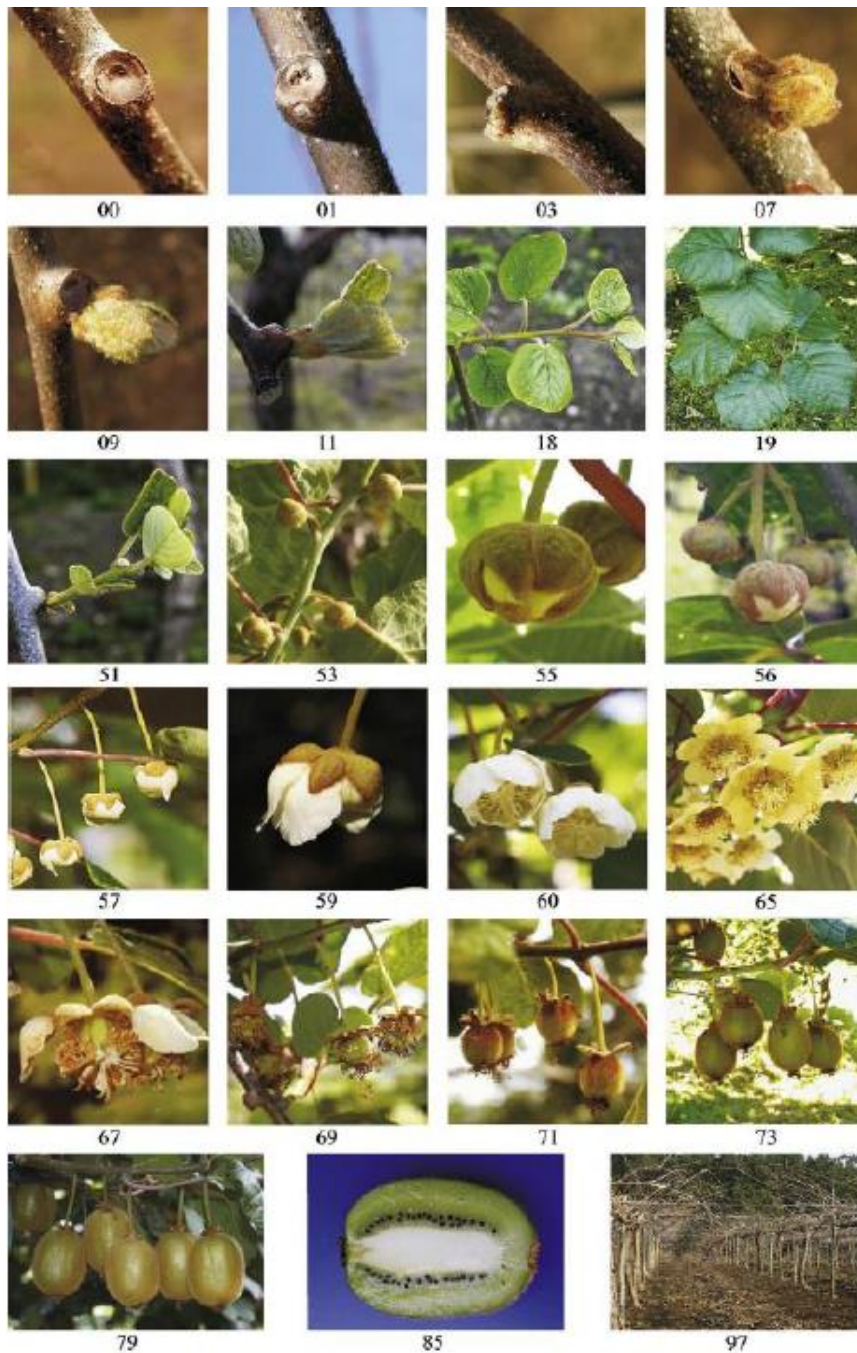
8 - Maturação do fruto

9 – Senescência e começo do repouso

Agustí, 1997

Table 3 Fruit trees and bushes, and grapevine

Species	Phenophases (BBCH-code)
<i>Malus domestica</i>	First flowers open (BBCH60), Full flowering (BBCH65), End of flowering (BBCH69), Fruits ripe for picking (BBCH87), 50% of leaves fallen (BBCH95)
<i>Prunus armeniaca</i> ( <i>Armeniaca vulgaris</i> )	First flowers open (BBCH60), Full flowering (BBCH65), End of flowering (BBCH69), Fruits ripe for picking (BBCH87)
<i>Prunus avium</i> ( <i>Cerasus avium</i> )	First flowers open (BBCH60), Full flowering (BBCH65), End of flowering (BBCH69), Colouring of leaves (BBCH94)
<i>Prunus cerasus</i>	First flowers open (BBCH60), Full flowering (BBCH65), End of flowering (BBCH69)
<i>Pyrus communis</i>	First flowers open (BBCH60), Full flowering (BBCH65), End of flowering (BBCH69), Fruits ripe for picking (BBCH87)
<i>Ribes rubrum</i> ( <i>R. sylvestre</i> )	First flowers open (BBCH60), Fruits ripe for picking (BBCH87)
<i>Vitis vinifera</i>	Beginning of bud burst (BBCH07), Leaf unfolding (BBCH11), First flowers open (BBCH60), Full flowering (BBCH65), End of flowering (BBCH69); Beginning of ripening (BBCH81) <i>or</i> berries developing colour (BBCH83) <i>or/and</i> softening of berries (BBCH85), beginning of leaf-fall (BBCH94) <u>and/or</u> 50% of leaves fallen (BBCH95)



Descrição da escala BBCH dos estados fenológicos primários e secundários da *Actinidia deliciosa* cv 'Hayward', seguido de respetivo registo fotográfico de alguns dos estados (Salinero, Vela, & Sainz, 2009).

Anexo I – Escala alfabética dos estados fenológicos da *Actinidia deliciosa* cv 'Hayward' (Neves, 2008).



A. Gomo de Inverno



B. Gomo Inchado



C. Abrolhamento



D. Gomo de Inverno



E. Folhas Visíveis



F. Botões Florais Visíveis



G. Folhas Separadas



H. Botões Florais Separados



I. Pétalas Visíveis



J. Campânula



K. Plena Floração



L. Vingamento



M. Frutos Crescimento



N. Maturação



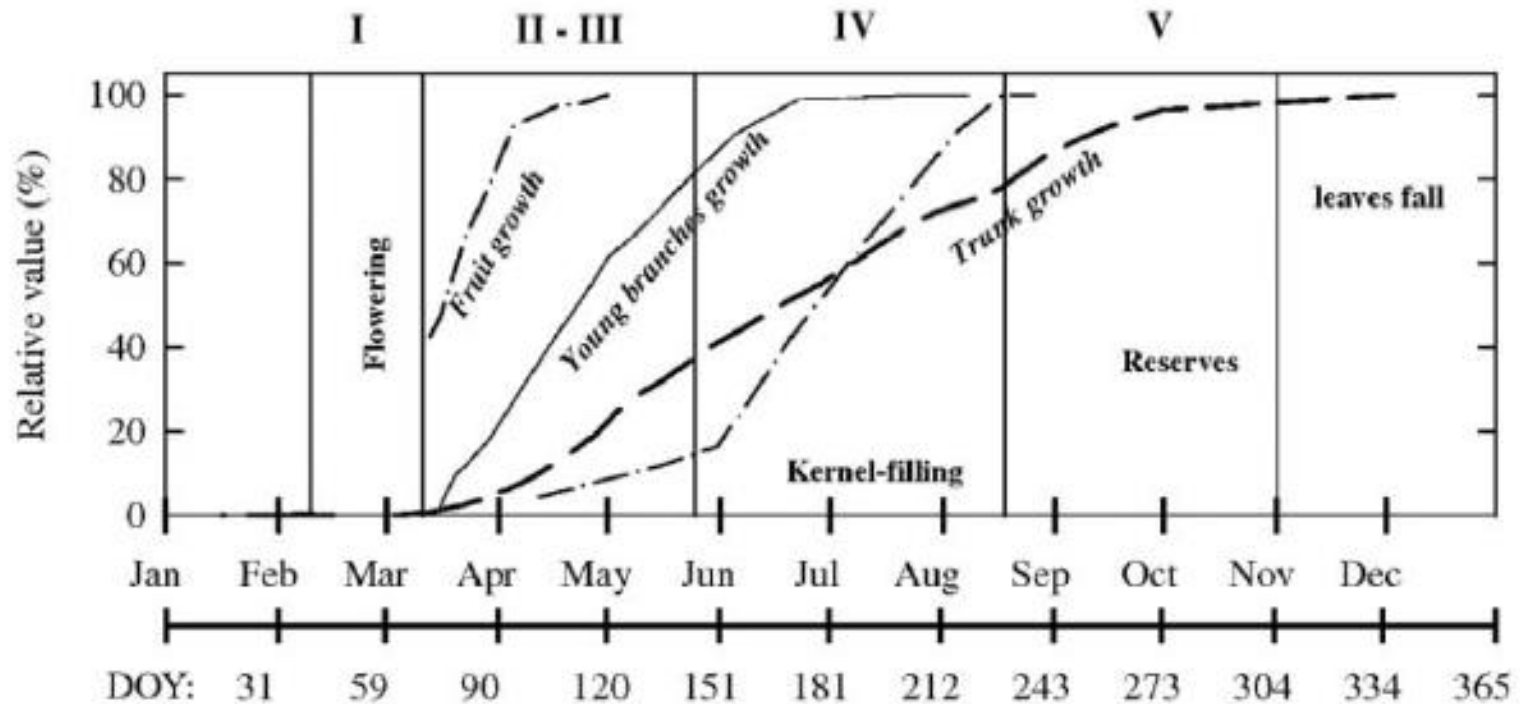


Phenological growth stages of 'Flordastar' peach trees according to the BBCH (numbers) and Baggioini (letters) codes.

Oussama H. Mounzer et al., 2008

- A – Botão de inverno
- B - Botão inchado
- C - Cálice à vista
- D - Corola à vista
- E – Estames à vista
- F - Flor aberta
- G - Queda das pétalas
- H - Frutos vingado
- I - Fruto jovem
- J - Fruto em crescimento

Schematic representation of *P. dulcis* tree developmental Stages I–V.



Nortes P A et al. *Tree Physiol* 2009;29:375-388

**Cell  
division**



**Cell  
expansion**



**Maturation**

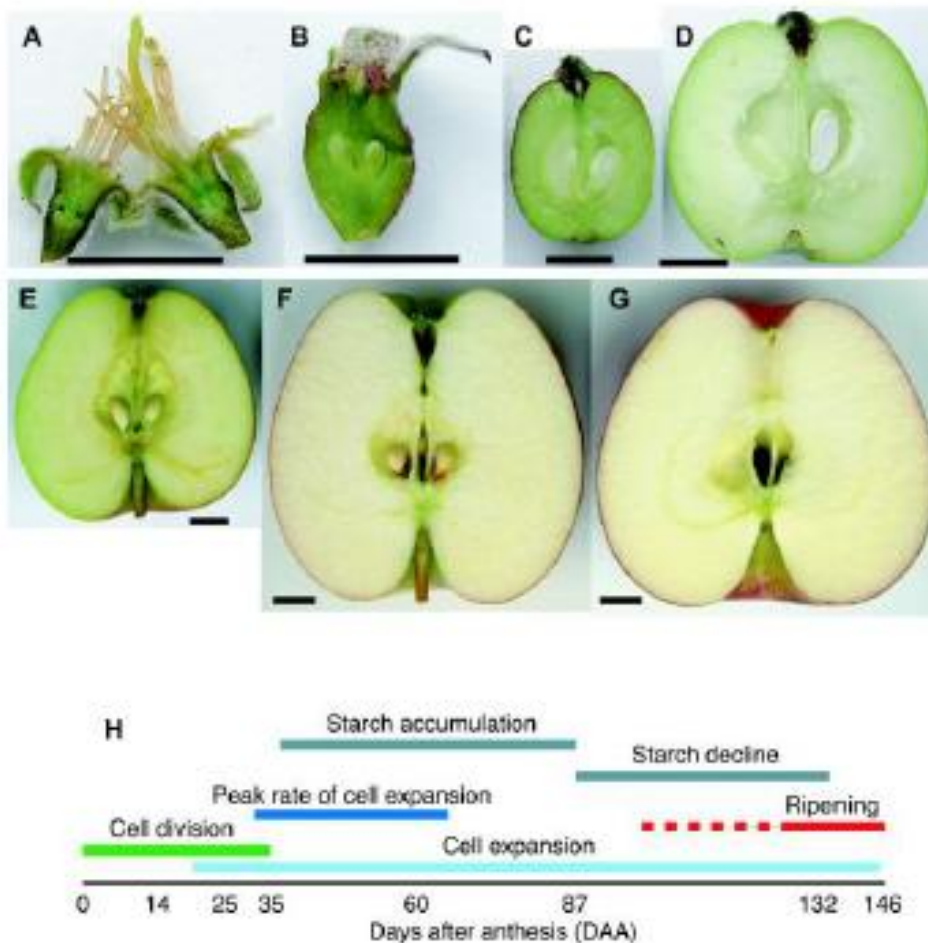


**Ripening**



**Senescence**





*Apple fruit development.* Apple fruit at various stages of development. A, 0 DAA, B, 14 DAA, C, 35 DAA, D, 60 DAA, E, 87 DAA, F, 132 DAA, G, 146 DAA. H, diagram of fruit development showing the timing of major physiological events and the sampling time points, adapted from [17–19]. Ripening is shown as a solid and dashed red, solid from the time of the climacteric and dashed for events prior to the climacteric. Bar = 1 cm.

Janssen BJ, Thodey K, Schaffer RJ, Alba R, Balakrishnan L, Bishop R, Bowen JH, Crowhurst RN, Gleave AP, Ledger S, McCartney S, Pichler FB, Snowden KC, Ward S. *Global gene expression analysis of apple fruit development from the floral bud to ripe fruit.* *BMC Plant Biol.* 2008 Feb 17;8:16. [PMID: 18279528](https://pubmed.ncbi.nlm.nih.gov/18279528/)