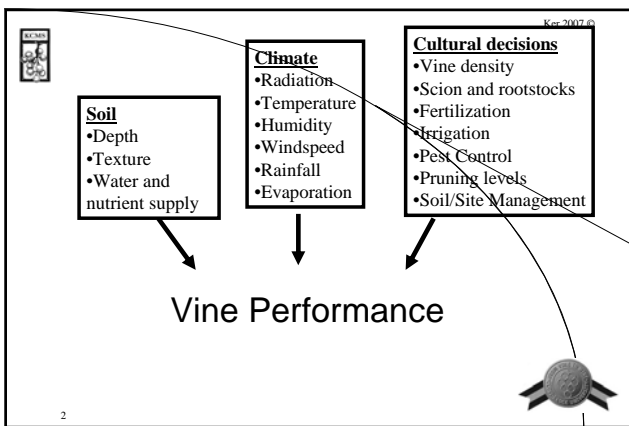


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Phenology and Growth of Grapevines

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1



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Phenology

- the study of the events or growth stages that recur seasonally and relative to climatic factors (day length, temperature, solar radiation, etc)


3

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How does a vine grow



- Growth is indeterminate
- Can grow wood or fruit
- Fruit bud initiation occurs in season **previous** to year of fruiting
- Fruit bud initiation dependent on sunlight

4




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Growth is indeterminate






5




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Wood or Fruit



6



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Growing Degree days

- growing degree days GDD
- $GDD = [(T_{max} + T_{min}) / 2] - \text{Threshold } T$

where threshold T for grapes is 50 F

7

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Growth

- “ an irreversible increase in the size of the plant “ (Mullins 1992)
- An increase in the size of cells already present
- An increase in the number of cells by divisions with meristems (growing points)

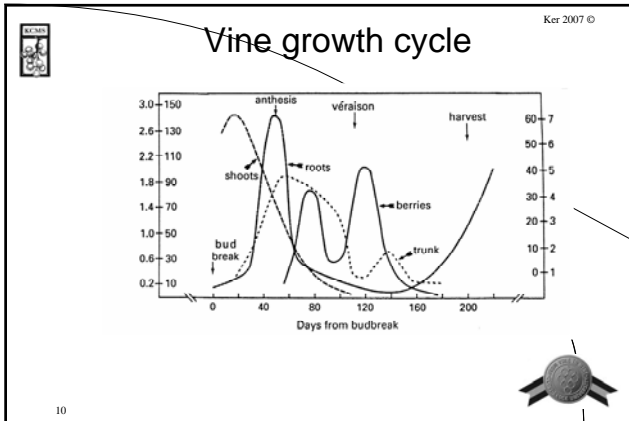
8

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Annual growth cycle

- Longer than a single 12 month period when looking from initiation of events until expression
- Need for accurate communication of developmental stages


9



- 11
- ### Components of a Good Descriptive System
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- Contains a succession of developmental events that follow each other
 - Contains easily recognizable, identifiable and adequately described stages
 - Uses consistent stages for assessment
 - Where possible incorporates quantifying measurements to increase precision
- 11


- 12
- ### Beginning and End of Dormancy
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- EL stages 01 and 47
 - Initial stages begin prior to harvest
- 12

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Dormancy Initiation

- Photoperiod decreases
- Mean daily temperature decreases
- Hormonal response
 - Gibberellic acid ↓
 - Auxins (IAA) ↓
 - Cytokinins ↓
 - Dormins (abscisic acid) ↑




13

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Dormancy types

- **Innate Dormancy** aka **Endodormancy**
 - Buds incapable of growth due to hormone levels
 - Can only be overcome by “chilling requirement”
- Chill unit = number of hours between 32 and 40 F
- For grapes in NE this requirement is met usually by Late December




14

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Dormancy Types

- Once chilling requirement is met what limits growth?
 - Environmental factors – temperature, moisture, sunlight, ?????
- **Imposed Dormancy** or **Ectodormancy**




15

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Budburst

- Winter bud
- Budswell
- Woolly bud
- Green Tip
- Rosette of leaf tips visible
- First leaf separated from the shoot tip

16




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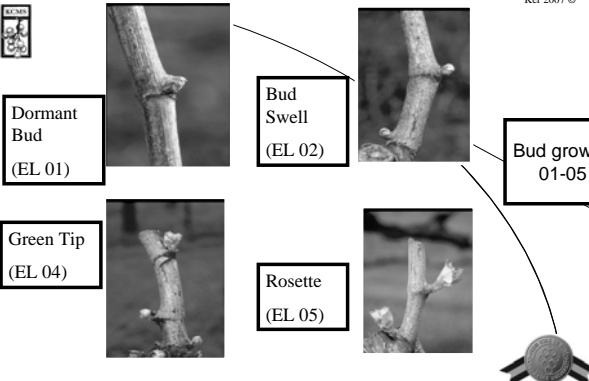
Budburst

- Occurs when endo and ecto dormancy factors satisfied
- ABA concentration ↓
- IBA, GA and cytokinins ↑
- Mean daily temp > 50 F* (Australia study at 46 F)
- Day length > 12 hrs

17



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Dormant Bud (EL 01)


Bud Swell (EL 02)

Bud growth 01-05


Green Tip (EL 04)

Rosette (EL 05)

18




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Shoots 10 cm

- Goes from 2 to 3 leaves separated through to 14 leaves separated with flower caps in place, colour fading
- *Beginning of use of nutrients absorbed by roots in current spring*




19

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Shoot growth

- Cell enlargement and cell division
- IAA allows for cell elasticity and expansion is due to water uptake
- Key items – sunlight and water!




20

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Early Shoot Growth 12-17


10 cm Growth (EL 12)




Seven Leaves (EL 14)




Ten Leaves (EL 16)




Twelve Leaves (EL 17)






21

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Flowering Begins

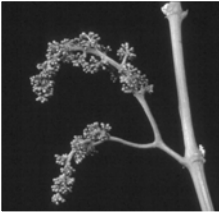
- 16 leaves separated, first caps loosen and fall
- 10% caps fallen
- 30 % caps fallen



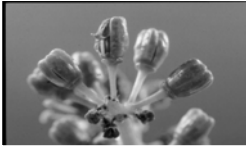
22

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Fourteen Leaves –
Immediate Prebloom
(EL 18)




Caps Beginning to
Dehisce
(EL 19)

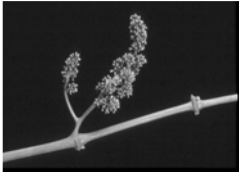
Begin flowering



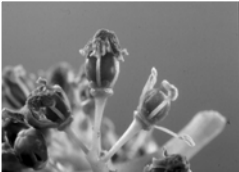
23

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10 Percent
Capfall (EL
20)




Cap Falling,
Stamens Visible

Capfall




24

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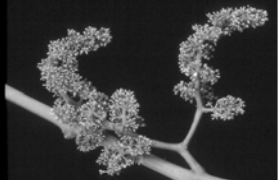
Full Bloom – 50% Caps off

- 17 to 20 leaves separated, 50% of caps fallen
- 80% caps fallen
- Cap Fall complete

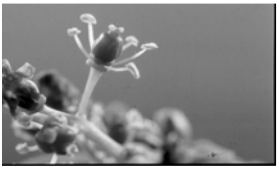


25

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80 Percent Caps Off
(EL 25)




Fully Exposed
Floret

Flowering late




26

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The next Crop

- Formation of the winter bud
- Light > compensation point
- Light on the leaf and bud
- Mean daily temp >60 F
- No excessive rainfall????




27

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Setting – Young Berries

- Setting young berries > 2 mm
- Berries peppercorn size approx 1/8 inch




28

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Successful fruit set

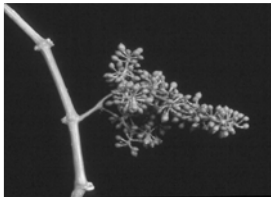
- Adequate sunlight
- Temperature (optimum pollen germination at 65 F)
- Dry but not arid conditions
- Can be hampered by
 - Temps 57 F or lower, or 85 F or higher
 - Rainy weather



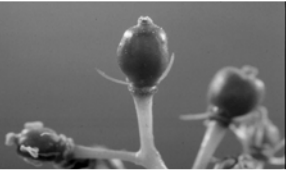
29

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Fruit Set (EL 27)



Close Up of Set Fruit

Fruit set




30

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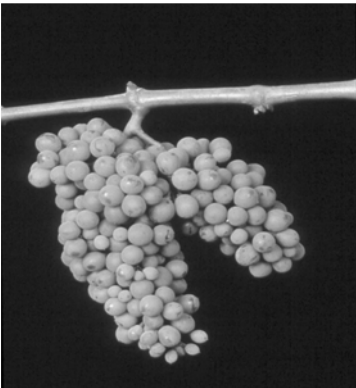
Veraison

- Berry softening begins
- Berry colouring begins

31




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Beginning of Veraison

32




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Veraison

- Berry color changes
- Berry accumulates water/sugar
- Berry accumulates flavorants
- Berry softens
 - Changes in cell wall composition

33




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Stages of Veraison: Physiological

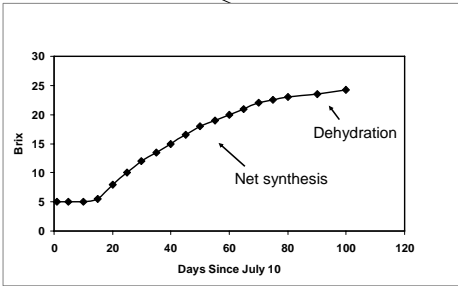
1. Sugar/Water accumulation via phloem alone
2. Arrest of xylem (water conducting tissue) transport to berry
3. Onset of dehydration
4. Raisining

34




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Berry Sugar Accumulation

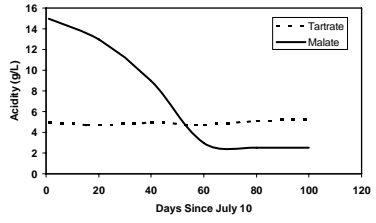


35




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Changes in Berry Acidity



36




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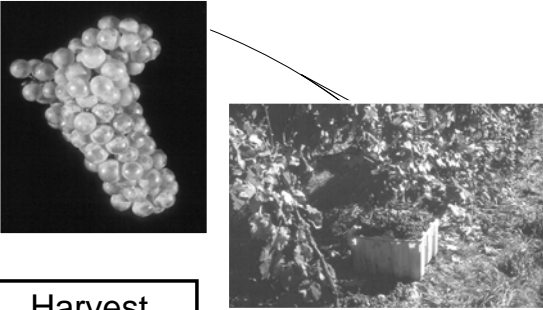
Harvest – Berries Ripe

- Berries harvest ripe
- Berries over-ripe
- Through to leaf fall

37




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Harvest

38




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Assessment of Grape Maturity

Berry Macrocomponents:

- Sugar
- pH
- Acidity
- Balance of Sugar/Acidity
- Ratio of Malate to Tartrate

39



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Assessment of Grape Maturity

Berry Protein Content:

- Total protein
- Protein profile
- Specific proteins
- Specific enzymatic activity level

40

