

Faktore wat seisoenale variasie in tros- en korrelmassa beïnvloed

Bespreking van voorkomende praktyke

SATI/RAISINS SA Produsente inligtingsdae, Aug 2023

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Probleemstelling - industrie uitdagings

- Trosgetalle goed, dus nie vrugbaarheidsprobleem
- Korrelmassa problematies, of minder korrels
- Lei tot laer oesmassa/uitpak
- Wetenskaplike redes wat lei tot laer korrelmassa/minder korrels?
- Wat veroorsaak yler set of afspeen?

Faktore - oorsig

- Klimaat
- Geneties/kultivar
- Langtermyn/reserwes
- Praktyke
 - Rypheidsgraad
 - Snoei/ooglading
 - Oesbeheer
 - Suier
 - Besproeiing/bemesting

Yield components for bud load (opbrengskomponente)

- * **Site and soil potential (terroir)** - at planting
- * **Rootstock / scion choice** - at planting
- * **Irrigation / fertilisation** - at planting / management
- * **Vines / ha (spacing)** - at planting
- * **Vigour and capacity** - during establishment
- * **Total cordon length per ha** - spacing, trellis system, vine development
- * **Bunches per shoot (fertility)** - initiation of bunches (previous season)
- * **Bud load** - in winter (pruning)
- * **Budburst %** - satisfying cold requirement during May / June
- * **Flowers / cluster** - just before / during budburst
- * **Berry mass** - 3 phases of berry growth (current season)
- * **Compensation ability** - climate and cultivation practices (previous and current seasons)

Adaptation of bud load

$$\text{Yield per vine (X)} = [A \times B + C] [D \times E]$$

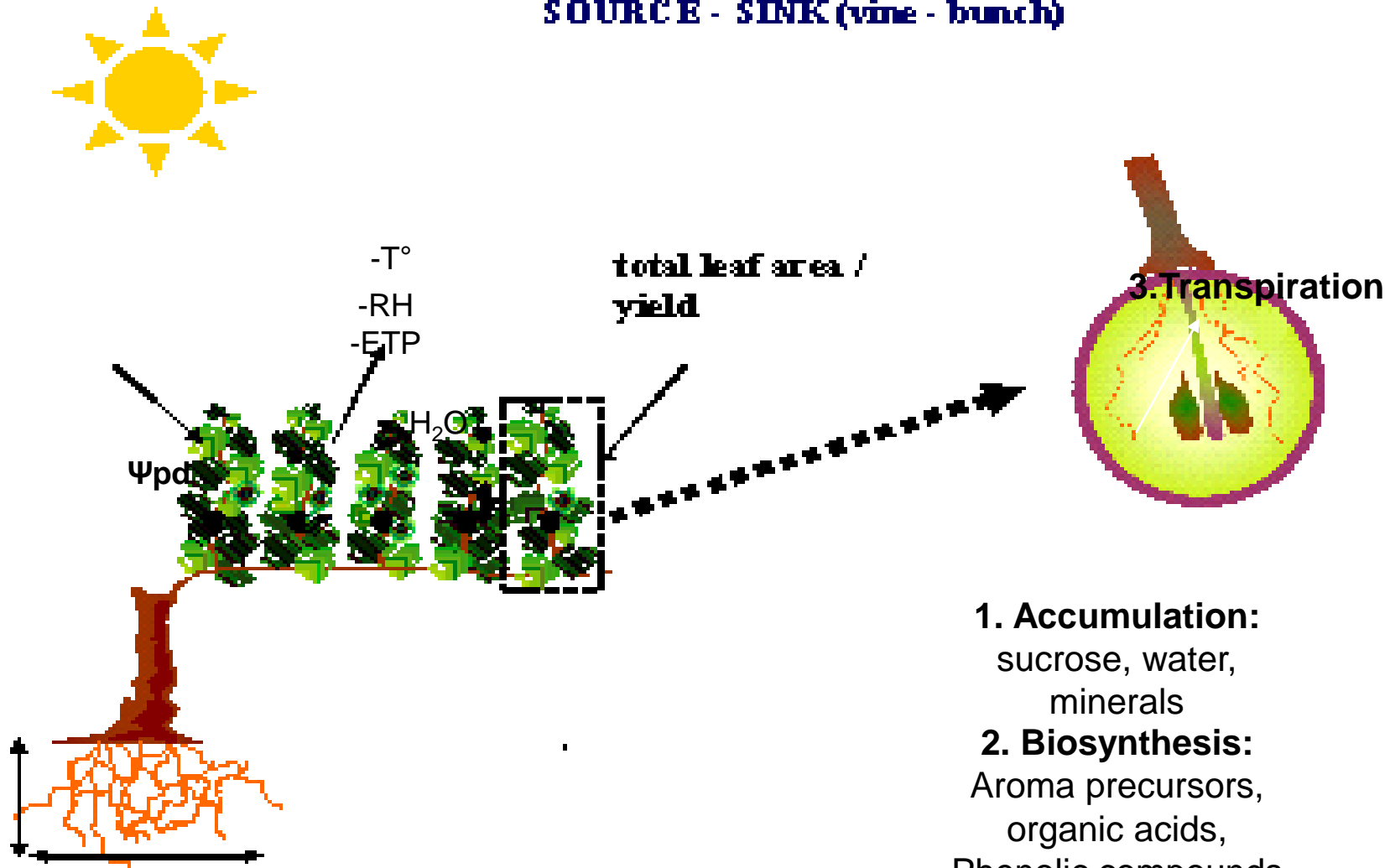
A	Bud load
B	Budburst percentage (buds per vine that burst normally as a percentage of buds allocated at pruning)
C	Collar buds (not assigned during pruning) that forms "extra" shoots able to bear grapes
D	Fertility – average amount of bunches per bud that burst
E	Bunch size / mass (genetic, growth conditions, cultivar)



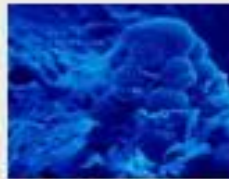
Balans?

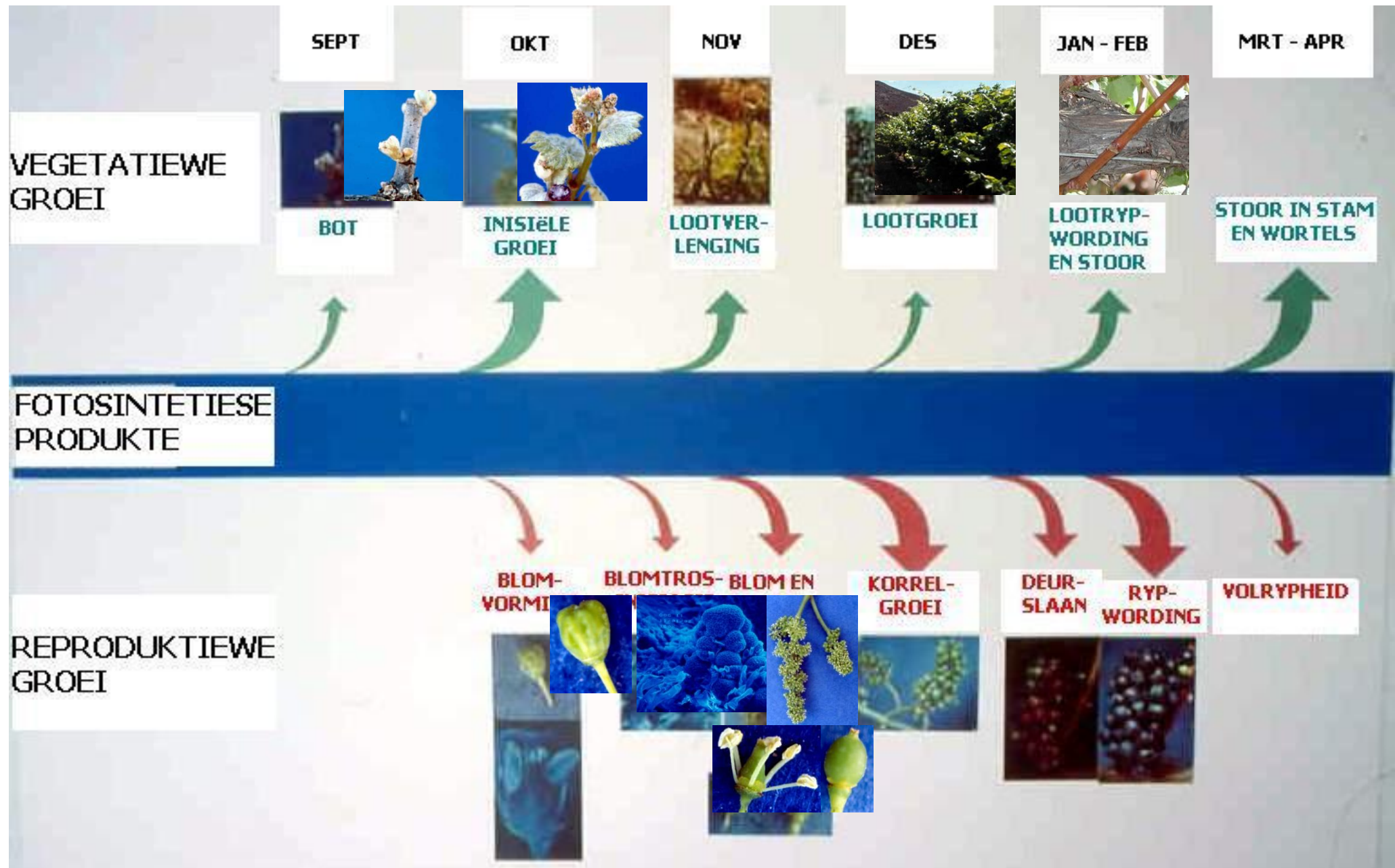


SOURCE - SINK (vine - bunch)

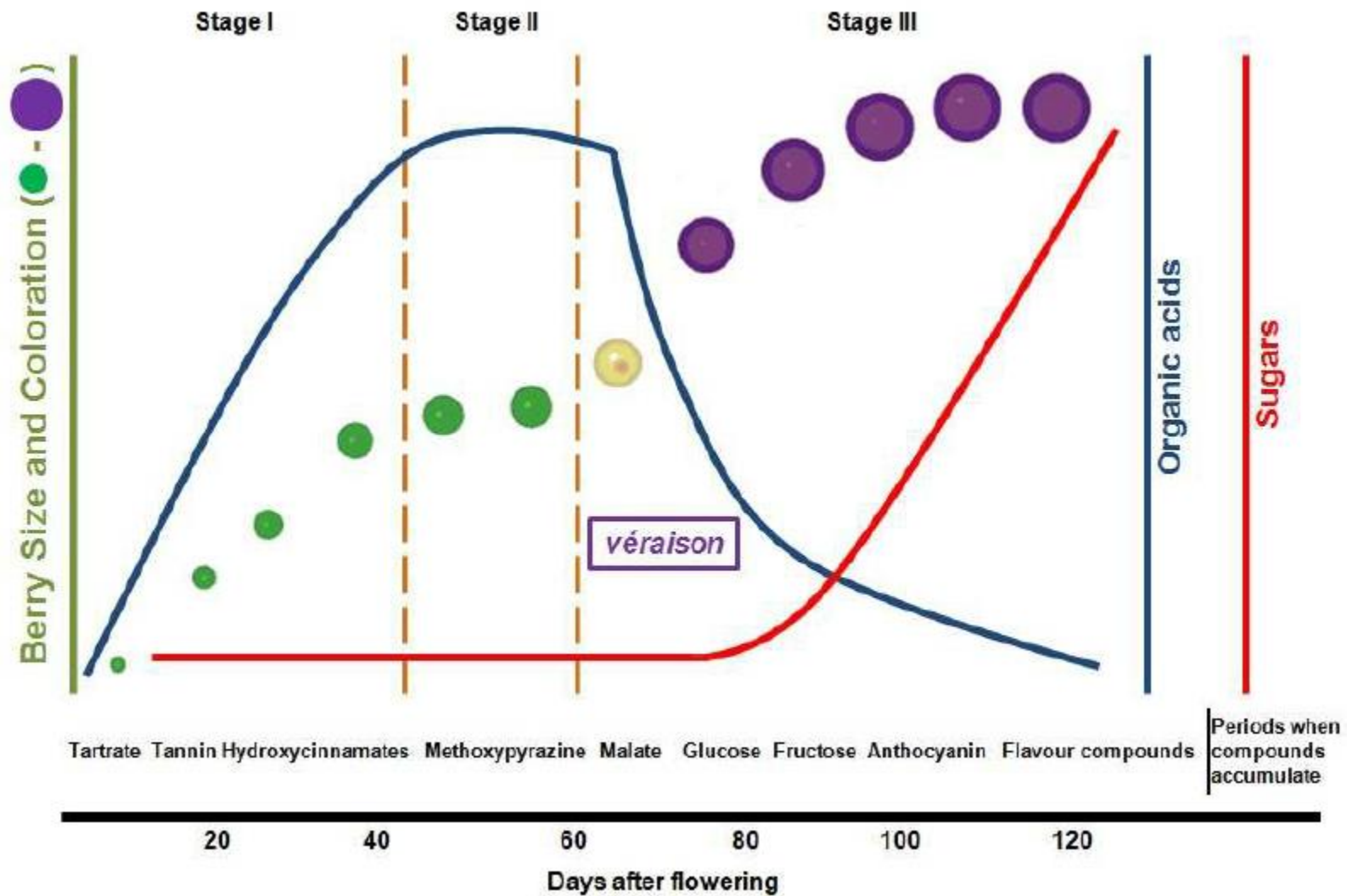


- 1. Accumulation:**
sucrose, water,
minerals
- 2. Biosynthesis:**
Aroma precursors,
organic acids,
Phenolic compounds

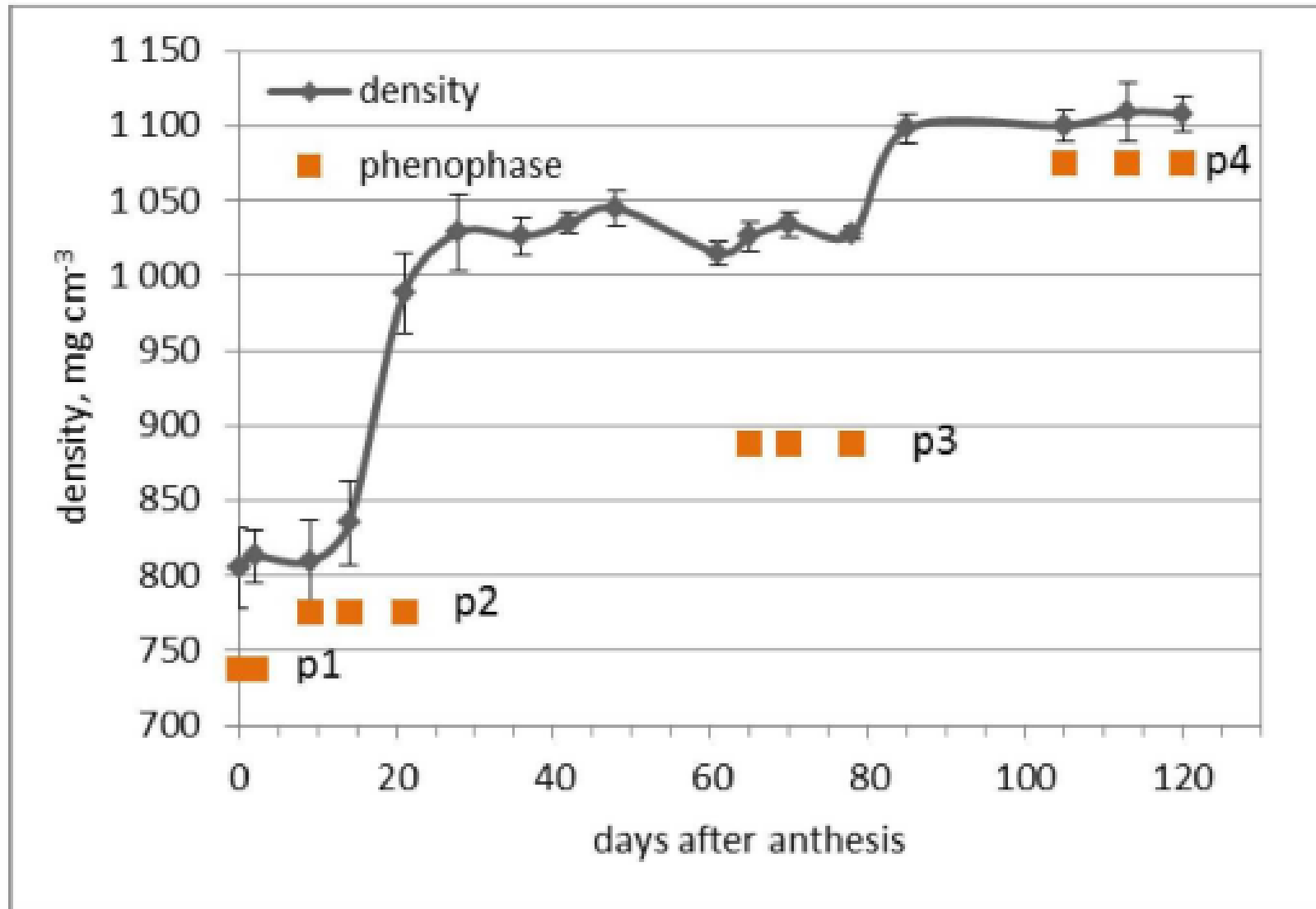




Noronha 2010



Swart Korinte (Letchov and Roychev 2017)



P1 – bot-
kappieval
P2 – vol blom-
set
P3 – deurslaan
P4 - ryp

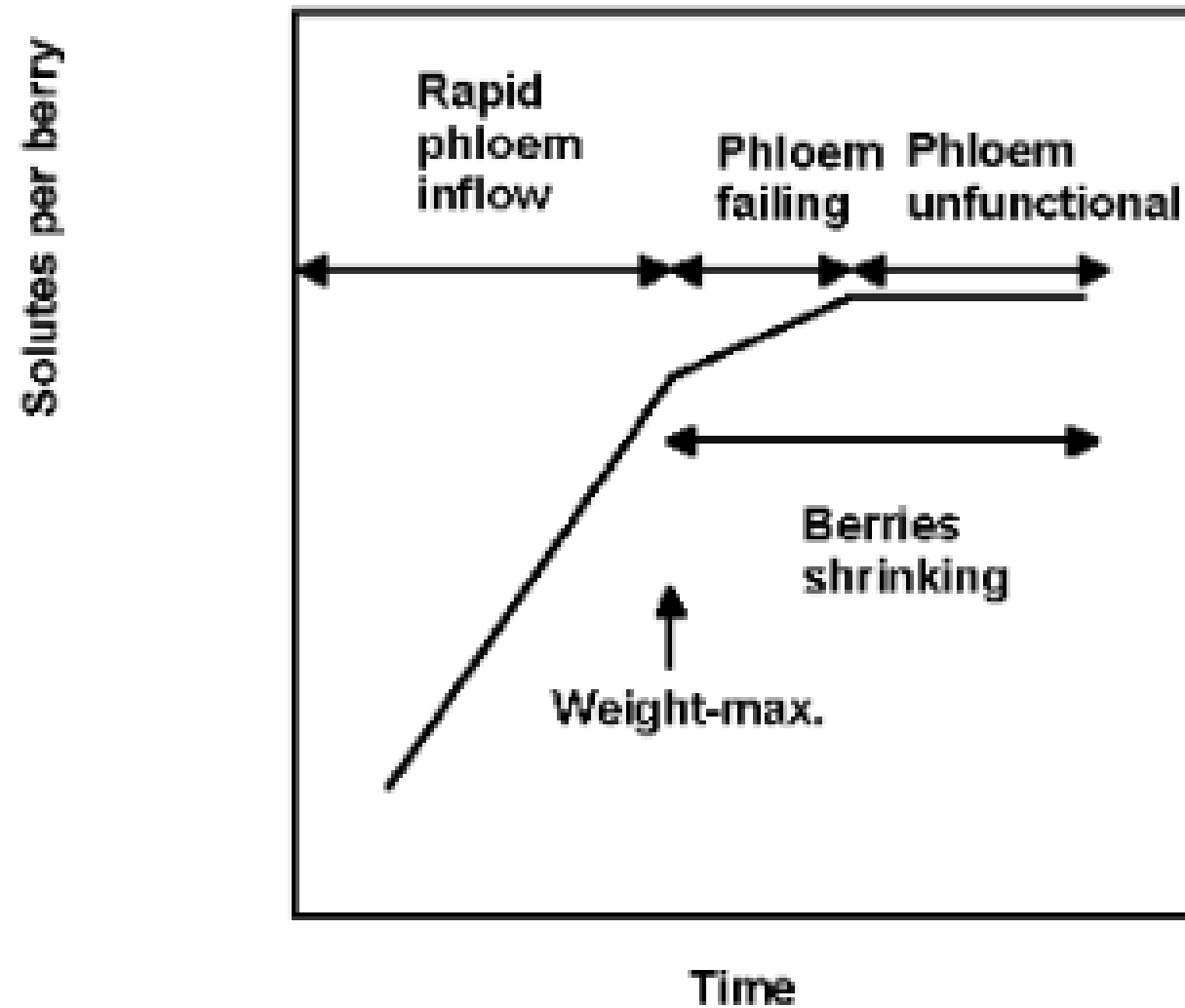
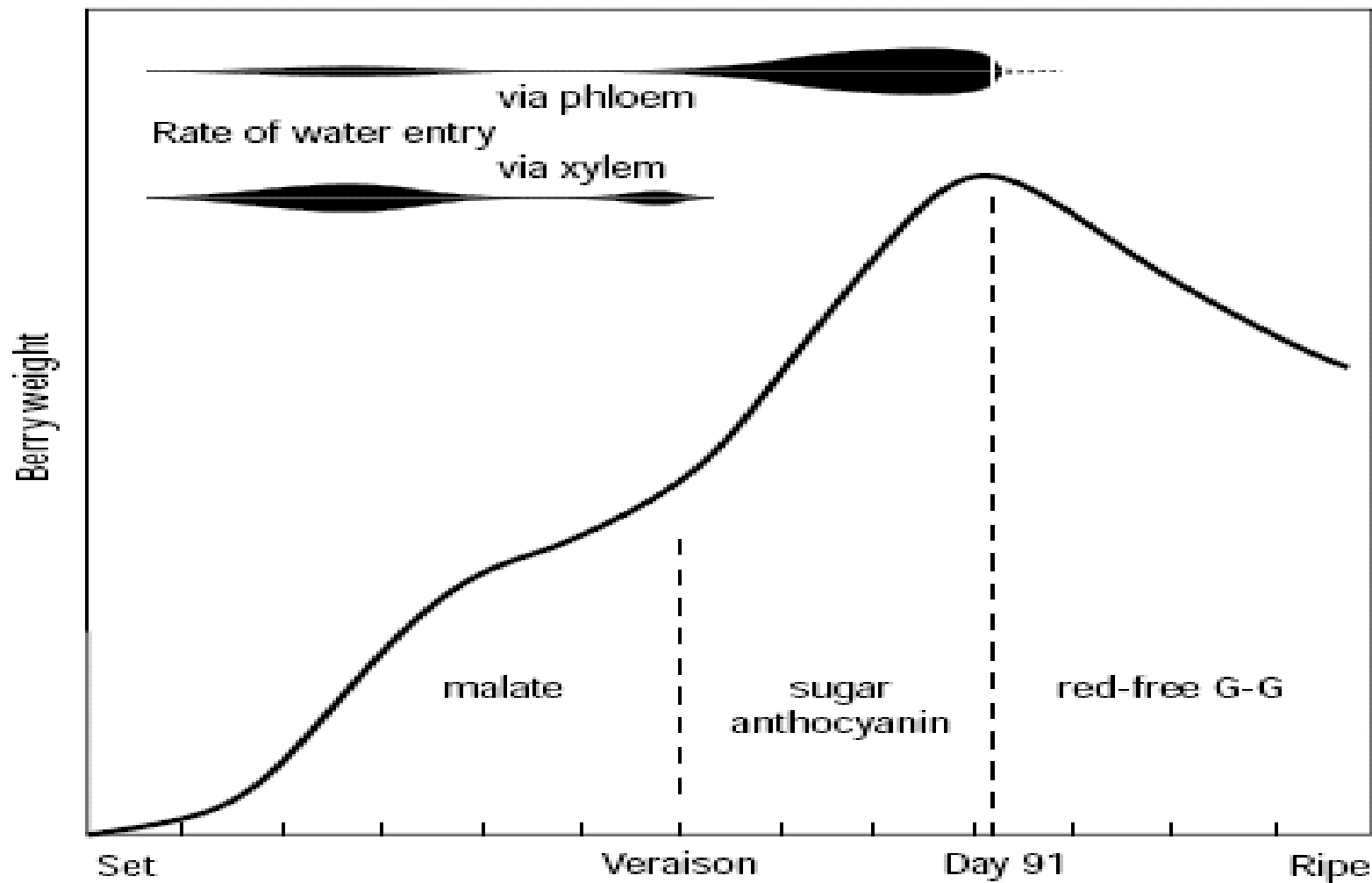


Figure 3. Hypotheses from Figure 2 (from McCarthy and Coombe 1999, reproduced with permission).

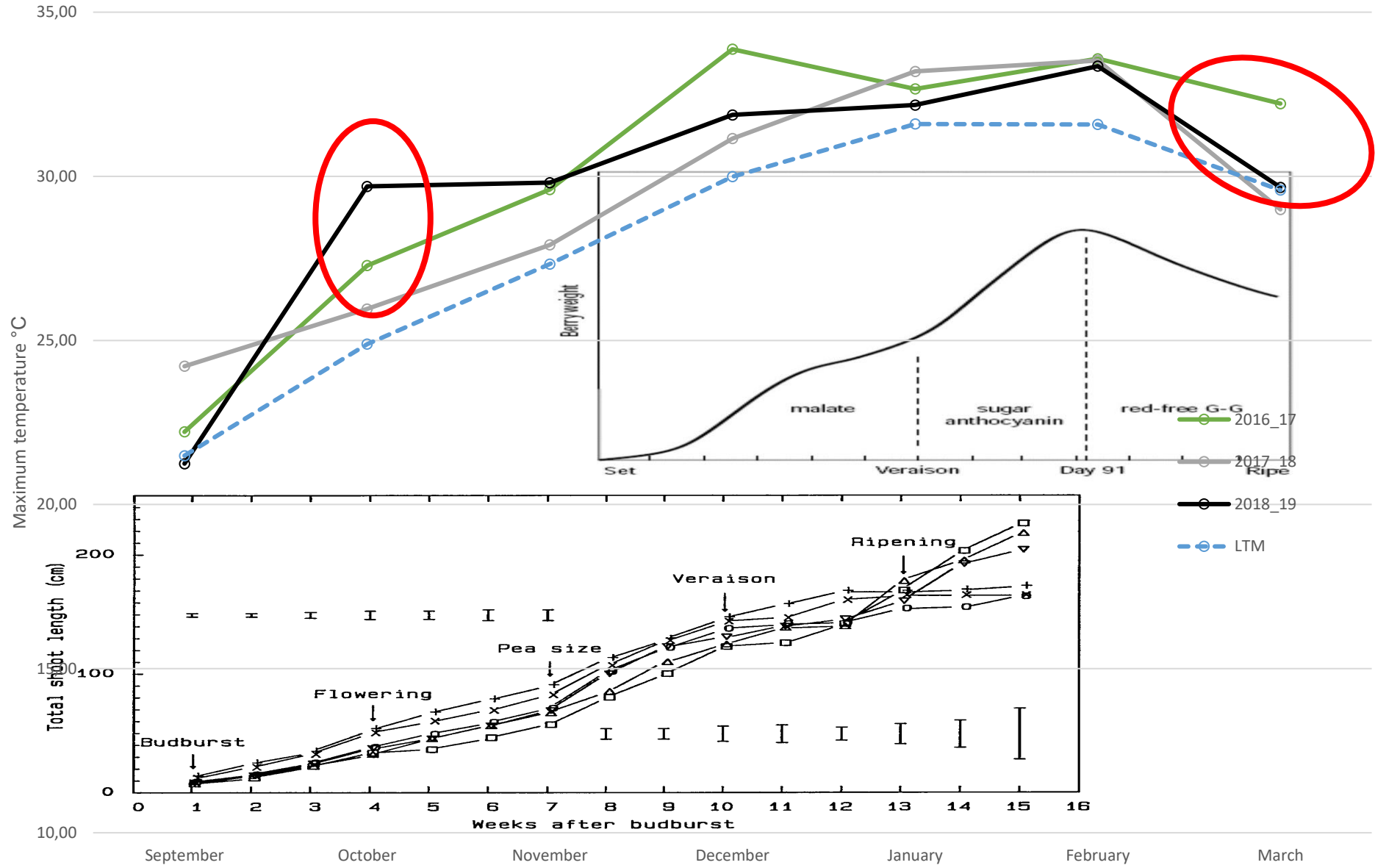
Berry development



Klimaatsverwante faktore

- Makro/meso Klimaat - kritiese tye (blom, vrugset)
 - Koue temp, wind, reen, hittegolf kan blom en sukses van set beïnvloed
- Mikroklimaat - skadu, variasie - wel beheerbaar

Aan de Doorns



Kultivar/geneties bepaalde aspekte

- Korrel- en tros grootte verskille/fenologie
- Vrugbaarheid gekoppel aan snoeitegniek
- Abnormaliteite (millerandage. . .) - min kultivars met sulke probleme
- Reaksie op waterspanning (i.e. isohidries/anisohidriese geaardheid)

Reserwes

- Interne faktore
 - reserwestatus, - baie sterk groei, laat blaarval, nie ooglopend 'n probleem
- Induksie/vrugbaarheid

Bestuurspraktyke (snoei, oesbeheer, suier)

- Bron/vraagpuntbalanse (kompetisie) - ooglading/oeslading
- Tros/korreluitdunning - tydsberekening en onvermoë om die res van seisoen te 'voorspel'
- Rosyntjiebedryf aangemoedig om oeste beheer.
- Snoeipraktyk - streng met snoei - vroeg inkom met eerste oesbeheer (1 tros/loot en ook opgevolg met suier) (daardie is krities en kan dalk beteken dat produsent te veel verminder)
- Snoeityd+vrugbaarheid - effek op tyd van bot, tyd van induksie - dalk nie so relevant?
- Suier

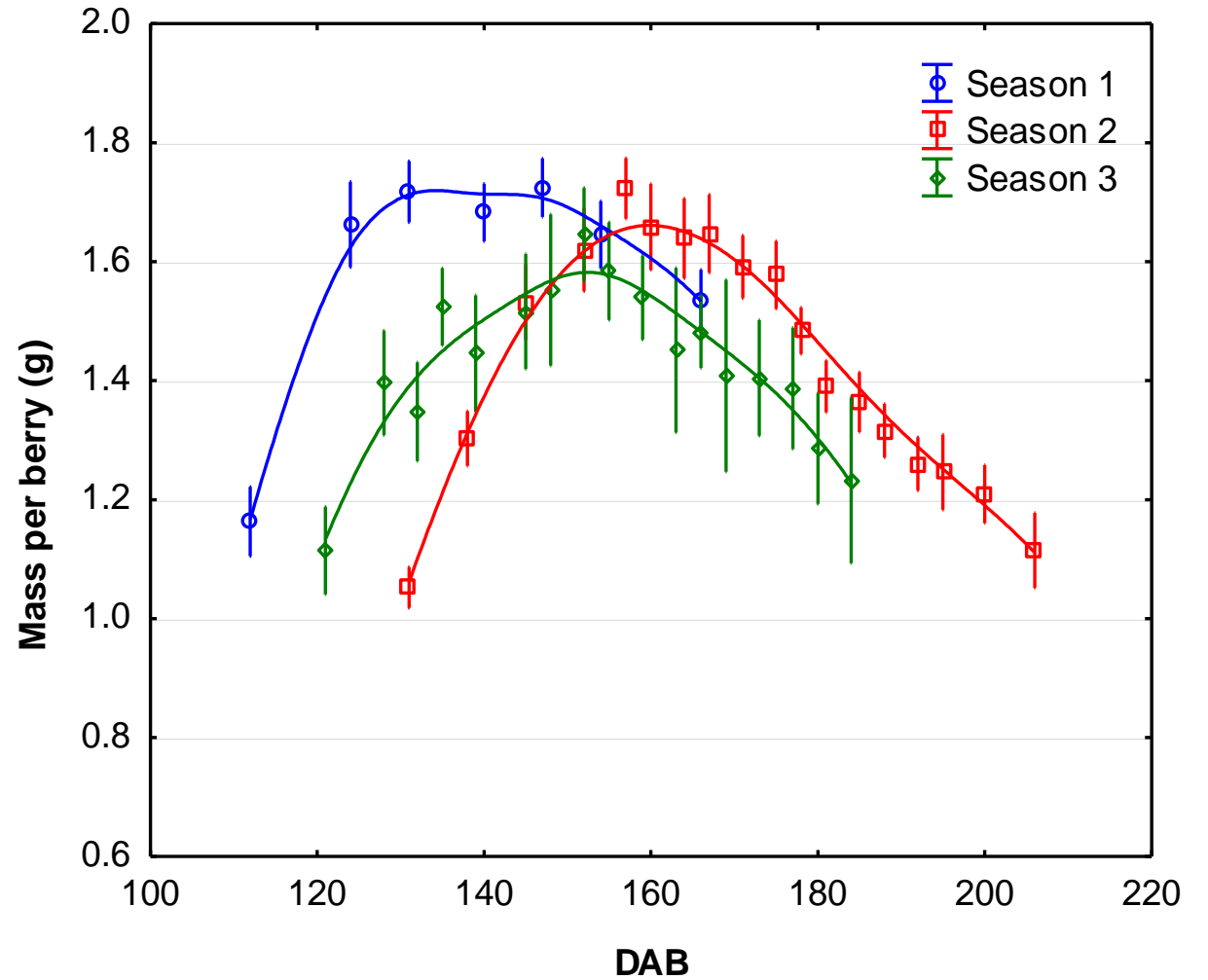
Bestuurspraktyke

- Tyd van oes/rypheidsgraad
 - i.e. Shiraz - afname in korrelnmassa - sterk afname aan einde.
 - Rosyntjies - einskappe van korrel itv droging (dopdikte, ens).



Berry growth

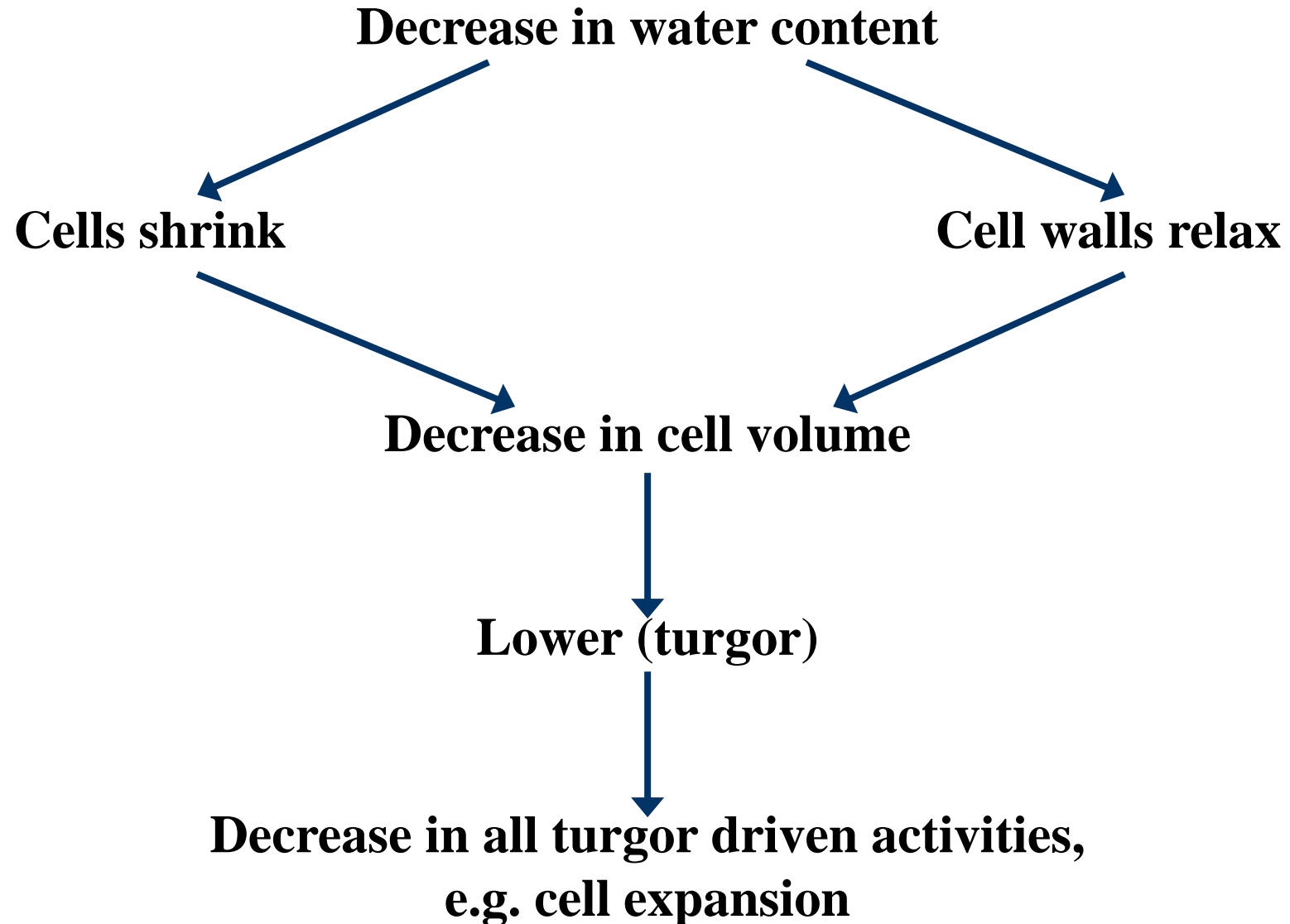
Season	Treatment	a	c
2	NSF	1.74a	140.12 a
	NSR	1.76a	137.61 a
	SF	1.60b	140.12 a
	SR	1.68ab	138.77 a
3	NSF	1.66a	125.49 ab
	NSR	1.70a	124.28 a
	SF	1.49ab	132.32 b
	SR	1.51b	126.98 ab



Bestuurspraktyke (vervolg)

- Voedingstatus/bemesting
- Besproeiing/plantwaterstatus

WATER DEFICIT STRESS



Decrease in cell expansion

Smaller leaves

Smaller berries

**Plasma membrane becomes
thicker and more compressed**

**Cells contract and plasma
membrane becomes thicker**

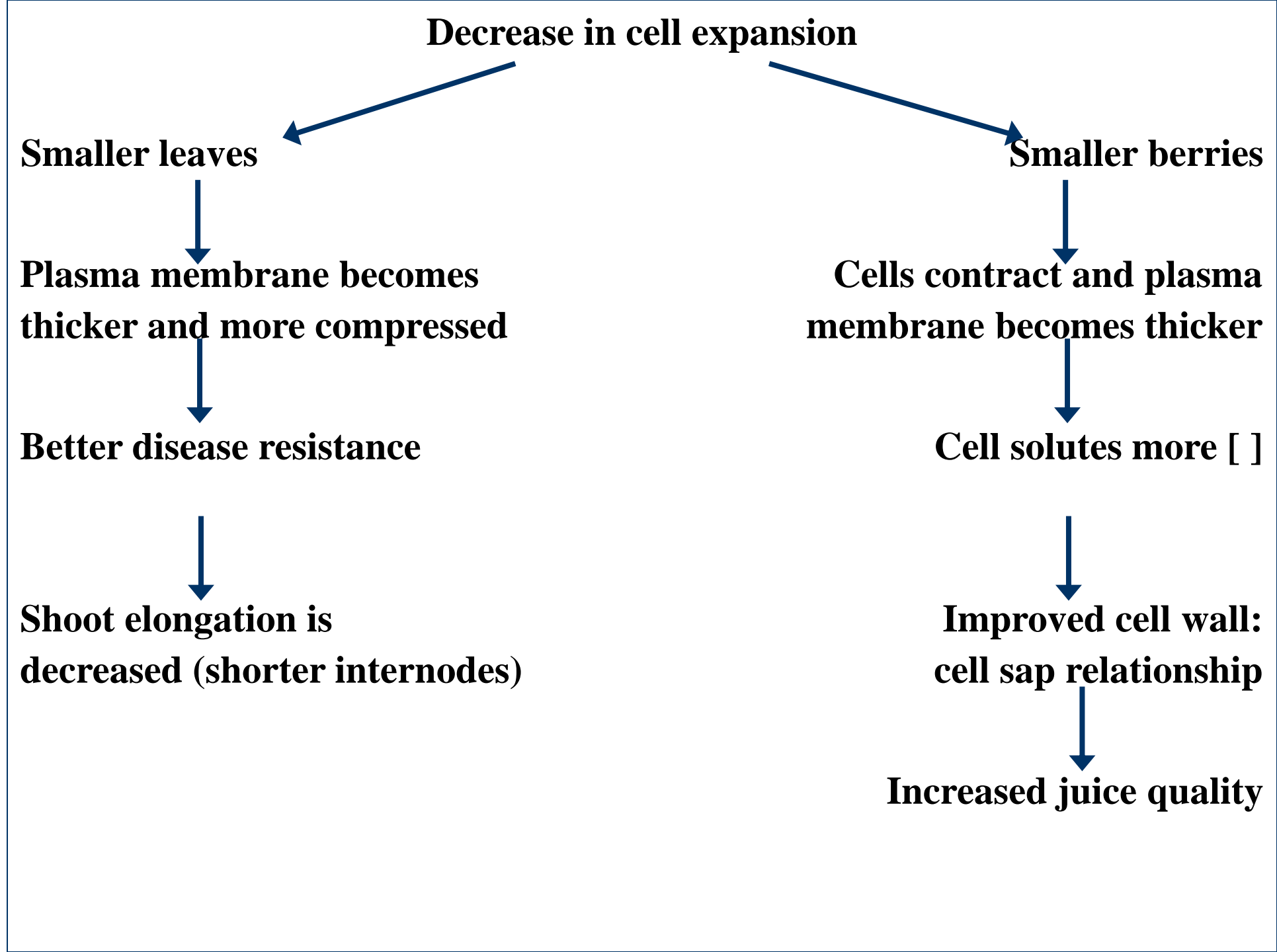
Better disease resistance

Cell solutes more []

**Shoot elongation is
decreased (shorter internodes)**

**Improved cell wall:
cell sap relationship**

Increased juice quality



Waterspanning/hitte impact



- Blom tot Veraison uiteraard sensitieve periode en veranderinge daar grootliks onomkeerbaar. . . . voor véraison is die korrel 'n "utilising sink" en na dit 'n "storage sink"
- Interaktief met bron:vraagpunt en dus ook lowergrootte:oeslading @ mikroklimaat
- OJEDA et al. (2001) - water limitation does not affect cell division but decreases cell volume
- Irreversible even if water is available during ripening

Korrelontwikkeling/opbrengs



● Yield reduction with water deficits - Why?

- \approx Cluster and berry nr.
- \downarrow Berry mass and volume (Hardie et al. 1976, Sivilotti et al. 2005, Wang et al. 2003)

● 3 Phases

- No reduction in cell division in phase 1 (except acute stress)
- Cell enlargement phase
- Deficit before véraison
 - Irreversible smaller berry size
- WD modifies both the onset and duration of individual phases (Ojeda et al. 2001, 2002)

Berry volume



- Moderate stress before veraison:
 - reduced berry volume by 32%
 - increased concentration of substances
 - Increased biosynthesis of flavonol, proanthocyanin and anthocyanins
- Strong water deficit applied after veraison:
 - reduced berry volume
 - increased concentration
 - Increased biosynthesis of flavonol, proanthocyanin and anthocyanins

Tafeldruiwe

- resultate van SA studies in Oranjeriviergebied (2018-2023)

Prime - 2018/19, 2019/20, 2020/21

- Troskompaktheid (korrels/cm lateraallengte)

Sultana - 2020/21, 2021/22, 2022/23

- Korrelgrootte (massa, deursnee)
- Totale Oplosbare Vastestowwe (TOVS)
- Korreldigtheid

Results: Prime GA₃+ABA trial, Kanoneiland

Temperature and relative humidity on days/nights of treatment applications

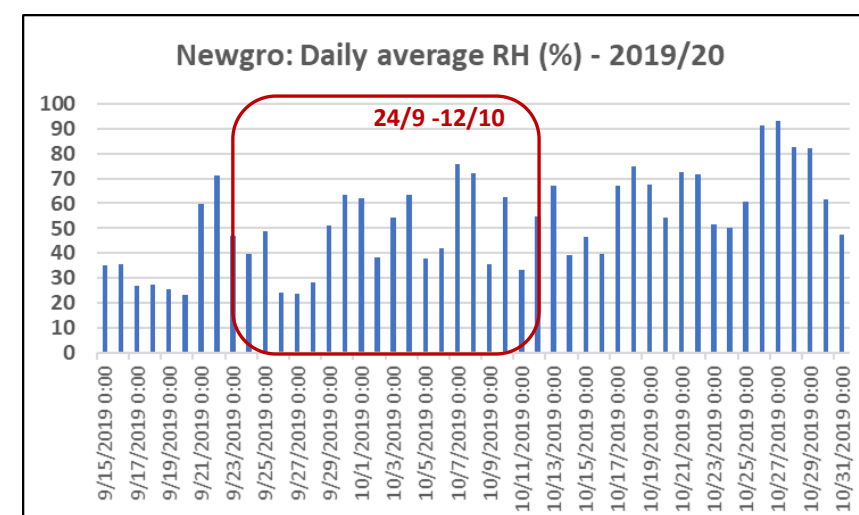
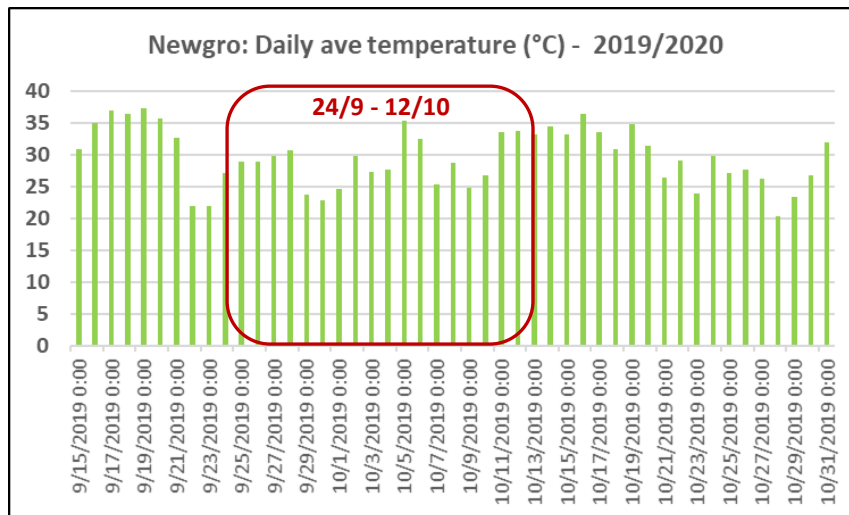
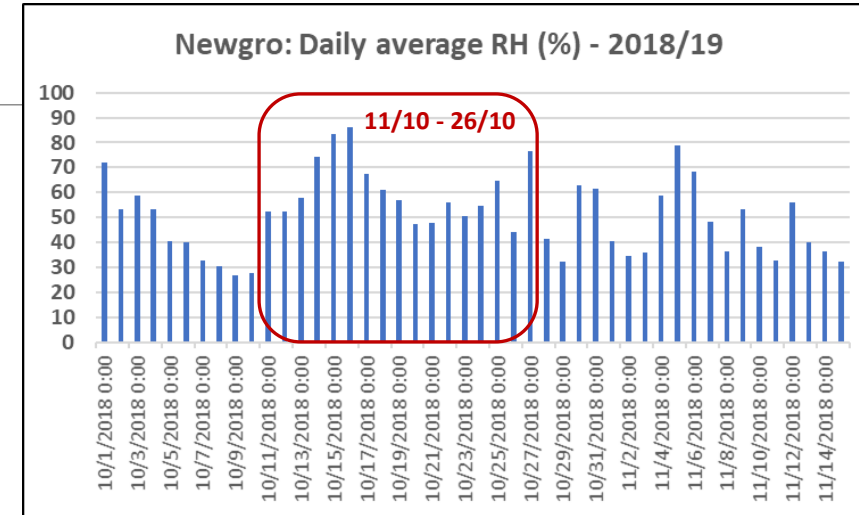
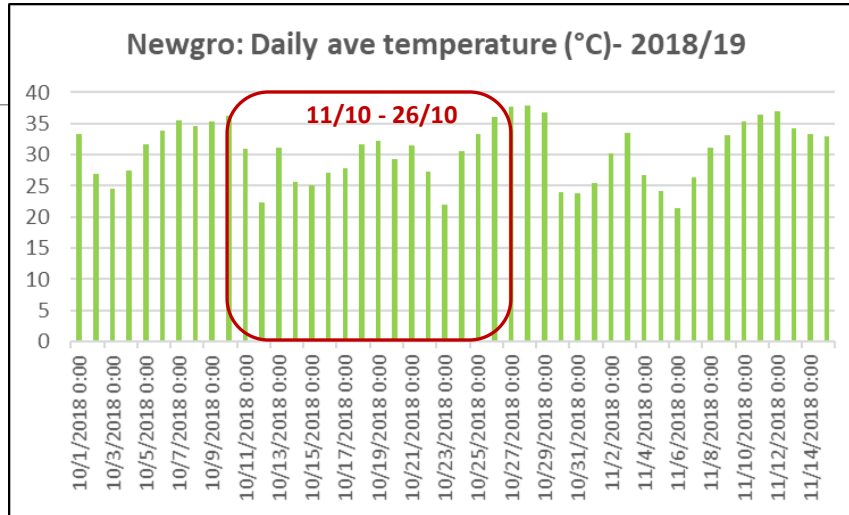
Season	Thin1	Thin2	Thin3	Thin4	Thin5	Sizing1	Sizing2
2018/19	11/10	14/10	17/10	20/10	22/10	23/10	26/10
T Max	31	26	28	29	27	22	36
T Min	13	10	11	16	15	11	15
RH (%)	16-53	19-82	19-61	13-39	28-50	30-50	10-47
Season	Thin1	Thin2	Thin3	Thin4	Thin5	Sizing1	Sizing2
2019/20	24/9	27/9	30/9	3/10	6/10	9/10	12/10
T Max	27	30	23	27	32	25	34
T Min	14	12	8	8	11	11	11
RH (%)	16-49	10-28	22-62	15-64	16-76	18-62	11-67
Season	Thin1	Thin2	Thin3	Thin4	Thin5	Sizing1	Sizing2
2020/21	5/10	8/10	11/10	14/10	17/10	20/10	23/10
T Max	27	30	22	34	36	26	36
T Min	15	12	10	15	14	15	19
RH (%)	17-49	28-71	17-50	15-48	15-54	13-30	19-57

No rainfall during the application period (all 3 seasons)

Favourable conditions for set of normal berries

All 3 seasons: Low % shot berries due to relative high temp, no rain, low RH

Results: Temp and Relative humidity



Results: Prime GA₃ trial

Bunch compactness



Significant differences between treatments for:

Bunch compactness (total no berries/cm lateral)

all thinning treatments < control (less compact)

no significant differences between thinning treatments

no significant differences between seasons

Thinning treatment	Bunch compactness*	
	normal berries/cm	Total berries/cm
No thinning	1.81 b	1.975 b
2 x GA	1.41 a	1.527 a
5 x GA	1.41 a	1.519 a
GA + ABA	1.42 a	1.508 a
*average over three seasons		

Treatment		Bunch compactness (Total berries/cm)			
Thin	Sizing	18/19	19/20	20/21	Means
Cont	Dip	1.95	1.96	1.95	1.95
Cont	ESS	1.87	2.10	2.17	2.05
Cont	C250	2.01	2.01	1.92	1.98
Cont	C500	1.75	2.02	1.99	1.92
GAx2	Dip	1.43	1.57	1.71	1.57
GAx2	ESS	1.37	1.43	1.63	1.48
GAx2	C250	1.43	1.52	1.62	1.52
GAx2	C500	1.44	1.56	1.61	1.54
GAx5	Dip	1.56	1.79	1.70	1.68
GAx5	ESS	1.27	1.43	1.61	1.44
GAx5	C250	1.37	1.52	1.61	1.48
GAx5	C500	1.38	1.56	1.49	1.47
GA+VBC	Dip	1.24	1.40	1.69	1.45
GA+VBC	ESS	1.25	1.58	1.73	1.52
GA+VBC	C250	1.31	1.48	1.69	1.49
GA+VBC	C500	1.36	1.57	1.81	1.58
Means		1.50	1.65	1.75	1.63

Tafeldruiwe - Oranjeriviergebied

Sultana (Kanoneiland), by eerste kommersiële oesdatum van seisoen:

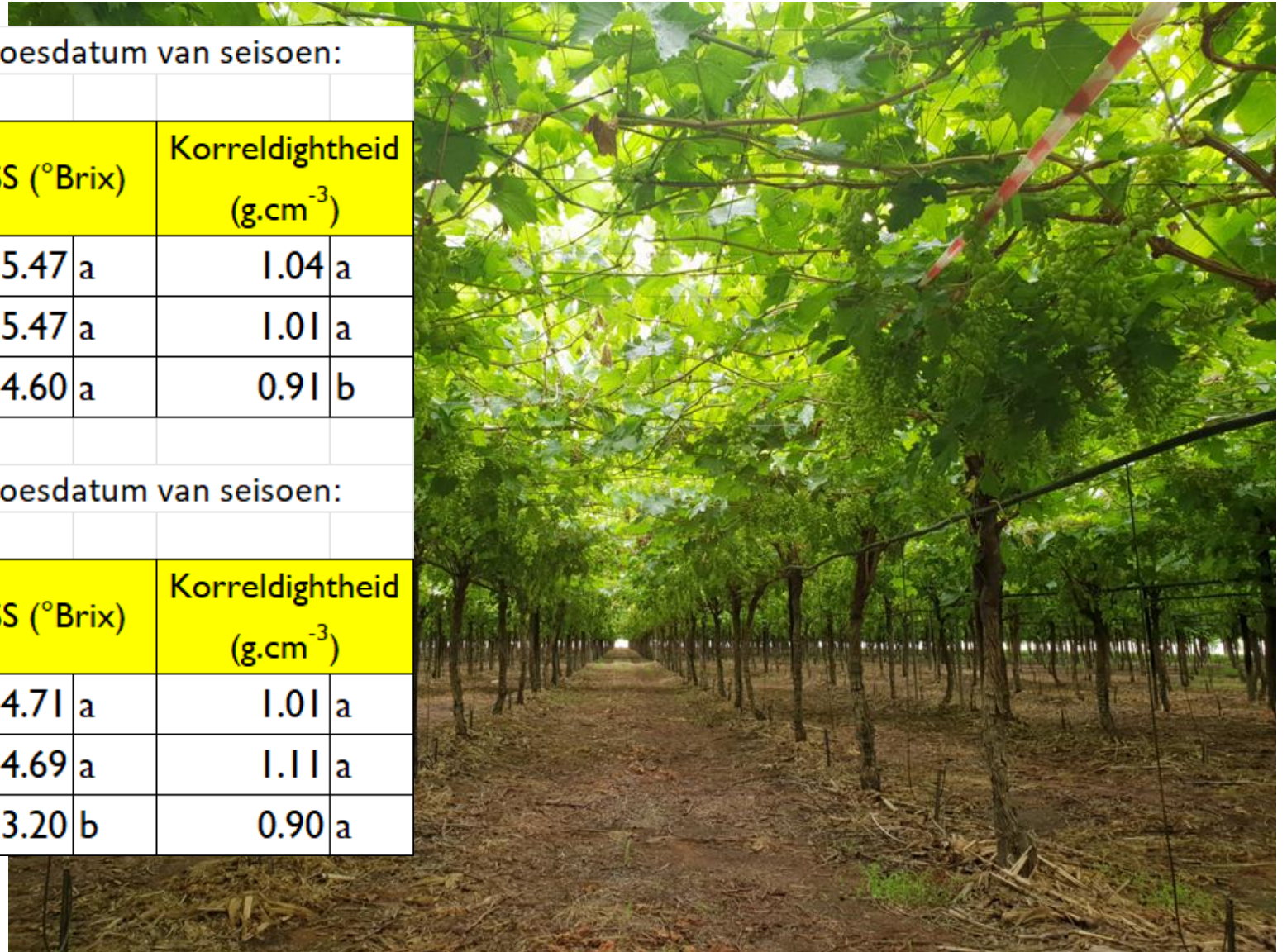
[OOP]

Seisoen	Korrelmassa (g)	Korreldeursnit (mm)	TSS (°Brix)	Korrel-digtheid (g.cm ⁻³)
2020/21	6.84 a	18.78 a	15.47 a	1.04 a
2021/22	5.54 b	17.78 a	15.47 a	1.01 a
2022/23	5.44 b	18.41 a	14.60 a	0.91 b

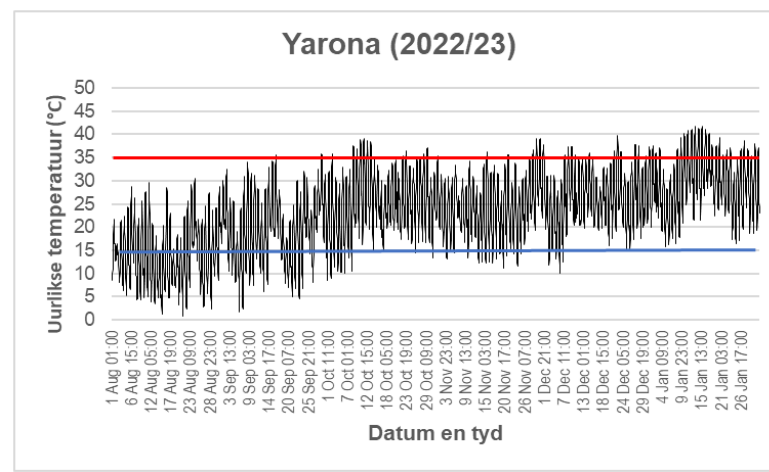
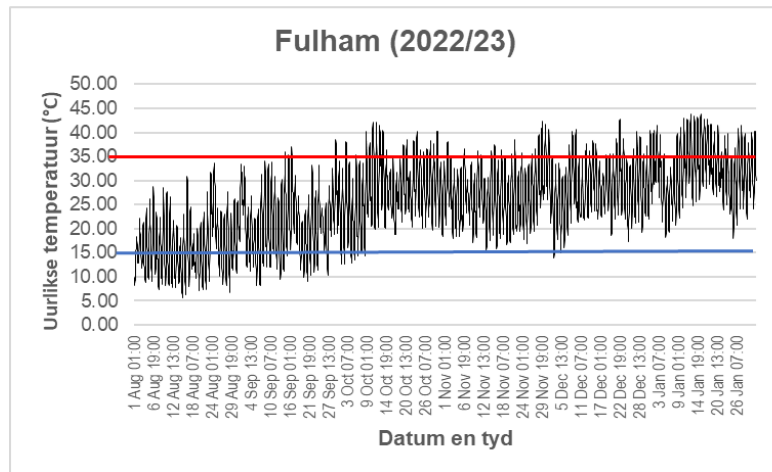
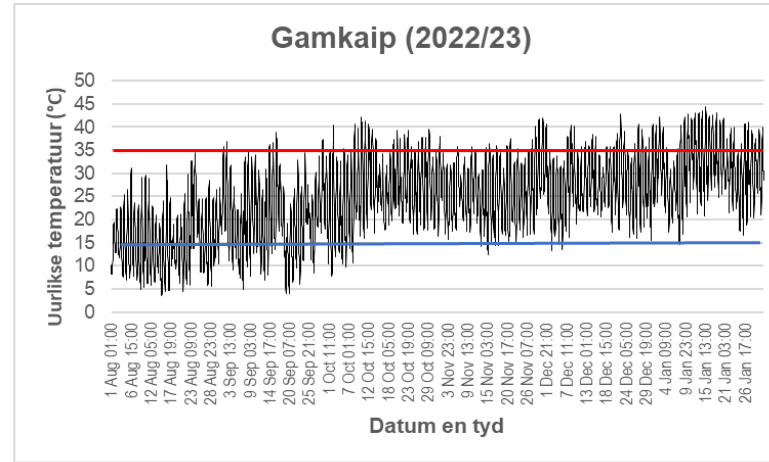
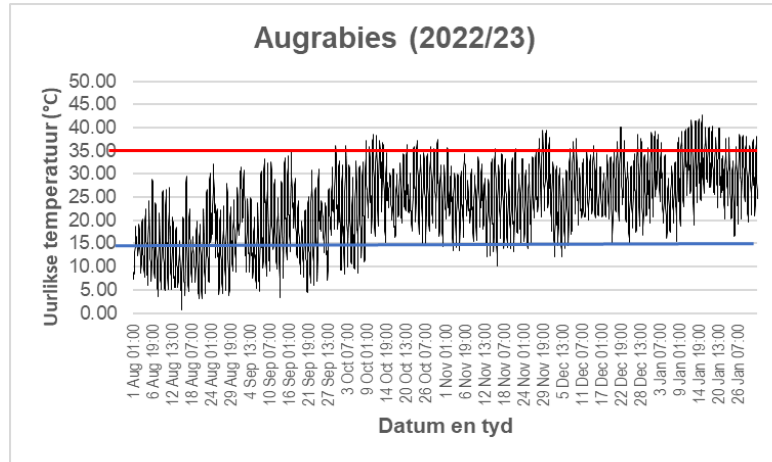
Sultana (Kanoneiland), by eerste kommersiële oesdatum van seisoen:

[NET]

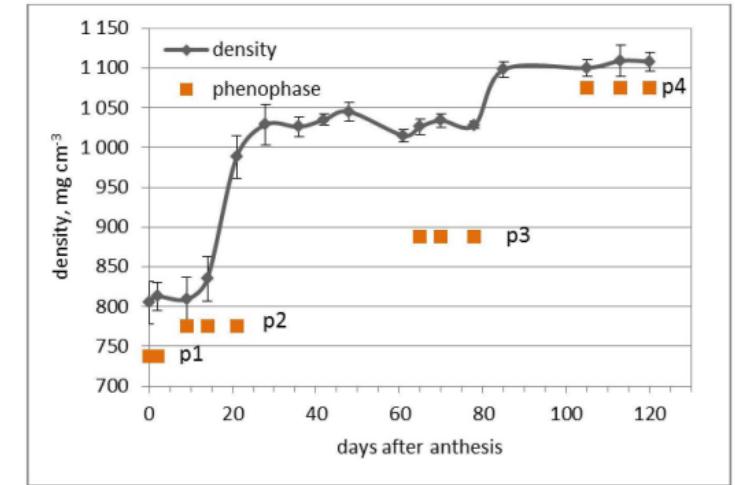
Seisoen	Korrelmassa (g)	Korreldeursnit (mm)	TSS (°Brix)	Korrel-digtheid (g.cm ⁻³)
2020/21	7.18 a	18.21 a	14.71 a	1.01 a
2021/22	6.84 a	18.44 a	14.69 a	1.11 a
2022/23	5.60 b	18.57 a	13.20 b	0.90 a



Oranjeriviergebied: uurlikse temperatuur 2022/23



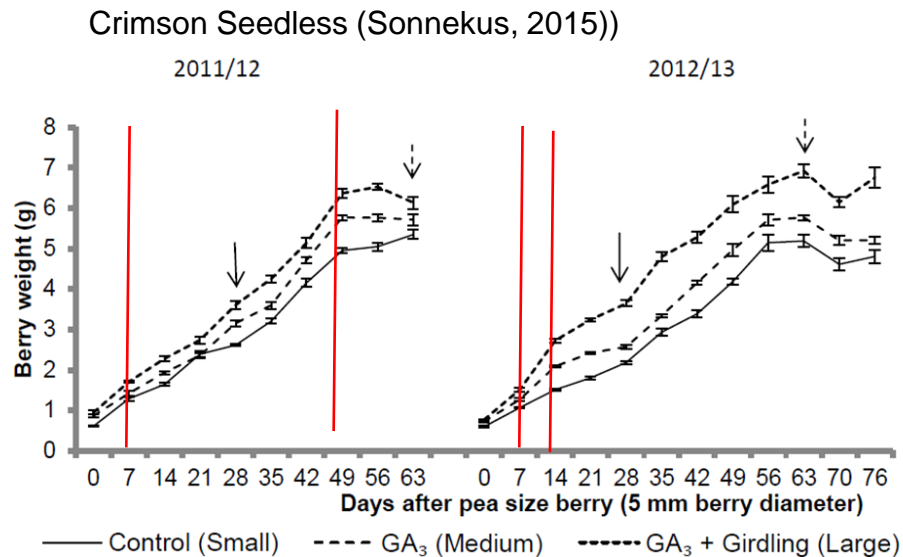
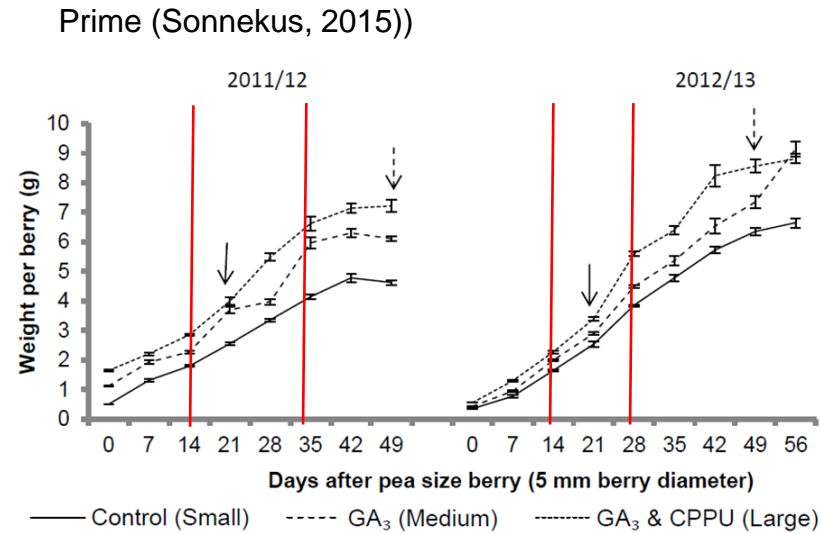
Swart Korinte (Letchov and Roychev, 2017)



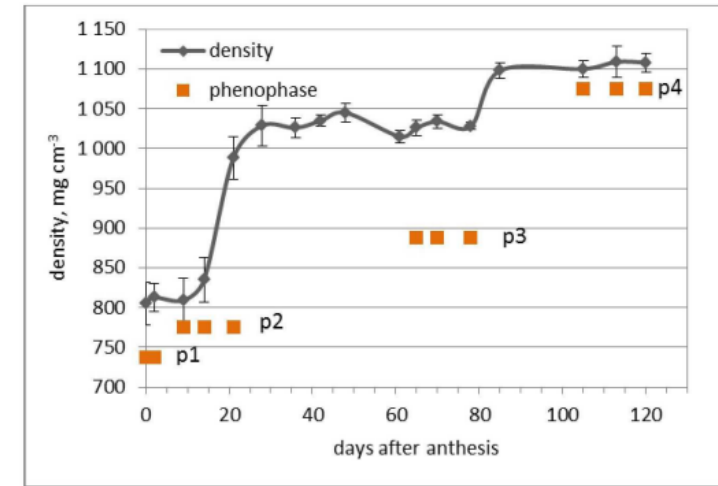
Eksponensiële toename in digtheid
15-30 DNVB
Selding word benadeel by temp > 35°C
[Dookoozlian, 2002; Iland, 2011]

Korrelset word benadeel by temp > 38°C; temp < 15°C
[Dookoozlian, 2002; Kenedy, 2002; Iland, 2011]

Tafeldruiwe: Korrelgroei



Swart Korinte (Letchov and Roychev, 2017)



Eksponensiële toename in digtheid
15-30 DNVB

Seldeling word benadeel by temp > 35°C
[Dookoozlian, 2002; Iland, 2011]

Opsomming, gevolgtrekking en aanbeveling:

- Moontlike redes waarom verwagte oesmassas nie gerealiseer het nie:
 - vroeë afspening (voor aanvang van blom)
 - afspening tydens blom en set, of na set
 - klimaatuiterstes (temperature hoër as 38°C, gepaard met lae relatiewe humiditeit en in sommige gevalle ook met wind)
 - kritieke periode is vanaf 2 weke voor blom, tot 2 tot 3 weke na blom.
- laer as verwagte korrelnmassas:
 - toestande (temperatuuruiters) in die 2 tot 3 weke na set
 - seldeling benadeel > minder selle per korrel > laer digtheid en massa

Daar was ook blokke waar daar nie 'n verband tussen genoemde klimaattoestande en die laer as verwagte oesmassa waargeneem is nie. Verskeie ander faktore mag ook 'n rol gespeel het en in-diepte perseel-spesifieke ontledings sal meer antwoorde kan gee.

Bestuurspraktyke om seisoenale variasie in tros- / korrelmassa te beperk:

Faktor	Produsent in beheer?		Riglyn
	Ja	Nee	
Kultivar (Geneties)		X	Kultivarkeuse
Klimaat		X	Oorhoofse nette/ plastiek - beïnvloed mikroklimaat, skakel nie klimaatuiterstes totaal uit nie.
Reserwestatus	√		Voeding, besproeiing, snoei
Wingerdpraktyke	√		
Snoei/ooglading	√		Pas aan by spasiëring, groei, produksiemikpunt
Suier	√		Vroeg streng suier
Blare verwyder	√		Nie te veel blare verwyder voor blom
Oesbeheer	√		Voor blom verminder na 1 tros/loot, finale oesbeheer volgens kv se verbouingsvereistes
Chemies uitdun	√		Pas aan volgens LT weervoorspelling
Trosinkorting	√		Kan trosinkorting later doen in risiko-seisoen
Besproeing/ Bemesting	√		Voldoende voorsiening volgens norme
Rypheidsgraad by oes	√		Te laat oes kan bydra tot massaverlies

Thank you
Enkosi
Dankie

“Spare slides” not to count



Vit 314 & 444: Overview: Grape berry set

[Dookoozlian, 2002; Kenedy, 2002; Iland, 2011]

Anthesis/ Antese

- Calyptra detaches from flower base, exposing stamens and pistil
- Rapidly at 28-35°C (1 week from start anthesis to full bloom)
- Slower at lower temp (<18°C – up to 2 weeks)

Pollination and fertilization

- Hermaphroditic flowers – self-pollinating
- Opt temp for pollen tube growth: 26-32°
- Pollen tube growth and fertilization reduced/ inhibited by:

 - Temp > 38°C
 - Temp < 16°C
- Practical application in table grape production:
 - Dormancy management practices – affecting time of bud break/ flowering
 - Planning of thinning treatments? What is expected re set?

Overview: Grape berry development

[Dookoozlian, 2002; Kenedy, 2002; Iland et al., 2011]

Fruit set/ Vrugset:

Effect of environmental factors/ Effek v omgewingsfaktore

- Temperature

- Fruit set is reduced/ inhibited by temp > 38°C; temp < 15°C (effect on pollen tube growth)
- Low temp may contribute to incomplete attachment of calyptras

- Rainfall and relative humidity – may reduce fruit set

- Incomplete attachment of calyptras
- Rain can dilute stigmatic fluid – interfere with pollen grain germination

- Radiation

- Radiation per se not a major factor
 - Limited photosynthesis due to whole vine shading – limit carbohydrate supply to inflorescence
 - Low light conditons + low temp = negative
-

- Water (Irrigation)

- Nutrition