Evaluating overhead nets and plastic covers for climate modification, harvest timing and product performance

compiled by Eunice Avenant[1,2] and Jan Avenant[3]

presented by Eunice Avenant[1,2]
at SA Table Grape Conferrence, 06-08-2026

[1]Project leader; Extra-ordinary Lecturer in Viticulture, SAGWRI & DVO, Stellenbosch University. [2]SATI Training Manager
[3]Project Team member; Independent researcher.






Background

Main reasons for using overhead nets in table grape industry:

- Modification of microclimate
- Protection against: Hail damage/ Wind damage/ Bird damage



Main reasons for using overhead plastic covering:

- Permanently installed overhead plastic:
  (protection/ advanced bud break + delayed harvest)



- Plastic over canopy + bunch zone (protection)



- Soil-less production of table grapes
  (Pisciotta et al., 2022)



SATI South African Table Grape Industry

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SAGWRI South African Grape and Wine Research Institute

Background:
Why did industry request this research?

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- Increased production costs force producers to increase production while maintaining quality.
- Production targets not met in recent seasons, due to over-shattering, physical marks and berry cracking could be linked to temperature and relative humidity extremes at various vineyard growth stages and rain during the ripening/harvesting period.
- Decreased fertility associated with shading effect of certain overhead covers *(reported in previous studies; observed by producers)*
- Producers need cost-effective techniques/systems to protect grapes against damage associated with rain during ripening/harvest
- Producers will benefit from techniques/ systems that will enable them to move the harvest date of selected cultivars later (periods of high demand/low supply/ high prices) *[According to information shared by producers and marketing companies, such a window of opportunity occurs in the late part of the SA production season (after Week 12 – April and early May)].*

Background: What is known?

Previous research in SA and internationally reported benefits & risks of protective coverings.

Benefits of overhead nets (N) and overhead plastic (P)

- (1) Protection of the vines and crop against hail, wind and bird damage (N, P).
- (2) Protection of vines and crop against rain, decreasing risk of berry cracking and disease incidence (P).
- (3) Microclimate modification, including decreased air temperature and wind speed, increased relative humidity, decreased maximum temperature in the bunch zone, decreased temperature difference between maximum and minimum temperature in the bunch zone (N).
- (4) Microclimate modification, including increased air temperature and decreased wind speed (P).
- (5) Improved berry size, yield, quality (less sunburn/ blemishes) and homogeneity of plants and fruit (N, P).
- (6) Decreased water use (N,P).. up to 40% under N+P.
- (7) Manipulating harvest date (P): through advancement, or protection (delay harvest date).

Risks of overhead nets/ plastic covering

(could be managed through water, nutrition and canopy management):

- (1) Shading effect negatively impacts fertility and colour development.
- (2) Too high temperatures under plastic covering.

(Avenant, 1994, 1997; Loubser et al, 1995; Avenant & Avenant 2002, 2020; Rana et al. 2004; Novello & De Palma, 2008, 2013; De Palma et al., 2022; Avenant et al., 2023; Strydom et al., 2023)

Background:Limitations of previous studies

- Previous studies:
  - most focused on nets only/ plastic only
  - did not include a range of phenological stages when covering was implemented
  - not all studies included evaluation of grape quality after cold storage.
  - limited published results from regions with climate extremes
  - few studies included an economic analysis of the covering techniques evaluated.
  - very few studies included sensory evaluation of the grapes

  - Crimson Seedless is the only cultivar listed under the top five cultivars produced in SA (SATI, 2025) which was included in previous studies. None of the "new generation" cultivars included under the top five, namely Autumn Crisp®, Sweetglobe™ and Sweet Celebration™, were included in the previous studies.

  - The statement made in several publications, including the recent study of Palotti (2023), that cultivars differ regarding their reaction to protective coverings, emphasises the importance of conducting a trial with protective covering on these "new generation" cultivars.

Background:
How do these projects build on previous projects?

(1) Net covering on its own and permanently installed plastic covering (covering implemented at three different phenological stages - after hydrogen cyanamide application; after set; veraison) are being evaluated.

(2) After cold storage grape quality evaluation is done.

(3) The one project is conducted in the Orange River region, where climate extremes occur.

(4) In Project 3 different plastic covering materials are evaluated in the same site.,

(5) An economic analysis of the cost-effectiveness of the covering techniques evaluated will be included (all three projects).

(6) Sensory evaluation of grapes at harvest will be included for Project 1 (OR) and Project 2 (Hex) from Season 2

PROJECT 1: Maintaining and enhancing table grape quality:

Overhead Nets and Plastics as Climate-modifying Systems (N. Cape)

compiled by Eunice Avenant[1,2] and Jan Avenant[3]

presented by Eunice Avenant[1,2]
at SA Table Grape Conference, 06-08-2026

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[3]Project Team member; Independent researcher.



Workplan

Cultivar	IFG Ten
Rootstock	Ramsey
Plant year	2018
Soil form	Augrabies
Trellis system	Gable
Spacing	3 m x 1.6 m
Irrigation system	Microsprinkler
Location	Roepersfontein Farm, Kanoneiland

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Randomised block design with 6 treatments and 4 replicates

Treatment description*	Net	Plastic		Scheduled stage to implement plastic cover
		On canopy	Over-head	
1. Control	X	X	X	None
2. Net*	√	X	X	None
3. Net* plus Plastic# after HC application	√	X	√	After HC application to harvest
4. Net* plus Plastic# after set	√	X	√	After set to harvest
5. Net* plus Plastic# veraison	√	X	√	Veraison to harvest
6. Net* plus Plastic directly on canopy++	√	√	X	Veraison to harvest

#permanently installed overhead plastic (PlasticY; 76% transmission/24% shade effect; 59% diffused light)
++not permanently installed
*permanently installed white net with a 20% shade effect
HC = hydrogen cyanamide

Implementing of covers OR





Fully randomised design with 6 treatments and 4 replicates

Proposed size of one replicate and the total trial:

Each replicate will comprise 3 panels (6 vines per panel) over 11 rows (968 m^2)

Distance (m) of 3 panels = 3 panels x 6 vines/panel x 1.6 m/vine = 29 m

Distance (m) of 11 rows = 10 rows x 3 m/row = 33 m

Area of 1 replicate = 29 m x 33 m = 968 m^2

Area of the whole trial = 3.80 ha





PROJECT 2: Rain Protection Covers for Harvest Timing Manipulation (Hex)

compiled by Eunice Avenant[1,2] and Jan Avenant[3]

presented by Eunice Avenant[1,2]

at SA Table Grape Conference, 06-08-2026

[1]Project leader; Extra-ordinary Lecturer in Viticulture, SAGWRI & DVO, Stellenbosch University. [2]SATI Training Manager
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Workplan
Trial 1: Comparing three protective covers

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7 treatments allocated in a randomised block design, with 4 replicates

Treatment	Stage to implement cover
1. Control (Uncovered)	None
2. Overhead plastic# (Permanently installed, "stored" on trellis)	After HC application until harvest
3. Overhead plastic# (Permanently installed, "stored" on trellis)	After set until harvest
4. Overhead plastic# (Permanently installed, "stored" on trellis)	Veraison until harvest
5. Plastic on canopy and over bunch zone (Short-term installed)	Veraison until harvest
6. Nets* (Permanently installed)	Veraison until harvest
7. Paper bags (Bunches covered with bags)	Veraison until harvest

Cultivar	Sugrathirtyfive (Autumn Crisp®)
Rootstock	Ramsey
Plant year	2019
Soil texture	Sandy with high stone fraction
Trellis system	Gable
Spacing	3 m x 1.6 m
Irrigation system	Drip irrigation
Location	De Hoop, De Doorns

#permanently installed overhead plastic (PlasticY: 76% transmission (24% shade effect); 59% diffused light)
++not permanently installed
*permanently installed white net with a 20% shade effect
HC = hydrogen cyanamide

Implementing of covers Hex





Workplan

Trial 1: Comparing three protective covers

7 treatments allocated in a completely randomised design, with 4 replicates

Size of one replicate and the total trial:

Each replicate will comprise 4 panels (5 vines per panel) over 11 rows.

Distance (m) of 4 panels = 4 panels x 5 vines/panel x 1.6m/vine = 32 m

Distance (m) of 11 rows = 11 rows x 3 m/row = 33 m

Area of 1 replicate = 32 m x 33 m = 1056 m2

Area of the whole trial + 4 ha







Workplan

Trial 2: Evaluate overhead plastic and bags for delaying harvest date.

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Treatments allocated within a randomised split-plot design, comprise **Covering as main plot treatment** and **Harvest date as split-plot treatment**.
H1 = first harvest when minimum maturity standards have been reached.
Each treatment combination is replicated four times.
[Trial 2's harvest date treatments will be allocated as split-plot treatments within the applicable treatments of Trial 1].

Main plot treatment (Covering)	Stage to implement cover	Split-plot treatment (Harvest date)
1. Control (Uncovered)	None	**H1; H2** (H1+2 weeks); **H3** (H1+4 weeks); **H4** (H1+6 weeks)
3. Overhead plastic (Permanently installed)	After set until harvest	**H1; H2** (H1+2 weeks); **H3** (H1+4 weeks); **H4** (H1+6 weeks)
7. Paper bags (Bunches covered with bags)	Veraison until harvest	**H1; H2** (H1+2 weeks); **H3** (H1+4 weeks); **H4** (H1+6 weeks)

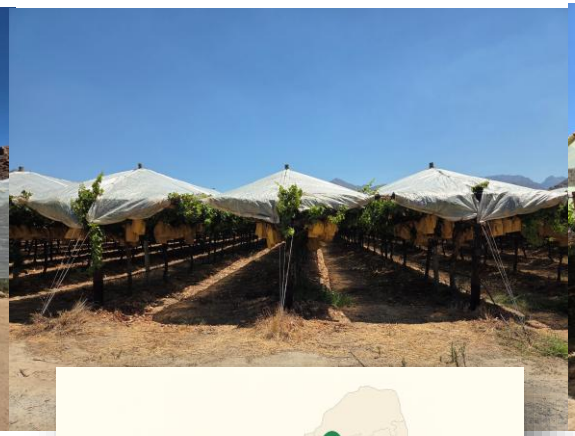
PROJECT 3: Practical industry evaluation of plastic covering materials to improve/maintain quality and manipulate harvest timing (Producer Trials)

compiled by Eunice Avenant[1,2] and Jan Avenant[3]

presented by Eunice Avenant[1,2]
at SA Table Grape Conferrence, 06-08-2026

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PROJECT 3: Industry evaluation of plastic covering materials (Producer Trials)

Workplan: *Trial block details*

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Evaluating Plastic Covers: Trial block details (UPDATED 202511)

Region	Farm/ Company	Cultivar	Scenario				Purpose of plastic			Timimg
			Control (Uncovered)	Plastic Product1	Plastic Product2	Plastic Product3	Protection (rain)	Microclimate modification	Delayed harvest	of cover implimentation
Hex River Valley (De Doorns)	Denau	Sugrathirtyfive	Control	PlasticA	-	-	√	√	X	Veraison
Hex River Valley (De Doorns)	De Vlei	Sugrathirtyfive	Bunch bags	PlasticA	PlasticV	PlasticNV	√	√	√	After set
Orange River (Blouputs)	Dippenaar Choice Fruit (Leerkrans)	Sweet Celebration	No uncovered Control	PlasticA	PlasticY	-	√	√	X	Pea size
Orange River (Kanoneiland)	Karsten Boerdery (Newgro)	Thompson Seedless	Control	PlasticY	PlasticW	PlasticE	√	√	X	After set
Northern Provinces (Groblersdal)	Schoonbee Landgoed	Sugrathirtyfive	White Net	White Net+ PlasticA	-	-	√	√	X	After HC application/ Open during flower/set/ Cover after set-Harvest

Workplan

Summary of weather stations and sensors for microclimate data collection

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Project	Site	Treatment	Compact weather station (above canopy) - temp, RH, wind, light, rain, VPD, ETo	Temp-RH above canopy	Temp-RH below canopy	PAR above canopy	Soil-temp & SWC	Installation date	Number of measuring sites
Commercial	Blouputs (Leerkrans)	Agralia		✓	✓		✓	Dec 2025	14
		Serroplast		✓	✓		✓		
	Groblersdal (Schoonbee)	White Net		✓	✓		✓	Dec 2025	
		Agralia + White Net		✓	✓		✓		
	Kanoneiland (Newgro)	Control (Uncovered)		✓	✓		✓	Dec 2025	
		Serroplast-EcoYellow		✓	✓		✓		
		Serroplast-EcoWhite		✓	✓		✓		
		Serroplast-EciLed		✓	✓		✓		
	Hex River Valley (Denau)	Control (Uncovered)		✓	✓		✓	Jan 2026	
		Agralia		✓	✓		✓		
	Hex River Valley (De Vlei)	Control (Uncovered)		✓	✓		✓	Jan 2026	
		Agralia		✓	✓		✓		
		Daios Vented		✓	✓		✓		
		Daios Non-vented		✓	✓		✓		
Orange River	Kanoneiland (Roepersfontein)	T1 Control (Uncovered) x 3	✓		✓	✓	✓	Oct/Nov 2025	12
		T2 Net x 3	✓		✓	✓	✓		
		T3 Net+Plastic after HC x 3	✓		✓	✓	✓		
		T6 Net+Plastic on canopy x 3	✓		✓	✓	✓		
Hex	Hex River Valley (De Hoop)	T1 Control (Uncovered) x 3	✓		✓	✓	✓	Nov/Dec 2025	15
		T2 Plastic after HC x 3	✓		✓	✓	✓		
		T5 Plastic on canopy x 3	✓		✓	✓	✓		
		T6 Net x 3	✓		✓	✓	✓		
		T7 Bags x 3			✓ (in bag)				
Total number of measuring sites									41

Results - Preliminary

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Preliminary data discussion focuses on three objectives of all three projects:

Investigate/establish the impact of covers on…

- berry ripening parameters
- grape quality at harvest and after cold storage
- vineyard microclimate

Results – Project 1

Kanoneiland (Roepersfontein) Sweetglobe™

Berry mass, berry marks, juice quality

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Berry mass, berry marks and juice quality of Sweet Globe™ table grapes harvested on 2 January 2026 following treatment with different plastics covers and implementing times at Roepersfontein Farm, Karsten Boerdery (2025/2026 season).

Parameter	Treatments						Mean	CV%	Prob > F[1]
	T1	T2	T3	T4	T5	T6			
Berry mass (g)	13.93	14.01	13.42	13.59	13.85	13.62	13.74	5.7	NS
Berry marks (%)	1.29 b	2.62 b	9.98 a	1.55 b	2.31 b	2.22 b	3.33	52.2	***
TSS (°Brix)	13.75	13.75	13.25	13.15	13.63	13.1	13.44	4.3	NS
TA (g/L)	6.21	6.00	7.18	6.98	6.38	6.46	6.54	9.1	NS
pH	3.417	3.432	3.345	3.397	3.365	3.435	3.399	2.3	NS
TSS:TA	22.58	23.24	18.48	19.24	21.72	20.92	21.03	11.3	NS

1. One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the values within each row indicate significant difference according to LSD-test

Berry mass and juice quality (TSS, TA, pH) did not differ significantly between covering techniques

Occurrence of brown marks on berries, was highest for T3 (Overhead Plastic implemented after hydrogen cyanamide application)

Results - Project 1

Kanoneiland (Roepersfontein) Sweetglobe™

Yield and quality at harvest

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Yield and grape quality of Sweet Globe™ table grapes measured on 7, 12,14 and 15 Januany 2026 following treatment with different plastic covers and implementing times at Roepersfontein Farm, Karsten Boerdery (2025/2026 season).

Parameter	Treatments						Mean	CV%	Prob > F[4]
	T1	T2	T3	T4	T5	T6			
[1]Bunches/vine	45.12	44.00	39.06	43.88	43.81	45.69	43.59	17.8	NS
[2]Calculated yield (kg/vine)	18.99 c	21.45 bc	24.93 ab	26.72 a	24.65 ab	23.94 ab	23.45	24.2	***
[2]Calculate yield (ton/ha)	39.6	44.7	51.9	55.7	51.4	49.9	48.8	24.2	***
Number of bunches not ready to be harvested on 14 January 2026	15.94	15.69	20.25	19.38	20.75	20.75	18.72	39.6	NS
[3]Calculated farm yield (kg/vine)	15.55 c	17.49 bc	19.78 ab	21.71 a	20.15 ab	19.77 ab	19.07	27.4	**
[3]Calculated farm yield (cartons/ha)	7196 c	8095 bc	9154 ab	10048 a	9327 ab	9149 ab	8828	27.4	**
[3]Calculated farm export (cartons/ha)	6975 b	7822 ab	4121 c	9907 a	8575 ab	8477 ab	7646	29.1	**
Export (%)	96.88 a	96.62 a	43.43 b	98.61 a	91.76 a	93.54 a	86.81	9.4	***
Local (%)	2.31	1.03	0.22	0.48	2.11	1.21	1.23	164.7	NS
Cull (%)	0.81 b	2.34 b	56.35 a	0.91 b	6.13 b	5.26 b	11.97	11.97	***
Average bunch mas (g)	429.9 c	495.3 bc	644 a	626.3 a	522.3 ab	546.7 bc	546.7	17.4	**
Export bunch mass (g)	437.1 d	503.7 cd	636.0 a	631.8 ab	581.2 abc	527.9 bcd	553.0	17.4	**
Local bunch mass (g)	311	258	395	291	334	430	337	34.3	NS
Cull bunch mass (g)	326	661	661	577	507	442	509	34.3	NS

[1]Number of bunches harvested on 7, 12 and 14 January 2026 and the number of bunches still on the vines on 15 January 2026.

[2]Calculated yield = Yield measured at harvest on 7, 12 and 14 January 2026 plus (number of bunches still on the vines at 15 January 2026 x the average bunch mass) .

[3]Calculated farm yield = Calculated yield - (8 bunches x the average bunch mass). The 8 bunches were allocated additionally extra for reseach purposes.

[4]One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the value within each row indicate significant difference according to LSD-test

Beneficial impacts of covers on production and quality:

- Yield of all four plastic treatments (T3-T6) significantly higher > Control (T1)
- Bunch mass of all overhead plastic treatments (T3-T5) significantly higher > Control (T1)
- Export of T4 (Overhead Plastic implemented after set) significantly higher > Control.

Results - Project 1

Kanoneiland (Roepersfontein) Sweetglobe™

Yield and quality at harvest

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Yield and grape quality of Sweet Globe™ table grapes measured on 7, 12,14 and 15 Januany 2026 following treatment with different plastic covers and implementing times at Roepersfontein Farm, Karsten Boerdery (2025/2026 season).

Parameter	Treatments										Mean	CV%	Prob > F[4]
	T1		T2		T3		T4		T5		T6				
[1]Bunches/vine	45.12		44.00		39.06		43.88		43.81		45.69		43.59	17.8	NS
[2]Calculated yield (kg/vine)	18.99	c	21.45	bc	24.93	ab	26.72	a	24.65	ab	23.94	ab	23.45	24.2	***
[2]Calculate yield (ton/ha)	39.6		44.7		51.9		55.7		51.4		49.9		48.8	24.2	***
Number of bunches not ready to be harvested on 14 January 2026	15.94		15.69		20.25		19.38		20.75		20.75		18.72	39.6	NS
[3]Calculated farm yield (kg/vine)	15.55	c	17.49	bc	19.78	ab	21.71	a	20.15	ab	19.77	ab	19.07	27.4	**
[3]Calculated farm yield (cartons/ha)	7196	c	8095	bc	9154	ab	10048	a	9327	ab	9149	ab	8828	27.4	**
[3]Calculated farm export (cartons/ha)	6975	b	7822	ab	4121	c	9907	a	8575	ab	8477	ab	7646	29.1	**
Export (%)	96.88	a	96.62	a	43.43	b	98.61	a	91.76	a	93.54	a	86.81	9.4	***
Local (%)	2.31		1.03		0.22		0.48		2.11		1.21		1.23	164.7	NS
Cull (%)	0.81	b	2.34	b	56.35	a	0.91	b	6.13	b	5.26	b	11.97	11.97	***
Average bunch mas (g)	429.9	c	495.3	bc	644	a	626.3	a	522.3	ab	546.7	bc	546.7	17.4	**
Export bunch mass (g)	437.1	d	503.7	cd	636.0	a	631.8	ab	581.2	abc	527.9	bcd	553.0	17.4	**
Local bunch mass (g)	311		258		395		291		334		430		337	34.3	NS
Cull bunch mass (g)	326		661		661		577		507		442		509	34.3	NS

[1]Number of bunches harvested on 7, 12 and 14 January 2026 and the number of bunches still on the vines on 15 January 2026.

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[4]One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the value within each row indicate significant difference according to LSD-test



Beneficial impacts of covers on production and quality:

- Yield of all four plastic treatments (T3-T6) significantly higher than Control (T1)
- Export of T4 (Overhead Plastic implemented after set) significantly higher than Control.

T3 (Overhead Plastic implemented after hydrogen cyanamide application)

- highest cull percentage (56%) & lowest export percentage (43%) due to brown marks.
- *T3 is not recommended (too early implementation)*

Results - Project 1

Kanoneiland (Roepersfontein) Sweetglobe™

Post cold storage quality

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Post storage quality of Sweet Globe™ table grapes harvested on 7 January 2026, following treatment with different plastic covers and implimentation times at Roepersfontein Farm, Karsten Boerdery, Kanon-eiland, and stored for 6 weeks at -0.5°C.

Storage parameter[1]	Treatments												Mean	CV%	Prob > F[2]
	T1		T2		T3		T4		T5		T6				
Colour of berries (rating 1-3)	1.29	a	1.03	b	1.09	b	1.02	b	1.00	b	1.07	b	1.08	16	
Bunch mass (g)	731		733		774		793		761		808		767	15.8	NS
Condition of Rachis (rating 1-5)	3.36		3.44		3.19		3.37		3.21		3.35		3.32	9.7	NS
Condition of Pedicel & Receptacle(rating 1-5)	4.33	b	4.29	b	4.23	b	4.56	a	4.23	b	4.40	ab	4.34	7.3	**
Firmness (Durofel scale 0 to 100%)	84.94	d	88.28	ab	88.20	bc	92.26	a	87.02	cd	90.43	ab	88.52	4.3	***
Decay (%)	0.34		0.06		0.28		0.09		0.14		0.04		0.16	221.5	NS
Total berry Split (%)	0.02		0.05		0.38		0.01		0.00		0.00		0.08	584.7	NS
Total loose Berries (%)	0.94		1.2		1.1		1.06		0.83		0.67		0.97	149.9	NS
Non SO_2 related disorders															
Berry split (%)	0.022		0.018		0		0		0		0		0.007	696.1	NS
Loose berries (%)	0		0.17		0.00		0.17		0.18		0.10		0.10	438.8	NS
SO_2 related disorders															
Berry split (%)	0		0.032		0.38		0.011		0		0		0.071	636.7	NS
Loose berries (%)	0.94		1.02		1.1		0.89		0.65		0.57		0.86	143.7	NS
SO_2 Damage neck (%)	0.33		0.64		1.53		0.44		0.41		0.31		0.61	166.7	NS
SO_2 Damage Surface (%)	0		0		0		0		0		0		0	0	
Total SO_2 disorders (%)	1.27	b	1.69	b	3.02	a	1.34	b	1.05	b	0.88	b	1.54	114.4	**
Browning disorders															
External browning (%)	0		0		0		0		0		0		0	0	
Internal browning (%)	0		0		0		0		0		0		0	0	

[1] Storage parameters: Decay, berry split, loose berries, pedicel damage, surface damage and total SO_2 were expressed as percentage of the sample mass. Colour of berries was rated according to a 3-point scale (1=Pale & 3 = Yellow). Stem was condition rated according to a 5-point scale for colour and dehydration, with 1 = very good (green and hydrated) and 5 = very poor (brown and desiccated), berry firmness according to a Durofel scale according to a Durofel scale (0 = extremely soft to 100%=maximum - highest level of fimness).

[2] One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the values within each row indicate significant difference according to LSD-test.

- Berry colour of all cover treatments significantly greener than Control
- Pedicel & receptacle condition of T4 (Overhead Plastic implemented after set) significantly better
- Firmness tended to be higher under covering (only firmness of T4 significantly higher than Control)

T4, T5 or T6 could be used; T4 significantly better export and condition

Results - Project 2

Hex River Valley (De Hoop) Autumncrisp®

Quality at harvest & Post cold storage

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Berry mass and juice quality of AUTUMNCRISP® table grapes harvested on 4 February 2026 following treatment with different plastics covers and operating times at De Hoop Farm, Karsten Boerd Hex River Valley (2025/2026 season).

Parameter	Treatments							Mean	CV%	Prob > F[1]
	T1	T2[2]	T3	T4	T5	T6	T7			
Berry mass (g)	10.37		9.978	10.02	10.3	9.61	9.7	10.09	5.1	NS
TSS (˚Brix)	16.85		15.88	16.6	16.32	17.72	17.2	16.65	5.1	NS
TA (g/L)	4.94		5.93	5.46	5.09	4.75	5.00	5.22	11.6	NS
pH	3.36		3.18	3.365	3.438	3.152	3.362	3.316	9.6	NS
TSS:TA	34.75		27.47	30.87	32.3	37.85	34.73	32.72	14.8	NS

1. One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the values within each row indicate significant difference according to LSD-test

2. T2 not applied, due to plastics supplier delivering late

Trend of higher TSS & lower TA

[T1 (Control), T6 (Nets), T7 (Bags) > Plastic Covers (T4, T5, T6)

(trend of delaying impact of Plastic covers)

Farm harvested accordingly:

T1,T6,T7 on 4/2; T4,T5,T6 on 11/4 (1 week later)

Results - Project 2

Hex River Valley (De Hoop) Autumncrisp®

Yield, export, cull

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Yield, export and cull of AUTUMNCRISP® table grapes harvested on 4 and 11 February 2026, following treatment with different plastic covers implementing times at De Hoop Farm, Karsten Boerdery, Hex River Valley (2025/2026 season).

Storage parameter[1]	Treatments													Mean	CV%	Prob > F[2]
	T1		T2[3]	T3		T4		T5		T6		T7				
[3.] Calculated yield (cartons/ha)	6141	b	-	7655	ab	8387	a	8897	a	7736	ab	7742	ab	7935	14.6	*
[3.] Calculated export (cartons/ha)	5511	c	-	7336	ab	8155	ab	8710	ab	7597	ab	7003	bc	7591	15.6	*
[3.] Calculated cull (cartons/ha)	536	ab	-	279	bc	210	c	167	c	96	c	710	a	305	65.3	**
Export (%)	90	b	-	96	a	97	a	98	a	98	a	90	b	95	3.3	**
Cull (%)	1.93		-	1.85		2.71		2.05		1.02		4.05		2.17	59.9	NS

[1.] One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the values within each row indicate significant difference according to LSD-test.

[2.] T2 not applied, due to plastics supplier delivering late

Beneficial impacts of covers on production and quality:

- Export of all three plastic treatments (T3-T6) and nets significantly > Control (T1)

Results - Project 2

Hex River Valley (De Hoop) Autumncrisp®

Post cold storage quality

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Post storage quality of AUTUMNCRISP® table grapes harvested on 4 and 11 February 2026, following treatment with different plastic covers and implementing times at De Hoop Farm, Karsten Boerdery,Hex River Valley, and stored for 6 weeks at -0.5°C (2025/2026 season)

Storage parameter[1]	Treatments							Mean	CV%	Prob > F[2]
	T1	T2[3]	T3	T4	T5	T6	T7			
Bunch mass (g)	803.2		776.9	790.3	786.8	793	772	789.7	6.7	NS
Condition of rachis (rating 1-5)	3.19		3.35	3.41	3.28	3.07	3.23	3.27	8.7	NS
Condition of pedicel & receptacle(rating 1-5)	3.77		3.96	3.89	3.76	3.79	3.66	3.83	10.8	NS
Firmness (Durofel scale (0 to 100%)	81.26 ab		78.01 bcd	76.81 cd	75.85 d	80.3 abc	81.9 a	78.46	4.0	**
Total berry split (%)	0.14 c		10.31 a	7.11 ab	6.91 ab	0.6 c	1.72 bc	5.63	84.7	***
Total loose berries (%)	0 b		2.03 a	1.74 a	1.8 a	0 b	0 bc	1.06	136.7	***
Non SO_2 related disorders										
Berry split (%)	0		0	0	0	0.02	0	0.003	529.2	NS
Loose berries (%)	0		1.75	1.07	1.55	0	0	0.85	165.6	**
SO_2 related disorders										
Berry split (%)	0.14 c		10.31 a	7.11 ab	6.91 ab	0.58 c	1.72 bc	5.63	84.7	***
Loose berries (%)	0 b		0.284 b	0.673 a	0.242 b	0 b	0 bc	0.216	285.3	**
SO_2 damage neck (%)	0		0.027	0	0	0.02	0	0.011	553.4	NS
SO_2 damage Surface (%)	0		0.311	0.116	0.281	0.03	0.05	0.047	274.5	NS
Total SO_2 disorders (%)	0.14 c		10.93 a	7.9 ab	7.43 ab	0.63 c	1.77 bc	5.99	82.3	***
Browning disorders										
External browning (%)	0		3.12	0.29	1.19	0	0	0.83	242.6	NS
Internal browning (%)	0		0	0.331	0	0	0	0.047	1058.3	NS

[1] Storage parameters: Decay, berry split, loose berries, pedicel damage, surface damage and total SO_2 were expressed as percentage of the sample mass. Colour of berries was rated according to a 3-point scale (1=Pale & 3 = Yellow). Stem was condition rated according to a 5-point scale for colour and dehydration, with 1 = very good (green and hydrated) and 5 = very poor (brown and desiccated), berry firmness according to a Durofel scale according to a Durofel scale (0 = extremely soft to 100%=maximum - highest level of fimness).

[2] One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the values within each row indicate significant difference according to LSD-test.

[3] T2 not applied, due to plastics supplier delivering late

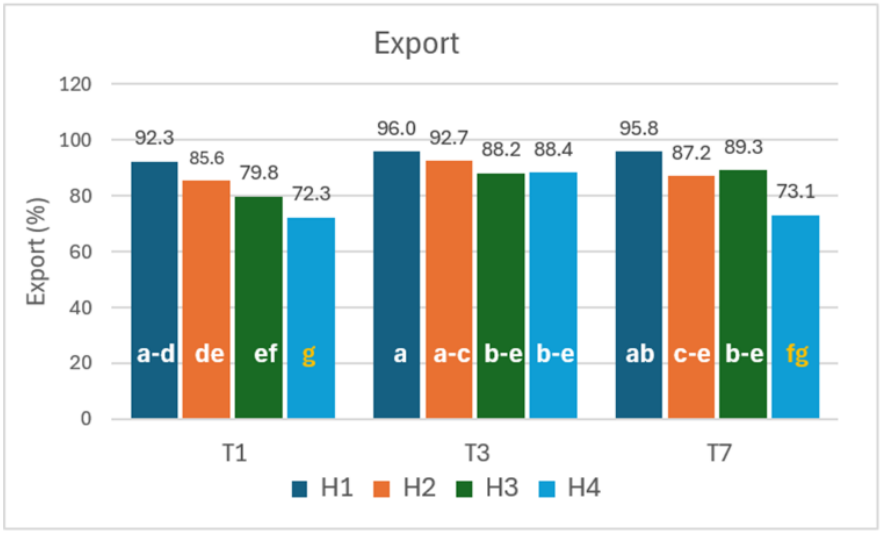
Trend of lower incidence of berry cracking (<2%) for T1, T6 and T7 (harvested 4/2, BEFORE rain); compared to 7-10% for T2-T5 (harvested 11/2, AFTER rain).

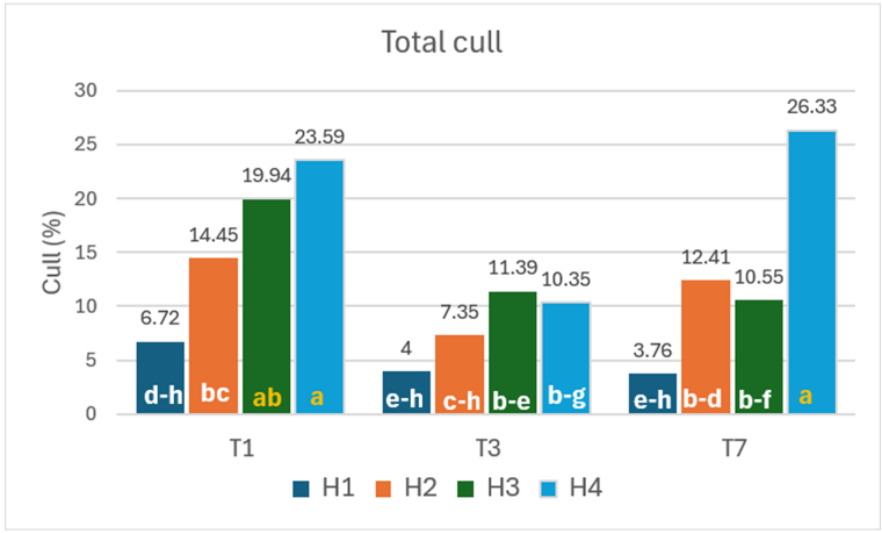
Plastic covers and/or bags did not prevent development of post-harvest berry cracking.

Results - Project 2

Hex River Valley (De Hoop) Autumncrisp®

Packout% and Cull% over 4 harvest dates





Significant Treatment x Harvest time interaction

- With T1H3, T1H4 and T7H4 significantly lower export%
- T3H4 was amongst the best performing treatments
  - With T3 (overhead plastic after set) 88% export at H4 (H1 + 6 weeks)

Results - Comm Project 3
Blouputs (Leerkrans) Sweet Celebration

Stellenbosch UNIVERSITY IYUNIVESITHI UNIVERSITEIT
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Bunch mass, berry mass and juice quality of Sweet Celebration™ table grapes harvested on 23 December 2025, following treatment with different plastic covers at Leerkrans Farm, Blouputs (2025/2026 season).

Parameter	Treatments				Mean	CV%	Prob > F[1]
	PlasticA		PlasticY				
Berry mass (g)	5.99	a	5.52	b	5.755	7.3	**
Berry volume	1.59		1.44		1.515	15.8	NS
Berry density	3.90		3.88		3.89	15.6	NS
TSS (°Brix)	17.18	b	18.91	a	18.04	4.0	***
TA (g/L)	6.6	a	5.8	b	6.2	12.0	***
pH	3.97		3.91		3.936	1.9	NS
TSS:TA	26.03	b	32.80	a	29.47	9.1	***

[1] One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the value within each row indicate significant difference according to LSD-test

PlasticY > PlasticA

- smaller berries
- TSS higher, TA lower → indicating a tendency of advanced ripening with PlasticY

Results - Comm Project 3
Blouputs (Leerkrans) Sweet Celebration

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Post storage quality of Sweet Celebration™ table grapes harvested on 23 December 2025, following treatment with different plastic covers at Leerkrans Farm, Blouputs, and stored for 6 weeks at -0.5°C (2025/2026 season).

Storage parameter[1]	Treatments		Mean	CV%	Prob > F[2]
	PlasticA	PlasticY			
Colour of berries	1.37 b	1.85 a	1.61	23.7	**
Bunch mass (g)	834	849	842	6.4	NS
Condition of rachis	3.30	3.15	3.22	9.4	NS
Condition of pedicel & receptacle	3.96 a	3.72 b	3.84	5.3	**
Firmness (Durofel scale 0 to 100%)	75.3	74.8	75.04	3.4	NS
Decay (%)	0.06	0.12	0.09	184.2	NS
Total berry split (%)	1.26	2.52	1.89	110.5	NS
Total loose berries (%)	3.36 a	1.59 b	2.47	65.1	**
Non SO_2 related disorders					
Berry split (%)	0.0	0.0	0.0	0.0	NS
Loose berries (%)	0.0	0.0	0.0	0.0	NS
SO_2 related disorders					
Berry split (%)	1.26	2.52	1.89	110.5	NS
Loose berries (%)	3.36 a	1.59 b	2.47	65.1	**
SO_2 damage neck (%)	5.37	3.77	4.57	54.1	NS
SO_2 damage Surface (%)	1.65	3.00	2.32	60.6	NS
Total SO_2 disorders (%)	11.6	10.90	11.3	40.7	NS
Browning disorders					
External browning (%)	0.89	0.89	0.89	37.5	NS
Internal browning (%)	0.0	0.0	0.0	0.0	NS

[1] Storage parameters: Decay, berry split, loose berries, pedicel damage, surface damage and total SO_2 were expressed as percentage of the sample mass. Colour of berries was rated according to a 3-point scale (1=Pale & 3 = Deep red). Stem condition was rated according to a 5-point scale for colour and dehydration, with 1 = very good (green and hydrated) and 5 = very poor (brown and desiccated), berry firmness according to a Durofel scale according to a Durofel scale (0 = extremely soft to 100%=maximum - highest level of fimness).

[2] One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the values within each row indicate significant difference according to LSD-test.

PlasticY compared to PlasticA
- berry colour significantly darker
- pedicel condition better
- occurrence of loose berries less

with PlasticY compared to PlasticA

Results - Comm Project 3
Groblersdal (Schoonbee) Autumncrisp®

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Bunch mass, berry mass and juice quality of AUTUMNCRISP® table grapes on 16 December 2025, following treatments with uncovered and a plastic sheet cover at Schoonbee Landgoed, Groblersdal (2025/2026 season).

Parameter	Treatments				Mean	CV%	Prob > F[1]
	White Nets		PlasticA + White Nets				
Berry mass (g)	8.52		9.43		8.97	11.8	NS
Berry volume (cm^3)	9.7		11.8		10.8	45.4	NS
Berry density (g/cm^3)	1.00		0.95		0.98	36.9	NS
TSS (°Brix)	8.84	b	10.34	a	9.59	10.1	**
TA (g/L)	12.98	a	10.84	b	11.91	12	**
pH	3.46		3.54		3.50	9.3	NS
TSS:TA	6.98	b	9.73	a	8.36	20.9	**

[1] One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the values within each row indicate significant difference according to LSD-test.

TSS values at harvest differed significantly between covering treatments

- PlasticA+White Net > White Net

- *Indicating a tendency of advanced ripening with PlasticA+White Net*

Results – Comm Project 3
Kanoneiland (Newgro) Sultanina

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Bunch mass, berry mass and juice quality of Sultanina table grapes on 22 December 2025, following treatment with different plastic covers at Newgrow Farm, Karsten Boerdery, Kanon-eiland (2025/2026 season).

Parameter	Treatments (Serroplast)								Mean	CV%	Prob > F[1]
	Control		PlasticY		PlasticW		PlasticE				
Bunch mass (g)	461		537		539		465		500	15.5	NS
Berry mass (g)	5.75		6.27		5.75		5.97		5.94	9.4	NS
Berry volume (cm^3)	3.54		3.76		3.68		3.34		3.58	9.8	NS
Berry density (g/cm^3)	1.78		1.81		1.82		1.88		1.82	5.3	NS
TSS (°Brix)	13.7	b	14.97	ab	13.5	b	16.4	a	14.64	10.4	**
TA (g/L)	10.3	bc	10.63	ab	11.25	a	9.72	c	10.47	6.3	**
pH	3.14		3.252		3.103		3.3		3.199	4.0	NS
TSS:TA	13.5	b	14.2	ab	12.0	b	17.1	a	14.2	17.3	**

[1] One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the values within each row indicate significant difference according to LSD-test.

- TSS & TA values at harvest differed significantly between covering treatments
  - TSS: PlasticE > Control; PlasticY; PlasticW
  - TA: PlasticE < Control; PlasticY; PlasticW

Indicating a tendency of advanced ripening with PlasticE

Results - Comm Project 3
Kanoneiland (Newgro) Sultanina

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Post storage quality of Sultanina table grapes harvested on 6 January 2026, following treatment with different plastic covers at Newgrow Farm, Karsten Boerdery, Kanon-eiland, and stored for 6 weeks at -0.5°C (2025/2026 season).

Storage parameter[1]	Treatments				Mean	CV%	Prob > F[2]
	Control	EcoYellow	EcoWhite	Ecoled			
Colour of berries (rating 1-3)	2.039	2.0144	2.013	2.013	2.0199	2.4	NS
Bunch mass (g)	597.5	625.7	585.2	620.8	607.3	8.5	NS
Condition of rachis (rating 1-5)	3.046	3.272	3.252	3.252	3.368	8.8	NS
Condition of pedicel & receptacle(rating 1-5)	4.636	4.859	4.739	4.797	4.758	5.4	NS
Firmness (Durofel scale (0 to 100%)	69.39 b	70.92 b	72.95 ab	75.48 a	72.19	6.0	**
Decay (%)	0.44	0.29	0.75	0.21	0.42	151.4	NS
Total berry split (%)	1.19	0.03	0.46	0.05	0.44	241.9	NS
Total loose berries (%)	1.3 b	2.55 a	1.47 ab	0.74 b	1.51	84.6	**
Non SO_2 related disorders							
Berry split (%)	0.6	0.03	0.35	0.05	0.26	267.3	NS
Loose berries (%)	0.094	0	0.593	0.067	0.189	334.1	NS
SO_2 related disorders							
Berry split (%)	0.6	0.03	0.35	0.05	0.26	267.3	NS
Loose berries (%)	1.2 b	2.55 a	0.88 b	0.67 b	1.32	91.0	**
SO_2 damage neck (%)	3.25	3.13	2.14	2.06	2.64	88.4	NS
SO_2 damage Surface (%)	0.56	0	1.64	0.13	0.58	380.0	NS
Total SO_2 disorders (%)	5.62	5.72	5	2.91	4.81	71.5	NS
Browning disorders							
External browning (%)	0	0	0	0	0	0	
Internal browning (%)	0	0	0	0	0	0	

[1] Storage parameters: Decay, berry split, loose berries, pedicel damage, surface damage and total SO_2 were expressed as percentage of the sample mass. Colour of berries was rated according to a 3-point scale (1=Pale & 3 = Yellow). Stem was condition rated according to a 5-point scale for colour and dehydration, with 1 = very good (green and hydrated) and 5 = very poor (brown and desiccated), berry firmness according to a Durofel scale according to a Durofel scale (0 = extremely soft to 100%=maximum - highest level of fimness).

[2] One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the values within each row indicate significant difference according to LSD-test.

Firmness tended to be higher under covering

(only PlasticE significantly higher than Control)

Results - Comm Project 3
Hex River Valley (Denau)

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saam vorentoe

Post storage quality of AUTUMNCRISP® table grapes harvested on 10 March 2026, following treatment with plastic cover at Dénau, Hex River Valley, and stored for 6 weeks at -0.5°C.

Storage parameter[1]	PlasticA
Colour of berries	1.5
Bunch mass (g)	1116.7
Condition of rachis	2.8
Condition of pedicel & receptacle	5.2
Firmness (Durofel scale (0 to 100%)	79.4
Decay (%)	11.1
Total berry split (%)	37.6
Total loose berries (%)	0.0
Non SO_2 related disorders	
Berry split (%)	0.0
Loose berries (%)	0.0
SO_2 related disorders	
Berry split (%)	37.6
Loose berries (%)	0.0
SO_2 damage neck (%)	0.0
SO_2 damage surface (%)	0.0
Total SO_2 damage (%)	37.2
Browning disorders	
External browning (%)	0.0
Internal browning (%)	0.3

[1] Storage parameters: Decay, berry split, loose berries, pedicel damage, surface damage and total SO_2 were expressed as percentage of the sample mass. Colour of berries was rated according to a 3-point scale (1=Pale & 3 = Yellow). Stem was condition rated according to a 5-point scale for colour and dehydration, with 1 = very good (green and hydrated) and 5 = very poor (brown and desiccated), berry firmness according to a Durofel scale according to a Durofel scale (0 = extremely soft to 100%=maximum - highest level of fimness). 00%=maximum - highest level of fimness).

High incidence of post-harvest berry cracking (38%). Plastic cover did not prevent development of post-harvest berry cracking.

Results - Comm Project 3
Hex River Valley (De Vlei)

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Post storage quality of AUTUMNCRISP® table grapes harvested on13 March 2026, following treatment with different plastic covers covers at De Vlei, Hex River Valley, and stored for 6 weeks at -0.5°C (2025/2026 season).

Storage parameter[1]	Treatments				Mean	CV%	Prob > F[2]
	Control	PlasticA	PlasticNV	PlasticV			
Colour of berries (rating 1-3)	1.18	1.08	1.60	1.24	1.235	46.3	NS
Bunch mass (g)	785.9 b	864.9 ab	868.1 a	808.5 ab	832.0	8.6	*
Condition of rachis (rating 1-5)	3.36 a	3.16 ab	3.05 b	3.03 b	3.149	8.3	*
Condition of pedicel & receptacle(rating 1-5)	3.64	3.52	3.47	3.36	3.498	9.1	NS
Firmness (Durofel scale (0 to 100%)	81.32	80.75	80.34	83.52	81.48	5.0	NS
Decay (%)	0.0	0.05	0.00	0.03	0.021	480	NS
Total berry split (%)	10.9	6.5	6.6	7.6	7.9	123.1	NS
Total loose berries (%)	1.37 a	0.29 b	0.04 b	0.10 b	0.45	215.3	*
Non SO_2 related disorders							
Berry split (%)	0.0	0.0	0.09	0.0	0.02	702.8	NS
Loose berries (%)	0.21	0.0	0.0	0.0	0.052	332.7	*
SO_2 related disorders							
Berry split (%)	10.9	6.5	6.5	7.6	7.9	123.6	NS
Loose berries (%)	1.16 a	0.29 b	0.04 b	0.10 b	0.40	211.8	*
SO_2 damage neck (%)	0.0		0.0	0.0	0.02	702.8	NS
SO_2 damage Surface (%)	0.0	0.0	0.0	0.06	0.016	554.7	NS
Total SO_2 disorders (%)	12.1	6.8	6.6	7.7	8.3	116.2	NS
Browning disorders							
External browning (%)	0.0	0.0	0.0	0.0	0.0	0.0	
Internal browning (%)	0.0	0.0	0.0	0.0	0.0	0.0	

[1] Storage parameters: Decay, berry split, loose berries, pedicel damage, surface damage and total SO_2 were expressed as percentage of the sample mass. Colour of berries was rated according to a 3-point scale (1=Pale & 3 = Yellow). Stem was condition rated according to a 5-point scale for colour and dehydration, with 1 = very good (green and hydrated) and 5 = very poor (brown and desiccated), berry firmness according to a Durofel scale according to a Durofel scale (0 = extremely soft to 100%=maximum - highest level of fimness).

[2] One-way ANOVA represented by not significant (NS), significant for P<0.05 (*), P<0.01 (**) and P<0.001 (***). Different letters following the values within each row indicate significant difference according to

Trend of lower incidence of post-harvest berry cracking for Plastic covers (6.5-8%) compared to Control (Bags) (11%)

Results - Preliminary

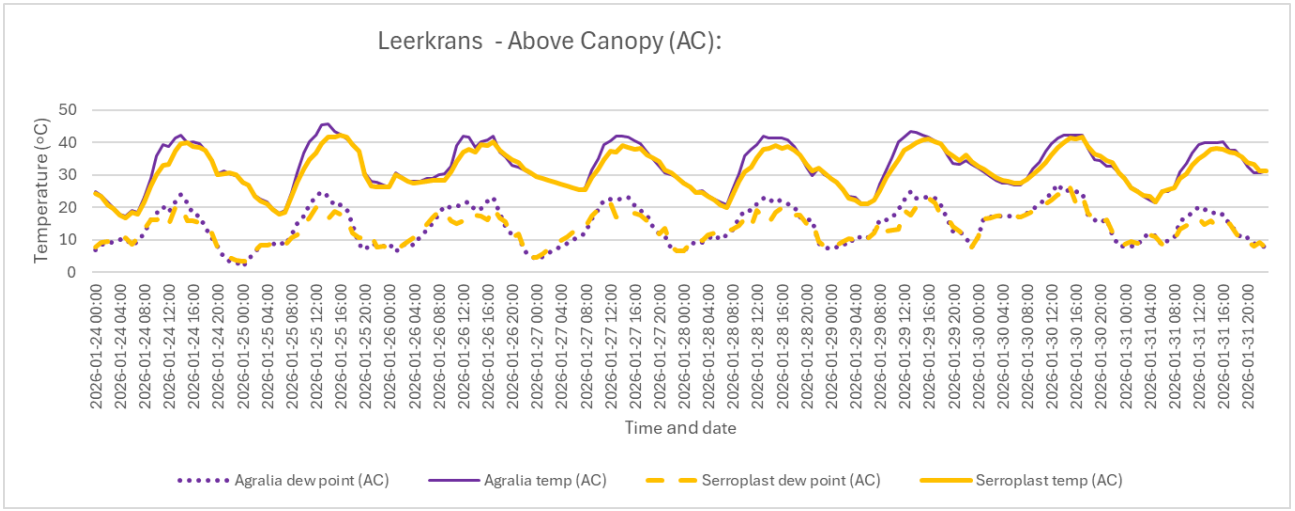
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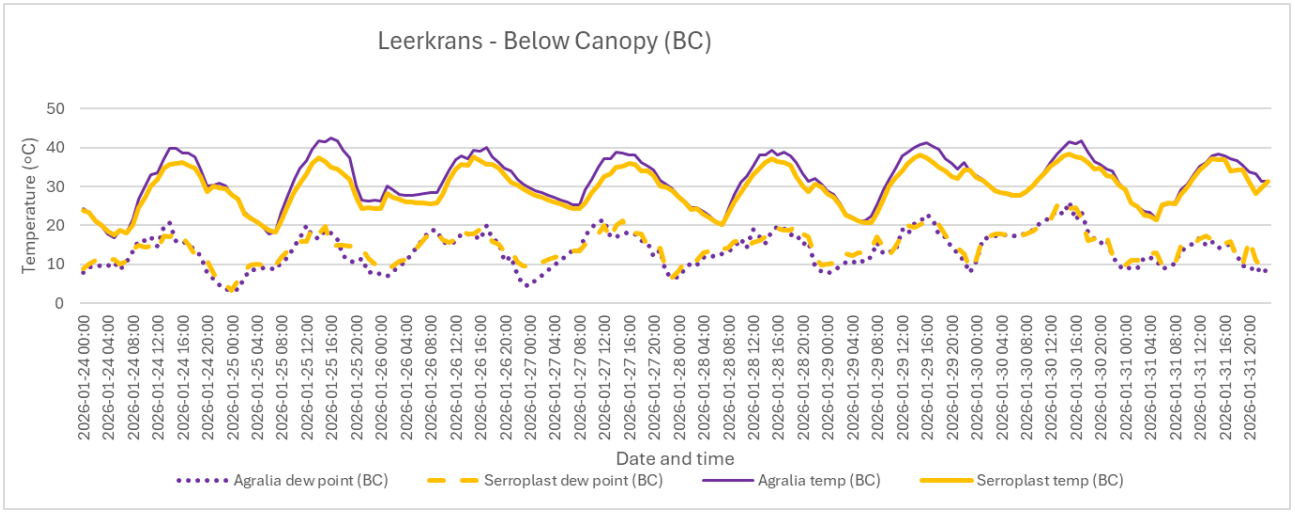
Preliminary data discussion focuses on three objectives of all three projects:

Investigate/establish the impact of covers on…

- berry ripening parameters
- grape quality at harvest and after cold storage
- vineyard microclimate

Results - Project 3
Blouputs (Leerkrans) Sweet Celebration



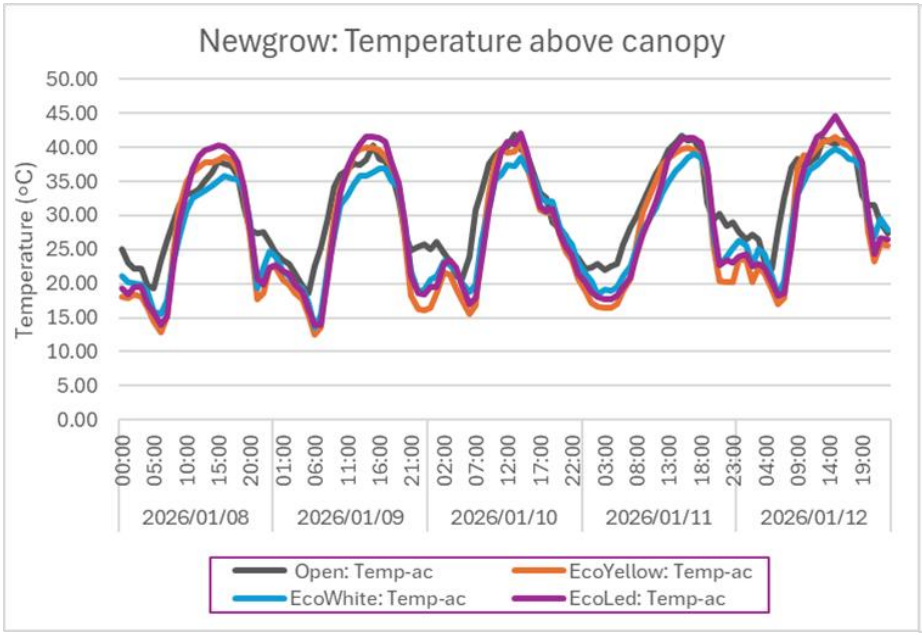


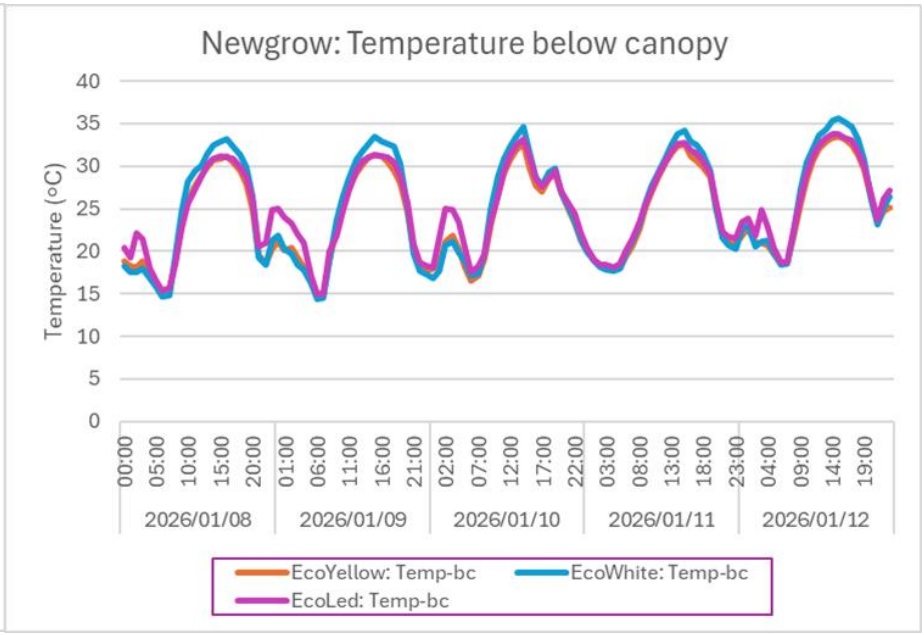
PlasticA temp higher, > 40 C AC.
PlasticY ≤ 40 AC, BC

Dew point not reached

Producer reported no problems with condensation

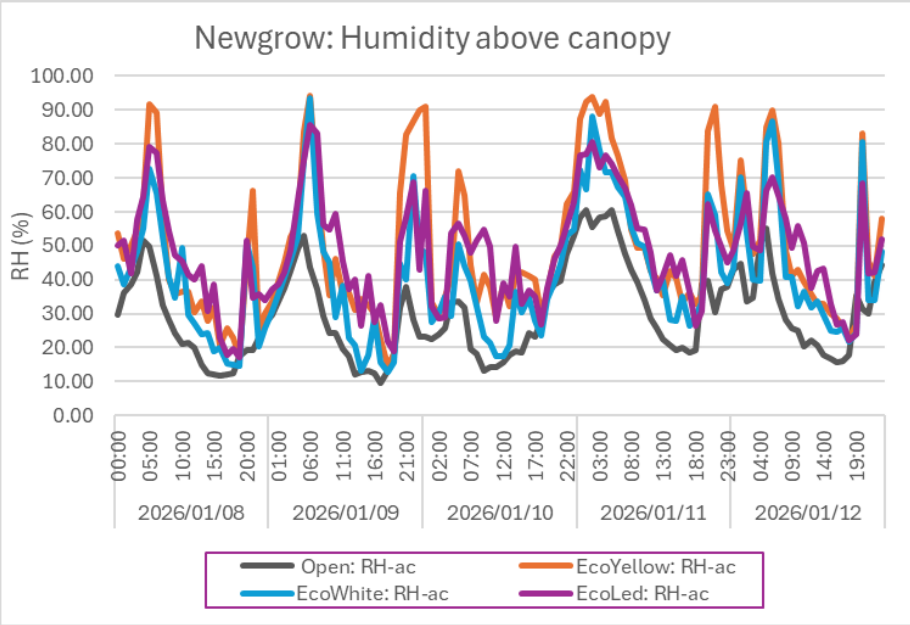
Results – Project 3
Microclimate: Kanoneiland (Newgrow)

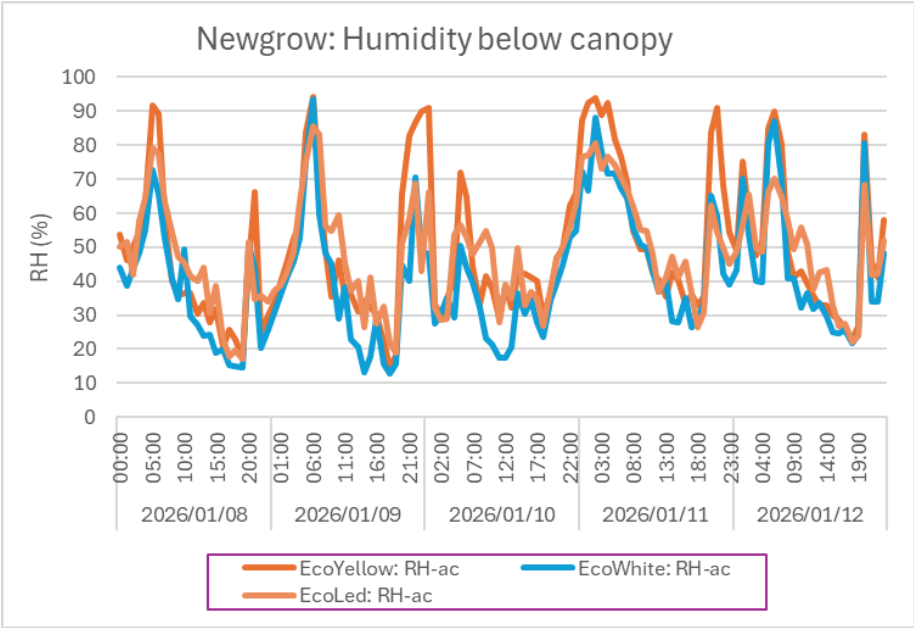




AC & BC temperature of PlasticY and PlasticE reached ≥ 40°C
BC temperature of all three plastic types ≤ 35°C (within optimal range for photosynthesis)

Results – Porject 3
Microclimate: Newgrow



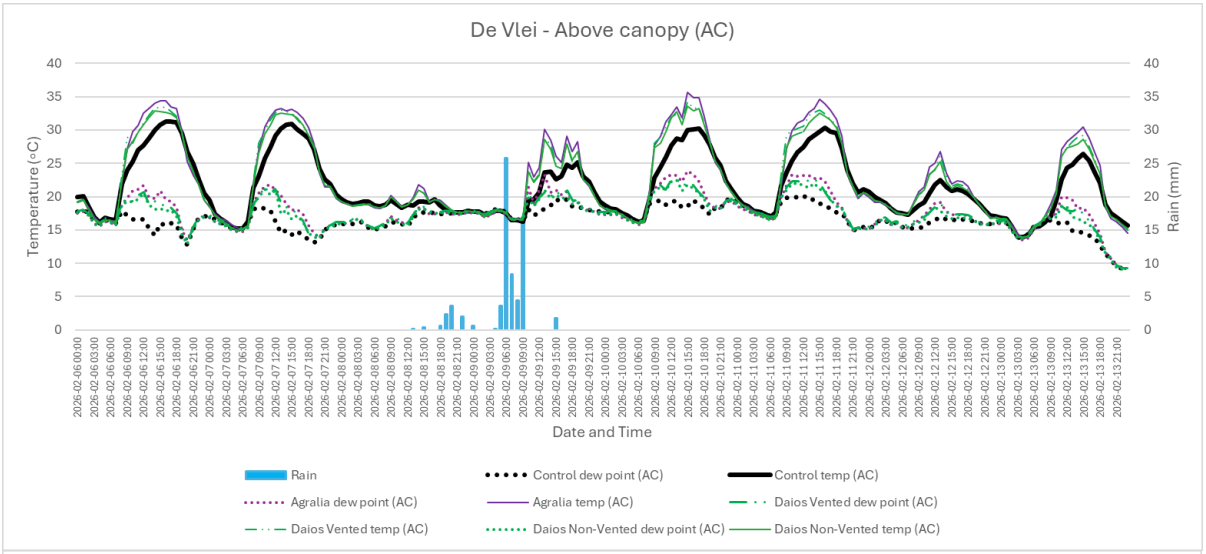


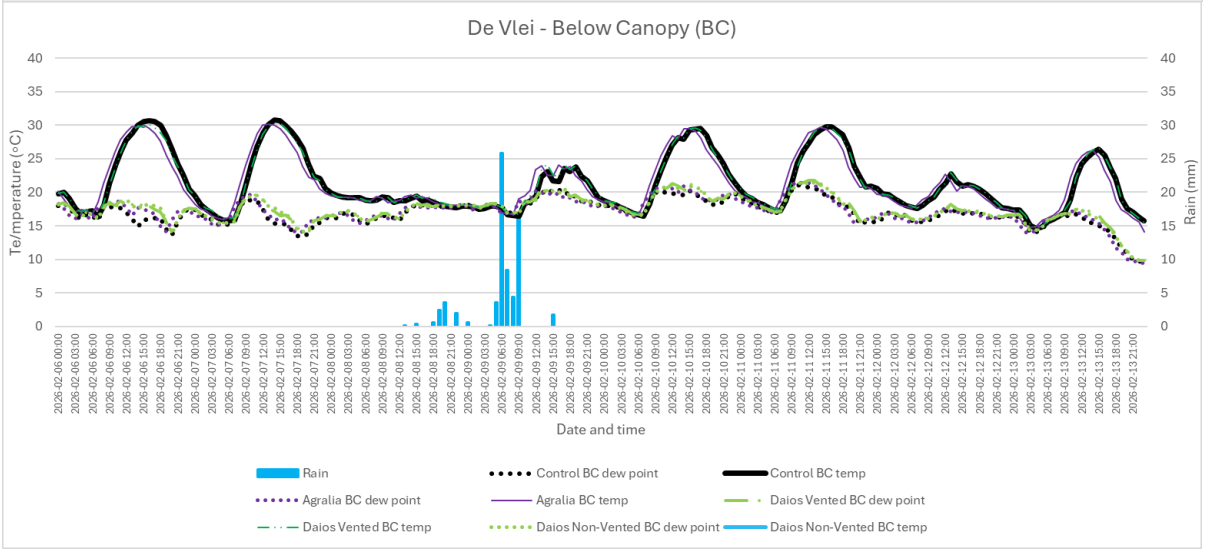
RH (AC & BC):
highest during the night, maximum of ± 90%

RH (AC): Control < PlasticW < PlasticE < PlasticY
RH (BC): PlasticW < PlasticE < PlasticY

Results - Project 3
Hex River Valley (De Vlei) Autumncrisp®

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Temperature:
AC: PlasticA > Plastic V NV > Control
BC: slight differences
AC & BC ≤ 35°C

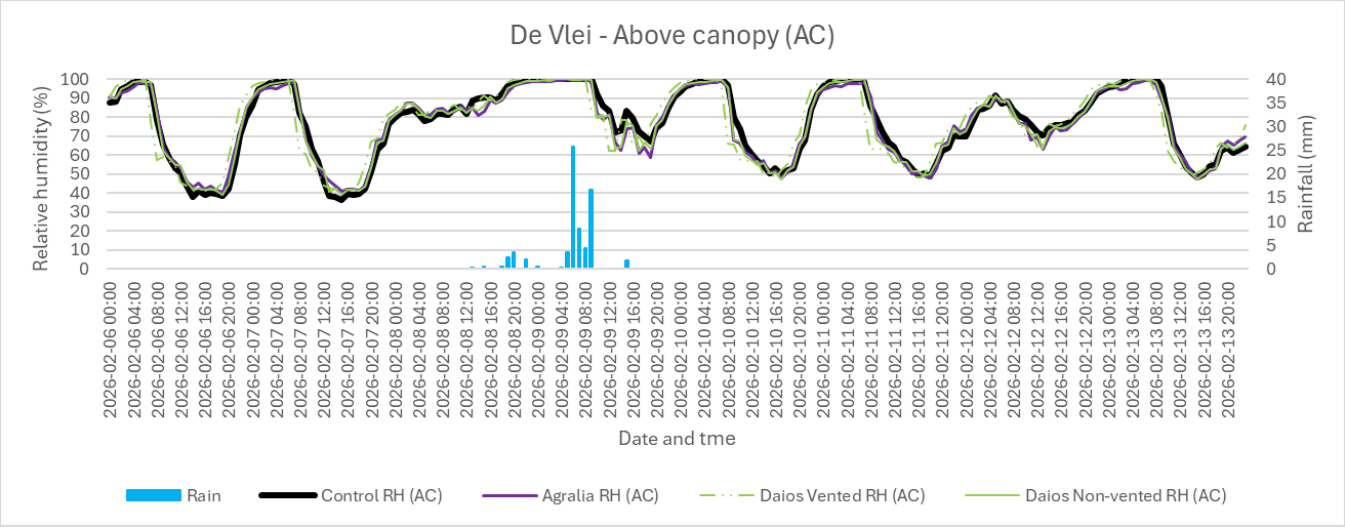
Dew point was reached several times (risk of cracking) under plastic and for control

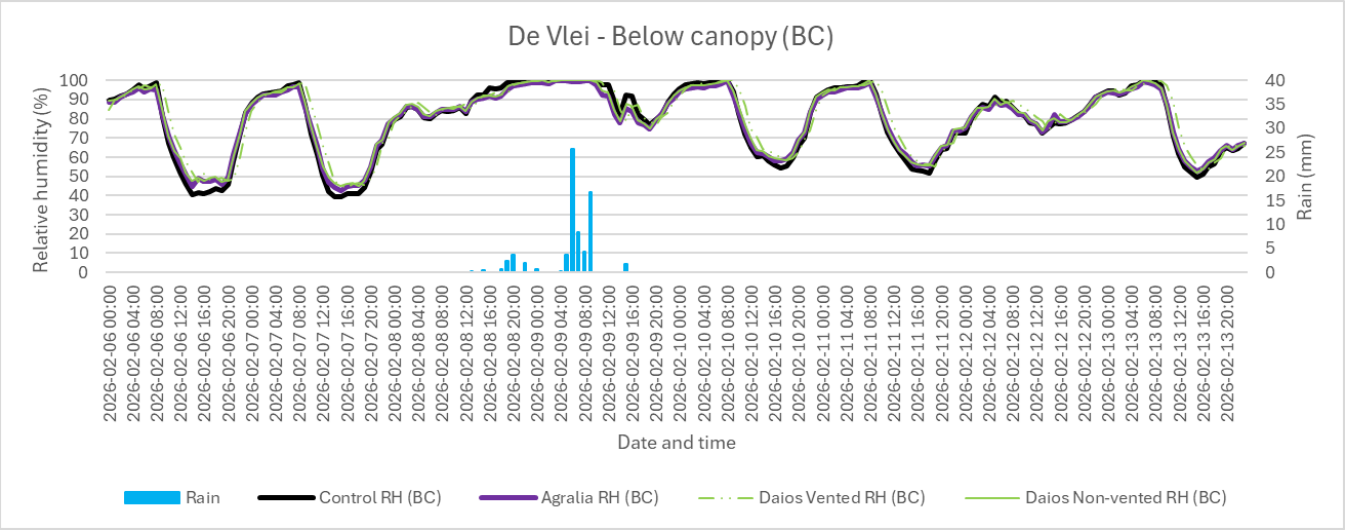
several rainfall events

High incidence of berry cracking/ microcracks at harvest (data still being processed).

Results - Project 3
Hex River Valley (De Vlei) Autumncrisp®

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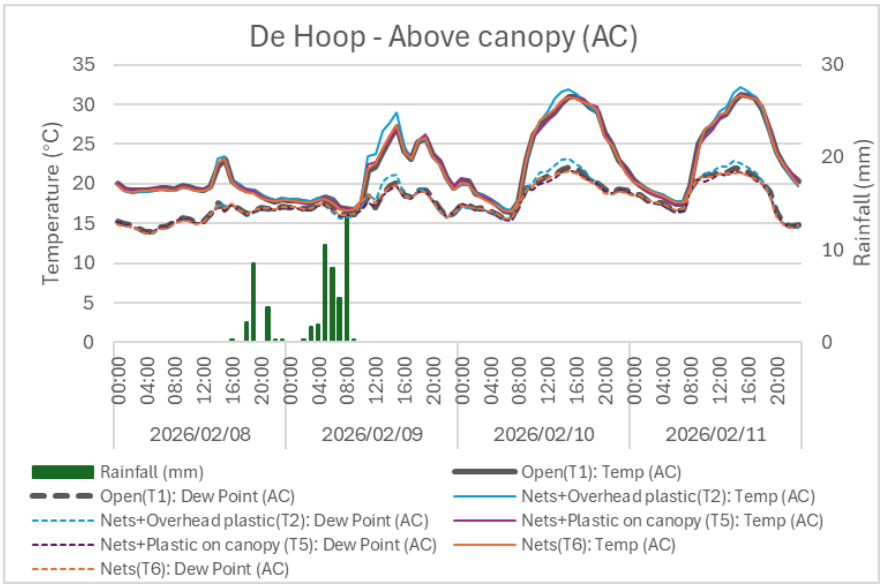


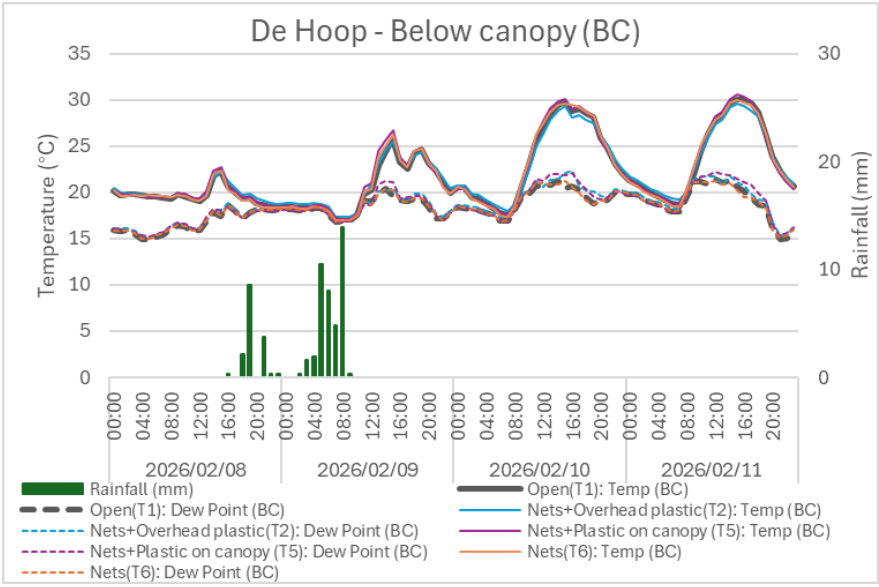


RH ≥ 95%; reached 100%
for several periods
under plastic and for control

(favourable conditions for cracking)

Results – Project 2 (Hex River)
Microclimate: De Hoop



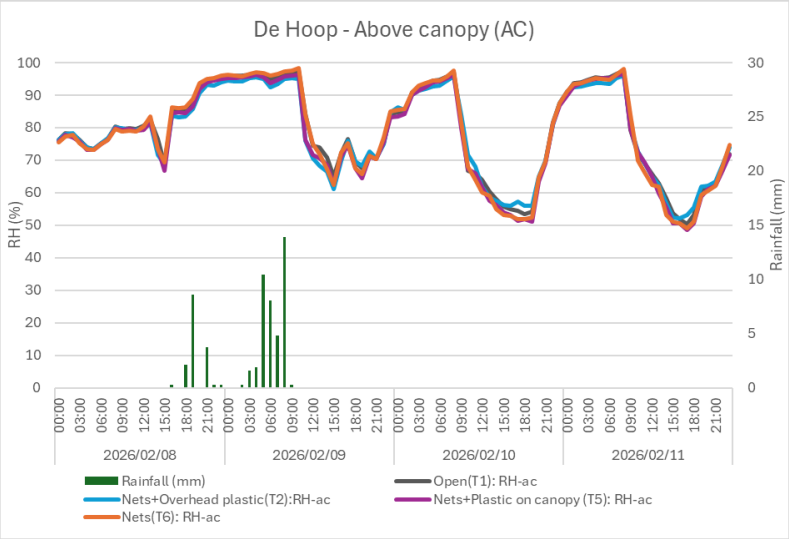


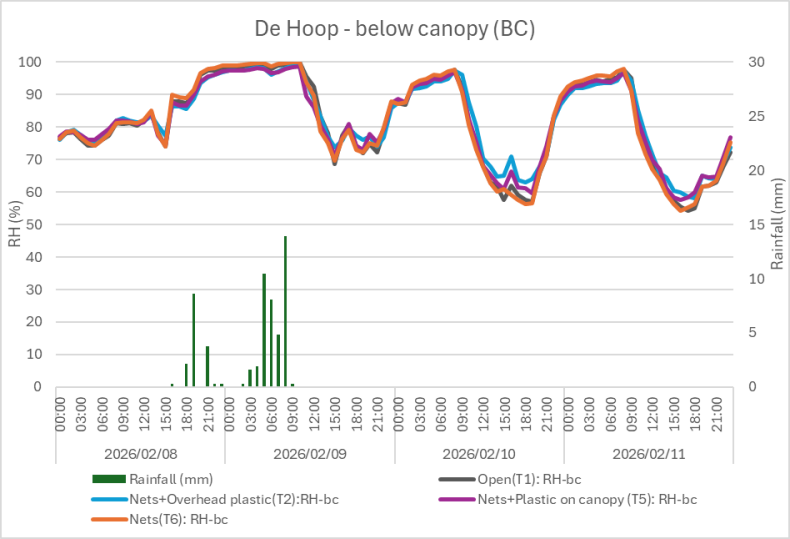
Temperature:
AC: T2 (Net+Overhead plastic) tend to be the highest
BC: slight differences
AC & BC ≤ 35°C

Dew point was reached several times (risk of cracking) under plastic and for control
Several rainfall events

Berry cracking/ microcracks recorded at harvest

Results – Project 2 (Hex River)
Microclimate: De Hoop

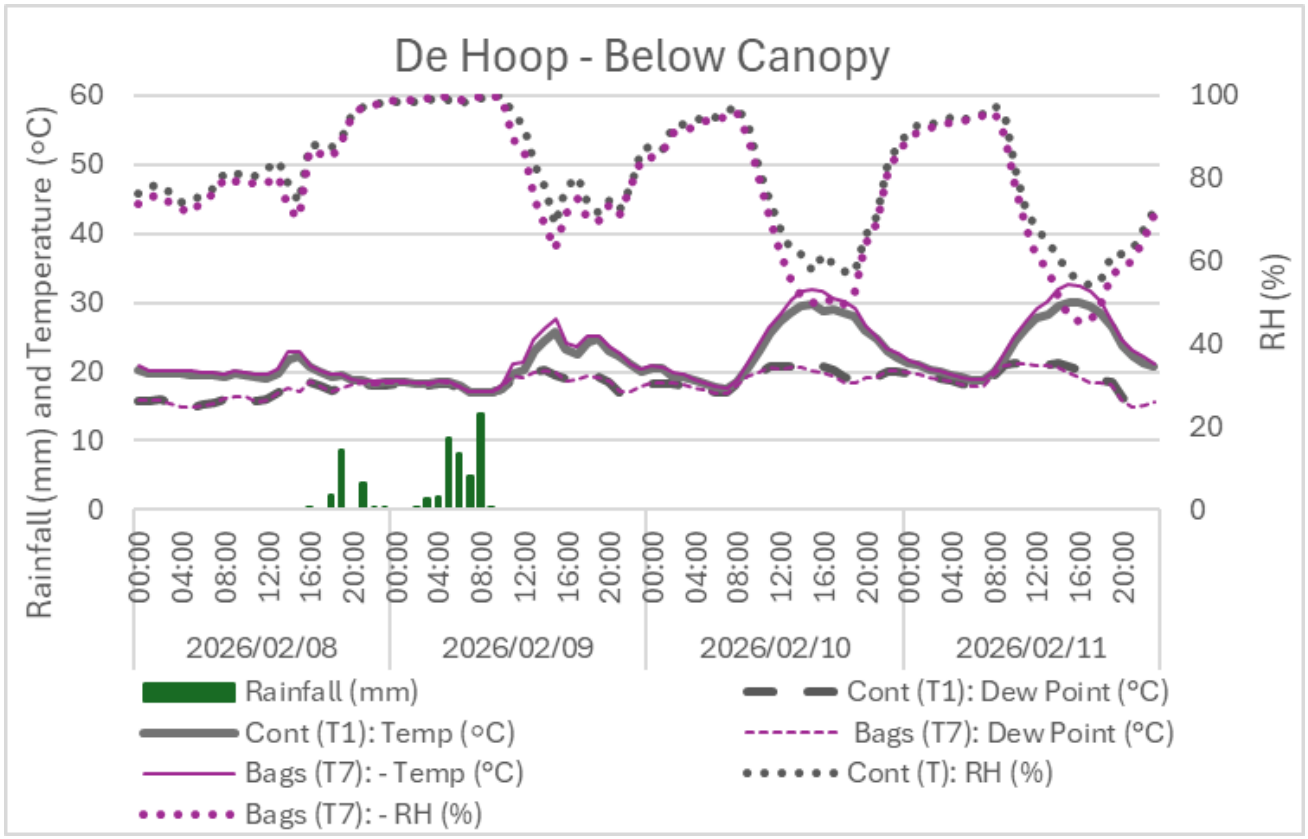




RH (AC & BC):
highest during the night, with slight differences between treatments
T2 (Nets+Overhead plastic) tends to reach higher RH than other treatments during day

RH ≥ 95%; reached 100% for several periods under plastic, nets and for control (favourable conditions for cracking)

Results – Project 2 (Hex River)
Microclimate: De Hoop



Temp & RH in bag: slight differences in temp in bag vs outside
Temperature in bag tend to be higher during the day
RH at night: similar values for Control (outside temp) as inside bag
RH during day: tend to be higher inside bag
Dew point reached inside bag… bag = physical barrier against rain, but condensation can occur inside bag

Key findings from preliminary results

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	PROJECT 1 (Orange River reion)	PROJECT 2 (Hex River region)	PROJECT 3 (Commercial project
Focus/Aim	Microclimate modification	**Protection & Harvest delay**	**Evaluate different plastic covers in different scenario's, in collaboration with producers**
Preliminary findings	**T4, T5 or T6 could be used; T3 not recommended:** highest cull percentage (56%) and lowest export percentage (43%)	**Trial 1: Potential delay of ripening recorded**; T3, T4, T5 should be evaluated further for delaying harvest date. **Trial 2: Harvest date could be delayed by 2-4 weeks.**	**Trend of advanced ripening under covers** recorded for Blouputs, Groblersdal, Newgro and Denau Hex sites - evaluate further. **Microcracks/berry cracking occurred both under covers and in uncovered controls** under conditions of high humidity (De Vlei, De Hoop) indicating that **plastic covers cannot fully prevent these issues.** Further investigation - **strategies to manage humidity**

Treatment description*	Net	Plastic		Scheduled stage to implement plastic cover
		On canopy	Over-head	
1. Control	X	X	X	None
2. Net*	√	X	X	None
3. Net* plus Plastic# after HC application	√	X	√	After HC application to harvest
4. Net* plus Plastic# after set	√	X	√	After set to harvest
5. Net* plus Plastic# veraison	√	X	√	Veraison to harvest
6. Net* plus Plastic directly on canopy++	√	√	X	Veraison to harvest

Key findings from preliminary results

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	PROJECT 1 (Orange River reion)	PROJECT 2 (Hex River region)	PROJECT 3 (Commercial project
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Treatment	Stage to implement cover
1. Control (Uncovered)	None
2. Overhead plastic# (Permanently installed, "stored" on trellis)	After HC application until harvest
3. Overhead plastic# (Permanently installed, "stored" on trellis)	After set until harvest
4. Overhead plastic# (Permanently installed, "stored" on trellis)	Veraison until harvest
5. Plastic on canopy and over bunch zone (Short-term installed)	Veraison until harvest
6. Nets* (Permanently installed)	Veraison until harvest
7. Paper bags (Bunches covered with bags)	Veraison until harvest

Key findings from preliminary results

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	PROJECT 1 (Orange River reion)	PROJECT 2 (Hex River region)	PROJECT 3 (Commercial project
Focus/Aim	**Microclimate modification**	**Protection & Harvest delay**	**Evaluate different plastic covers in different scenario's, in collaboration with producers**
Preliminary findings	**T4, T5 or T6 could be used; T3 not recommended:** highest cull percentage (56%) and lowest export percentage (43%)	**Trial 1: Potential delay of ripening recorded**; T3, T4, T5 should be evaluated further for delaying harvest date. **Trial 2: Harvest date could be delayed by 2-4 weeks/6 weeks with T3?**	**Trend of advanced ripening under covers** recorded for Blouputs, Groblersdal, Newgro and Denau Hex sites - evaluate further. **Microcracks/berry cracking occurred both under covers and in uncovered controls** under conditions of high humidity (De Vlei, De Hoop) indicating that **plastic covers cannot fully prevent these issues.**

Main plot treatment (Covering)	Stage to implement cover	Split-plot treatment (Harvest date)
1. Control (Uncovered)	None	H1; H1+2 weeks; H1+4 weeks; H1+6 weeks
3. Overhead plastic (Permanently installed)	After set until harvest	H1; H1+2 weeks; H1+4 weeks; H1+6 weeks
7. Paper bags (Bunches covered with bags)	Veraison until harvest	H1; H1+2 weeks; H1+4 weeks; H1+6 weeks

n - strategies to manage humidity

Key findings from preliminary results

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	PROJECT 1 (Orange River reion)	PROJECT 2 (Hex River region)	PROJECT 3 (Commercial project
Focus/Aim	**Microclimate modification**	**Protection & Harvest delay**	**Evaluate different plastic covers in different scenario's, in collaboration with producers**
Preliminary findings	**T4, T5 or T6 could be used; T3 not recommended:** highest cull percentage (56%) and lowest export percentage (43%)	**Trial 1: Potential delay of ripening recorded**; T3, T4, T5 should be evaluated further for delaying harvest date. **Trial 2: Harvest date could be delayed by 2-4 weeks.**	**Trend of advanced ripening under covers** recorded for Blouputs, Groblersdal, Newgro and Denau Hex sites - evaluate further. **Microcracks/berry cracking occurred both under covers and in uncovered controls** under conditions of high humidity (De Vlei, De Hoop) indicating that **plastic covers cannot fully prevent these issues.** Further investigation - **strategies to manage humidity**

Region	Farm/ Company	Cultivar	Scenario				Purpose of plastic			Timimg
			Control (Uncovered)	Plastic Product1	Plastic Product2	Plastic Product3	Protection (rain)	Microclimate modification	Delayed harvest	of cover implimentation
Hex River Valley (De Doorns)	Denau	Sugrathirtyfive	Control	PlasticA	-	-	√	√	X	Veraison
Hex River Valley (De Doorns)	De Vlei	Sugrathirtyfive	Bunch bags	PlasticA	PlasticV	PlasticNV	√	√	√	After set
Orange River (Blouputs)	Dippenaar Choice Fruit (Leerkrans)	Sweet Celebration	No uncovered Control	PlasticA	PlasticY	-	√	√	X	Pea size
Orange River (Kanoneiland)	Karsten Boerdery (Newgro)	Thompson Seedless	Control	PlasticY	PlasticW	PlasticE	√	√	X	After set
Northern Provinces (Groblersdal)	Schoonbee Landgoed	Sugrathirtyfive	White Net	White Net+ PlasticA	-	-	√	√	X	After HC application/ Open during flower/set/ Cover after set-Harvest

Conclusion/recommendation based on preliminary results

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It is **recommended** that three the projects continue for at least a second season (as scheduled):

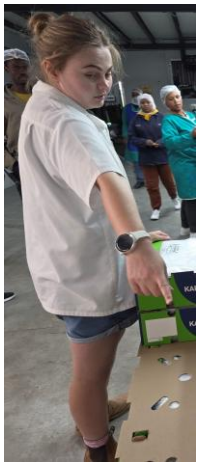
- to gain further confidence in results obtained (verifying preliminary results and testing repeatability).
- this will include:
  - collecting detail microclimate data over a full season
    - further investigating relationships between microclimate (in particular RH & temp) conditions/ production/quality
  - further investigating promising treatments
  - documenting change in plastics characteristics and performance over time
  - recording return fertility over time

Project team













Equipment installation

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Acknowledgments

- **Project Funding (Project 2): SATI**
- **Research facilities: SAGWRI**
- **Student Funding: SATI**
- **Collaborating producers and their farm teams:**
  - Karsten Boerdery (Roepersfontein, Newgro, De Hoop)
  - Dippenaar Choice Fruit (Leerkrans)
  - De Vlei Boerdery (De Vlei)
  - Denau
  - Schoonbee Landgoed `

Key findings from preliminary results

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Berry ripening parameters	Site
TSS values at harvest differed significantly between covering treatments	Blouputs-Leerkrans
(trend of advanced ripening under covers)	Groblersdal-Schoonbee
	Kanoneiland-Newgro
	Hex-Denau
Trend of higher TSS & lower TA (trend of delaying impact of Plastic covers)	
T1 (Control), T6 (Nets), T7 (Bags) > Plastic Covers (T4, T5, T6)	Hex-De Hoop
Quality at harvest	**Site**
Protective/ Beneficial impact of plastic covers confirmed	several sites
↑ Yield (Overhead plastic after set, Overhead plastic at veraison, Canopy plastic)	
↑ Export (Overhead plastic after set)	
↓ waste (berry cracking; decay)	
Brown marks on Sweetglobe ^{TM} berries at harvest	
Highest for Overhead Plastic implemented after HC application (65% cull)	Kanoneiland-Roepersfontein
Implimentation of cover should be done later (from after set)	
Quality after cold storage	**Site**
Firmness tended to be higher under covering	Kanoneiland both sites
Berry colour	
↑ darker red	Blouputs-Leerkrans
↑ green colour with all cover treatments	Kanoneiland-Roepersfontein
Pedicel condition	
trend of better condition under plastic covers	several sites

Key findings from preliminary results

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PAR	**Site**
PAR transmitted by all covers > light saturation point for photosynthesis	all sites
(800 µmol.m^{-2}.s^{-1} = ± 30% of full sun light intensity)	
All covers allow sufficient PAR transmission; do not limit photosynthesis	
PAR Open > Nets > Nets+Overhead plastic	
Temperature, Relative humidity & Dew poit	**Site**
AC in some sites reach ≥ 40°C	Blouputs, Kanoneiland, Groblersdal
BC temperature of all coverings < 35°C *(within optimal range for photosynthesis)*	all sites, except Blouputs
Conditions assosioated with ↑risk of berry cracking/ microcracks	Hex-De Vlei, De Hoop
when ambient temperature reaches dew point	Groblersdal-Schoonbee
with relative humidity reaching 95%+ to 100%	Kanoneiland-Newgro
Temp & RH in bag: slight differences in temp in bag vs outside	
Temperature in bag tend to be higher during the day	Hex-De Hoop
RH (AC & BC):	
highest during the night, with slight differences between treatments	
Nets+Overhead plastic reach higher RH than other treatments during day	
RH in bag:	
At night: similar values for Control (outside temp) as inside bag	Hex-De Hoop
RH during day: tend to be higher inside bag	Hex-De Hoop
Windspeed: ↓ with overhead covers	**Site**
Open > Nets > Nets+Plastic on canopy >Nets+Overhead plastic	Kanoneiland-Roepersfontein
Nets+Plastic on canopy > Open > Nets > Nets+Overhead plastic	Hex-De Hoop