Technical Document – Tasman Koru SunRed Trial Report - April 2025.

Abstract

A SunRed colour and fruit sizing biostimulant trial with controls was implemented on two blocks of Koru apples that were known for their poor colour development. This was applied in a programmed approach where K-bomber was used prior to the start of fruit colouration to move the Koru apple trees away from vegetative growth, and into fruit maturation. Pre-harvest three covers of SunRed and Folicist were applied to enhance the red colour quality.

Assessments were made firstly to capture both preharvest fruit qualitative data, assessing colour quality and size, and secondly to capture commercial harvest picking data. In all the assessments, there were statistically significant improvements in the treatment effect on fruit quality. This made a positive impact in allowing up to 50% more fruit to be harvested in the earlier picks (compared to the control), leaving much less lower quality fruit to be sent to the pack house in the final pick.

By application of the trial results to the previous seasons packhouse report, the use of an appropriately applied, seasonally adjusted SunRed programme could potentially benefit a Koru apple growers return on investment by tens of thousands of dollars.

Background

New Zealand apple growers have faced challenges in achieving optimal red coloration in Koru apples, a trait highly valued in the market. Koru apples, known for their bi-coloured appearance with an orange-red hue on a yellow background, are a natural cross between Fuji and Braeburn varieties.

The development of red pigmentation in apples is influenced by temperature. Cooler temperatures enhance the production of anthocyanins, the pigments responsible for red coloration. However, higher temperatures can inhibit this process, leading to less vibrant red hues.

To address the challenges of achieving optimal red coloration, growers can consider the use of biostimulants like Biolchim's SunRed. SunRed is a foliar-applied biostimulant formulated from plant extracts rich in oxylipins, phenylalanine, methionine, and monosaccharides. These components work synergistically to stimulate the natural physiological processes involved in fruit ripening and pigmentation.

- Pigment Accumulation: SunRed supplies phenylalanine, a precursor in the anthocyanin biosynthesis pathway, and oxylipins, which enhance the expression of genes involved in pigment formation. This dual action promotes increased anthocyanin production, leading to more intense red coloration.
- Sugar Accumulation: The monosaccharides in SunRed serve as energy sources, supporting the metabolic processes necessary for pigment synthesis and overall fruit development.
- Cell Wall Strengthening: Oxylipins in SunRed also induce the synthesis of lignin and monolignols, reinforcing cell walls and maintaining fruit firmness and storability.

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After Sunred applications, fruit ripen faster and reach a final colouration which is more intense without altering flesh firmness and fruit shelf life.

This trial explores how by integrating SunRed into pre-harvest orchard management practices, New Zealand apple growers can overcome the challenges associated with red colouration in Koru apples, leading to improved pack-out rates and potentially higher returns.

Proposal

The proposal was to investigate the application of SunRed to part of a 5 ha block Koru apples at Tasman, New Zealand. In this trial, the SunRed treatment programme was to be applied to both five- and eight-year-old Koru trees. Colour quality and weight enhancements were to be assessed relative to control trees.

The 2024-25 season was described as “normal” for colour development, with many cool nights to bring on good high grade colour development.

Assessments would be conducted to firstly compare quality improvements such as fruit colour enhancements and weight and secondly assess how these enhancements would impact on the picking efficiency at harvest.

A return on investment could then be calculated.

8-Year-Old Koru Trees

5-Year-Old Koru Trees

Method

The orchard air blast sprayer was used to apply the following treatments, using a water rate of 666L/ha. Treatments – applied to 5 and 8-year Koru blocks, plus a control for both. The overall colour enhancement programme is summaries in the following table.

PRODUCT	DOSAGE	APPLICATION TIME
K-BOMBER	2.5-3 kg/ha	2 applications starting just before fruit starts to change colour,10 days apart (dosages depend on vigourness of the plant)
SUNRED **+** **FOLICIST**	6 L/ha + 0,5 L/ha	2 applications at 15 and 7 days prior to harvest. Due to being a regionally poor colour season a third application was made 3 days before harvest.

K-bomber was used just prior to colour change to shift the trees focus from vegetative growth to fruit growth and maturity.

Then three applications of SunRed and Folicist were applied to enhance colour and fruit sizing. (The initial programme was for 2 SunRed applications). Folicist gives the trees a metabolic boost for the ripening process as well as builds tolerances to the induced metabolic stresses that could hinder the ripening process.

Application Recommendations

- Apply the treatments during sunny days.
- Spray the treatments as uniform as possible avoiding dripping.
- Do not use the treatments with copper, mineral oils, and SE formulation (emulsion). In practice, the grower applied the treatments on their own as a separate dedicated cover to the treatment blocks.
- Apply on dry plants.

Application dates.

- 14th Feb – K-Bomber 3kg/ha
- 24th Feb – K-Bomber 3kg/ha
- 2nd March – SUNRED® 6l/ha + Folicist 500ml/ha
- 10th March – SUNRED® 6l/ha + Folicist 500ml/ha
- Due to delayed harvest, a third application was made.
- 21st March – SUNRED® 6l/ha + Folicist 500ml/ha

Data Collection

Two forms of data collection where undertaken:

1. Visual colour quality assessment and fruit weight. Randomly selected, twenty-five apple samples were collected from each treatment and control blocks and assessed visual for surface red colour percentage, colour intensity score (1-5) and colour evenness score (1-5). Individual apples in the samples were weighed. Apple selection was using the same random selection method used to take apple maturity samples.

Treatment verses Control apple sample collection and assessment.

2. Harvest assessment. Branches were tagged in the treatment and control areas. Apple numbers were counted on each prior to harvest. (Branch selection was from the mid-to lower canopy region with an even distribution of east or west orientation). After each harvest pick, apple numbers per tagged branch were recounted and recorded.
3. It was also intended to have fruit maturity data collected such as fruit firmness and brix from the treatment vs control fruit. This did not happen.

Results

Pre-harvest Fruit Quality Assessments

Due to seasonal factors in some subregions of Tasman, a packhouse led delay in the apple harvest occurred due to slow maturity and colour development.

The two planned SunRed applications were applied preharvest based on the predicted harvest dates. Due to the delay, it was decided to apply a third application which went on 3 days prior to the first pick on 24th March.

Preharvest colour development and weight assessments were made on 17th and 21st March. Summary table for the 21st March assessment below which occurred prior to the third SunRed application.

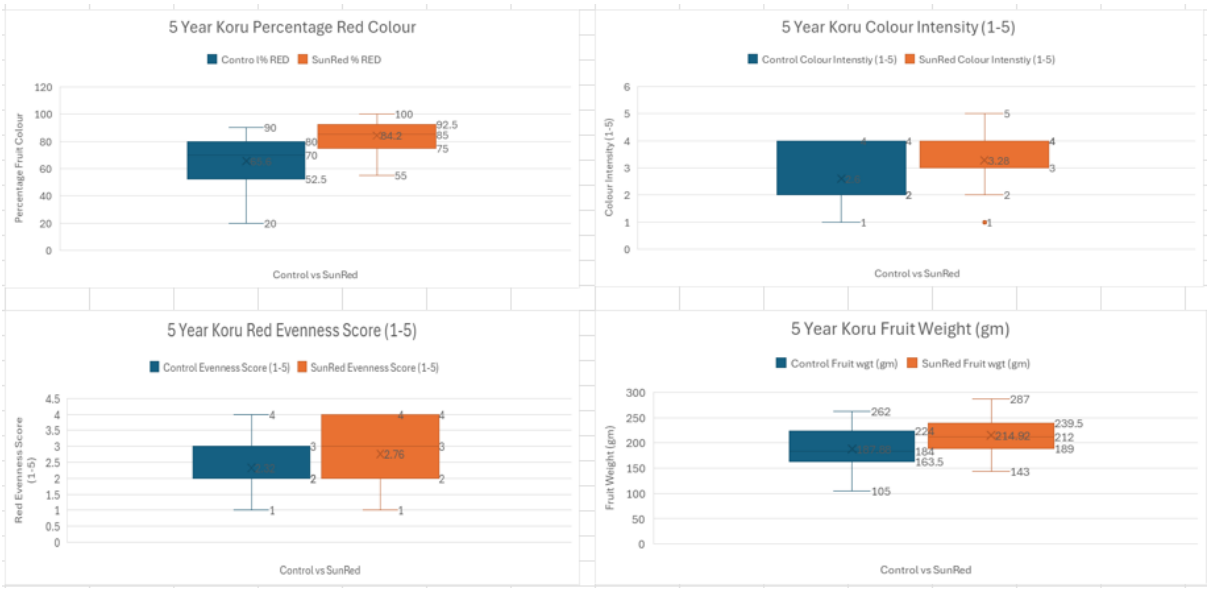
5 Year Koru Data Summary Table - SunRed Treatment vs Control				Assessed 21st March		1st Pick 24th March
Parameter	Means (SR vs C)	Av. % Increase	F	P-value (0.05)	F crit	Stat.Significant (95%)
Red Colour (%)	84.2 vs 65.6	28%	21.5105	2.73334E-05	4.0427	YES
Colour Intensity Score (1-5)	3.28 vs 2.60	26%	5.2308	0.026641297	4.0427	YES
Colour Evenness Score (1-5)	2.76 vs 2.32	19%	2.5252	0.118605233	4.0427	numerically different
Fruit Weight (gm)	215 vs 188	14%	7.3294	0.009368887	4.0427	YES

8 Year Koru Data Summary Table - SunRed Treatment vs Control				Assessed 21st March		1st Pick 24th March
Parameter	Means (SR vs C)	Av. % Increase	F	P-value (0.05)	F crit	Stat.Significant (95%)
Red Colour (%)	90.2 vs 72.4	25%	19.5379	5.62041E-05	4.0427	YES
Colour Intensity Score (1-5)	3.32 vs 2.64	26%	6.1381	0.016802424	4.0427	YES
Colour Evenness Score (1-5)	2.68 vs 1.96	37%	10.2316	0.002446292	4.0427	YES
Fruit Weight (gm)	202 vs 184	10%	5.6266	0.021746977	4.0427	YES

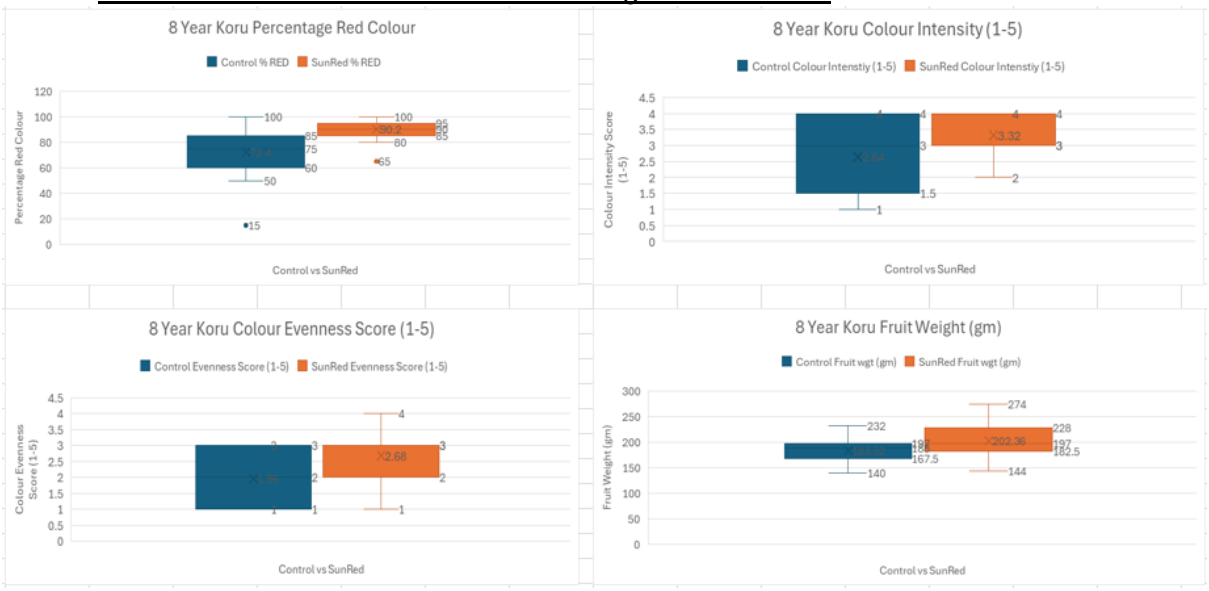
In all but one assessment for the 5- and 8-year-old trees, treated fruit showed a significant improvement with a 95% confidence level over the non-treated control. The treated apples presented a greater uniformity in colour development as depicted in the following distribution graphs. All average improvement percentages were double figures in the range of 19 – 37%. The only non-significant difference at (at 95% confidence level) was colour evenness in the 5-year Koru, which still showed a 19% numerical increase with the SunRed treatment.

Weights were significantly improved for both koru tree ages, with average weights of 5-year and 8-year fruit increasing by 14 and 10%, respectively.

- 5-Year Koru Pre-harvest Colour and Weight Assessment



- 8-Year Koru Pre-harvest Colour and Weight Assessment



- Visual Assessment

Visual differences were very noticeable, both in colour and size when sample apples were displayed as in photos below. Fruit was arranged to display their best face.

5-Year-Old Koru Fruit

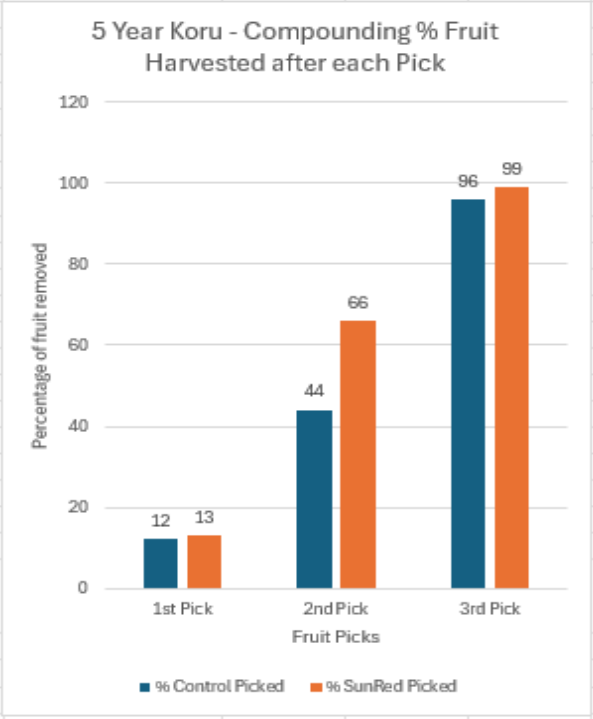
8-Year-Old Koru Fruit

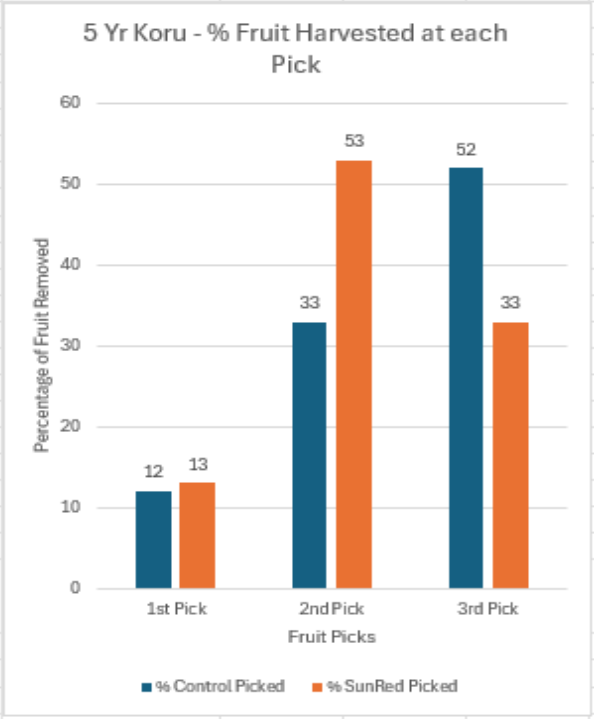
Harvest Assessment

Harvest was conducted over three picks starting 24th March. Fruit numbers remaining on tagged branches were counted after each commercial pick on 26th March 3rd and 17th April. Results are tabled and graphed below depicting both compounding pick percentage as well as individual pick percentage.

5 Yr Koru - Compounding % Fruit Harvested After each Pick			
	1st Pick	2nd Pick	3rd Pick
% Control Picked	12	44	96
% SunRed Picked	13	66	99
% Improvement	1	22	3

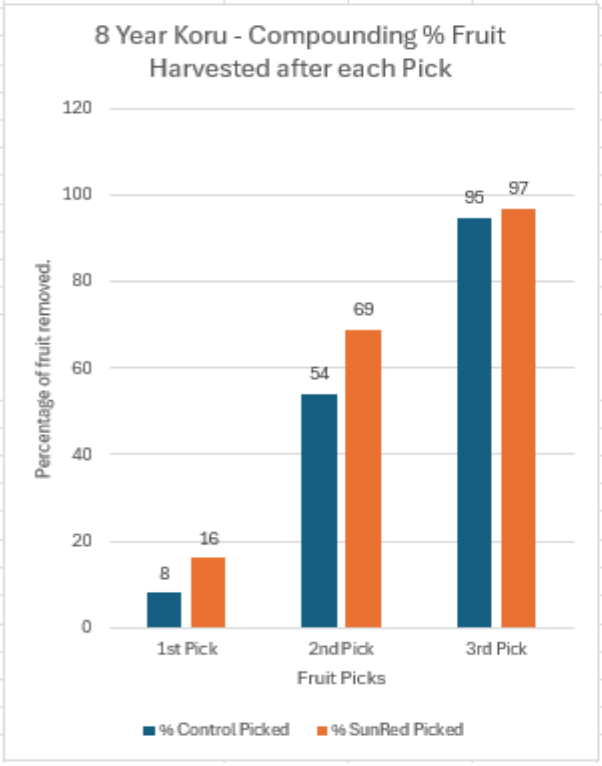
5 Yr Koru - % fruit removed at each Pick			
	1st Pick	2nd Pick	3rd Pick
% Control Picked	12	33	52
% SunRed Picked	13	53	33
% Improvement	1	20	-19

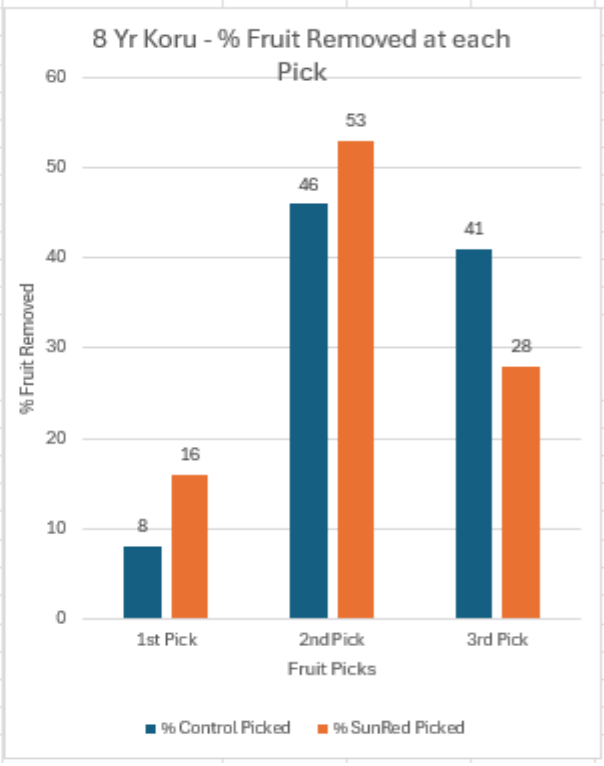




8 Yr Koru - Compounding % Fruit Harvested After Picks			
	1st Pick	2nd Pick	3rd Pick
% Control Picked	8	54	95
% SunRed Picked	16	69	97
% Improvement	8	15	2

8 Yr Koru - % fruit removed at each Pick			
	1st Pick	2nd Pick	3rd Pick
% Control Picked	8	46	41
% SunRed Picked	16	53	28
% Improvement	8	7	-13





Discussion

The aim of this study was to assess the merits of using SunRed to enhance the colour development of Koru apples. Any enhancement should reflect in an improvement to the harvest efficiency, and the amount of harvestable fruit for the season. Such improvements should deliver a greater return on investment to the grower through enhanced pack out grades and volumes.

Both qualitative and quantitative assessments showed a statistically significant improvement in fruit quality, fruit volume and was reflected in commercial quantitative increases in fruit harvested in the first and second picks.

Commercial apple crops are harvested in multiple picks to optimise selection of fruit picked to colour and size. The best fruit is harvested in the first two picks, with the quality of fruit finally harvested in the last pick being of a lower grade as reflected in pack outs. By the end of the second pick, 50% more of the crop had been harvested in the 5-year-old Koru, and 25% more in the 8-year-old Koru relative to the controls.

This improvement in early pick fruit, not only has a harvesting cost advantage for the SunRed treated blocks, but also income advantage for the grower. Using packhouse data grading and payment data from the previous year enabled trial results to reflect on the potential ROI achieved if trial outcomes were applied. See appendix for details.

1. Fruit size was increased – an average of 12% for the 5- and 8-year blocks – 14 and 10%, respectively. The lift in size packing grade and relative payments would return an extra $10984/Ha.
2. Colour Intensity increase – colour intensity increased 26% for both 5- and 8-year blocks. Assuming a respective drop in Choice grade fruit, and lift in Premium grade fruit, this would deliver a ROI of $8361/Ha.

3. Collective increase of fruit size and colour – Calculated fruit quality improvements for both colour and size would give a $20496/Ha increase ROI.

This season, harvest was delayed by the packhouse for a week due to initial poor colour development. SunRed biostimulant relies on the physiological ripening process to be underway, and then it enhances this process by optimising the colour development potential. The first two planned SunRed applications were applied based on the harvest date estimate. Due to the seasonal delay in fruit ripening, it is likely that the first application was too early. Consequently, a third application was made 3 days prior to actual harvest date to enhance the colouration process, even though the trial colour assessment was made on the day of the third application, but before it was applied.

This of third application added to the cost of treatment inputs.

In a practical sense, a better appreciation for seasonally adjusted timing could save on input costs, and the colour enhancement results achieved.

Overall, this trial led to an excellent quality outcome that could be translated into a significant ROI for any grower choosing to appropriately implement a SunRed programme.

Appendix

The following tables calculate the potential return on investment from implementing the trial data SunRed colour enhancement programme and the influence it could potential have on packhouse grades from the previous season.

Koru Apple Harvest Quality Enhancement Trial Costing							
Treatment - Promote uniform ripening, fruit colour and overall quality							
Product	Pack Size	Cost/Pack	Cost/L	No. L/ha	Cover Cost/ha	No. Covers	Treatment Cost/ha
K-Bomber 55 20kg	20	$ 395.00	$ 19.75	3	$ 59.25	2	$ 118.50
Folicist 5L	5	$ 319.00	$ 63.80	0.5	$ 31.90	3	$ 95.70
SunRed 20L	20	$ 620.00	$ 31.00	6	$ 186.00	3	$ 558.00
Total Cost/ha							**$ 772.20**

Potentail Return on Investment from a SunRed Programme on Koru Apples (2024-25 data reflected on 2023-24 Packhouse Results)											
Koru Apple - Packhouse Data from 2023-24 Season (Based on 5ha Koru Block)					SunRed Apple Weight Increase			SunRed Apple Colour Intensity Increase			SunRed Payment Increase Total
	Pool	TCEs	Payment Rate	Payment	Av. SunRed Wgt Inc.	SunRed Wgt Increased TCEs	Payment Rate	Av. SunRed Colour Intensity	SunRed Colour Intensity Increased TCE's	Payment Rate	Payment Rate
Fruit Size and Colour ROI	KORU(R) - CH Size 060	2131	18.09	$ 38,549.79	112%	2386.72	$ 43,175.76	74%	1576.94	$ 28,526.84	$ 31,950.07
	KORU(R) - CH Size 080	4287	18.04	$ 77,337.48	112%	4801.44	$ 86,617.98	74%	3172.38	$ 57,229.74	$ 64,097.30
	KORU(R) - CH Size 100	1415	18.00	$ 25,470.00	112%	1584.8	$ 28,526.40	74%	1047.1	$ 18,847.80	$ 21,109.54
	KORU(R) - CH Size 120	275	17.50	$ 4,812.50	88%	242	$ 4,235.00	74%	203.5	$ 3,561.25	$ 3,133.90
	KORU(R) PG 80/90/100	2022	26.02	$ 52,612.44	112%	2264.64	$ 58,925.93	126%	2547.72	$ 66,291.67	$ 74,246.68
	KORU(R) PG Size 045	12	50.19	$ 602.28	112%	13.44	$ 674.55	126%	15.12	$ 758.87	$ 849.94
	KORU(R) PG Size 050	249	46.04	$ 11,463.96	112%	278.88	$ 12,839.64	126%	313.74	$ 14,444.59	$ 16,177.94
	KORU(R) PG Size 060	972	42.03	$ 40,853.16	112%	1088.64	$ 45,755.54	126%	1224.72	$ 51,474.98	$ 57,651.98
	KORU(R) PG Size 070	3048	41.01	$124,998.48	112%	3413.76	$ 139,998.30	126%	3840.48	$ 157,498.08	$ 176,397.85
	KORU(R) PG Size 080	1625	37.02	$ 60,157.50	112%	1820	$ 67,376.40	126%	2047.5	$ 75,798.45	$ 84,894.26
	KORU(R) PG Size 090	857	30.10	$ 25,795.70	112%	959.84	$ 28,891.18	126%	1079.82	$ 32,502.58	$ 36,402.89
	KORU(R) PG Size 100	1	25.12	$ 25.12	112%	1.12	$ 28.13	126%	1.26	$ 31.65	$ 35.45
	KORU(R) PG Size 110	171	21.55	$ 3,685.05	112%	191.52	$ 4,127.26	126%	215.46	$ 4,643.16	$ 5,200.34
	KORU(R) PG Size 120	63	20.16	$ 1,270.08	112%	70.56	$ 1,422.49	126%	79.38	$ 1,600.30	$ 1,792.34
	KORU(R) PG Size 135	17	20.11	$ 341.87	88%	14.96	$ 300.85	126%	21.42	$ 430.76	$ 379.07
		17145		$467,975.41			$ 522,895.41			$ 513,640.74	$ 574,319.54
	Payment Variation from 2023-24						$ 54,920.00			$ 45,665.33	$ 106,344.13
	Increase ROI per ha						$ 10,984.00			$ 9,133.07	$ 21,268.83
	Less - Cost of SunRed Programme ($772/ha)						$ 772.00			$ 772.00	$ 772.00
	ROI / Ha						**$ 10,212.00**			**$ 8,361.07**	**$ 20,496.83**

Note: Tasman - Packhouse PG, Premium Grade. CH, Choice Grade.