

## STORAGE EVALUATION OF STONE FRUIT CULTIVARS RECENTLY RELEASED BY ARC INFRUITEC/NIETVOORBIJ:

# Alpine Nectarine and Lady Red, Ruby Red, Sunkiss & Sundew Plums

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Capespan Technology Development conducted storage evaluations on certain stone fruit cultivars recently released by the Agricultural Research Council (Infruitec-Nietvoorbij), namely: Alpine nectarine, and the plum cultivars Lady Red and Ruby Red, as well as the African Pride™ cultivars, Sunkiss and Sundew. The evaluation of each cultivar, over a period of three to four seasons, was aimed at establishing the optimum harvest maturity, the optimum cold storage regime and the optimum packaging for best maintenance of fruit quality in export fruit.

The evaluation for plums entailed lay out of trials in a randomised complete block design with five replicates per harvest maturity, using three trees per plot. The fruit was sampled at three maturities,

usually a week apart, with a target flesh firmness of 9.0, 7.0 and 5.0 kg. Two cartons of plums, with approximately 60 fruit per carton were sampled per replicate at each harvest date. One carton of plums per replicate per harvest date was subjected to single-temperature storage, and the other to dual-temperature storage. The single-temperature regime comprised 42 days at -0.5 °C, followed by a shelf life period of three days at 15 °C.

The dual-temperature regime, on the other hand, comprised 10 days at -0.5 °C, 12 days at 7.5 °C, 20 days at -0.5 °C, followed by a shelf life period of three days at 15 °C. Flesh firmness, total soluble solids and titratable malic acid were determined at harvest. Before and after shelf life examinations were conducted to measure

Table 1: Recommendations on certain stone fruit cultivars recently released by ARC: Infruitec - Nietvoorbij, with specific reference to optimum harvest maturity, storage conditions and quality maintenance packaging.

Fruit kind	Cultivar	Harvest date	Optimum harvest maturity*, cold storage conditions and packaging	Comments
Nectarine	Alpine	Mid November	Harvest at 8.0 Kg; store at -0.5°C; use perforated nectarine wrapper to control shrivel	Conduct a number of picks to ensure even maturity in carton. Pre-ripening not necessary if harvested at correct maturity
Plum	Lady Red	Mid December	Harvest at 7.5 Kg; store at dual-temperature to avoid internal disorders; use perforated plum wrapper to control shrivel	
Plum	Ruby Red	Late December/ Early January	Harvest at 7.5 Kg; store at dual temperature; guard against long period at 7.5 °C to avoid soft fruit; use perforated plum wrapper to control shrivel	High risk under single- temperature storage
Plum	African Pride™ (Sunkiss)	Late December/ Early January	Harvest at 7.5 Kg; store at dual temperature; no wrapper required	Sensitive skin for rubmarks
Plum	African Pride™ (Sundew)	Late December/ Early January	Harvest at 7.5 Kg; store at dual temperature; no wrapper required	Sensitive skin for rubmarks, prone to high internal browning if harvested over mature

\* Harvest flesh firmness determined on the cheek of the fruit using penetrometer with 11-mm plunger





flesh firmness, shrivel, decay, and the internal disorders: gel breakdown, internal browning and overripeness.

With the nectarine trial, a randomised complete block design was also used, with five replicates per harvest maturity, and five trees per plot. The fruit was sampled at three maturities according to a flesh firmness of approximately, 12.5, 9.5 and 6.5 Kg. Four cartons, each containing approximately 25 fruit, were sampled per replicate on each harvest date. For each harvest maturity, two cartons of nectarines per replicate were placed into cold storage immediately after harvest, while the remaining two cartons were pre-ripened at 20 °C for 24 - 48 hours. Both pre-ripened and non pre-ripened fruit were cold stored for 38 days at -0.5 °C, followed by a shelf life of three days at 15 °C. Skin colour according to DFB Skin Colour Chart N.1A, flesh firmness, total soluble solids and titratable malic acid were determined at harvest. Before and after shelf life examinations were conducted to measure flesh firmness, shrivel, decay, and the internal disorders: woolliness, pulpiness and overripeness.

All of the data generated for these cultivars, over the years, cannot be presented and discussed in a single paper. To do so may also create confusion, since the different data sets on the same cultivar were in some cases not consistent across seasons. This is

not strange for new cultivars, since it is well known that the age of the tree may significantly influence storage potential. Furthermore, it is common knowledge that the inherent quality of a particular cultivar may vary considerably from season to season, even with fruit from the same orchard. This is primarily due to differences in climatic conditions and/or cultural practices that may influence stress levels.

The recommendations per cultivar, which are presented in Table 1, have been formulated taking three to four years research results into consideration. While recommendations are made regarding optimum harvest maturities, no recommendation regarding the range of the optimum harvest window is presented. Similarly, where the dual-temperature storage regime is recommended for plums, it does not imply that the 12-day warming phase at 7.5 °C, as was used in this study, has to be adhered to. In the case of both the optimum harvest maturity window, and the duration at 7.5 °C in the dual-temperature regime, the exact specifications will depend on the specific marketing requirements.

To provide an indication of the physiological behavior of the different maturities of fruit, as influenced by the different storage conditions, a data set for each cultivar is presented for the examination conducted after the simulated shelf life period. The data sets were selected to indicate typical cultivar response to the treatments, and not to indicate optimum maturity, which, as previously mentioned, has been determined using multiple data sets. The nectarine data is shown in Table 2, and the plum data in Table 3.

The results presented in Tables 2 and 3 reflect a very stringent evaluation, since the maturity and quality parameters were determined at the end of a shelf life period. This indicates the likely condition of the fruit at the latest probable time that it would be consumed, and thus, represents a worse case scenario.

For these specific cultivars, the information in this paper provides a basic understanding of the fruit physiology during storage, and gives guidelines for harvest, storage and packaging. A more comprehensive understanding of how to optimise the quality of these cultivars will be developed over the years through commercial experience.

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<b>ALPINE</b>	Harvest 1 (12.5kg)		Harvest 2 (9.1kg)		Harvest 3 (7.1kg)	
	NPR1	PR1	NPR	PR	NPR	PR
Flesh firmness (kg)	5.9	3.1	2.3	1.2	1.4	0.9
Shrivel (%)	0.0	0.0	2.5	1.7	15.5	10.0
Woolliness (%)	0.0	0.0	0.0	9.5	0.0	1.4
Pulpiness (%)	36.0	12.6	18.5	13.4	0.0	1.4
Total internal defects (%)	36.0	12.6	18.5	22.9	0.0	2.8

1 NPR = non pre-ripened, and PR = pre-ripened.

<b>LADY RED</b>	Harvest 1 (9.0kg)		Harvest 2 (7.8kg)		Harvest 3 (6.6kg)	
	ST1	DT1	ST	DT	ST	DT
Flesh firmness (kg)	6.4	6.7	4.4	5.4	5.2	3.3
Shrivel (%)	8.3	19.2	23.3	14.1	7.8	8.6
Gel Breakdown (%)	26.6	0.0	53.3	0.0	0.0	1.6
Internal Browning (%)	3.3	0.0	0.0	0.0	0.0	0.0
Overripeness (%)	0.0	0.0	0.0	0.0	0.0	0.0
Total internal defects (%)	29.9	0.0	53.3	0.0	0.0	1.6

<b>RUBY RED</b>	Harvest 1 (9.7kg)		Harvest 2 (7.9kg)		Harvest 3 (6.9kg)	
	ST	DT	ST	DT	ST	DT
Flesh firmness (kg)	5.2	3.9	3.7	2.4	5.0	1.9
Shrivel (%)	0.0	2.7	1.4	0.0	16.4	2.1
Gel Breakdown (%)	12.0	0.0	0.0	0.0	0.0	0.0
Internal Browning (%)	73.0	10.0	44.4	1.1	52.9	0.0
Overripeness (%)	0.0	0.0	0.0	0.0	0.0	0.0
Total internal defects (%)	85.0	10.0	44.4	1.1	52.9	0.0

<b>SUNKISS</b>	Harvest 1 (8.7kg)		Harvest 2 (7.0kg)		Harvest 3 (3.7kg)	
	ST	DT	ST	DT	ST	DT
Flesh firmness (kg)	5.1	3.1	4.6	3.7	2.0	1.9
Shrivel (%)	3.6	0.6	6.7	2.9	0.7	0.0
Gel Breakdown (%)	0.0	0.0	13.1	0.0	74.0	0.8
Internal Browning (%)	0.0	1.3	0.0	0.0	0.0	0.0
Overripeness (%)	0.0	0.0	0.0	0.0	0.0	0.0
Total internal defects (%)	0.0	1.3	13.1	0.0	74.0	0.8

<b>SUNDEW</b>	Harvest 1 (9.3kg)		Harvest 2 (7.4kg)		Harvest 3 (6.4kg)	
	ST	DT	ST	DT	ST	DT
Flesh firmness (kg)	7.8	2.3	5.5	2.3	4.4	1.1
Shrivel (%)	0.0	1.2	0.0	0.0	0.0	0.0
Gel Breakdown (%)	0.0	0.7	0.0	0.8	0.0	0.6
Internal Browning (%)	98.0	14.7	84.8	0.0	99.4	59.0
Overripeness (%)	0.0	0.0	0.0	0.0	0.0	0.7
Total internal defects (%)	98.0	15.4	84.8	0.8	99.4	60.3

1 ST = single-temperature, and DT = dual-temperature cold storage regime.

**Table 2:** Effect of harvest maturity and pre-ripening<sup>1</sup> on the quality of Alpine nectarines cold-stored for 38 days, followed by a shelf life period of 3 days at 15 °C.

**Table 3:** Effect of harvest maturity and cold storage at single- and dual-temperature for 42 days, followed by a shelf life period of 3 days at 15 °C, on the quality of the plum cultivars Lady Red and Ruby Red, and the African Pride™ cultivars, Sunkiss and Sundew.