OPTIMUM HARVEST MATURITY AND COLD-STORAGE POTENTIAL OF THE NEW SAPO TRUST STONE FRUIT VARIETIES SWEET DECEMBER AND SUMMER JEWEL

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INTRODUCTION

The commercialisation of new fruit varieties for the South African fruit industry is a robust and competitive business, the success of which is highly dependant on an in-depth understanding of variety performance, from the orchard to the consumer. This knowledge, acquired by way of disciplined process, is a necessity when undertaking informed variety investment and cultivar management decisions.

To enable the effective and responsible commercialisation of varieties, the SAPO Trust has appointed ExperiCo (Fruit Technology Solutions) as their ISO 9001:2008 certified service provider. In this capacity ExperiCo conducts storage trials across the SAPO Trust variety range, with the aim of providing comprehensive commercial harvesting, packaging and storage protocols for successful varieties, upon their release to the South African fruit industry.

The SAPO Trust recently released two stone fruit varieties from Zaiger Genetics in the USA via Zaiger SA, to the South African fruit industry, namely the peach Sweet December and the nectarine Summer Jewel. ExperiCo conducted the post-harvest evaluations for a period of one year per variety, namely on Sweet December during the 2009 season, and on Summer Jewel during the 2010 season. The indications were that the cold-storage potential for Sweet December was good, whilst for Summer Jewel it was moderate. The cosmetic appeal and the eating quality of both varieties, was good. Both varieties are available from Zaiger SA (contact person Michael Anderson at michael@zaigersa.co.za).

The aim of this communication is to assist growers and exporters intending to commercialise Sweet December and / or Summer Jewel. Since the results represent only one year of evaluation from a single production area per variety, this initial information will need to be expanded upon during the commercialisation process.

EXPERIMENTATION

The varieties were sourced from one producer in the Ceres area, using optimally managed orchards. It was aimed to harvest each population of fruit at different flesh firmness target maturities. The targets for Sweet December were 9.0 kg (harvest one – H1), 7.0 kg (harvest two – H2) and 5.0 kg (harvest three – H3) and for Summer Jewel, were 7.0 kg (H1) and 5.0 kg (H2). For the advanced harvest maturity, 20 boxes of fruit were sampled, with 10 boxes utilised for 28 days cold-storage and 10 boxes for 35 days cold-storage. In the case of the less advanced maturities, 40 boxes of fruit were sampled. Of these, 20 boxes were subjected to pre-ripening (PR) to a flesh firmness of ± 6.5 kg, whilst the remaining 20 boxes were not pre-ripened (NPR). Each batch of the 20 boxes was again divided to provide for 10 boxes for each cold-storage duration. Of the 10 boxes per storage duration, 5 boxes (each comprising a single replicate) were examined at the end of cold-storage and 5 boxes at the end of the simulated shelf-life period. Fruit was cold-stored according to a single-temperature (ST) at –0.5°C. In this paper, only the storage results for fruit examined after the shelf-life period of 7 days at 10.0°C are presented.

The maturity of the fruit at harvest was ascertained by measuring the flesh firmness with an Effegi penetrometer (11.0 mm plunger), total soluble solids content (TSS) using a Atago DBX-30 digital refractometer and titratable malic acid determined by titration against 0.1N NaOH to a pH end-point of 8.2. Fruit quality after cold-storage and after the shelf-life period was assessed by measurement of flesh firmness, shrivel, decay and internal quality in terms of woolliness, pulpiness and overripeness (OR). A taste observation was also made at each after shelf-life examination.

RESULTS AND DISCUSSION

Harvest maturity and cold-storage potential of Sweet December peaches

A good separation between the harvest maturities was achieved, with a progression in maturity from 11.7 kg to 8.5 kg to 5.3 kg over the sampling time (Table 1). The TSS levels were good at each maturity stage and as could be expected, increased the later the harvest, whilst malic acids declined.

Table 1: Harvest maturity of Sweet December peaches, sampled at three maturities in Ceres

Harvest maturity (week)	Examination parameters		
	Flesh firmness (kg)	TSS (%)	Malic acid (%)
H1 (50)	11.7	12.5	0.34
H2 (51)	8.5	13.0	0.33
H3 (51)	5.3	14.2	0.27

After shelf-life (Table 2), decay incidence generally increased with advanced harvest maturity, with an average across storage durations and PR treatments of 2.8%, 5.1% and 50.0% for H1, H2 and H3, respectively. A low level of pulpiness, which was highest for the H1-NPR fruit, cold-stored for 35 days (10.0%), was recorded. Pulpiness is an internal condition, where the flesh contains a limited amount of free juice after cold-storage. This condition is generally more prolific for fruit harvested at relatively high flesh firmnesses, and hence, PR of less mature fruit prior to cold-storage, may assist in achieving optimal eating quality. Most importantly however, no woolliness occurred, a condition where the flesh is devoid of any juice, and where the fruit is deemed to be inedible.

Table 2: After shelf-life quality of Sweet December peaches, sampled at three maturities in Ceres, pre-ripened or non pre-ripened and then cold-stored at –0.5°C for periods of 28 and 35-days, plus a shelf-life of 7 days at 10.0°C for each duration

Treatment[3] (days)	Examination parameters[2]					
	Flesh firmness (kg)	Shrivel (%)	Decay (%)	Pulpy (%)	Woolly (%)	Overripe (%)
H1-PR (28)	2.6a	0.0a	0.0a	0.0	0.0	0.0
H1-NPR (28)	4.5bc	0.0a	0.0a	0.0	0.0	0.0
H1-PR (35)	3.6abc	3.7b	1.9a	0.0	0.0	0.0
H1-NPR (35)	4.9cd	0.0a	9.3a	10.0	0.0	0.0
H2-PR (28)	2.4a	0.0a	9.3a	3.2	0.0	0.0
H2-NPR (28)	4.4bc	0.0a	3.7a	0.0	0.0	0.0
H2-PR (35)	3.1ab	0.0a	1.9a	2.0	0.0	0.0
H2-NPR (35)	5.9d	0.0a	5.6a	3.3	0.0	0.0
H3-NPR (28)	3.3ab	0.0a	50.0b	0.0	0.0	0.0
H3-NPR (35)	4.2bc	0.0a	50.0b	0.0	0.0	0.0
Prob. >F[1]	***	**	**	NS	NS	NS

1. One-way ANOVA table where NS, *, ** and *** represent non-significant or significant at the 5.0%, 1.0% or 0.1% level, respectively
2. Values in the same column followed by different letters indicate significant differences (P<0.05) according to the LSD test
3. PR=pre-ripened fruit, NPR=non pre-ripened fruit.

Figure 1: Quality of Sweet December peaches after 35-days of single temperature cold-storage, followed by a seven day shelf-life period

In conclusion, Sweet December used for this evaluation, had good cosmetic appeal (Figure 1), good storage potential and above average taste (taste data not shown). The optimum harvest maturity range, in terms of flesh firmness is approximately 12.0 kg to 8.0 kg. Although pulpiness was not excessive, it is suggested that the less mature fruit, be PR prior to cold-storage. Fruit can be stored at a ST regime, for a period of up to 35 days. Since shrivel was very low, no wrapper is required for this cultivar. A good decay control strategy is recommended, particularly for the more mature fruit

Harvest maturity and cold-storage potential of Summer Jewel nectarines

The pre-harvest condition of the fruit was good (Figure 2) and a good separation between the harvest maturities was achieved, with a flesh firmness of 10.0 kg at H1 and 6.2 kg at H2 (Table 3). The TSS levels were high, particularly for the more mature H2 fruit (17.2%).

Table 3: Harvest maturity of Summer Jewel nectarines, sampled at two maturities in Ceres.

Harvest maturity (week)	Examination parameters		
	Flesh firmness (kg)	TSS (%)	Malic acid (%)
H1 (06)	10.0	14.1	0.93
H2 (07)	6.2	17.2	0.87

Figure 2: Pre harvest condition of Summer Jewel nectarines, sampled from Ceres

The fruit remained firm during storage (Table 4) and was firmer for the NPR treatments, than for the PR treatments. Shrivel was moderate to low, whilst decay was consistently high across treatments, at an average level of 19.0%. Moderate pulpiness (average of 22.0%), which is comparable to other commercial nectarine varieties, occurred across the majority of treatments, at a slightly higher level for the NPR fruit, than for the PR fruit. Most importantly however, no woolliness occurred. Overall this population of fruit showed good cosmetic appeal (Figure 2), moderate storage potential and good taste (taste data not shown).

Based on this evaluation, an optimum harvest maturity range of approximately 10.0 kg to 6.0 kg is recommended. To reduce the risk of pulpiness development, the fruit should be PR to a flesh firmness of around 6.5 kg, prior to the cold-storage, and can be cold-stored at a ST regime, for a period of up to 35-days. However, although not verified, if the risk of pulpy fruit is perceived to be high, a shorter cold-storage duration of 28-days should be followed. In order to contain shrivel development during cold-storage, packaging with a wrapper should be tested. As was the case with Sweet December, a good decay control strategy is recommended, particularly for the more mature fruit.

Table 4: After shelf-life quality of Summer Jewel nectarines, samples at two maturities in Ceres, pre-ripened or non pre-ripened and then cold-stored at –0.5°C for a period of 28 and 35-days, plus a shelf-life of 7-days at 10.0°C for each duration

Treatment[3]	Examination parameters[2]					
	Flesh firmness (kg)	Shrivel (%)	Decay (%)	Pulpy (%)	Woolly (%)	Overripe (%)
H1-PR (28)	1.7a	6.7	13.3	0.0	0.0	0.0
H1-NPR (28)	3.8b	10.0	13.3	30.0	0.0	0.0
H1-PR (35)	1.7a	0.0	20.1	20.0	0.0	0.0
H1-NPR (35)	3.9b	0.0	19.1	26.7	0.0	0.0
H2-NPR (28)	2.8ab	5.1	13.6	36.7	0.0	0.0
H2-NPR (35)	3.7b	0.0	33.6	20.0	0.0	0.0
Prob.>F[1]	***	NS	NS	NS	NS	NS

1-3 Refer to Table 2

CONCLUSION

Based on single population evaluations, the storage potential appeared to be good for Sweet December, and moderate for Summer Jewel. For both varieties, the cosmetic appeal and the eating quality were good. The storage performance is based on the assumption that decay can be effectively controlled by the implementation of a suitable pre- and post-harvest decay management strategy. Due to the moderate level of pulpiness recorded for Summer Jewel, the performance will largely be dependant on the level of the market resistance to pulpiness. Consequently, it would therefore be prudent to take cognisance of pulpiness trends, when compiling a suitable handling protocol and marketing plan for this variety.