

OPTIMUM HARVEST MATURITY AND COLD STORAGE POTENTIAL OF SUN SUPREME™ PLUMS

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Introduction

The Sun Supreme™ plum cultivar was bred by the South African Agricultural Research Council - Infruitec-Nietvoorbij and was released to the stone fruit industry in 2005. The skin as well as the flesh colour of the fruit is yellow. Within the current yellow skinned plum cultivar range, Sun Supreme™ ripens between African Pride™ and Songold. It is normally harvested from the middle to the end of January in the Western Cape. An outstanding characteristic of the cultivar is the excellent fruit size, in the range of 55-65mm fruit diameter. During evaluation by ExperiCo it was established that Sun Supreme™ has a tendency for fruit drop during maturation, that it ripens from the stone outwards, and that under certain cold storage conditions could develop unacceptable levels of internal breakdown (IB). This communication presents the findings of the research conducted to overcome these challenges, and to optimise the eating quality.

Fruit Maturation

Typically, on the tree, the maturation of Sun Supreme™ plums during the phase of fruit softening from 10 down to 8 kg was associated with a pronounced increase in TSS and decrease in malic acid (Fig. 1). With further maturation the fruit continued to soften, but the levels of TSS and malic acid remained more or less constant until the flesh firmness reached approximately 5 kg. Unfortunately, it was found that Sun Supreme™ had a fruit drop problem, which was deemed commercially excessive, as soon as flesh firmness declined below approximately 7 kg.

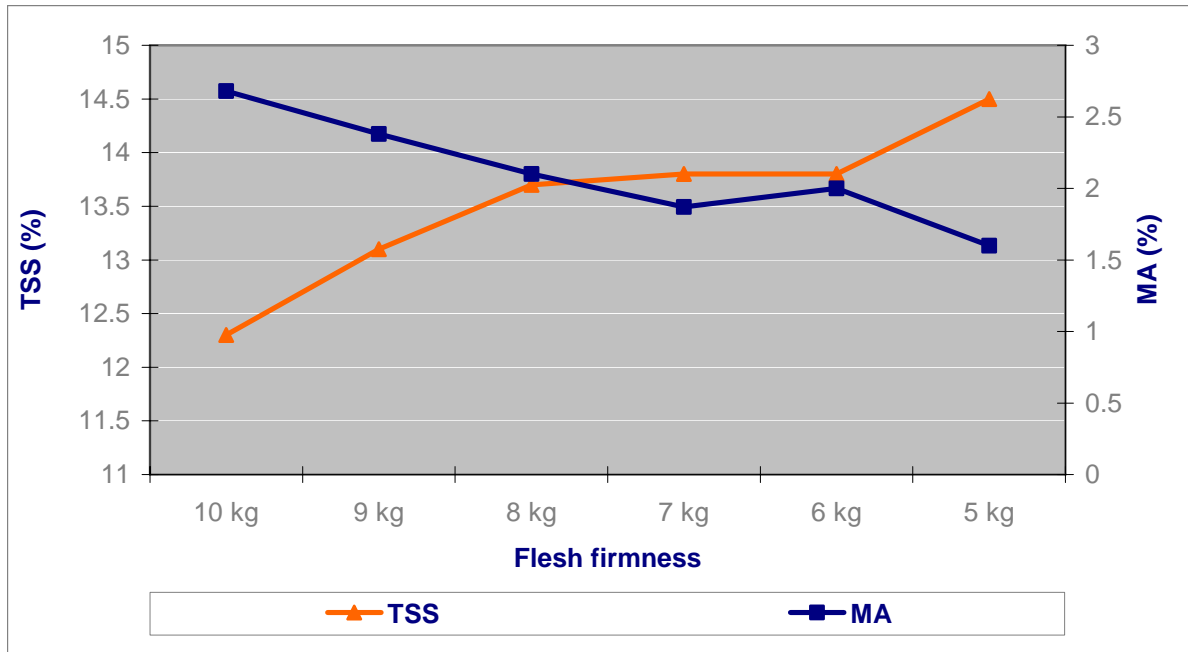


Figure 1 : Accumulation of total soluble solids (TSS) and breakdown of titratable malic acids (MA) during the softening of Sun Supreme™ plums

Optimum harvest maturity

Sun Supreme™ plums harvested within a flesh firmness range between 5 to 10 kg developed low levels of IB when cold stored according to a dual-temperature regime. However, in fruit stored at a single temperature of -0.5°C , there was a trend for considerably more IB in fruit harvested at a flesh firmness of 8 kg or lower, compared to fruit harvested less mature in the flesh firmness range of 9 to 10 kg (Fig. 2). Due to the excessive fruit drop at a flesh firmness lower than 7 kg, a minimum flesh firmness of 7 kg and maximum of 10.5 kg, together with a minimum TSS of 13.0% was recommended as optimum harvest maturity. The post-storage malic acid levels in Sun Supreme™ tended to be relatively high, ranging from 1.9% to 2.7%. In some cases, acids as high as 3.6% were measured in fruit harvested at a flesh firmness of 10 kg. Consequently, there is a risk that any deviation from the flesh firmness and TSS recommendations, could impact negatively on the post storage taste of the fruit.

Handling and storage

Sun Supreme™ fruit quality was determined after storage periods of 35 and 42 days at a single-temperature (ST) regime at -0.5°C , and after a dual-temperature (DT) regime comprising 10 days at -0.5°C , followed by 10 days at 7.5°C and 15 or 22 days at -0.5°C (PD 10 temperature regime). The fruit was subsequently evaluated before and after a simulated shelf life period of 7 days at 10°C . Results consistently indicated that fruit stored at ST, developed more IB compared to fruit that was stored at DT (Figs. 2 and 3). Although IB was reduced by cold storage at DT, it was not eliminated.

The plums also had an average to poor taste, particularly when harvested at a flesh firmness higher than 7 kg. It was surmised that the poor taste was due to the high malic acid levels at harvest. No or minimal shrivel developed during cold storage.

After the initial trials to determine the optimum harvest maturity and cold storage regime, two additional trials aimed at reducing IB and improving the eating quality were conducted. The plums were harvested at a flesh firmness of approximately 10 kg (Fig. 4) and cold stored according to a DT, PD 9 temperature regime. Treatment variables employed were; pre-ripening at 20°C prior to cold storage, holding temperature during the first 10 days of cold storage (-0.5°C and 5°C that simulated accumulation time prior to shipping), and ripening at 20°C after cold storage. Of the various temperature and ripening combinations tested, it was found that only fruit stored according to a DT PD 9 temperature regime and ripened at 20°C after cold storage, had an acceptable taste with no internal disorders (Fig. 5). This handling procedure also resulted in fruit with attractive yellow skin colour (Fig. 6). The post-storage ripening period at 20°C will depend on harvest maturity and client preference in terms of flesh firmness, but will typically range between 5 and 10 days. Even after 10 days at 20°C, the internal and external appearance of Sun Supreme™ plums harvested at 10 kg flesh firmness was good (Fig. 7). The temperature during the first 10 days in cold storage (-0.5°C or 5°C) did not affect the internal quality. This suggests that Sun Supreme™ plums can be cooled and stored at 5°C during the first 10 days of cold storage instead of -0.5°C with no adverse effect on quality, but this needs to be reconfirmed.

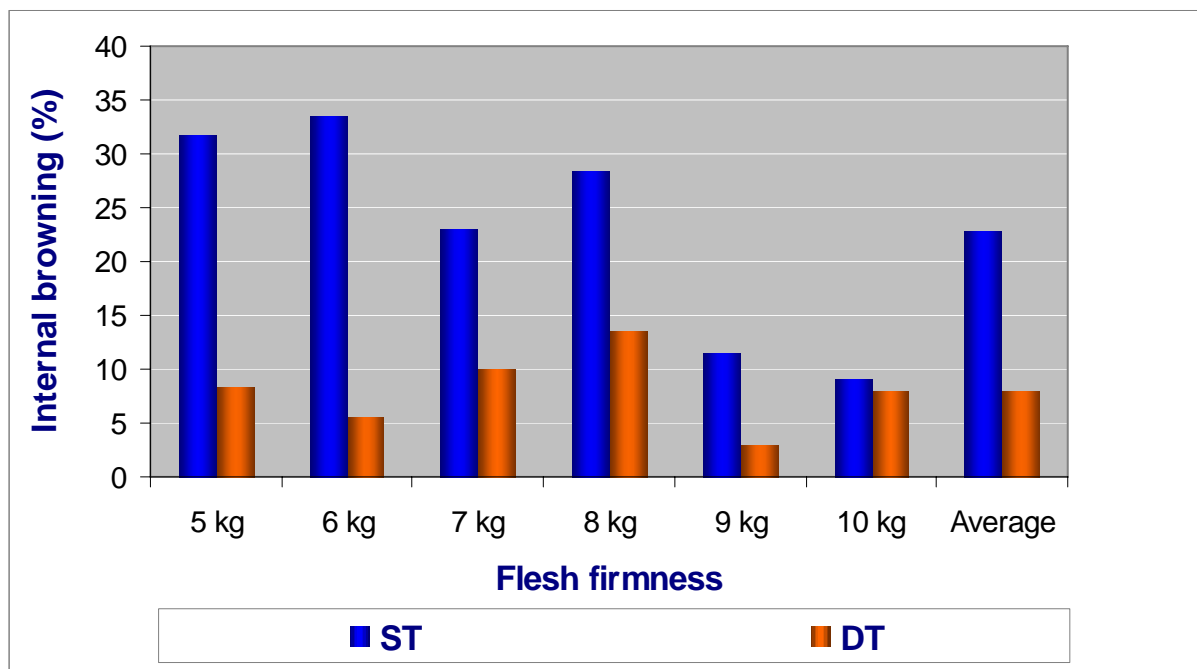


Figure 2 : Average percentage internal browning across 15 populations of Sun Supreme plums harvested at different maturities and subjected to single- (ST) and dual-temperature (DT) regimes followed by a simulated shelf life



Figure 3 : Internal browning in Sun Supreme plums stored at a single temperature of -0.5°C



Figure 4: Typical skin colour of Sun Supreme plums harvested at a flesh firmness of 10.2 kg



Figure 5: Internal quality of Sun Supreme plums harvested at a flesh firmness of 10.2 kg, after cold storage and ripening for 5 days at 20°C



Figure 6: Skin colour of Sun Supreme plums harvested at a flesh firmness of 10.2 kg, after cold storage according to a PD 9 dual temperature regime and ripened thereafter for 5 days at 20°C



Figure 7: Internal and external appearance of Sun Supreme plums harvested at a flesh firmness of 10.2 kg, after cold storage and ripening for 10 days at 20°C

Conclusions

Due to the fruit drop tendency of Sun Supreme™ plums at a flesh firmness below 7 kg, this cultivar should be harvested relatively firm, in a flesh firmness range between 7 and 10.5 kg, and with a minimum TSS of 13.0%. The fruit should be stored according to a dual-temperature regime (PD 9 or PD 10), to reduce the development of IB during cold storage. With this harvest and storage protocol, the fruit will ripen slowly and will typically only lose approximately 1 to 2.5 kg in flesh firmness over a cold storage period of up to 42 days. As a result of the relatively high flesh firmness and high acid after cold storage, the taste development is often sub-optimal. However, an acceptable taste and skin colour can be achieved, by ripening the fruit at 20°C after cold storage.

As is always the case with new information, growers and exporters following these recommendations should follow a good risk management strategy until satisfied that adequate semi-commercial testing has been conducted.