**Project Title:**
Develop optimum ripening protocols for nectarines and plums arriving too green (skin colour) or too firm in market.

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**Objectives & Rationale**
Develop protocols to ripen firm, poorly coloured nectarines and plums, to an acceptable eating quality and skin colour in the market place.

**Methods**
Nectarines were cold stored with and without pre-ripening, before onset of cold storage. Plums on the other hand were subjected to treatments with or without ethylene after cold storage. At the end of cold storage, nectarines and plums were subjected to different ripening temperatures for various durations, based on the rate of quality deterioration, and the fruit quality examined when different treatments reached the target flesh firmness. The ripening patterns were monitored and the effect of the various treatments on fruit quality assessed.

**Key Results**

**Nectarines**

‘Regal Pearl’: In both 2017 and 2018, nectarines pre-ripened before cold storage exhibited the best internal quality after simulated sea export. The post cold storage ripening temperature of 20 °C was generally the best option in terms of fruit quality for pre-ripened and non-pre ripened fruit. Pre-ripening shortened the ripening process of nectarines after cold storage by ± 3 days, compared to non-pre-ripening. The 2019 ‘Regal Pearl’ population did not require ripening after cold storage because they were at desired flesh firmness at start of shelf life.

‘August Red’: In 2017 extremely high decay levels occurred after storage, thus neither flesh firmness nor fruit quality could be assessed. In 2018, pre-ripening before cold storage did not have the same positive effect as with ‘Regal Pearl’. Similarly, the ripening temperature of 20 °C resulted in the best quality, irrespective of pre ripening. It was evident in 2019 that ‘August Red’ nectarines pre-ripened before cold storage exhibited a big difference in firmness reduction. Ripening of pre-ripened ‘August Red’ nectarines at 15 °C and 20 °C generally resulted in better post storage quality, with careful monitoring required to avoid over ripeness.

**Plums**

‘Songold’: In 2017 the ethylene treatment after cold storage just before onset of post storage ripening resulted in faster ripening of ‘Songold’ plums as measured using flesh firmness. There was a tendency for ethylene application after cold storage to cause higher levels of internal browning and gel breakdown. Ethylene treatment and higher post storage holding temperature, in 2018, resulted in accelerated fruit ripening, measured by flesh firmness. Gel breakdown occurred in all treatments. In the 2019 season, the ethylene application of ‘Songold’ plums had no softening effect. Generally, higher post storage ripening temperature resulted in faster ripening of ‘Songold’ plums with no problematic internal disorders exhibited by this ‘Songold’ population. A shelf life of 4-5 days was possible with this population.

‘African Delight’: In the 2017 season, ethylene applications had no effect on flesh firmness of ‘African Delight’ plums. However, post cold storage ripening at 25 °C had a significant effect on reducing flesh firmness. In 2018, ethylene treatment had an effect on the 15 °C and 20 °C treatments, accelerating the reduction in flesh firmness, compared to the same temperature
treatments without ethylene applications. The use of 25°C as ripening temperature seemed to be the best temperature option for skin colour development, with no shrivel and moderate levels of overripeness. However, committed monitoring is necessary. The application of an ethylene treatment in 2019, after cold storage, had no softening effect on the “African Delight” plums. Ripening required 6 days, with high levels of shrivel developing, while the target flesh firmness of 2.7 to 3.6 kg was not reached. The best practice will be to harvest at the right maturity to avoid the need for post cold storage ripening.

Conclusion/Discussion

The research is based on results generated for specific fruit populations, with each population being unique. Arrival quality at overseas destinations will determine if ripening procedures are possible and which actions need to be followed. Generally, pre-ripening of nectarines resulted in good quality fruit after simulated sea export, with limited ripening needed. Post cold storage ethylene treatment of plums before ripening is not advised and can reduce quality. Generally, the warmer the ripening temperature, the faster fruit ripen. In this case it will be critical to monitor closely not to over ripen and then to cool fruit temperature down as soon as the target flesh firmness is reached to slow the ripening process and enable acceptable shelf life.