VALENCIA ORANGE SELECTIONS

Letsitele citrus production region

Letsitele is one of the best Valencia orange production regions in Southern Africa and is classified as a hot-dry climatic zone.

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Historically achieved fruit quality, fruit size, yield and colour development all contribute to the suitability of Letsitele in the Limpopo Province for Valencia production. Consumer expectations for quality fruit in the export market are high, and prolonged shelf life is vital. Valencias, collectively referred to as "hard citrus", can withstand long shipping periods due to their inherent characteristics. This ensures good value in the production chain.

Citrus Research International (CRI) established a Valencia cultivar evaluation project in Letsitele, to expand the Valencia options for this production region. The cultivars included were Bennie 1 and 2, Jasi, Kobus du Toit Late, McClean, McClean SL, Midknight 1, Skilderkrans and Turkey. Jasi, McClean and Skilderkrans are open cultivars; the rest are privately managed. The selection includes a range from the early ripening until the later maturing cultivars based on the ripening times in this hot-dry production region.

Figure 1. Valencia tree characteristics (shape and yield) **A.** Turkey Valencia **B.** Midknight 1 Valencia **C.** Bennie 2 Valencia **D.** McClean SL Valencia **E.** Jasi Valencia **F.** Kobus du Toit Late Valencia

Objective

The aim of the project is to evaluate new Valencia cultivars to identify additional options for the hot-dry production region of Letsitele. Evaluation characteristics include consistent productivity, fruit size, rind colour, internal fruit quality (Juice, °Brix, acid levels and °Brix/acid ratio), low seed count and an extended harvest window.

Trial evaluation

To determine optimal harvest windows, field observations for fruit characteristics, production parameters and fruit maturity measurements were conducted twice to thrice during the season. Turkey, McClean and Jasi were used as the commercial comparison range. The rootstocks used included Citrange 35, Carrizo citrange, Swingle citrumelo, X639 and US-812 (SxB) citrandarins. Field observations included yield determination and descriptions of characteristics of new cultivars, to verify trueness to type and to determine climatic suitability. Fruit characteristics were quantified as fruit size, number of seeds, colour development and internal quality (juice content, °Brix and titratable acids). According to standard export requirements, a °Brix/acid ratio of 9:1 for Valencias is considered adequate for the start of the season and could increase to a peak maturity of 10:1. After that, as acid content reduces, the ratio increases to 12:1. At values beyond that, the fruit is considered over mature.

Characteristics of the rootstock used in the project

Swingel citrumelo is nematode, *Phytophthora* root rot/gummosis resistant, drought, cold tolerant and citrus tristeza virus (CTV) tolerant. Acid levels are higher in fruit in cooler production areas, but have a delayed external colour development (two to three weeks behind Carrizo). Good on replant soils, but not when clay content is higher than 25 – 30%.

Carizzo citrange is intermediately resistant to *Phytophthora* root rot/gummosis, nematode, and CTV tolerant, with good internal fruit quality, and earlier external colour development compared to Swingle citrumelo. Trees are medium sized, smaller than Swingle citrumelo, and young trees show vigorous growth. Excellent crop and high internal quality on young trees but sensitive to high pH soils.

X639 citrandarin is *Phytophthora* root rot/gummosis, nematode, and CTV tolerant, with good internal fruit quality, medium tree size, performs well on higher pH soils and has good cold hardiness. X639 tends to induce creasing in fruit.

US 812 citrandarin is resistant to *Phytophthora* root rot, nematode, CTV, and blight, with good internal fruit quality, precocious bearing, medium tree size, performs well on higher pH soils. Sweet orange trees are medium sized on this rootstock.

Citrange 35 has intermediate resistance to *Phytophthora* root rot and is tolerant to nematodes and CTV, with good internal fruit quality and earlier external colour development compared to Swingle citrumelo. Trees are small to medium-sized.

Results and discussion

Turkey Valencia This cultivar was derived from a tree mutation discovered in a Valencia orchard in the Mersin region of Turkey. It was a single tree, approximately six years old, bearing large, well-coloured fruit of good flavour and low rag. Its main distinguishing characteristic was its early maturation (**Figure 6**), up to six weeks earlier than other Valencias in this region. Its tree structure (**Figure 1A**), rind texture (**Figure 2A**) and soft rag are like midseason Valencias. However, it is classed as a true Valencia and planted extensively in SA. The tree is moderately vigorous and is more compact and erect in shape than most Valencia selections (**Figure 1A**). Turkey does not require crop manipulation. Rind disorder may be a problem if the fruit hangs past optimal maturity.

To determine compatibility, Turkey was planted on three rootstocks at the trial site: Carrizo citrange, Swingle citrumelo and Citrange 35. However, yield was the best on Carrizo, relative to tree size. Most fruit ranged from 85 – 70 mm (counts 56 to 72). The average seed count per fruit was 1.0 and peaked at 3.8 seeds (**Figure 5**). The external colour (between T1 and T3) in the middle of June was similar for all three rootstocks. C35 gave the smallest tree size (2.5 m) and showed signs of incompatibility at the bud union, making this a poor scion-rootstock combination. Based on the ratios, maturity is at end May to mid-June (**Figure 6**). For tree and fruit characteristics, see **Figure 1A** and **2A**.

Midknight 1 (I15) originated as a spontaneous mutation in a commercial Midknight orchard in the Rustenburg region in the North West Province. The cultivar is a mid-to-late-maturing Valencia with very good internal quality (**Figure 3** and **4**) and external appearance. Trees have a similar growth habit to that of the original Midknight tree (**Figure 1B**) with the ability to set heavier crops and produce better fruit quality than the original Midknight. The trees were planted on two rootstocks, Carrizo citrange

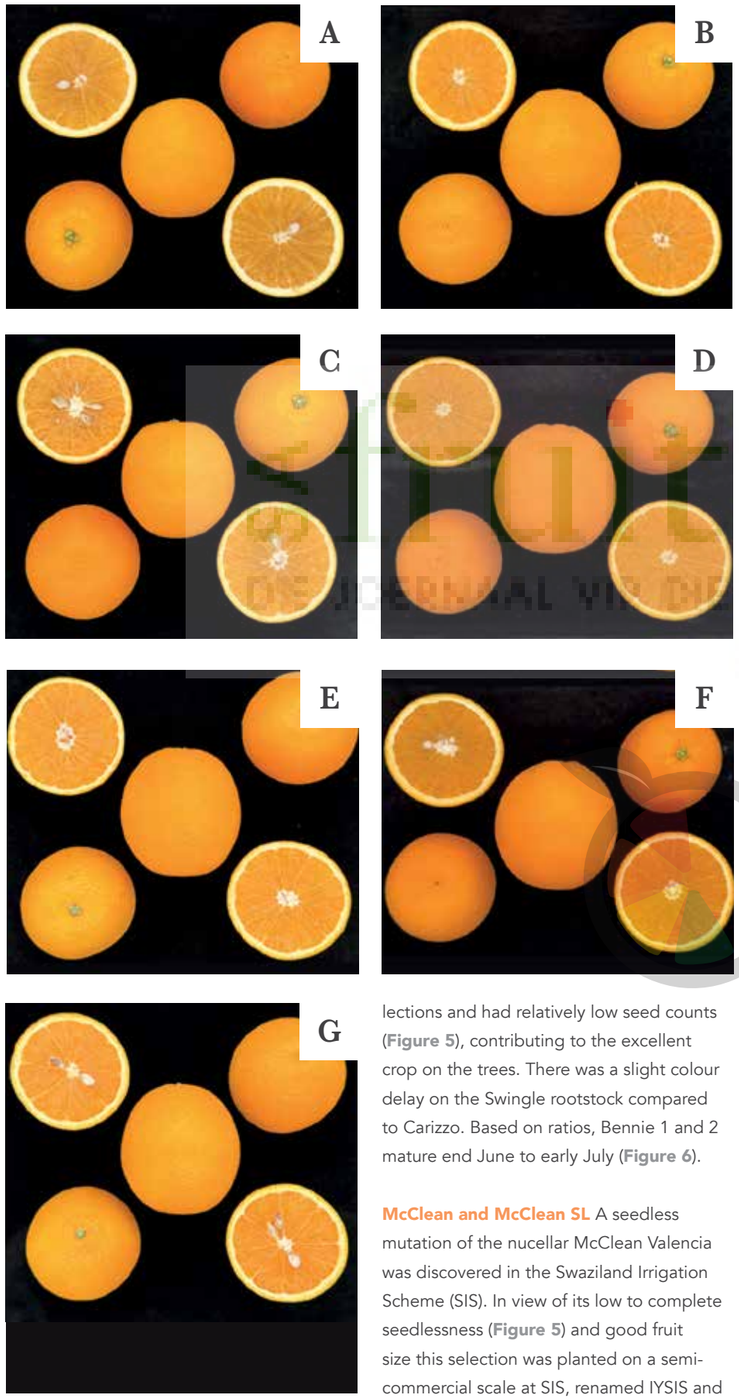

Figure 2. Valencia fruit characteristics (shape, rind texture, colour, seeds) **A.** Turkey Valencia **B.** Midknight 1 Valencia **C.** Bennie 2 Valencia **D.** McClean SL Valencia **E.** Skilderkrans Valencia **F.** Jasi Valencia **G.** Kobus du Toit Late Valencia

and Swingle citrumelo. In the 2022 season fruit size was uniform and ranged between count 72/64 and 56, and the juice content was above 56% (**Figure 3**), °Brix levels were 11.6 on average (**Figure 4**) and acids were around 1.3%. Midknight 1 fruit were mostly seedless or low-seeded, with up to 1.7 seeds per fruit (**Figure 5**). The characteristic Midknight twig dieback was also visible on Midknight 1. The fruit shape was round, the rind texture relatively smooth, and the fruit raggy, with a medium rind thickness that peeled moderately easily (**Figure 2B**). Maturity is mid to end July (**Figure 6**).

Bennie 1 and 2 A Valencia bud mutation was discovered in the Limpopo Valley in an old clone Valencia Late orchard. The fruit from these trees coloured 4 – 5 weeks earlier than the Valencia Late fruit (**Figure 6**), had a low seed count (**Figure 5**), were uniformly round and size and were significantly larger and cleaner in appearance than the Valencia Late fruit. On young trees, fruit size and shape are uniform, with medium to large fruit, but slightly coarse rinds (**Figure 2C**). The fruit shape is round, and the fruit rind colour is uniform, developing a deep orange at maturity (**Figure 2C**). Yields are generally very good, with an average yield of 60 to 80 tonnes per hectare for mature orchards. Bennie 2 is replacing Bennie 1 as an option due to improved production qualities.

Bennie does not require crop manipulation to improve yields and fruit size peaked between count 88 and 56 (avg. 64 – 56). Internal quality was very good on both selections and had relatively low seed counts (**Figure 5**), contributing to the excellent crop on the trees. There was a slight colour delay on the Swingle rootstock compared to Carizzo. Based on ratios, Bennie 1 and 2 mature end June to early July (**Figure 6**).

McClean and McClean SL A seedless mutation of the nucellar McClean Valencia was discovered in the Swaziland Irrigation Scheme (SIS). In view of its low to complete seedlessness (**Figure 5**) and good fruit size this selection was planted on a semi-commercial scale at SIS, renamed IYSIS and now the property of Swaziland Fruit Canners (Pty) Ltd. Production has been promising and the addition of McClean SL bodes well for the new range of Valencia cultivars. This is a mid to slightly later-maturing Valencia (**Figure 6**) with good internal quality and appearance. Swingle and US-812 induced higher acid levels in the fruit than the other rootstock options. McClean was the control variety, with seeded fruit having up to 3 seeds (**Figure 5**). In the Letsitele area, fruit matures in late July (**Figure 6**). Yields of 50 – 60 tonnes per hectare are expected for mature orchards, but crop manipulation is required. Fruit size with smooth rinds is medium to medium/large (avg. between count 88 and 56). The tree shape and growth are like that of other Valencias.

Skilderkrans A mutation was discovered in the Hoedspruit region of the Limpopo Province. Given its low seed counts and good fruit size, Skilderkrans was included in the trial and planted on both Carizzo citrange and Swingle citrumelo. The tree shape is fairly erect but vigorous, leading to lower yields and requiring crop manipulation. Skilderkrans fruit peels easily and rind oil is low. Internal flesh colour is orange (**Figure 2E**) and fruit is low-seeded, from seedless to 3.7 seeds per fruit (**Figure 5**). Fruit tends to have rind chimeras like some other Old-clone Valencias. Fruit size was bigger this season, more favourable for good quality fruit, and varied from medium to large (count 88 – 56). Internally, the °Brix content was good, reaching 12 (**Figure 3**), and a 1.2 – 1.4% acid level was obtained on both Carizzo and Swingle. Juice percentage increased to an average of 57% later in the season (**Figure 4**), above the minimum requirement for export and good external colour was observed (T1-2). The fruit had a smooth rind, fibre strength was relatively soft, and the shape was round. Skilderkrans is later maturing with peak maturity at the end of July in Letsitele (**Figure 6**).

Jasi is a mutation discovered in the Letsitele region in an Old-Clone orchard. Given its low seed counts (**Figure 5**) and good fruit size, this selection is considered a promising addition to the new range of Valencia cultivars. It is a later maturing Valencia with

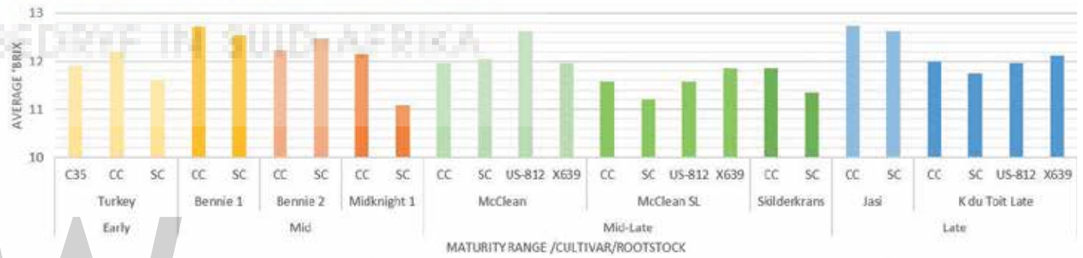

Figure 3: Average °Brix content for the 2022 season at Groep 91 (Letsitele)

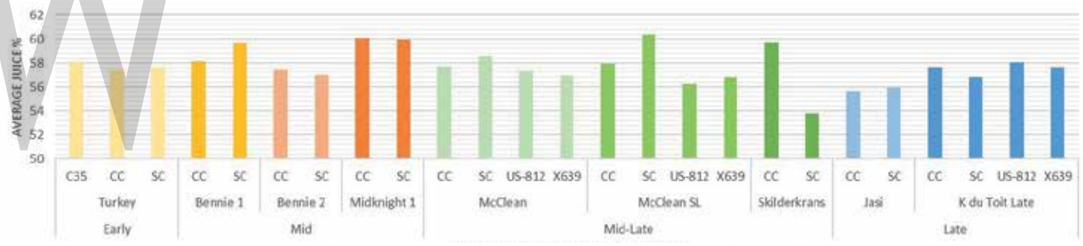

Figure 4: Average juice content for the 2022 season at Groep 91 (Letsitele)

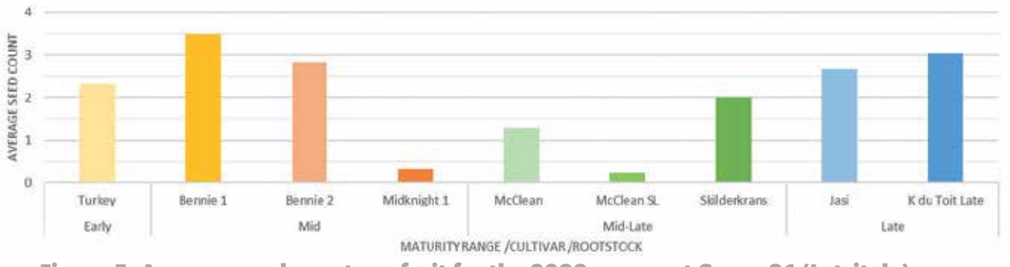

Figure 5: Average seed count per fruit for the 2022 season at Groep 91 (Letsitele)

good internal fruit quality and external appearance. The tree is compact and less vigorous than old clone Valencias (**Figure 1E**) and bears good, early crops. Fruit size is uniform medium to medium large, with smooth rinds. Most fruit ranges from 90 – 80 mm (counts 56 to 64/72) and seed counts are one to two per fruit (**Figure 5**). The fruit shape is round to slightly elongated and fruit rind colour is a deep orange at maturity (**Figure 2F**). Yields of 60 – 70 tonnes per hectare are expected for mature orchards. The internal flesh colour is orange, and the flesh texture is softer than standard Valencias. Maturity is mid-July to mid-August (**Figure 6**). Suggested rootstocks are Swingle citrumelo and Carrizo citrange, depending on soil type and whether plantings are on new or replant soils.

Kobus du Toit Late was also discovered in an Old-Clone Valencia orchard in the Letsitele Valley. The main characteristics of the cultivar were good yields and a desirable fruit size with low seed counts (**Figure 5**). Trees have medium to large canopies and their shape is like other Valencia cultivars (**Figure 1F**). The cultivar was evaluated on four rootstocks (CC, SC, US-812 and X639) and produced medium and large fruit sizes (88 – 56), with 0.8 – 4.2 seeds per fruit average (**Figure 5**). The colour development was similar on all rootstock combinations closer to peak maturity and ranged between T1 and T2 on the colour plate. The internal quality was good with a juice percentage above 54 (**Figure 4**), °Brix reached 13 (**Figure 3**) and good acids were achieved for this later maturing cultivar. Maturity occurs mid to end of July, to mid-August (**Figure 6**).

Conclusion

Turkey Valencia remains the best early maturing option for the Southern African citrus industry, keeping in mind that CRI is evaluating a range of potentially new early cultivars. Due to its yellow fruit colour and susceptibility to rind disorders, the optimal picking window for Turkey Valencia is the first four weeks of peak maturity. Turkey Valencia trees yield a good crop every season, with favourable fruit sizes.

Midknight 1 covers the middle of the Valencia season with good internal quality fruit, large fruit size, smooth rinds, and low seed counts. The fruit set in hot production areas remains challenging due to temperature spikes in early spring, causing flower drop without fruit set. Midknight selections perform better in the intermediate citrus production regions.

Bennie 2 has replaced Bennie 1. It's recommendable to harvesting the cultivar after the middle of the Valencia season, to ensure physiological fruit maturity and to reduce rind-pitting. The typical characteristics of Bennie include an excellent crop on the trees, favourable fruit size for optimum export requirements and very good internal quality.

McClean SL remained completely seedless with good internal quality and optimum fruit size (count 88 – 56) compared to McClean (control). McClean cropped a better yield on the trees, whereas McClean SL required crop manipulation. Skilderkrans remained problematic due to alternate bearing patterns and chimeric fruit. For new Valencia plantings better options for mid to late-maturing cultivars are available to select from.

Performance of Jasi and Kobus du Toit Late were similar to late maturing Valencias. Both cropped excellent yields with very good internal quality. The fruit size of Jasi was larger than Kobus du Toit, with fewer seeds per fruit. Jasi developed a compact tree, whereas Kobus du Toit is a more vigorous tree.

It is suggested to include Turkey as the early maturer, Midknight 1 for the intermediate period, Bennie 2 as the mid to mid-late cultivar, and Jasi or Kobus du Toit Late for the end of the Valencia season. Soil type should determine the rootstock choice.

Figure 6: Valencia maturity table (Letsitele)

		May				June				July				August				September			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1/2	Turkey																				
3	Midknight (control)																				
1	Bennie 1 and 2																				
2	Midknight 1																				
3	Old Clone*																				
1	McClean SL																				
3	Skilderkrans (Exp)																				
3	Jasi																				
2	Kobus du Toit Late (Exp)																				

KEY: 1 CGA Cultivar Company, 2 Citrogold, 3 Open