



Sandveld cultivar trial under irrigation: Aurora 2023/24

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The Sandveld production region produces approximately 13% (2023 harvest year) of the country's potatoes in

summer and winter plantings on 6 487 ha. This region contributes to the entire potato supply chain – export, seed, table and processing potatoes. Table potatoes are

primarily exported to Angola, while seed potatoes are exported to Mozambique. The main cultivars for table and processing purposes are Mondial, Sifra, FL2108, and Valor.

The trial was carried out on Rietfontein farm in the Aurora region, situated at the base of the western side of Piketberg. This area falls within South Africa's winter rainfall area (Figure 1), recording average annual rainfall of approximately 395 mm over the past 21 years, according to the closest Agricultural Research Council (ARC) weather station. The Rietfontein station on the farm recorded an average of 295 mm per year between 2018 and 2023.

The region's Mediterranean climate is characterised by warm summers and cold, wet winters. The planting period for this production region is unique,

Figure 1: Location of Aurora in the Sandveld production area.

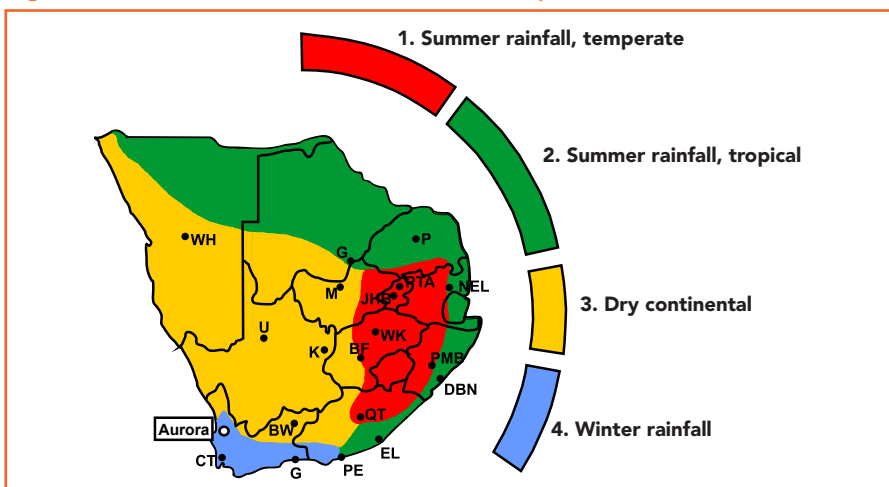


Table 1: Summary of technical information regarding the trial site and layout.

Farm	Fisantevlug, Rietfontein
Producer	Albert de Villiers
Planting date	26 September 2023
Harvest date	20 February 2024
Irrigation/dryland	Irrigation
Double or single rows	Double rows
Interrow spacing	0.75 m
In-row spacing	0.30 m
Plant population	41 666 plants/ha

Table 2: Fertiliser programme.

	Nutritional value					
	N (kg/ha)	P (kg/ha)	K (kg/ha)	Ca (kg/ha)	Mg (kg/ha)	S (kg/ha)
Before planting	48.75	69.1	66.78	105.4	17.8	83.4
Week 1	26.39	4.14	27.43	0	1.55	0
Week 2	26.39	4.14	27.43	0	1.55	0
Week 3	26.39	4.14	27.43	0	1.55	0
Week 4	27.79	4.48	26.88	18.1	1.34	0
Week 5	18.19	6.27	37.63	0	1.88	0
Week 6	27.79	4.48	26.88	18.1	1.34	0
Week 7	18.19	6.27	37.63	0	1.88	0
Week 8	27.79	4.48	26.88	18.1	1.34	0
Week 9	14.62	5.04	30.24	0	1.51	0
Week 10	14.62	5.04	30.24	0	1.51	0
Week 11	14.62	5.04	30.24	0	1.51	0
Week 12	14.62	5.04	30.24	0	1.51	0
Total	306.15	127.66	425.93	159.7	36.27	83.4

Two to three tonnes gypsum/ha

Table 3: Soil nutrient status of the trial site before planting.

pH (KCl)	Density (g/cm ³)	UIT H+ cmol (+)/kg	P	K	Na	Ca	Mg	% Ca	% Mg	% K	% Na	CEC
			Bray I (mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(%)	(%)	(%)	(%)	
4.8	1.525	0.265	40.5	21	12.5	101	29	45.05	21.25	4.75	4.95	1.1

with potatoes being planted year-round. Most potatoes are, however, planted in February and June.

Trial design

The cultivar trial was conducted in sandy soil and laid out in a randomised block design with three replications per cultivar. Additional technical information regarding the

trial is summarised in *Table 1*. *Table 2* outlines the past season’s fertiliser programme. Soil samples were collected before planting to assess the soil nutrient status at the trial site (*Table 3*). Corrections to the pivot points were made on a varietal basis.

Cultivars with short and long growth periods were included in the trial. The growth periods of certain

cultivars may have impacted the crop yield. The length of growth periods is determined by seasonal conditions, and is measured as the number of days from emergence to leaf senescence. *Table 4* outlines the variations in growth periods among different cultivars. Additionally, *Table 4* indicates the plant readiness of seed potatoes during planting, and provides information on population density and haulm count observed later during the growth period.

Yield and marketing indices

Evaluating new cultivars such as the Aurora cultivar trial provides results regarding, among other things, crop yield and marketing index as well as cooking quality and processing characteristics. Marketing indices for specific cultivars are calculated by classing and sorting each cultivar based on quality and size group distribution (for example Class 1 Large or Class 2 Large-medium).

Prices are then compared to market prices obtained during the week of harvest. The performance of new cultivars cannot be solely based on the results of one specific season, as climate conditions vary from year to year. Therefore, cultivars are tested across multiple seasons.

Abiotic factors

Temperature, radiation, water availability (whether through proper irrigation scheduling or rainfall), as well as heat units are important factors that significantly influence the potato plant’s growth period. Hence, these factors are carefully considered during the evaluation of cultivar performance. Relevant weather data is obtained from a nearby weather station.

The average rainfall during the 2023/24 season (*Figure 2*) was below the norm, despite Aurora being in the winter rainfall region. However, there was an exception in September when extremely high rainfall was recorded between 1 and 26 September, just before the planting date.

Figure 3 indicates the minimum and maximum temperatures. During this specific season, there were

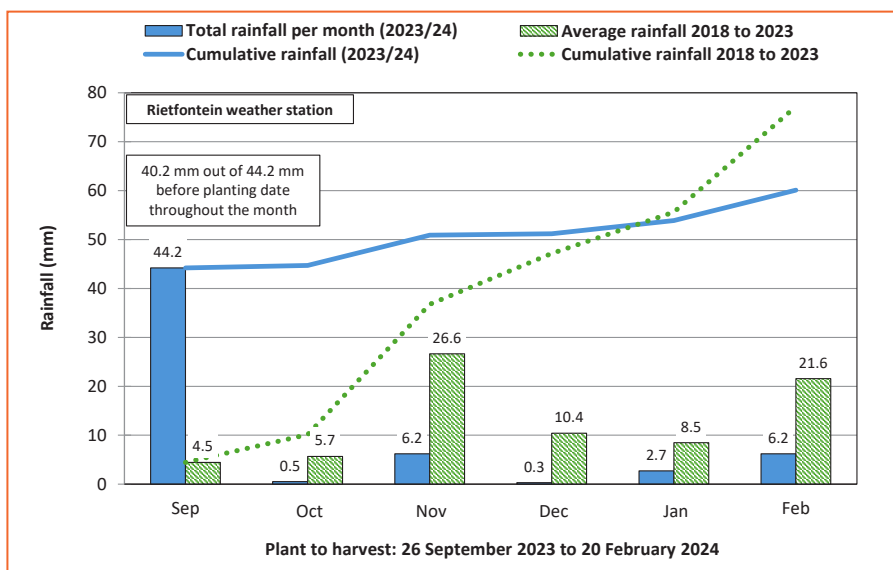
Table 4: Characteristics regarding growth period, plant readiness, population density (%) and haulm count for each cultivar.

Agent	Cultivar	Growing period (days) ¹	Plant readiness ²	Plant population (%)	Haulms per plant	Haulms per ha
	11Z55A5	Medium to long (100 – 120)	1	85	3	106 248
	Amany	Medium to long (110)	2	96	2.9	115 998
	Cayman	Medium (100 – 110)	2	90	3.1	116 248
	Foxy	Short to medium (90 – 100)	3	91	4.1	155 456
	Lady Alicia	Medium (95 – 100)	1	97	2.9	177 206
	Lady Luce	Medium (110)	0	93	2.5	96 873
	Lanorma	Short (80 – 90)	1	87	3.2	115 998
	Lilly	Medium (100)	2	90	4.3	161 247
	Mondial	Medium to long (110 – 115)	0	96	3.3	131 998
	Norman	Medium (90 – 100)	1	84	3.2	111 998
	Noya	Medium (90 – 110)	2	87	2.2	79 749
	P1	Medium to long (110)	2	88	3.5	128 331
	Palace	Long (110 – 115)	1	99	3.2	131 998
	Panamera	Medium (90 – 110)	1	99	2.7	111 373
	Prince	Long (110 – 115)	0	97	3.3	133 373
	Sababa	Medium to long (110 – 115)	1	96	2.9	115 998
	Sifra	Short to medium (90 – 100)	1	94	3.2	125 331
	Sound	Medium (100)	0	94	3.9	152 748
	Tyson	Short to medium (90 – 100)	2	96	2.6	103 998
	Valor	Medium (100)	2	84	3.4	118 998

¹General guidelines and categories (days from emergence to natural leaf senescence, depending on the season): short: 70 to 90 days; short to medium: 80 to 100 days; medium: 90 to 110 days; medium to long: 90 to 120 days; long: 90 to 140 days.

²Plant readiness of seed potatoes: 1 - fresh; 2 - slightly fresh; 3 - ready for planting; 4 - slightly old; 5 - old.

Figure 2: Rainfall during the 2023/24 as well as average rainfall for the six previous seasons.



major fluctuations in maximum temperatures. Temperatures above 30°C were recorded for a total of 77 days, with 23 days above 35°C and three days above 40°C during the growth period, substantially more than in previous seasons. Temperatures were constantly high during the start and close to the end of the growth period, averaging 0.7°C more than the previous three seasons.

Heat units and radiation

The collection of heat units during the growth period is an important factor to consider with regard to plant growth. The trend of heat units available for the cultivar trial during this season at Aurora seems to be very close to the long-term data trend (Figure 4),

Table 5: Main reasons for downgrading.

Cultivar	Loose skin	Nematodes	Powdery scab	Secondary growth	Rot (decay)	Growth cracks	Malformation	Greening	Common scab	Moth	
11Z55A5	x				x	x					
Amany				x	x		x	x		x	
Cayman	x				x	x					
Foxy					x						
Lady Alicia	x		x		x						
Lady Luce	x		x								
Lanorma	x				x						
Lilly	x	x	x		x						
Mondial	x				x	x					
Norman	x				x				x		
Noya	x		x		x						
P1	x										
Palace			x								
Panamera	x		x		x						
Prince	x	x	x						x		
Sababa	x	x			x						
Sifra	x	x	x		x						
Sound			x								
Tyson	x				x						
Valor	x										
<5% incidence				5-15% incidence				>15% incidence			

but it is important to note that it is still higher than the previous few seasons.

Another factor to consider is the daily solar radiation levels (Figure 5). This measurement reflects sunlight energy hitting a horizontal surface. Consequently, higher radiation levels lead to increased photosynthesis during the growth period. The average daily radiation observed during these seasons (including the previous seasons), partially explains why the yield has been lower over the last two seasons.

During the 2020/21 and 2021/22 seasons, radiation levels slightly exceeded those of the preceding two seasons. When considering long-term data, daily radiation accumulation decreased by 10.2% in 2023/24

Figure 3: Minimum and maximum temperatures (°C) during the 2023/24 season as well as temperatures during the six previous seasons.

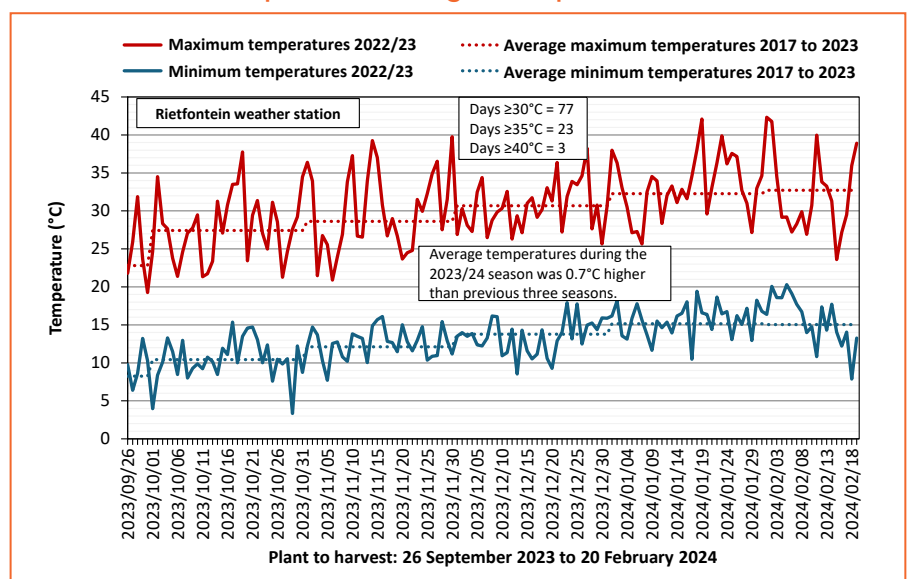
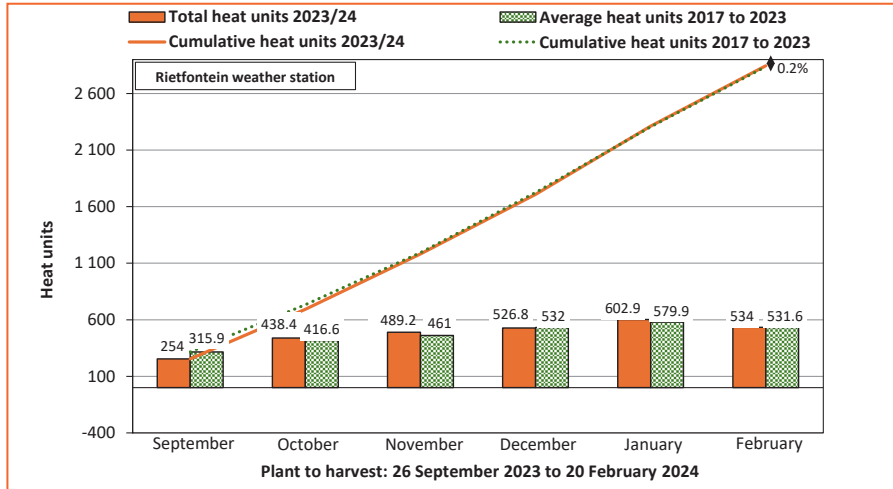


Figure 4: Heat units during the 2023/24 season, as well as the average heat units during the six previous seasons.



*Total heat units determined specifically for potatoes as a crop (threshold temperature = 5°C). Calculated from hourly data.

Figure 5: Average daily radiation during the 2023/24 season as well as the average radiation during the six previous seasons.

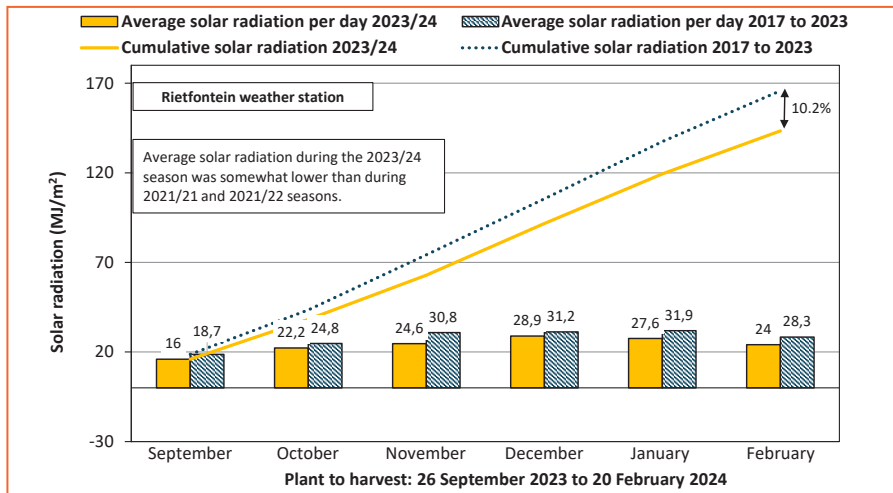
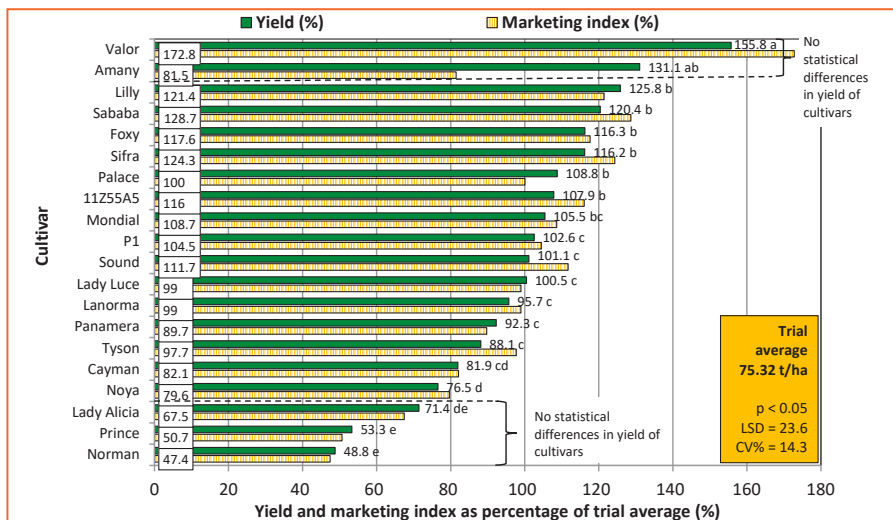


Figure 6: Total yield and marketing indices per cultivar as a percentage of the trial average.



*Values followed by the same letter do not significantly differ from one another.



compared to the period between 2017 and 2023. From November until the end of the season (roughly between tuber initiation and maturity) radiation (and effectively photosynthesis and ultimately yield) was lower than in previous seasons.

Significant cultivar effect

The yield data collected during harvest was subjected to statistical processing using the GenStat® program. The Tukey test of least significant differences (LSD) was used to separate the mean. The cultivar effect in this trial (Figure 6) was statistically significant (p<0.05) while the coefficient of variation (CV) was well within limits at 14.3%. These factors indicate that the trial was well executed, and that the results are reliable.

The yield of each cultivar is divided by the trial average (the trial average of all the cultivars is taken as 100%).



Size group distribution and grading are crucial evaluations when assessing the marketability of a potato cultivar. In this trial, potatoes were classed as marketable or non-marketable (rejected).

This way a yield index is established and every cultivar's performance in terms of yield is expressed as a percentage of the trial average.

Yield and quality aspects

The average yield of the 2023/24 trial is 75.32 t/ha, which is substantially lower than the previous six seasons' average of 92.1 t/ha. Also interesting to note is that the LINTUL simulations of the four previous seasons for Mondial in this region, have a yield potential averaging 129.8 t/ha but in this season it only yielded 79.5 t/ha. Valor and Amany produced the highest yields with no statistical difference in yield, but it is important to note that the relationship between marketable and non-marketable potatoes in Amany was less than desirable.

Valor, Sababa and Sifra achieved the best marketing indices. A good marketing index is ascribed to a higher

Figure 7: Size-group distribution of each cultivar in the trial.

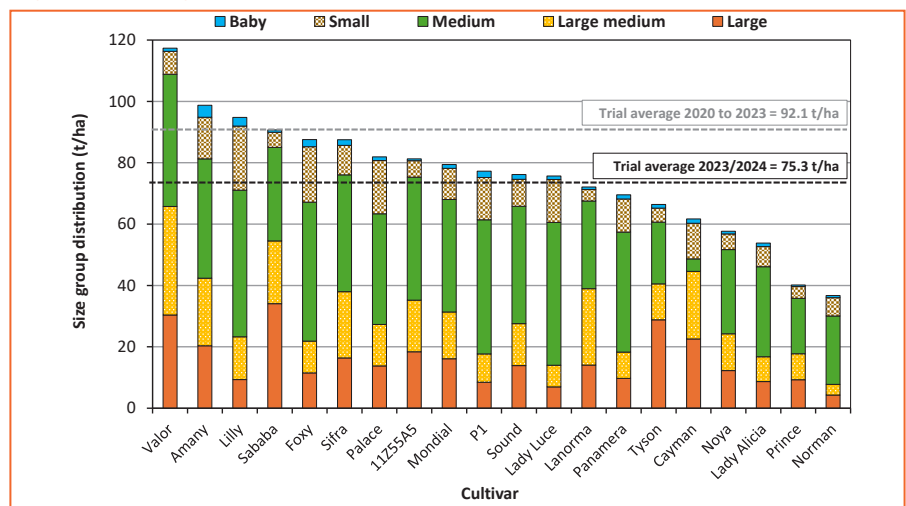


Figure 8: Grading of each cultivar in the trial.

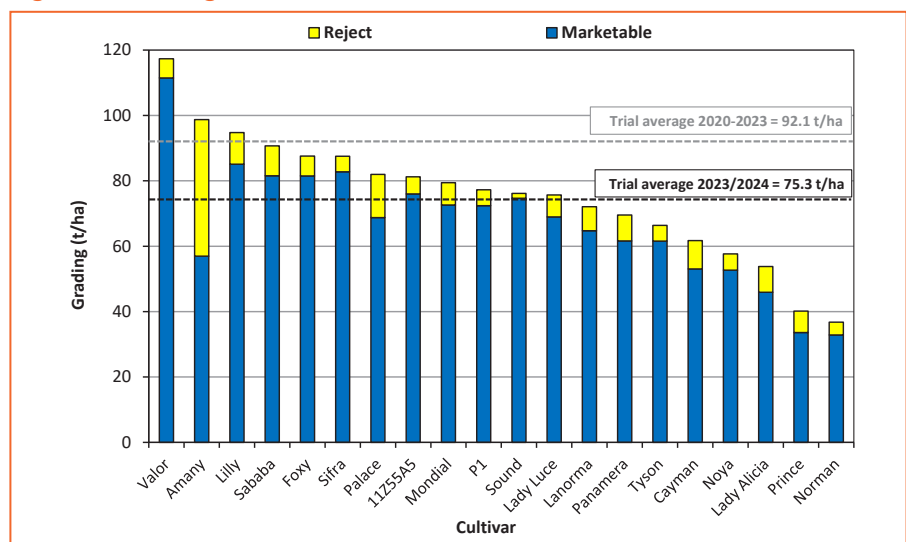
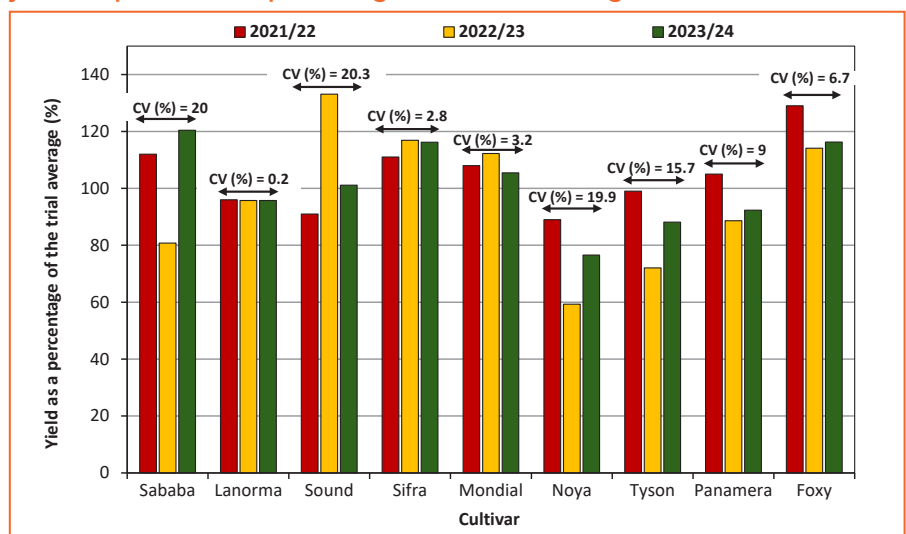


Figure 9: Performance of cultivars included in the trial for the past three years, expressed as a percentage of the trial average.



The coefficient of variation (CV %) is indicated on the graph. Essentially, it means the degree of variation in performance of the specific cultivar over the number of years indicated on the graph. The larger the CV % value, the greater the variation in the cultivar's performance.

Table 6: Keeping quality of cultivars observed six weeks after harvest.

Cultivar	Condition after six weeks	Observations
11Z55A5	Medium to undesired	15% soft rot but the rest were firm. Silver scab was present.
Amany	Good	Firm with a few sprouted tubers.
Cayman	Medium to undesired	15% soft rot but the rest were firm. Started sprouting.
Foxy	Good	One or two were slightly wilted with sprouts.
Lady Alicia	Medium	5% soft rot but the rest were firm. Started sprouting.
Lady Luce	Medium to undesired	15% soft rot but the rest were firm. Started sprouting.
Lanorma	Undesired	30% and more had soft rot.
Lilly	Medium to undesired	15% soft rot, but the rest were firm.
Mondial	Medium to undesired	10% soft rot, but the rest were firm. Started sprouting.
Norman	Medium	5% soft rot, but the rest were firm. Started sprouting.
Noya	Undesired	30% soft rot. Others started sprouting and wilting.
P1	Good	Very good condition.
Palace	Undesired	30% soft rot. Others started to sprout and wilt.
Panamera	Medium	Firm with a few wilted spots.
Prince	Medium to undesired	15% soft rot, but the rest were firm. Started sprouting.
Sababa	Undesired	50% soft rot. Highly undesirable condition.
Sifra	Medium to undesired	15% soft rot, but the rest were firm.
Sound	Good	One or two slightly wilted tubers with sprouting.
Tyson	Good	One or two slightly wilted tubers.
Valor	Medium to undesired	15% soft rot, but the rest were firm. Started sprouting.

Table 7: Processing characteristics and internal quality. (Carried out by ARC-Roodeplaat.)

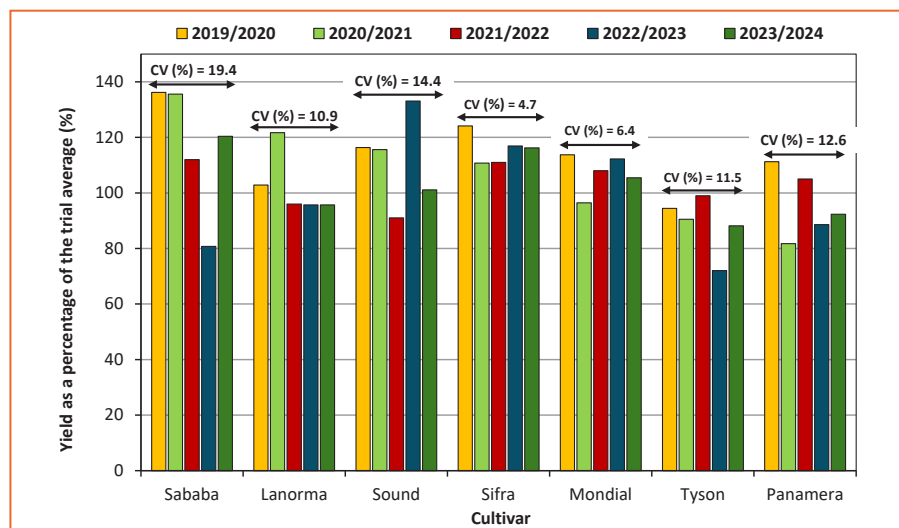
Cultivar	Chip colour ¹	SG ²	DM ³
11Z55A5	45	1.064	17
Amany	45	1.070	18
Cayman	45	1.082	21
Foxy	35	1.061	16
Lady Alicia	54	1.077	20
Lady Luce	51	1.076	19
Lanorma	50	1.067	18
Lilly	44	1.058	16
Mondial	51	1.065	17
Norman	45	1.080	20
Noya	42	1.077	20
P1	47	1.079	20
Palace	45	1.071	18
Panamera	43	1.075	19
Prince	47	1.071	18
Sababa	44	1.065	17
Sifra	37	1.074	19
Sound	47	1.064	17
Tyson	45	1.065	17
Valor	39	1.075	19

¹Chip colour with a value of >50 and without defects is acceptable for the chip industry.

²Specific gravity of >1.075 is acceptable for the processing industry.

³The percentage of dry matter is a calculated value: $DM\% = 24.182 + 211.04 * (SG - 1.0988)$. The actual percentage value will differ slightly between varieties based on the calculating value.

Figure 10: Performance of cultivars included in the trial for the past five years, expressed as a percentage of the trial average.



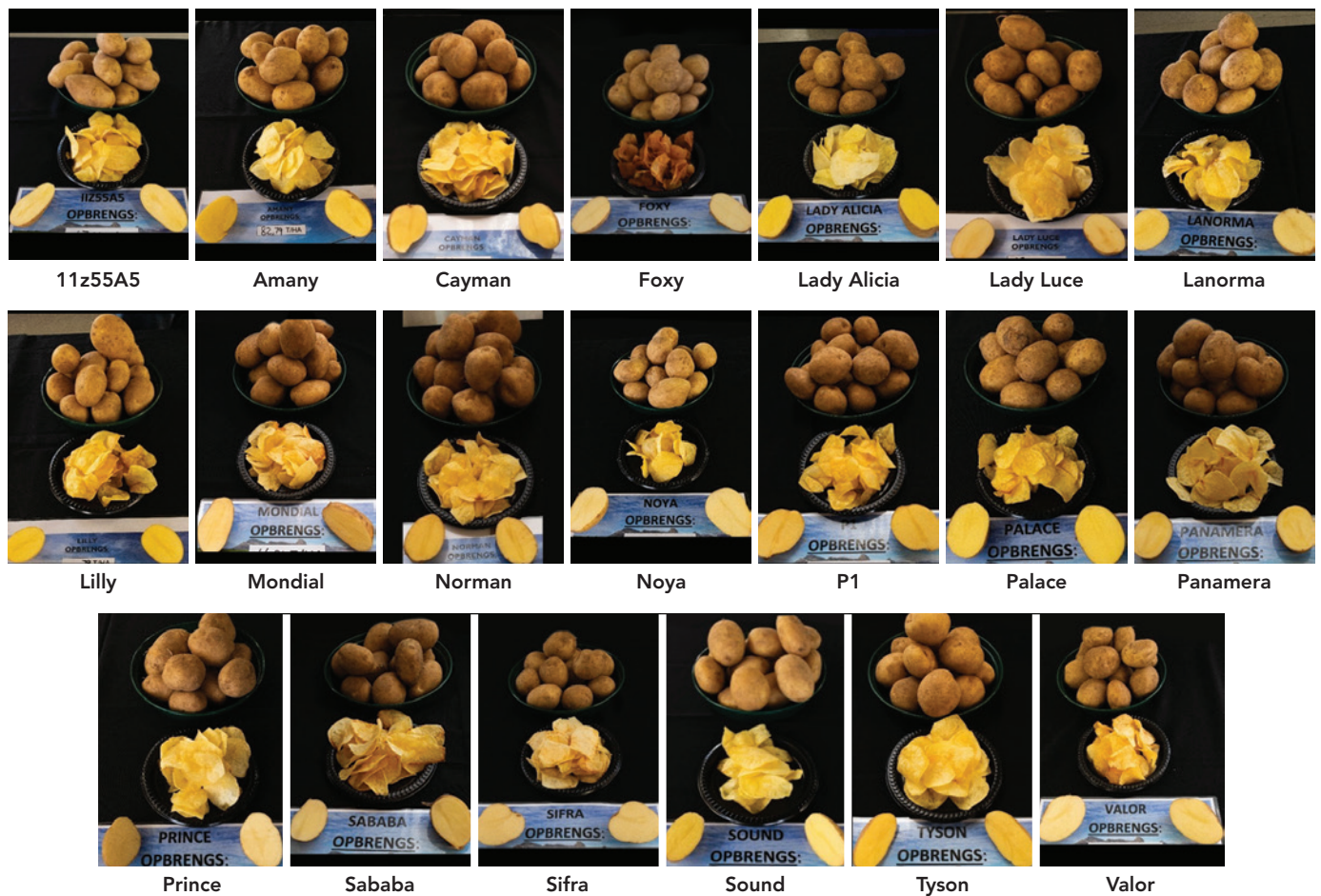
The coefficient of variation (CV %) is indicated on the graph. Essentially, it means the degree of variation in performance of the specific cultivar over the number of years indicated on the graph. The larger the CV % value, the greater the variation in the cultivar's performance.

yield of Large potatoes and Class 1 quality potatoes. A large percentage of non-marketable potatoes would for instance influence the marketing index negatively. Size group distribution and grading are crucial evaluations when assessing the marketability of a potato cultivar (Figures 7 and 8). In this trial, potatoes were classed as marketable or non-marketable (rejected).

Potato cultivar performance varies from one season to the next due to differences in climate. Therefore, it is important to monitor cultivar performance across multiple seasons. Cultivar variations over the past three to five seasons are illustrated in Figures 9 and 10.

Currently, Sifra and Mondial appear to be the most stable in this trial with Lanorma showing very stable

Table 8: Flesh colour and internal quality of cultivars in the 2023/24 trial at Aurora.



performance during the last three seasons.

Downgrading and quality

The main reasons for downgrading in this trial are indicated in Table 5. Loose skin, rot and powdery scab were the main reasons for the downgrading of potatoes from

marketable to rejected. Keeping quality was also informally evaluated five weeks post-harvest. Commentary regarding the condition of the cultivars is set out in Table 6. Soft rot was a major role-player.

Lastly, when evaluating the internal quality of potatoes, processing characteristics come into play. To meet

these processing requirements, cultivars must adhere to a chip colour standard of >50 and a specific gravity (SG) of ≥1.075 (Table 7). According to the analyses, only Lady Alicia and Lady Luce met both the SG and chip colour requirements. Table 8 indicates the specific cultivar’s flesh colour after harvest, both uncooked and fried. ©



Special thanks to the Sandveld workgroup, all trial participants and contributing Potatoes SA staff. For more information, send an email to enrike@potatoes.co.za.

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