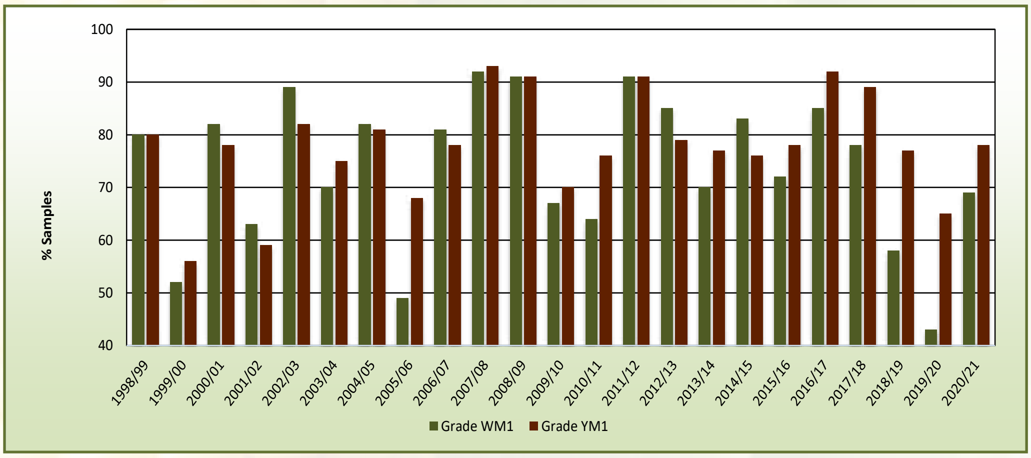
Maize Crop Quality 2020/21 - summary of results

RSA Grading

The maize crop, the second largest in history, was of better grading quality than the previous two seasons, comparing well with that of the 2013/14 and 2015/16 seasons. 69% of white maize samples received and graded was graded as maize grade one, last season this figure was only 43%. 78% of yellow maize samples received and graded was graded as grade one, compared to the 65% of the previous season. Please see Graph 33 for the percentages of samples (white and yellow) per season graded as grade 1, since commencement of the annual maize crop quality survey in 1998.

Graph 33: Percentage samples graded as Grade 1 over seasons



The percentage total defective kernels above and below the 6.35 mm sieve, 5.1% for white and 4.2% for yellow maize, was respectively 5.0% and 2.4% lower than the previous season. Defective white maize kernels above the 6.35 mm sieve made the largest contribution to the decrease in the percentage total defective kernels, decreasing from 8.1% last season to 3.0% this season. The percentage defective kernels below the 6.35 mm sieve for white maize increased slightly from 2.0% to 2.1% and that of yellow maize decreased slightly from 2.3% to 2.1%. The average percentage Diplodia infected kernels in white and yellow maize equaled the 0% of the previous season. Fusarium infected kernels of white maize equaled the 0.8% of the previous season, while Fusarium infected yellow maize decreased marginally from 0.7% to 0.6%.

The percentage of white maize samples that were downgraded to class other maize as a result of the percentage foreign matter exceeding 0.75%, decreased from 7% (38 samples) to 5% (29 samples) this season. The percentage for yellow maize increased slightly from 4% (14 samples) to 5% (21 samples) this season. One white and four yellow maize sample were downgraded as a result of other colour maize that exceeded 10% and 5% (maximum permissable deviation for grade 3) respectively. The average percentage combined deviations of white maize was 5.6% compared to the 10.7% of the 2019/20 season and that of yellow maize 4.5% compared to 6.9% previously.

Please refer to Tables 3 to 7 and Graphs 34 to 36 on pages 35 to 47.

USA Grading

Of the 1 000 maize samples graded according to USA grading regulations, 62% were graded US1, 21% US2, 7% US3, 3% US4, 2% US5, while sample grade and class mixed corn represented 3% and 2% respectively. The percentage samples graded as US1 varies substantially over seasons, varying from 30% to 41%, 51%, 71% and 58% over the previous five seasons. The percentage samples graded as US2 compared with the 25% and 27% of the previous two seasons respectively albeit lower. The main reason for downgrading the samples was (as in previous seasons) the percentage total damaged kernels exceeding the maximum limit per grade, followed by broken corn and foreign material. Please see Tables 8 and 9 on pages 48 to 53.

Physical Quality characteristics

Bushel weight/Test weight is applied as a grading factor in the USA grading regulations and is also routinely done at most intake points locally for stock verification purposes. White maize had an average test weight of 75.9 kg/hl compared to the 76.5 kg/hl of yellow maize. White and yellow maize's average test weight was respectively 0.3 kg/hl and 0.2 kg/hl higher than in the previous season. The test weight in total varied from 68.5 kg/hl to 82.6 kg/hl.

21 samples (2.1%) reported Bushel weight values below the minimum requirement (56.0 lbs or 72.1 kg/hl) for USA grade 1 maize, two of these samples were from the Vaalharts region, 10 were from the North West production regions, five from the Free State and six from Mpumalanga.

The 100 kernel mass ("as is" basis) of white maize was 33.3 g (34.9 g in 2019/20) and averaged higher than yellow maize's 31.2 g (last season 30.4 g). This trend is also observed in previous seasons. The percentage white maize kernels above the 10 mm sieve (21.6%) decreased by 6.2% compared to the previous season. The percentage yellow maize kernels above the 10 mm sieve (7.4%) was 1% lower than last season. The percentage yellow maize kernels above the 10 mm sieve was on average 14.2% lower than white kernels and the percentage yellow kernels below the 8 mm sieve 32.4% higher than that of white maize.

The percentages maize below the 6.35 mm and 4.75 mm sieves provides an indication of the breakage susceptibility. White maize was slightly less susceptible to breakage than during the previous season and the same can also be said for yellow maize. The percentage stress cracks observed varied overall from 1 to 49% and averaged 12%. White and yellow maize both also averaged 12%, previously 16% and 13% respectively. The average stress crack percentages over the last three seasons were the highest of all the seasons since 1999/00 when stress crack analyses were commenced.

Please refer to Tables 12 to 16 on pages 55 to 65 and Graphs 37 to 40 on pages 65 and 66.

The milling index obtained from the SAGL Milling Index 2021 model, varied from an average of 73 (equal to 2019/20) for white maize to an average of 76 (77 previously) for yellow maize. Grit Yield All (GYA) values averaged 63 for white maize and 64 for yellow maize, both equal to the previous season's averages.

Roff Milling and Whiteness Index (WI)

The average % extraction of total meal in white maize obtained with the Roff mill, averaged 77.6% (1.4% higher than the previous season) and varied from 66.6% to 81.4%. Please see Graphs 41 to 46 on page 72 for a comparison of the different fractions percentages as well as the percentage total meal extraction obtained on the Roff mill since 2012/13, the season when the development of the new model for Milling Index was commenced.

The whiteness index averaged 36.3 for unsifted and 27.0 for sifted maize meal. Sieving the sample eliminates differences in the readings as a result of particle size. The whiteness index of the previous season averaged 31.8 and 21.8 for unsifted and sifted maize meal respectively.

The higher the WI value obtained, the whiter the meal sample. The main contributing factors causing differences in WI values are the presence of other colour maize like yellow maize, the presence of defective kernels, the type of cultivar as well as the soil composition. The sample with the lowest sifted whiteness index values this season, namely -5.0, also had the highest percentage other colour maize, namely 12.8%. Please see Tables 17 and 18 on pages 67 to 71.

Nutritional Values

The maize industry requested that crude fibre be added to the scope of analysis performed on the annual maize crop quality survey. With the assistance of Foss, a calibration was developed on the Infratec 1241 Grain Analyser (NIT) during the 2017/18 season. The calibration will be updated annually with the latest season's results.

The average fat content of white maize equaled the 4.0% of the previous two seasons. Yellow maize also averaged 4.0%, 0.1% higher than the previous season. The 10-year average fat content of white maize is 4.1% and that of yellow maize 4.0%. The average protein content of yellow maize was 8.7%, while white maize averaged 8.3%, the lowest since the 2010/11 season. The 10-year average for yellow and white maize respectively is 9.1% and 8.8%.

The average starch contents of both white maize (75.5%) and yellow maize (74.7%) were 2.3% and 2.4% respectively higher than in the previous season. Ten-year averages for white and yellow maize are 73.2% and 72.9% respectively. The average crude fibre content of both white and yellow maize was 2.3%, 0.4% higher than in the previous season.

The fat, starch, protein and crude fibre nutritional components are reported as % (g/100 g) on a dry base.

Please refer to Tables 19 to 22 on pages 73 to 79 and Graphs 47 to 49 on page 80.

Genetic Modification (GM)

The SAGL used the EnviroLogix QuickComb kit for bulk grain, to screen 100 of the crop samples in order to quantitatively determine the presence of genetically modified maize (Cry1Ab, Cry2Ab and/or CP4 EPSPS traits). 90% of the samples tested positive for the Cry1Ab trait, 96% for Cry2Ab and 98% for the CP4 EPSPS trait.

The sensitivity of the measurements for Cry1Ab using the above-mentioned kit is 0.8%, i.e. approximately 6 GM kernels in 800 conventional maize kernels. The limit of detection (LOD) for measurements of the Cry1Ab protein is 0.4%.

The sensitivity of the measurements for Cry2Ab using the above-mentioned kit is 0.9%, i.e. approximately 8 GM kernels in 800 conventional maize kernels. The limit of detection (LOD) for measurements of the Cry1Ab protein is 0.5%.

The sensitivity of the measurements for CP EPSPS using the above-mentioned kit is 0.5%, i.e. 4 GM kernels in 800 conventional maize kernels. The limit of detection (LOD) for measurements of the Roundup Ready protein is 0.25%.

Values higher than 5%, the highest value of the detection range for all three traits, are reported as > 5%.

Important to remember is that the crop quality samples received and analysed by the SAGL are composite samples per class and grade, made up of individual deliveries to grain silos.

Please see Table 23 on page 81 for the results obtained as well as page 107 for a summary of the Events and Trade names/Brands represented by these three traits.

Mycotoxins

None of the 350 samples analysed this season, tested positive for Aflatoxin, Ochratoxin A, HT-2 or T-2 toxin residues.

The average Fumonisin level (Sum of B_1, B_2 and B_3) on all 350 samples tested was 100 µg/kg (ppb), compared to the previous season's average of 143 µg/kg. Levels ranged from not detected (ND) to 5 373 µg/kg. Of the 350 samples tested, 76 samples (22%) tested positive for fumonisin levels and the average of these positive results was 459 µg/kg. The previous season, 35% of the samples tested positive, with an average of 413 µg/kg.

The highest Deoxynivalenol (DON) level detected this season was 3 256 µg/kg, compared to the 7 700 µg/kg of last season. The average level of all samples tested this season was 279 µg/kg, 656 µg/kg the previous season. Both the percentage of positive results as well as the average of the positive results decreased this season. 85% of the samples tested positive for DON last season with the average of the positive results 768 µg/kg. This season, 64% of the samples tested positive with an average of 434 µg/kg.

18% of the samples tested positive for 15-acetyl-deoxynivalenol (15-ADON) residues, compared to 34% the previous season. The average of the positive results was 176 µg/kg compared to 238 µg/kg in the previous season.

Zearalenone residues were found in 3% of the samples, 13% during the previous season. Values ranged from ND to 101 µg/kg. The average of the positive samples was 38 µg/kg compared to the 70 µg/kg of the previous season.

Mycotoxin levels lower than the limit of quantitation (< LOQ) as well as limit of detection (< LOD) were seen as having tested negative for calculation purposes. Please see mycotoxin results in Table 24 on pages 89 to 101.