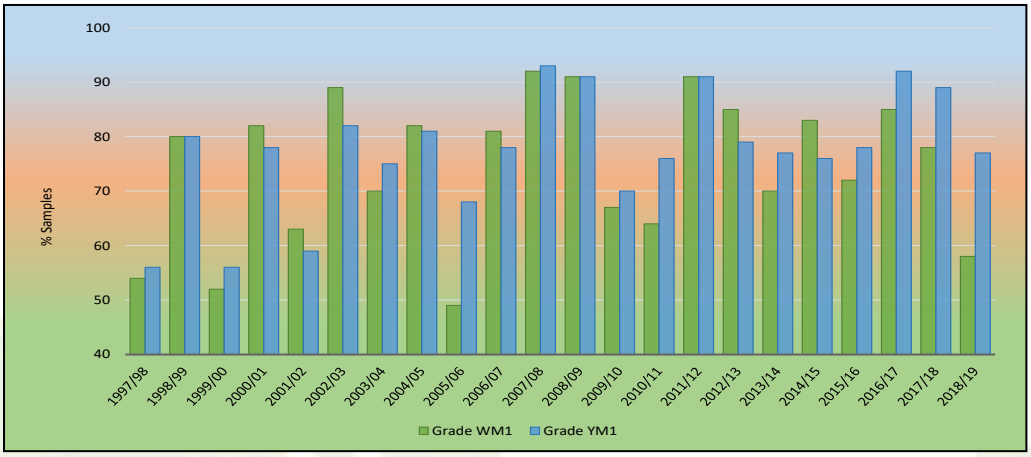
Maize Crop Quality 2018/19 - summary of results

RSA Grading

The maize crop was of below average quality as far as the white maize was concerned, with only 58% of white maize graded as maize grade one. Last season this figure was 78%. The yellow maize was of average quality with 76% graded as grade one, compared to the 89% of the previous season. Please see Graph 31 for the percentages of grade 1 samples (white and yellow) per season since commencement of the annual maize crop quality survey in 1998.

Graph 31: Percentage samples graded as Grade 1 over seasons



The percentage total defective kernels above and below the 6.35 mm sieve, 8.7% for white and 5.4% for yellow maize, was respectively 3.2% and 0.5% higher than the previous season. Defective white maize kernels above the 6.35 mm sieve made the largest contribution to the increase in the percentage total defective kernels, increasing from 3.7% last season to 6.8% this season. The percentage defective kernels below the 6.35 mm sieve was equal to last season's average, namely 1.8%. The average percentage Diplodia infected kernels in white maize increased from 0.1% to 0.4% this season and in yellow maize from 0.2% to 0.9%. Fusarium infected kernels decreased in both white and yellow maize compared to the previous season, from 0.9% to 0.3% in white and from 1.2% to 0.3% in yellow maize.

The number of samples that were downgraded to class other maize as a result of the percentage foreign matter exceeding 0.75%, increased from 4 each for white and yellow maize during the previous season, to 23 samples for white and 18 samples for yellow maize. Only one white and one 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 9.3% compared to the 5.9% of the 2017/18 season and that of yellow maize 5.7% compared to 5.1% previously.

Please refer to Tables 3 to 7 and Graphs 32 to 34 on pages 32 to 43.

USA Grading

Of the 808 maize samples graded according to USA grading regulations, 41% were graded US1, 27% US2, 13% US3, 5% US4, 4% US5, while sample grade and class mixed corn represented 7% and 3% respectively. The percentage samples graded as US1 varies substantially over seasons, varying from 41% to 51%, 71%, 58%, 64% and 42% over the previous five seasons. The percentage samples graded as US2 compared well with the 29% of the previous season. 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 44 to 49.

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. White maize had an average test weight of 75.9 kg/hl compared to the 76.9 kg/hl of yellow maize. White maize's average test weight was 1.1 kg/hl lower than the previous season and that of yellow maize 0.3 kg/hl lower. The test weight in total varied from 61.0 kg/hl to 83.6 kg/hl. 42 samples reported Bushel weight values below the minimum requirement (56.0 lbs or 72.1 kg/hl) for USA grade 1 maize, 17 of these samples were from the North West production regions, 18 from the Free State, three each from Mpumalanga and Gauteng and one from Limpopo.

The 100 kernel mass ("as is" basis) of white maize was 33.4 g and averaged higher than yellow maize (30.6 g) as in previous seasons. The percentage white maize kernels above the 10 mm sieve decreased by 1.6% compared to the previous season. The percentage yellow maize kernels above the 10 mm sieve decreased by 2.8%. The percentage yellow maize kernels above the 10 mm sieve was on average 16.3% lower than white kernels and the percentage yellow kernels below the 8 mm sieve 13.3% higher than that of white maize.

Both white and yellow maize were more susceptible to breakage than during the previous season, white maize to a greater extent so. The percentage stress cracks observed varied overall from 1 to 58% and averaged 17% for white and 13% for yellow maize. The average stress crack percentages 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 51 to 61 and Graphs 35 to 38 on pages 61 and 62.

The milling index obtained from the SAGL Milling Index 2019 model, varied from an average of 78.7 for white maize to 79.5 for yellow maize. Grit Yield All (GYA) values averaged 64.4 for white maize and 64.6 for yellow maize.

Roff milling and whiteness index (WI)

The average % extraction of total meal in white maize obtained with the Roff mill, averaged 76.0% (3.1% lower than the previous season) and varied from 67.7% to 80.5%.

The whiteness index averaged 30.2 for unsifted and 20.3 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 29.8 and 19.2 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 two samples with the lowest sifted whiteness index values this season, namely -7.67 and -5.19, also had the highest percentages total defective kernels (96.7%) and other colour maize (12.9%) respectively. Please see Tables 17 and 18 on pages 63 to 67.

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 previous 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 yellow maize this season. The 10-year average fat content of white maize is 4.1% and that yellow maize 3.9%. The protein content of yellow maize averaged 9.2%, which was 0.2% higher than that of white maize. The protein content of both white and yellow maize was slightly higher (0.3% and 0.2% respectively) than in the previous season.

The average starch content of white maize (73.6%) was 0.4% higher than in the previous season and yellow maize (72.7%) averaged 0.7% higher. Ten-year averages for white and yellow maize are 72.9% and 72.8% respectively. The average crude fibre content of white maize was 1.9% and that of yellow maize 2.0%.

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

Please refer to Tables 19 to 22 on pages 68 to 74 and Graphs 39 to 41 on page 75.

Genetic Modification (GM)

The SAGL used the EnviroLogix QuickComb kit for bulk grain, to screen 70 of the crop samples in order to quantitatively determine the presence of genetically modified maize (Cry1Ab, Cry2Ab and/or CP4 EPSPS traits). 91% of the samples tested positive for the Cry1Ab trait, 83% for Cry2Ab and 96% 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 76 for the results obtained as well as page 101 for a summary of the Events and Trade names/Brands represented by these three traits.

Mycotoxins

Aflatoxin (B_1 and G_1) residues were found on a white maize sample from region 23. This is only the second season that Aflatoxin residues are detected by SAGL on maize crop samples since the implementation of the UPLC-MS/MS technique in 2010. During the 2014/15 season, Aflatoxin B_1, B_2, G_1 and G_2 residues were found on one sample and B_1 as well as B_1 and B_2 residues on two more samples respectively.

The average Fumonisin level (Sum of B_1, B_2 and B_3) on all 350 samples tested was 298 µg/kg (ppb), compared to the previous season's average of 244 µg/kg. Levels ranged from not detected (ND) to 34 740 µg/kg. This extremely high concentration was detected on only one yellow maize sample. The second highest positive concentration was 7 341 µg/kg, which is more in line with previous seasons' results. Of the 350 samples tested, 151 samples (43%) tested positive for fumonisin levels and the average of these positive results was 689 µg/kg. The previous season, 44% of the samples tested positive, with an average of 554 µg/kg.

The highest Deoxynivalenol (DON) level detected was 11 181 µg/kg, compared to the 3 510 µg/kg of last season. The average level of all samples tested this season was 424 µg/kg, 393 µg/kg the previous season. 58% of the samples tested positive for DON last season compared to 68% this season. Although the percentage of positive results increased this season, the average of the positive results decreased from 674 µg/kg in 2017/18 to 627 µg/kg in 2018/19.

17% of the samples tested positive for 15-acetyl-deoxynivalenol (15-ADON) residues. The average of the positive results was 218 µg/kg compared to 163 µg/kg in the previous season.

Zearalenone residues were found in 10% of the samples, 8% during the previous season. Values ranged from ND to 957 µg/kg. The average of the positive samples was 98 µg/kg compared to the 61 µg/kg of the previous season.

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

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 84 to 95.