Maize Crop Quality 2017/2018 - summary of results

RSA Grading

The maize crop was of good quality, with 78% of white and 89% of yellow maize, graded as maize grade one, compared to the 85% and 92% of the 2016/2017 season. The percentage total defective kernels above and below the 6.35 mm sieve, 5.5% for white and 4.9% for yellow maize, was respectively 0.8% and 0.5% higher than the previous season. Slightly less Diplodia infected kernels was observed on both white and yellow maize this season. Fusarium infected kernels were also lower on white maize, but on yellow maize the average percentage increased with 0.4% to 1.2% compared to the previous season.

Foreign matter did not pose significant problems, with white and yellow maize each having four samples downgraded to class other maize due to foreign matter exceeding 0.75%. Only one yellow maize sample was downgraded as a result of other colour maize that exceeded 5%. The average percentage combined deviations of white maize was 5.9% compared to the 5.1% of the 2016/2017 season, that of yellow maize was also higher, 5.1% compared to 4.7% previously.

Please refer to Tables 3 to 7 on pages 28 to 36.

USA Grading

Of the 900 maize samples graded according to USA grading regulations, 51.3% were graded US1, 28.9% US2, 9.9% US3, 2.6% US4, 2.9% US5, while sample grade and class mixed corn represented 3.0% and 1.4% respectively. The percentage samples graded as US1 varies substantially over seasons, comparing 51% to 71%, 58%, 64%, 42% and 79% over the previous five seasons. The percentage samples graded as US2 was higher than the 20%, 22% and 23% of the previous three seasons respectively. The main reason for downgrading the samples was 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 38 to 43.

Physical Quality characteristics

Bushel weight/Test weight is applied as a grading factor in the USA grading regulations, but is also routinely done at most intake points locally. White maize had an average test weight of 77.0 kg/hl compared to the 77.2 kg/hl of yellow maize. White maize's average test weight was 0.7 kg/hl lower than the previous season and that of yellow maize 0.3 kg/hl higher. The test weight in total varied from 59.6 kg/hl to 82.5 kg/hl. Only 23 samples reported Bushel weight values below the minimum requirement (56.0 lbs or 72.1 kg/hl) for USA grade 1 maize, 13 of these samples were from the North West production regions, eight from the Free State and two from Mpumalanga.

The 100 kernel mass ("as is" basis) of white maize was 34.3 g and averaged higher than yellow maize (31.5 g) as in previous seasons. The kernel size of white maize was larger than in the previous season. The yellow maize kernels below the 10 mm sieve was also slightly larger than the previous season. The percentage yellow maize kernels above the 10 mm sieve were on average 15.1% lower than white kernels and the percentage kernels below the 8 mm sieve 11.2% higher than that of white maize.

Both white and yellow maize were slightly less susceptible to breakage than during the previous season. The percentage stress cracks observed varied overall from 1 to 38%, and averaged 11% for white and 9% for yellow maize, on average 3% higher than in the previous season.

Please refer to Tables 12 to 16 on pages 45 to 53.

The milling index obtained from the SAGL Milling Index 2018 model, varied from an average of 78.3 for white maize to 79.4 for yellow maize. Grit Yield All (GYA) values averaged 64.4 for white maize and 64.6 for yellow maize. Please see page 94 under the Methods Section for more information on this new parameter which was reported for the first time last season.

Roff milling and whiteness index (WI)

The average % extraction of total meal in white maize obtained with the Roff mill, averaged 79.1% (0.5% higher than the previous season) and varied from 70.9% to 83.8%.

The whiteness index averaged 29.8 for unsifted and 19.2 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 25.4 and 17.4 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 value of -5.8 this season, also had

the highest percentage other colour maize, namely 6.2%. Please see Tables 17 and 18 on pages 56 to 58.

Nutritional Values

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

From historical data, white maize in general tends to have a higher fat content than yellow maize, but a lower starch content. However, during the last three seasons, white maize's starch content exceeded that of yellow maize. No clear trend can be observed with regards to the protein content, although over the past two seasons yellow maize had a slightly higher protein content on average (0.2 – 0.3%).

The average fat content of white maize was 0.1% higher than yellow maize this season. The protein content of yellow maize averaged 9.0%, which was 0.3% higher than that of white maize. The protein content of both white and yellow maize was similar than in the previous season.

The average starch content of white maize (73.2%) was 0.9% lower than in the previous season and yellow maize (72.0%) averaged 1.7% lower. Yellow maize's starch content was also lower than the 10-year average of 72.9%.

Please refer to Tables 19 to 22 on pages 59 to 65.

The maize industry requested that crude fibre be added to the scope of analysis performed on the annual maize crop quality survey. As a result, crude fibre analyses were done on every tenth sample (99 samples in total) by means of the primary analysis method used by SAGL (In-house method 020). The aim is to gather data to investigate the development of a calibration on the Infratec 1241 Grain Analyser (NIT) with the assistance of Foss.

Genetic Modification (GM)

The SAGL screened 100 of the crop samples to test for the presence of the Cry1Ab, Cry2Ab and/or CP4 EPSPS traits. Important to remember is that the crop quality samples received by the SAGL are composite samples per class and grade, made up of individual deliveries to grain silos.

SAGL used the EnviroLogix QuickComb kit for bulk grain to quantitatively determine the presence of genetically modified maize.

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%.

Please see Table 23 on page 67 for the results obtained as well as page 95 for a summary of the Events and Trade names/Brands represented by these three traits.

Mycotoxins

None of the 350 samples 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 244 µg/kg (ppb) and ranged from not detected (ND) to 8 356 µg/kg. This average is higher than the previous season's 191 µg/kg. Of the 350 samples tested, 154 samples (44%) tested positive for fumonisin levels and the average of these positive results was 554 µg/kg. The previous season, 44% also of the samples tested positive, with an average of 431 µg/kg.

The highest Deoxynivalenol (DON) level detected was 3 510 µg/kg, compared to the 7 698 µg/kg of last season. The average level of all samples tested this season was 393 µg/kg, 339 µg/kg the previous season. 37% of the samples tested positive for DON last season compared to 58% this season. The average of the positive results decreased from 919 µg/kg in 2016/2017 to 674 µg/kg in 2017/2018.

18% of the samples tested positive for 15-acetyl-deoxynivalenol (15-ADON) residues. The average of the positive results was 163 µg/kg compared to 254 µg/kg in the previous season.

Zearalenone residues were found in 8% of the samples, as in the previous season. Values ranged from ND to 361 µg/kg. The average of the positive samples was 61 µg/kg compared to the 89 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 78 to 89.