5. Maize Crop Quality 2013/2014 - summary of results

5.1 RSA Grading

The maize crop was of good quality, with 70% of white and 77% yellow maize, graded as maize grade one. The percentage total defective kernels above and below the 6.35 mm sieve, 6.2% for white and 6.1% for yellow, compared well but was higher than the previous two seasons. The percentage defective kernels above the sieve increased compared to the two previous seasons, but the percentage defective kernels below the sieve decreased. Both the percentage Diplodia as well as Fusarium infected kernels were 0.4% higher than the previous season's 0.6% and 1.1% respectively. Foreign matter and other colour maize did not pose significant problems.

The average percentage combined or total deviations of white maize was 6.8% compared to the 4.9% of the 2012/2013 season, that of yellow maize was also higher, 6.4% compared to 4.8%. The average percentage total deviations on South African maize this season was 1.7% higher than the previous season.

Please refer to Table 4 on page 32.

5.2 USA Grading

Of the 930 maize samples graded according to USA grading regulations, 42% were graded US1, 31% US2, 11% US3, 7% US4, 6% US5, while mixed and sample grade represented 1% and 2% respectively. The percentage samples graded as US1 was significantly lower than the 79% of the previous season. The percentage samples graded as US2 was significantly higher than the 13% of the previous season. The main reason for downgrading the samples were the percentage total damaged kernels exceeding the maximum limit per grade.

5.3 Physical Quality factors

Hectolitre mass/Bushel weight/Test weight is applied as a grading factor in the USA grading regulations, but also routinely done at most intake points locally. White maize had an average hectolitre mass of 77.6 kg/hl compared to the 76.0 kg/hl of yellow maize. The hectolitre mass in total varied from 56.6 kg/hl to 81.9 kg/hl and averaged 76.8 kg/hl, slightly lower than the ten year average. Only 28 samples reported values below the minimum requirement (56.0 lbs or 72.1 kg/hl) for USA grade 1 maize, 15 of these samples were from Mpumalanga and 8 from the Free State.

The 100 kernel mass averaged 32.9 g which is 3.9 g higher than the previous season and also 0.6 g higher than the ten year average. White maize averaged 34.0 g and yellow maize 31.8 g.

The kernel size of both white and yellow maize were larger than the previous two seasons. The percentage yellow maize kernels above the 10 mm sieve were on average 9.8% lower than white kernels and the percentage kernels below the 8 mm sieve 7.4 % higher than that of white maize. The breakage susceptibility of both white and yellow maize compared well with the 2012/2013 season, although slightly higher. The % stress cracks varied from 0 – 53%, averaged 7% and was also slightly higher than previous seasons.

Please refer to Table 14 on page 50.

The milling index varied from 46.5 to 120.4 and averaged 90.9, 4.2 lower than the previous season. The average milling index for white maize is higher (93.0) than that of yellow maize (89.0).

5.4 Roff milling and whiteness index (WI)

The average % extraction of total meal in white maize obtained with the Roff mill averaged 79.0% (0.2% lower than the previous season) and varied from 73.5% to 84.8%.

The whiteness index averaged 25.3 for unsifted and 15.6 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 25.1 for unsifted maize meal. Sifted maize meal averaged 15.9.

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 of -18.0 this season also had the highest percentage of other maize namely 9.2%.

5.5 Nutritional Values

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

In general, white maize tends to have a higher fat content than yellow maize, but a lower starch content. No clear trend can be observed with regards to the protein content.

The average fat content of the 2013/2014 crop samples was 3.9%, equal to the weighted ten year average and 0.1% lower than the 2012/2013 samples. The average protein content (8.6%) was equal to the weighted ten year average and 0.6% lower than the 9.2% of the previous season. The starch content this season increased on average with 1.4% compared to the 71.6% of the previous season and is also 0.6% higher than the ten year weighted average of 72.4%.

The fat content of white maize was slightly lower (0.1%) than the previous season and 0.2% higher than that of yellow maize. The protein content of white maize was equal to that of yellow maize (8.6%). The starch content of both white and yellow maize is higher than the previous season by 1.5% and 1.2% respectively.

Please refer to Table 19 on page 62.

5.6 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 detection range for the Cry1Ab trait is 0.4% to 5%. 96% of the samples tested positive for Cry1Ab with values larger than 0.4% (Limit of quantification (LOQ)).

The detection range for the Cry2Ab trait is 0.5% to 5%. 90% of the samples gave values larger than the LOQ of 0.5% (positive results).

The detection range for the CP4 EPSPS trait is 0.25% to 5%. 94% of the samples tested positive for CP4 EPSPS with values larger than 0.25% (LOQ).

Values higher than 5%, the highest value of the detection range for all three traits, are reported as > 5%. This methodology has a precision coefficient of variation of 20%.

Please see Table 20 on page 64 for the results obtained as well as page 88 for a summary of the Events and Trade names/Brands represented by these three traits.

5.7 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 186 µg/kg (ppb) and ranged from 0 (not detected (ND)) to 5 357 µg/kg. This average is lower than the previous season's 257 µg/kg. Of the 350 samples tested, 143 samples (41%) tested positive for fumonisin levels and the average of these positive results was 456 µg/kg. The previous season, 45% of the samples tested positive, with an average of 571 µg/kg.

The highest Deoxynivalenol (DON) level detected was 6 134 µg/kg compared to the 617 µg/kg of last season. The average level of all samples tested this season was 289 µg/kg, 21 µg/kg the previous season. Nine percent of the samples tested positive for DON last season compared to the 69% of this season. The average of the positive results increased from 225 µg/kg in 2012/2013 to 417 µg/kg in 2013/2014.

Seventeen percent of the samples tested positive for 15-acetyl-deoxynivalenol (15-ADON) residues, the average of the positive results was 182 µg/kg. Only one sample tested positive the previous season.

Zearalenone residues were found in 12% of the samples, values ranged from 0 (ND) to 445 µg/kg. The average of the positive samples was 78 µg/kg compared to the 31 µg/kg of the previous season when 2% of the samples tested positive.

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 21 on pages 71 - 82.