SOUTH AFRICAN
COMMERCIAL MAIZE QUALITY
2009/2010

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1. Introduction

The calculated final commercial crop figure for maize for the 2009/2010 season by the National Crop Estimates Committee was 12 815 000 tons. This is 6 % more than the previous season's 12 050 000 tons. The major maize-producing region was the Free State (5 076 000 tons), followed by North West Province (2 868 000 tons) and Mpumalanga (2 745 000 tons). White maize contributed 61 % to the total production, which is 3 % more than the previous season's 58%.

The maize crop quality survey is done annually by the Southern African Grain Laboratory (SAGL).

800 composite samples, proportionally representing white and yellow maize of each production region, were analysed for quality.

The quality attributes which were tested for, include:
a. RSA grading:
All samples were graded according to the following factors, as defined in the South African grading regulation: defective kernels above and below 6.35 mm sieve, total defective kernels, foreign matter, other colour, total deviation and pinked kernels.
b. USA grading according to regulations on all samples to determine the following factors: Grain density expressed as Hectolitre mass, heat damaged, total damaged, broken corn and foreign matter (BCFM) and other colour.
c. Nutritional values (on all samples): Fat, protein and starch.
d. Physical Quality factors (on all samples): Hectolitre mass, 100 kernel mass, kernel size, breakage susceptibility, stress cracks and milling index.
e. Roff milling and whiteness index were done on all white maize samples.
f. Mycotoxin analyses were performed on 90 samples representative of white and yellow maize produced per region.
g. Testing for the presence of Genetically Modified (GM) maize were performed on 90 samples representative of white and yellow maize produced per region.

See methods on pages 55 - 59.

The 800 samples analysed consisted of 458 white maize samples and 342 yellow maize samples.

2. Maize Crop Quality - summary of results

2.1 RSA Grading

The general good quality observed with this particular maize crop quality survey, is reflected by the average grading of best grade, in terms of both the RSA and USA grading standards.

Of the 458 white maize samples analysed, 67 % were graded WM1, 28 % WM2 and 5 % WM3. Of the 342 yellow maize samples analysed, 70 % were graded YM1, 28 % YM2 and 2 % YM3. One white and one yellow maize sample were each graded Class Other Maize (COM). The percentages WM1 and YM1 grades were significantly lower than the past two seasons. Most of the samples were downgraded due to the % defective kernels which consisted mainly of Diplodia infected kernels above the 6.35 mm sieve. Only a few samples were downgraded as a result of the % foreign matter and % other colour maize.

The average percentage total deviation of 7.1 is 1.1 % higher than the weighted average (6.0 %) of the past ten seasons.

2.2 USA Grading

Of the 800 maize samples, 26 % were graded US1, 36 % US2, 16 % US3, 13 % US4, 6 % US5, 1 % mixed grade and 2 % sample grade, according to USA grading regulations. The samples were downgraded mostly due to the % total damaged kernels.

2.3 Nutritional Values

The average fat content of all of these samples was 4.0 %, average protein 8.3 % and average starch content 72.9 %. The average fat content is the same than the ten year average of 4.0 %, the average protein content is 0.5 % lower than the ten year average of 8.8 % and the average starch content of 72.9 % is 1.2 % higher than the ten year average. The nutritional values compared well (within 0.2 %) with the previous season.

Yellow maize had a lower fat content (3.8 %) than white maize (4.2 %), both values are 0.2 % higher than the previous season. The starch content in yellow maize averaged 73.4 % and was higher than in white maize (72.6 %). The average protein content in white maize was 8.4 % and in yellow maize 8.1 %.

From the available data it is clear that the % fat in yellow maize is lower over the past 5 seasons than that in white maize and the % starch higher in yellow maize than in white maize.

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

2.4 Physical Quality factors

Hectolitre mass is applied as a grading factor in the USA grading regulations. White maize had an average hectolitre mass of 77.9 kg/hl compared to the 76.6 kg/hl of yellow maize. The hectolitre mass varied from 60.2 kg/hl to 84.4 kg/hl. Only 1 % of the samples were below the minimum requirement for USA grade 1 maize of 72.1 kg/hl.

The 100 kernel mass averaged 34.7 g (higher than the previous five seasons). The 100 kernel mass of the yellow maize averaged 33.0 g and 36.0 g in white maize.

Yellow maize kernels were smaller on average than white kernels as observed in Tables 12 to 14. The breakage susceptibility for white maize is similar to the previous season and slightly less susceptible than yellow maize. The % stress cracks varied from 0 – 36 %, averaged 4% and compared well with previous seasons.

The milling index varied from 52.7 to 119.1 and averaged 90.3. The average milling index for yellow maize is lower (88.8) than that of white maize (91.4).

2.5 Roff milling and whiteness index (WI)

The average % extraction of total meal with the Roff mill averaged 77.8 % and varied from 71.3 % to 82.6 % in white maize. This average value is a little lower than the previous season (2008/2009) which had an average of 78.6 %, a minimum of 70.0 % and maximum of 84.9 %.

The whiteness index averaged 27.7 and varied from -3.0 to 38.5 for unsifted maize meal. Sifted maize meal averaged 22.4, with a minimum of -7.5 and maximum of 35.4.

The higher the WI value, the whiter the meal. The main contributing factors causing lower WI values are the percentage defective kernels, the presence of another colour maize like yellow maize as well as cultivar. The sample with the lowest WI value of -3.0 (unsifted) and -7.5 (sifted) had a presence of 5.1 % other colour maize and graded WM2. The second lowest WI sample, 5.8 (unsifted) and -2.7 (unsifted) contained 6.5 % other colour maize and graded WM3. The third lowest WI sample 6.8 (unsifted) and 5.0 (sifted) had 41.3 % total defective kernels present and graded COM.

The whiteness index of the previous season averaged 29.7 and varied from 16.2 to 38.1 for unsifted maize meal. Sifted maize meal averaged 20.5, with a minimum of 3.7 and maximum of 35.0.

2.6 Mycotoxins

The percentage Fusarium infected kernels ranged from 0 to 3.7 % and averaged 0.8 %. The percentage Diplodia infected kernels ranged from 0 to 10.8 % and averaged 1.6 %.

The average mycotoxin levels were more or less the same than in previous seasons. The total Fumonisin level averaged 251 µg/kg (ppb) and ranged from 0 to 4 035 µg/kg. The Deoxynivalenol level averaged 206 µg/kg and ranged from 0 to 1 845 µg/kg. No Aflatoxin, Ochratoxin A, Zearalenone or T - 2 Toxin were found in the samples.

2.7 Genetic Modification (GM)

The SAGL screened 90 (11 %) of the crop samples to test for the presence of MON810 (Bt maize event) and NK603 (RUR).

The methodology applied by the SAGL is a quantitative enzyme-linked immunosorbent assay (ELISA). The SAGL does however not report quantities recorded below the limit of detection and above the value of the reference standards used, since this falls outside the linear range of the method. The crop quality samples received by the SAGL are composite samples per class and grade, made up of individual deliveries to the silos.

The limit of detection for the MON810 methodology used is 0.15 %. The highest reference standard is 2.0% and quantitation values can only be guaranteed up to 2.0 %. Ninety-six percent of the samples tested positive for MON810 with values larger than 0.15 % (LOD).

The limit of detection for the NK603 methodology used is 0.25 %. The highest reference standard is 1.8% and quantitation values can only be guaranteed up to 1.8 %. Sixty one percent of the samples tested positive with values larger than 0.2 % (LOD).

3. Production regions

The RSA is divided into 36 grain production regions.

Regions 1 to 9 are winter rainfall areas (Western Cape), as well as the Eastern Cape and Karoo where very little commercial maize is being produced.

Region 10 is Griqualand West and region 11 Vaalharts. Region 34 falls within Gauteng, region 35 within the Limpopo Province and region 36 within KwaZulu-Natal.

The main production regions are:
a) Regions 12 to 20 which are all within the North West province,
b) Regions 21 to 28 in the Free State,
c) Regions 29 to 33 in Mpumalanga.

The contribution of the three main production areas was as follow:
a) The Free State contributed 40 % of which 63 % was white maize and 37 % yellow maize.
b) North West contributed 22 % of which 82 % was white maize and 18 % yellow maize.
c) Mpumalanga contributed 21 %, white and yellow maize each contributed 50 % to this total.

These contributions of the three main production areas made up 83% of the total maize production in the RSA.

See chart for the different provinces and the list of Grain Production regions, Grain Handlers and silos (pages 12 - 15).

South African Provinces