SOUTH AFRICAN
COMMERCIAL MAIZE QUALITY
2008/2009

Acknowledgments

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1. Introduction

The calculated final commercial crop figure for maize for the 2008/2009 season by the National Crop Estimates Committee was 12 050 000 tons. This is 5 % less than the previous season's 12 700 000 tons. The major maize-producing region was the Free State (4 421 250 tons), followed by Mpumalanga (2 783 400 tons) and the North West (2 529 000 tons). White maize contributed 56 % to the total production, which is 3 % less than the previous season.

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

810 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 46 - 50.

The 810 samples analysed consisted of 483 white maize samples and 327 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 483 white maize samples analysed, 91 % were WM1, 7 % WM2, 1 % WM3 and 1 % graded Class Other Maize (COM). Of the 327 yellow maize samples analysed, 91 % were YM1, 7 % YM2, 1 % YM3 and 1 % COM. Most of the samples were downgraded due to the % defective kernels. Only a few samples were downgraded as a result of the % foreign matter and % other colour. The white and yellow maize graded similarly with regards to the sample percentage per grade.

The average percentage total deviation of 4.6 is 1.6 % lower than the weighted average (6.2 %) of the past ten seasons.

2.2 USA Grading

Of the 810 maize samples, 75 % were graded US1, 17 % US2, 4 % US3, 2 % US4, 1 % US5, 0.5 % mixed grade and 0.5 % sample grade, according to USA grading regulations. The samples were downgraded mostly because of the % total damaged kernels.

2.3 Nutritional Values

The average fat content of all samples was 3.8 %, average protein 8.3 % and average starch content 72.7 %. The average fat content is 0.2 % lower 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 72.7 % is 1 % higher than the ten year average.

Yellow maize had a lower fat content (3.6 %) than white maize (4.0 %) which is exactly the same as the previous season. The starch content in yellow maize averaged 73.2 % and was higher than in white maize (72.4 %). The average protein content in white maize was 8.3 % and in yellow maize 8.2 %.

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

The nutritional components, fat, starch and protein were reported as % 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 77.6 kg/hl compared to the 76.6 kg/hl of yellow maize. The hectolitre mass varied from 61.6 kg/hl to 82.2 kg/hl. Only 2 % of the samples were below the minimum requirement for USA grade 1 maize of 72.1 kg/hl.

The 100 kernel mass averaged 34.2 g (higher than the previous three seasons). The 100 kernel mass of the yellow maize averaged 32.9 g and 35.1 g in white maize.

Yellow maize kernels were smaller on average than white kernels as observed in Tables 12 and 13. The breakage susceptibility is similar to the previous seasons. The % stress cracks varied from 0 – 50 %, averaged 5 % and compared well with previous seasons.
The milling index varied from 68.6 to 115.4 and averaged 93.6. The average milling index for yellow and white maize is similar to each other.

2.5 Roff milling and whiteness index(WI)

The average % extraction of total meal with the Roff mill averaged 78.6 % and varied from 70.0 % to 84.9 % in white maize. These values are a little lower than the previous season (2007/2008) which had an average of 79.6 %, a minimum of 71.8 % and maximum of 85.5 %.

The whiteness index 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.

The higher the WI value, the whiter the meal. The main contributing factors causing lower WI values are cultivar and the presence of another colour maize like yellow maize. The sample with the lowest WI value of 16.2 (unsifted) and 3.7 (sifted) had a presence of 4.6 % other colour maize and graded WM2.

The whiteness index of the previous season averaged 27.9 and varied from 19.6 to 41.7 for unsifted maize meal. Sifted maize meal averaged 19.1, with a minimum of 8.5 and maximum of 37.4.

2.6 Mycotoxins

The percentage Fusarium infected kernels ranged from 0 to 5.8 % and averaged 0.6 %. The percentage Diplodia infected kernels ranged from 0 to 1.6 % and averaged 0.1 %.

The average mycotoxin levels were more or less the same than in previous seasons. The Fumonisin and Deoxynivalenol levels dominated the other toxin levels like previous seasons. The Fumonisin level averaged 0.5 ppm and ranged from 0 to 3.3 ppm. The Deoxynivalenol level averaged 0.4 ppm and ranged from 0 to 2.9 ppm. No Aflatoxin was found in the samples. Low levels of Ochratoxin and Zearalenone were found in a few 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-one 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 %. Ninety 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 were as follow:
a) The Free State contributed 38 % of which 59 % was white maize and 41 % yellow maize.
b) Mpumalanga contributed 24 % of which 46 % was white maize and 54 % yellow maize.
c) North West contributed 22 % of which 80 % was white maize and 20 % yellow maize.

These contributions of the three main production areas make 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 5 - 8).

3.1 Main production regions – summary of results

The maize quality of the three main maize producing

South African Provinces