Sorghum Crop Quality 2023/24 – Summary of Results

The national Grading Regulations (Government Notice NO. R.15 of 08 January 2016, Regulation 4. Standards for classes) states that a consignment of sorghum shall be classified as Class GM Sorghum if it consists of malt sorghum that does not have a dark testa and complies with the standards for the grades. A consignment of sorghum shall be classified as Class GH Sorghum if it consists of malt sorghum that has a dark testa and complies with the standards for the grades.

Eighty percent (20) of the 25 samples analysed for the purpose of this survey was determined to be class GM. Of these, 13 samples (65%) were graded as Grade GM1. Four samples (20%) was graded GM2 and three samples (15%) were graded Class Other Sorghum (CO). Of the 5 samples determined to be class GH, 60% (3 samples) was graded GH1 and the remaining two samples were grade GH2.

No white sorghum samples were received this season for inclusion in the survey.

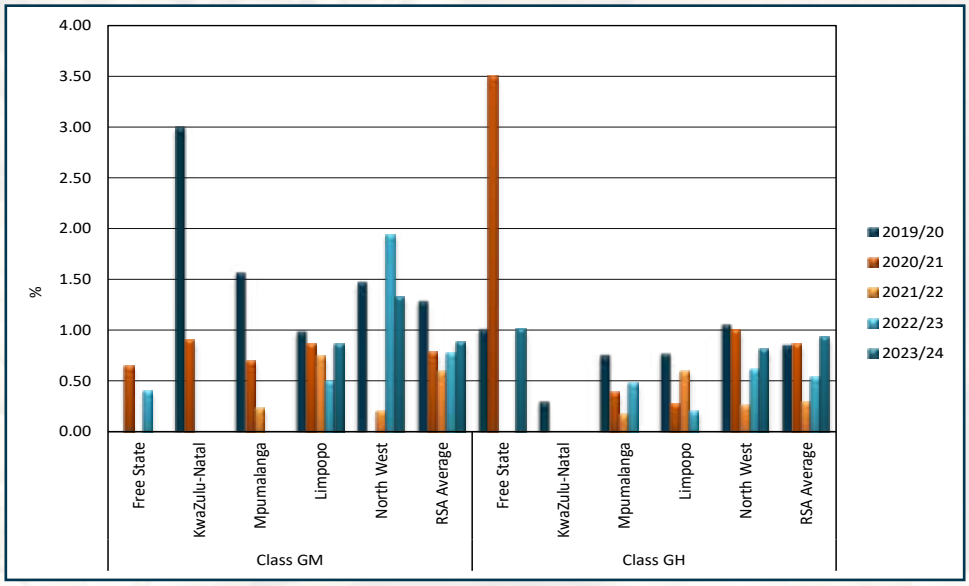
Certain varieties of sorghum contain tannins (specifically condensed tannins) in the seed coat layer beneath the pericarp (commonly referred to as the testa layer) of the grain. These varieties are variously referred to as: tannin, high-tannin, brown, bird-proof, bird-resistant, or bitter sorghums.

Varieties of sorghum not containing tannins are referred to as: non-tannin, low-tannin, condensed tannin-free, or sweet sorghums.

The detection of tannin in sorghum grain for grading purposes is done by SAGL by means of the bleach test. Please refer to the methodology followed under Methods on page 28.

See Graphs 16 to 18 for the weighted average percentages foreign matter, defective sorghum and small kernel sorghum per class per province over five seasons.

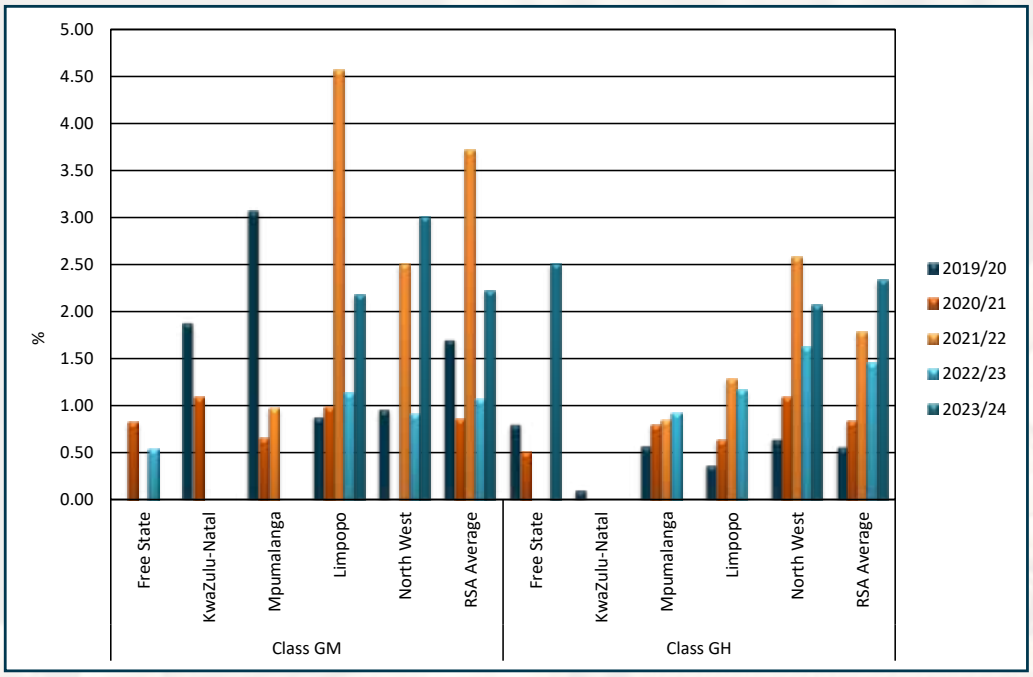
Graph 16: Average percentage foreign matter per class per province over five seasons



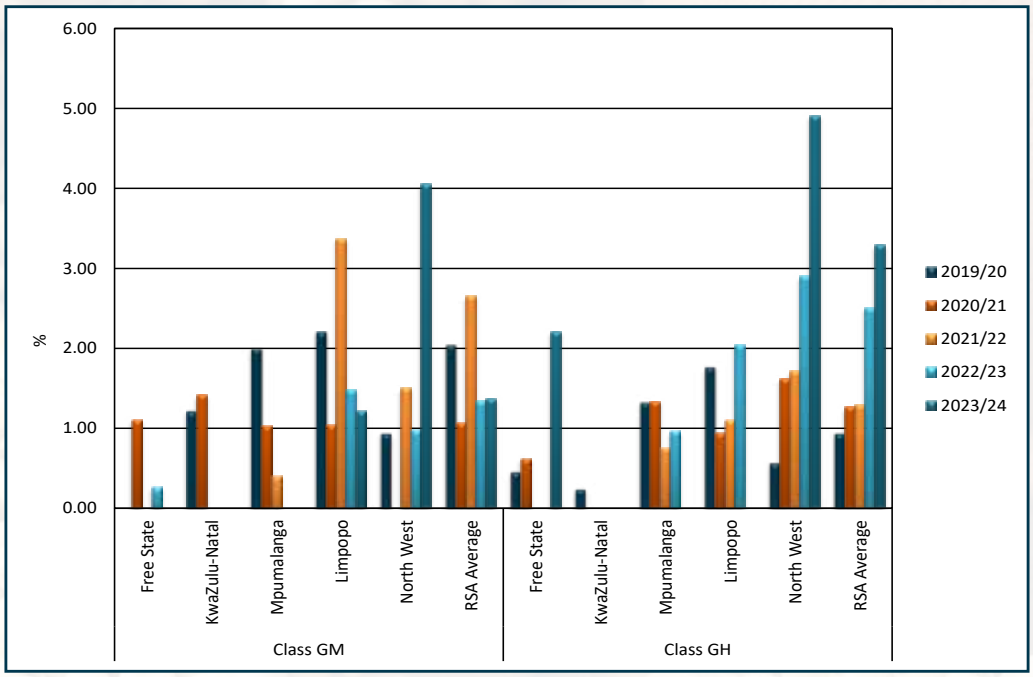
GM sorghum's foreign matter varied between 0.86% for Limpopo (19 samples) and 1.33% for North West (1 sample). GH sorghum's foreign matter varied between 0.81% for North West (2 samples) and 1.01% for the Free State (3 samples). The national weighted averages for GM and GH sorghum were 0.88% and 0.93% respectively.

The percentage defective GM sorghum averaged 2.18% for Limpopo and was 3.01% for North West. The weighted average defective GH sorghum varied between 2.07% (North West) and 2.51% (Free State). The national weighted averages were 2.22% for GM and 2.33% for GH sorghum.

Graph 17: Average percentage defective sorghum per class per province over five seasons



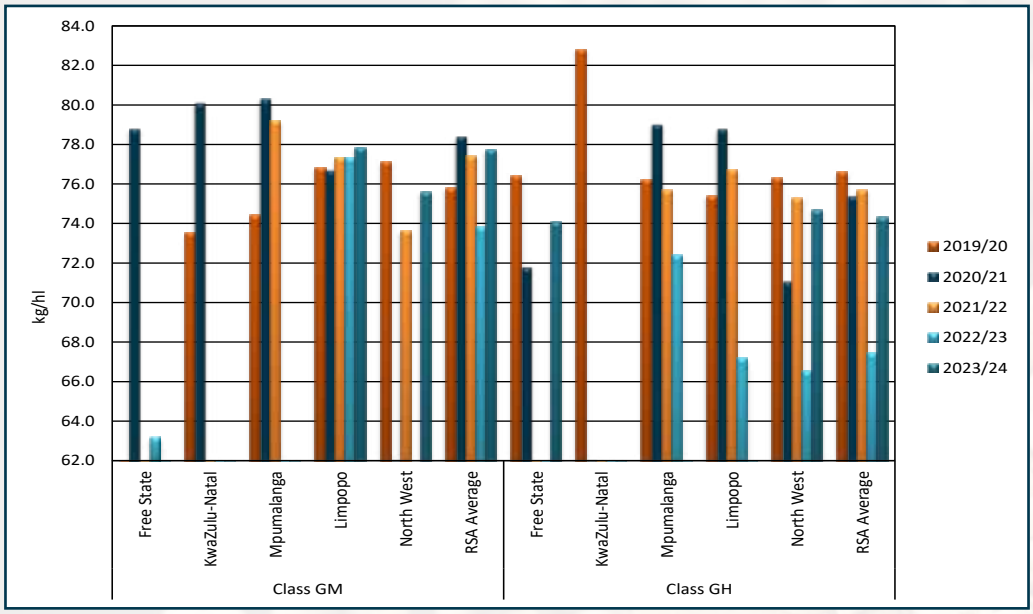
Graph 18: Average percentage small kernel sorghum per class per province over five seasons



As in previous seasons, GH sorghum again showed the highest percentage small kernels (class average 3.29%), ranging from 2.21% in the Free State to 4.91% in North West. Small kernels in GM sorghum varied between 1.22% in Limpopo and 4.05% in North West, the weighted average for the class was 1.37%.

As shown in Graph 19, GM sorghum had the highest weighted average test weight, namely 77.7 kg/hl, while GH sorghum averaged 74.3 kg/hl. Test weight values for GM sorghum ranged between 75.6 kg/hl (North West) and 77.8 kg/hl (Limpopo average). GH values varied from 74.1 kg/hl (Free State) to 74.7 kg/hl (North West). Test weight was determined on unscreened samples.

Graph 19: Average test weight per class per province over five seasons

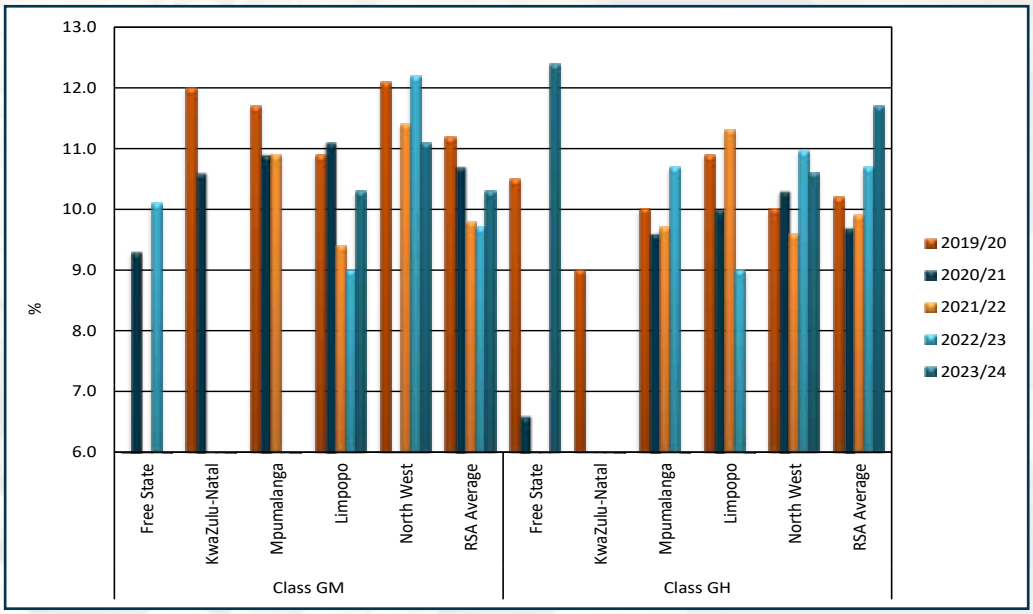


GM sorghum also had the highest 1 000 kernel mass values, ranging between 20.3 g and 26.7 g (14% moisture basis) and averaging 23.9 g. GH sorghum averaged 19.0 g and varied between 18.3 g and 20.0 g. Last season these averages were 24.2 g and 23.3 g respectively.

The image analysis results showed that the GM sorghum on average had slightly longer kernels, while the kernel width was similar for GM and GH sorghum. The variation (indicated by the standard deviation) in these parameters is similar for both GM and GH sorghum. Kernel elongation, defined as % Width/Length, showed a wider variation as the length and width parameters as can be expected, with average standard deviations of 5.6% for GM and 5.5% for GH sorghum. A totally round kernel will have a % Width/Length of 100. GM sorghum's Volume / surface area percentage was over the last five seasons on average 4% higher than that of GH sorghum.

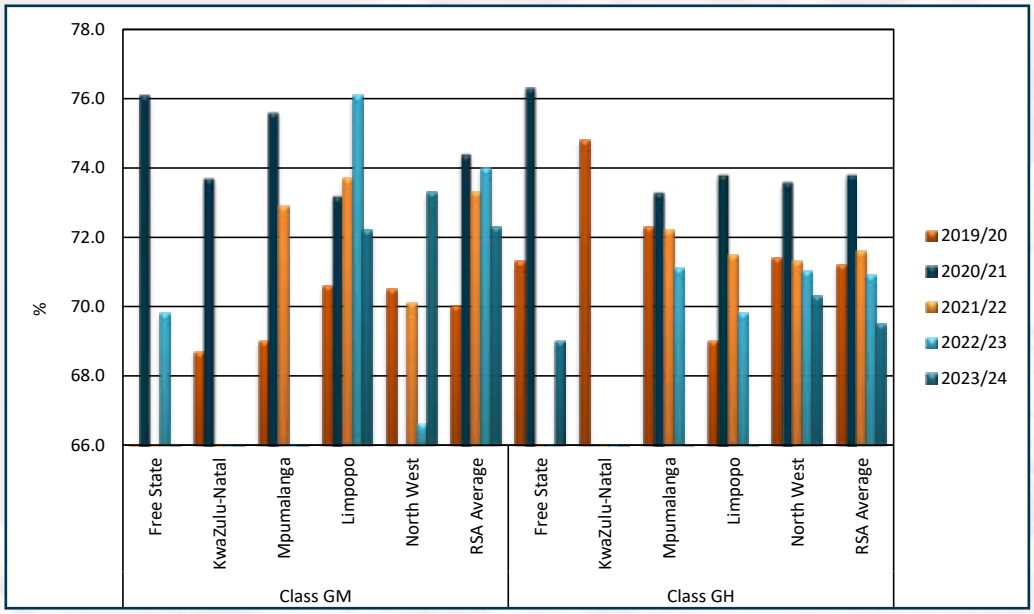
As shown in Graph 20, the crude protein content for GM sorghum varied between 10.3% in Limpopo and 11.1% in North West. GH sorghum's average crude protein content ranged from 10.6% in North West to 12.4% in the Free State. Nationally, GM and GH sorghum averaged 10.3% and 11.7% respectively.

Graph 20: Average percentage crude protein per class per province over five seasons



Graph 21 shows that the average total starch content for GM sorghum varied from 72.2% in Limpopo to 73.3% in North West. GH sorghum, varied between 69.0% (Free State) to 70.3% (North West). The weighted total starch content of GM sorghum was 72.3% and that of GH sorghum 69.5%.

Graph 21: Average percentage total starch per class per province over five seasons



The crude fat content of the crop samples was determined for the third consecutive season. The national average for GM sorghum was 3.9% and that for GH sorghum 3.2%. The previous season's averages were 3.3% for GM sorghum and 3.0% for GH sorghum.

The crude protein, total starch and crude fat contents of the samples were calculated and reported on a dry basis.

Hunterlab colour determinations were done on a milled fraction of dehulled sample above the 1.8 mm slotted sieve. The Hunterlab spectrophotometer separates the components of reflected color into a threedimensional colour scale, namely the Hunter L, a, b scale where L represents lightness (100 being white and 0 being black), a represents green to red variation and b represents variation from blue to yellow.

Please see Graphs 22 to 27 for a comparison of the ranges in the L, a, b values obtained on GM and GH sorghum over the seven seasons since the commencement of this project. The minimum and maximum values are based on a single composite grading sample's result in a specific season.

Although there are currently no acceptable ranges for these parameters defined, the colour must be within the consumer-acceptable range, which traditionally are products with a slightly pink hue. Not only the dehulling process, but also other traits such as pigmentation differences determine the end product colour.

Mycotoxins

Mycotoxin analyses were performed on all 25 sorghum crop samples. The samples were tested by means of a SANAS ISO/IEC 17025 accredited multi-mycotoxin method using UPLC-MS/MS. With this technique simultaneous quantification and confirmation of Aflatoxin B_1; B_2; G_1; G_2, Fumonisin B_1; B_2; B_3, Deoxynivalenol, 15-ADON, HT-2 Toxin, T-2 Toxin, Zearalenone and Ochratoxin A is possible in one run.

None of the samples tested positive for any of these mycotoxins this season or in seasons 2022/23, 2020/21, 2019/20 and 2017/18.

One sample from Limpopo tested positive for Fumonisin B_1 residues in the 2021/22 season. Fumonisin, Deoxynivalenol (DON) and Zearalenone residues were found on some of the samples of the 2018/19 season. None of the levels however raised any concerns.

The limit of quantification (LOQ) for each of the above-mentioned mycotoxins according to this method is:

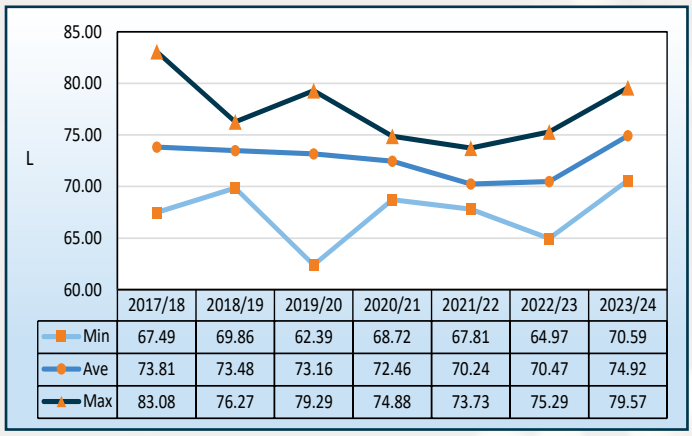
- Aflatoxin B_1 5 µg/kg
- Aflatoxin B_2 5 µg/kg
- Aflatoxin G_1 5 µg/kg
- Aflatoxin G_2 5 µg/kg
- Fumonisin B_1 20 µg/kg
- Fumonisin B_2 20 µg/kg
- Fumonisin B_3 20 µg/kg
- Deoxynivalenol 100 µg/kg
- 15-ADON 100 µg/kg
- Ochratoxin A 5 µg/kg
- Zearalenone 20 µg/kg
- HT-2 toxin 20 µg/kg
- T-2 toxin 20 µg/kg

The LOQ means the lowest concentration level that can be quantified with acceptable precision and accuracy by the LC-MS/MS.

The limit of detection (LOD) is the lowest concentration level that can be detected but not quantified and is 50% of the LOQ of each mycotoxin.

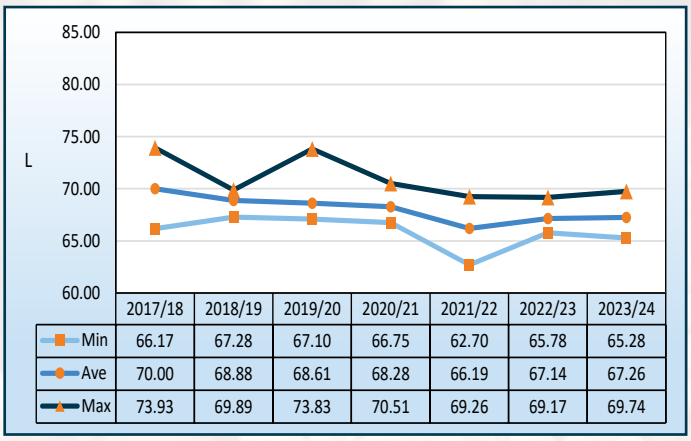
The Methods section of this report on pages 28 to 30 provides a description of the procedures and methodologies followed.

Graph 22: Range of Hunterlab L values on GM sorghum over seven seasons



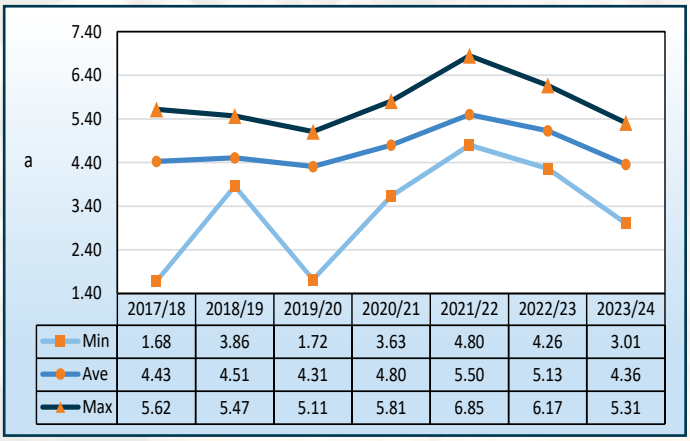
	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Min	67.49	69.86	62.39	68.72	67.81	64.97	70.59
Ave	73.81	73.48	73.16	72.46	70.24	70.47	74.92
Max	83.08	76.27	79.29	74.88	73.73	75.29	79.57

Graph 23: Range of Hunterlab L values on GH sorghum over seven seasons



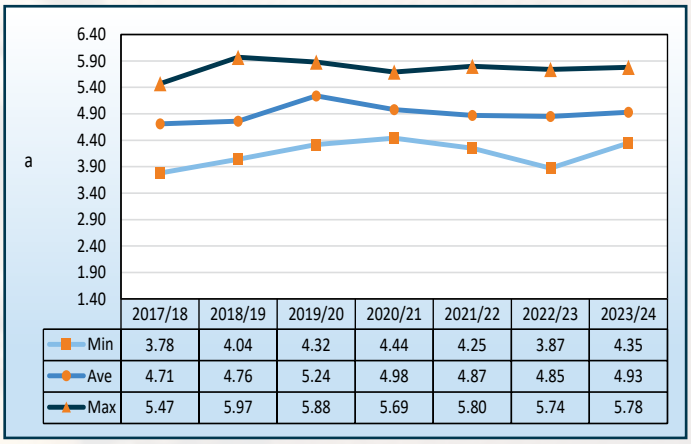
	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Min	66.17	67.28	67.10	66.75	62.70	65.78	65.28
Ave	70.00	68.88	68.61	68.28	66.19	67.14	67.26
Max	73.93	69.89	73.83	70.51	69.26	69.17	69.74

Graph 24: Range of Hunterlab a values on GM sorghum over seven seasons



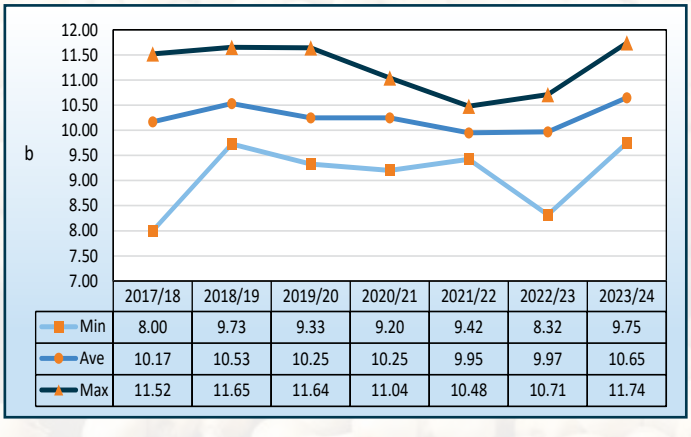
	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Min	1.68	3.86	1.72	3.63	4.80	4.26	3.01
Ave	4.43	4.51	4.31	4.80	5.50	5.13	4.36
Max	5.62	5.47	5.11	5.81	6.85	6.17	5.31

Graph 25: Range of Hunterlab a values on GH sorghum over seven seasons



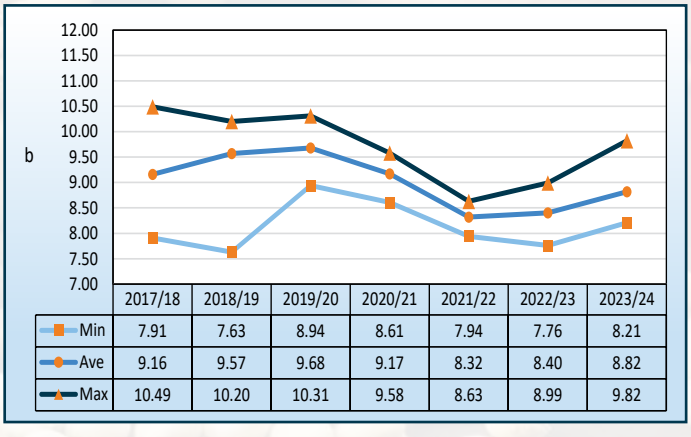
	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Min	3.78	4.04	4.32	4.44	4.25	3.87	4.35
Ave	4.71	4.76	5.24	4.98	4.87	4.85	4.93
Max	5.47	5.97	5.88	5.69	5.80	5.74	5.78

Graph 26: Range of Hunterlab b values on GM sorghum over seven seasons



	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Min	8.00	9.73	9.33	9.20	9.42	8.32	9.75
Ave	10.17	10.53	10.25	10.25	9.95	9.97	10.65
Max	11.52	11.65	11.64	11.04	10.48	10.71	11.74

Graph 27: Range of Hunterlab b values on GH sorghum over seven seasons



	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Min	7.91	7.63	8.94	8.61	7.94	7.76	8.21
Ave	9.16	9.57	9.68	9.17	8.32	8.40	8.82
Max	10.49	10.20	10.31	9.58	8.63	8.99	9.82