Sorghum Crop Quality 2021/22 – Summary of results

Seventy-one percent (15) of the 21 samples analysed for the purpose of this survey was determined to be class GM. Of these, 10 samples (67%) were graded as Grade GM1. Two samples were graded GM2 and three samples were graded Class Other Sorghum (COS). Of the six samples determined to be class GH, 83% (5 samples) was graded GH1 and the remaining sample was graded GH2. No white sorghum samples were received this season for inclusion in the survey.

Certain varieties of sorghum contain tannins (strictly-speaking 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.

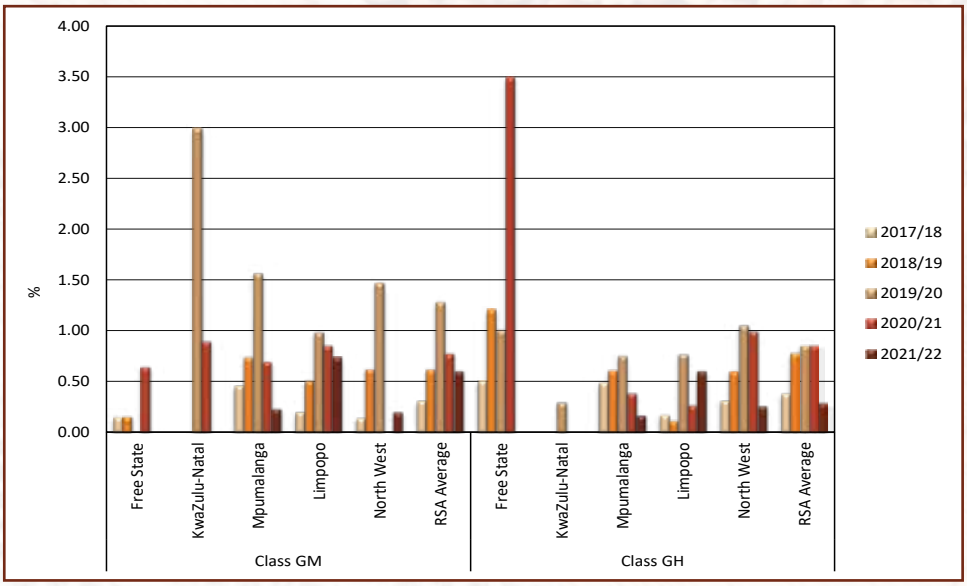
Varieties of sorghum not containing tannins are various referred to as: non-tannin, low-tannin, condensed tannin-free, or sweet sorghums.

According to the national Grading Regulations (Government Notice NO. R.15 of 08 January 2016, Regulation 4. Standards for classes), 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.

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 27.

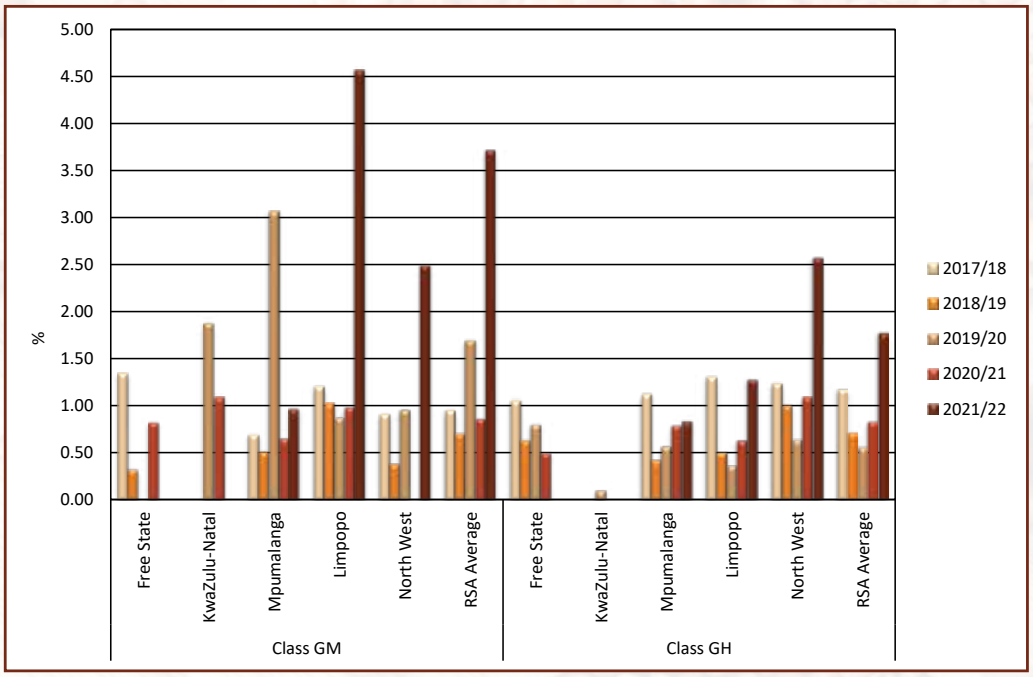
Please see Graphs 16 to 18 for the weighted average percentages foreign matter, defective sorghum and small kernel sorghum per class per province over five seasons. The 11 samples received from Limpopo had the highest average percentage foreign matter (0.74%) for GM sorghum. A single GH sorghum sample also from Limpopo showed the highest foreign matter percentage (0.60%). The national weighted averages were 0.60% and 0.29% for GM and GH sorghum respectively.

Graph 16: Average percentage foreign matter per class per province

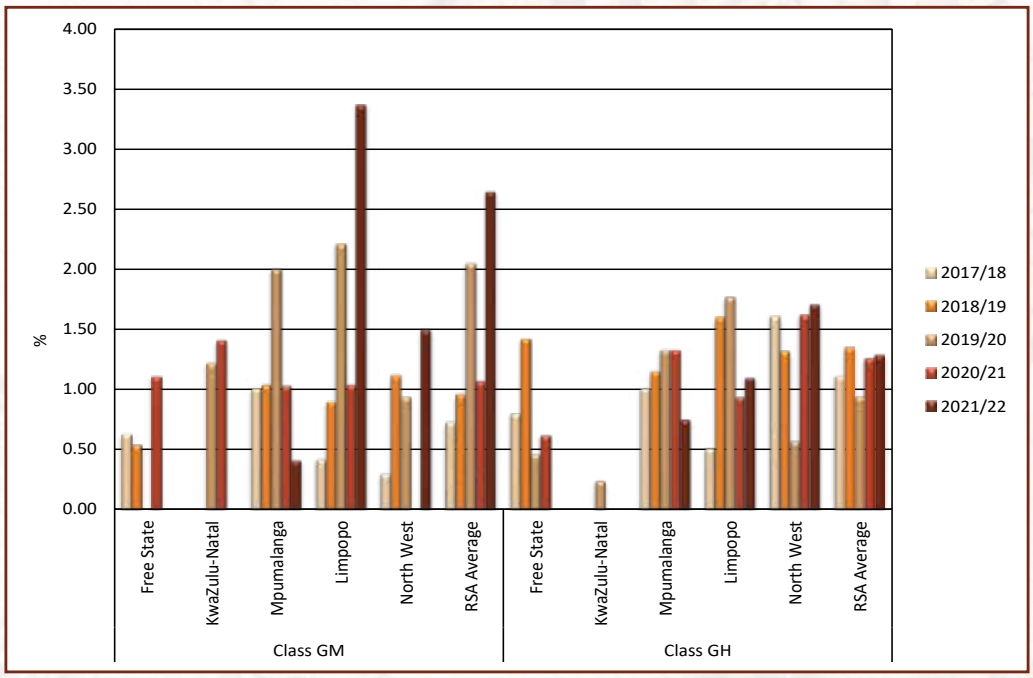


The percentage defective GM sorghum was the highest (4.57%) in Limpopo. North West (3 samples) had the highest percentage defective GH sorghum, namely 2.58%. The national averages were 3.72% for GM and 1.78% for GH. GM sorghum showed the highest percentage small kernels (national average 2.65%), with the samples from Limpopo having the highest percentage namely 3.37% and the Mpumalanga samples (N=3) the lowest with 0.41%. GM sorghum had the lowest percentages small kernels in Mpumalanga (two samples) with 0.75% and the highest in North West (1.71%), the weighted average for the class was 1.29%.

Graph 17: Average percentage defective sorghum per class per province



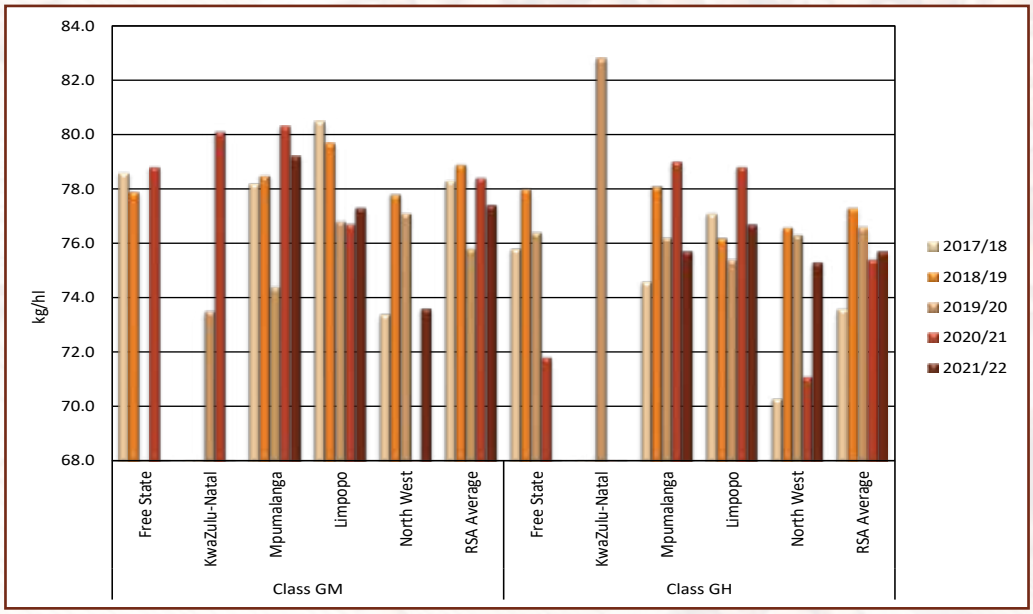
Graph 18: Average percentage small kernel sorghum per class per province



GM sorghum had the highest weighted average test weight, namely 77.4 kg/hl, while GH sorghum averaged 75.7 kg/hl. Please refer to Graph 19. Test weight values for GM sorghum ranged between 72.9 kg/hl and 80.3 kg/hl, with Mpumalanga reporting the highest average and North West the lowest. GH values varied from 73.5 kg/hl to 76.7 kg/hl. The sample from Limpopo reported the highest value with the lowest GH average reported in North West. Test weight was determined on unscreened samples.

GM sorghum also had the highest 1 000 kernel mass values, ranging between 16.4 g and 27.9 g (14% moisture basis) and averaging 23.9 g. GH sorghum averaged just 0.6 g lower at 23.3 g and varied between 20.4 g and 26.7 g. Last season these averages were 27.3 g and 26.2 g respectively.

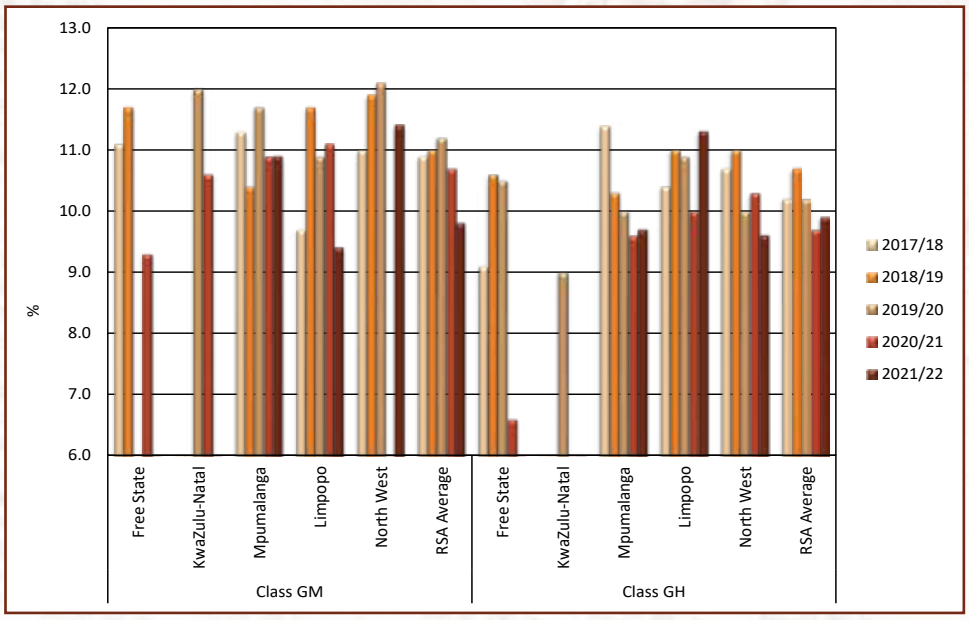
Graph 19: Average test weight per class per province



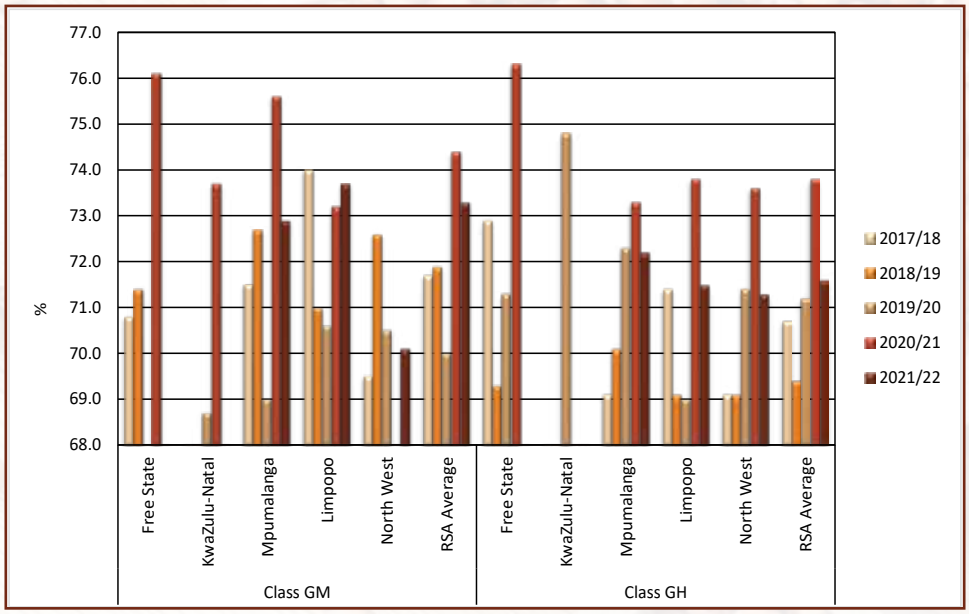
The image analysis results showed that the GM sorghum on average had longer kernels and also slightly wider kernels than the GH sorghum. The variation (indicated by the standard deviation) in these parameters is similar for both GM and GH sorghum. Kernel elongation, defined as W/L% (width divided by length, expressed as a percentage) showed a wider variation as the length and width parameters as can be expected, with average standard deviations of 5.4% for GM and 5.0% for GH sorghum. A totally round kernel will have a W/L% of 100. GM sorghum's volume to surface ratio was over the last five seasons on average 3% higher than that of GH sorghum.

The crude protein, total starch and crude fat contents of the samples were calculated and reported on a dry basis. North West had the highest protein average of 11.4% for GM sorghum, while Limpopo averaged the lowest with 9.4%. For GH sorghum, the sample from Limpopo had the highest protein content with 11.3% and North West averaged the lowest with 9.6%. Nationally, GM and GH sorghum averaged 9.8% and 9.9% respectively. The highest average total starch content for GM sorghum was reported in Limpopo (73.7%) and the lowest (70.1%) in North West. The highest average total starch content for GH sorghum, namely 72.2%, was reported in Mpumalanga. The weighted total starch content of GM sorghum was 73.3% and that of GH sorghum 71.6%. Please see Graphs 20 and 21.

Graph 20: Average percentage crude protein per class per province



Graph 21: Average percentage total starch per class per province



The crude fat content of the crop samples was determined for the first time this season. The national average for GM sorghum was 3.5% and that for GH sorghum 3.0%. There was just a slight variation of 0.1% in average fat content between provinces for both GM and GH sorghum.

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 three-dimensional 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 five seasons. The minimum and maximum values are based on a single composite 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.

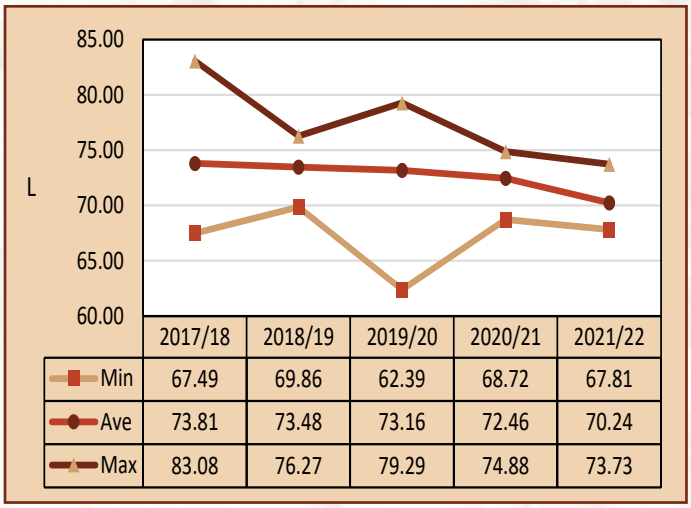
Mycotoxin analyses were performed on all 21 sorghum crop samples. The samples were tested by means of a SANAS ISO/IEC 17025 accredited multi-mycotoxin method using UPLC-MS/MS. With this technique simultaneous quantification and confirmation of Aflatoxin B_1; B_2; G_1; G_2, Fumonisin B_1; B_2; B_3, Deoxynivalenol, 15-ADON, HT-2 Toxin, T-2 Toxin, Zearalenone and Ochratoxin A is possible in one run.

One sample from Limpopo tested positive for Fumonisin B_1 residues. 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. None of the samples tested positive for any of these mycotoxins in the 2017/18, 2019/20 and 2020/21 seasons.

Please see mycotoxin results in Table 10 on page 26.

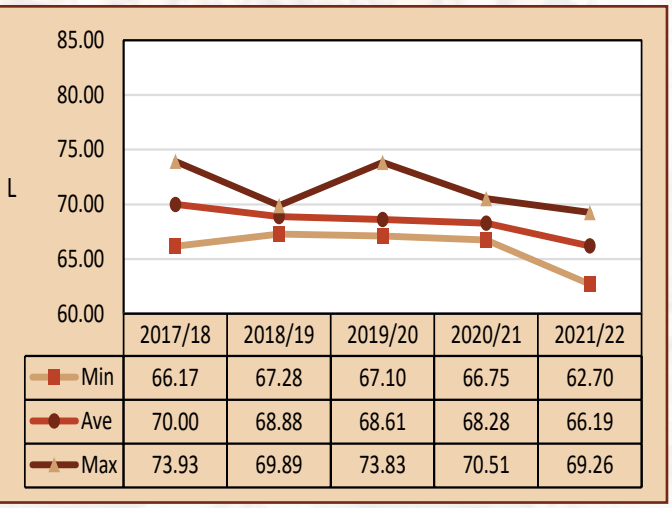
The Methods section of this report on pages 27 to 29 provide a description of the procedures and methodologies followed.

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



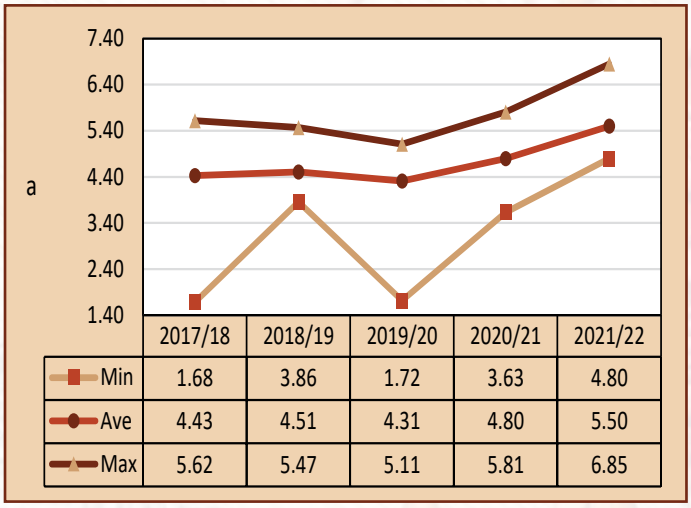
	2017/18	2018/19	2019/20	2020/21	2021/22
Min	67.49	69.86	62.39	68.72	67.81
Ave	73.81	73.48	73.16	72.46	70.24
Max	83.08	76.27	79.29	74.88	73.73

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



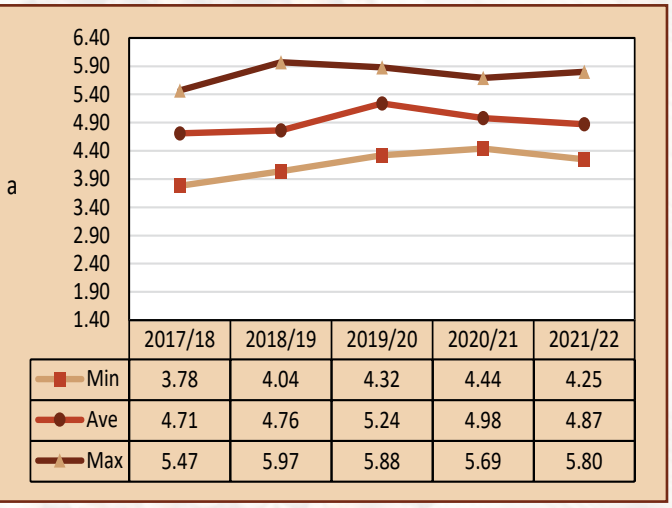
	2017/18	2018/19	2019/20	2020/21	2021/22
Min	66.17	67.28	67.10	66.75	62.70
Ave	70.00	68.88	68.61	68.28	66.19
Max	73.93	69.89	73.83	70.51	69.26

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



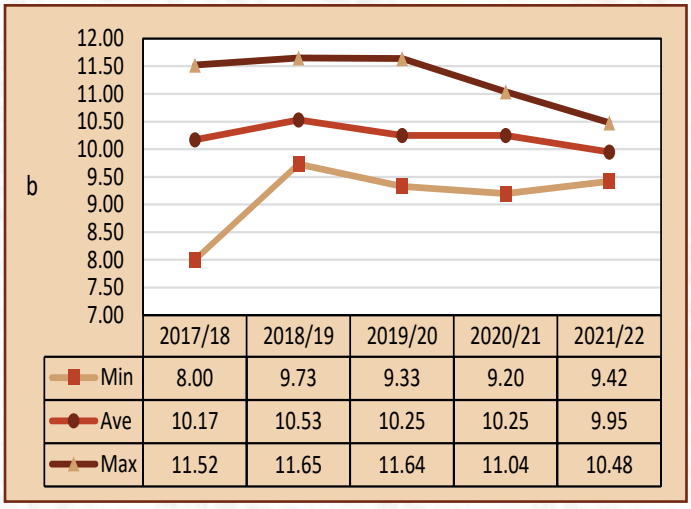
	2017/18	2018/19	2019/20	2020/21	2021/22
Min	1.68	3.86	1.72	3.63	4.80
Ave	4.43	4.51	4.31	4.80	5.50
Max	5.62	5.47	5.11	5.81	6.85

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



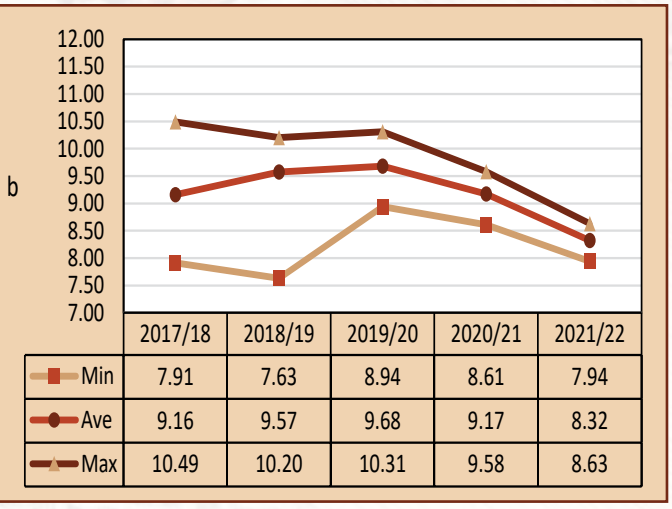
	2017/18	2018/19	2019/20	2020/21	2021/22
Min	3.78	4.04	4.32	4.44	4.25
Ave	4.71	4.76	5.24	4.98	4.87
Max	5.47	5.97	5.88	5.69	5.80

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



	2017/18	2018/19	2019/20	2020/21	2021/22
Min	8.00	9.73	9.33	9.20	9.42
Ave	10.17	10.53	10.25	10.25	9.95
Max	11.52	11.65	11.64	11.04	10.48

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



	2017/18	2018/19	2019/20	2020/21	2021/22
Min	7.91	7.63	8.94	8.61	7.94
Ave	9.16	9.57	9.68	9.17	8.32
Max	10.49	10.20	10.31	9.58	8.63