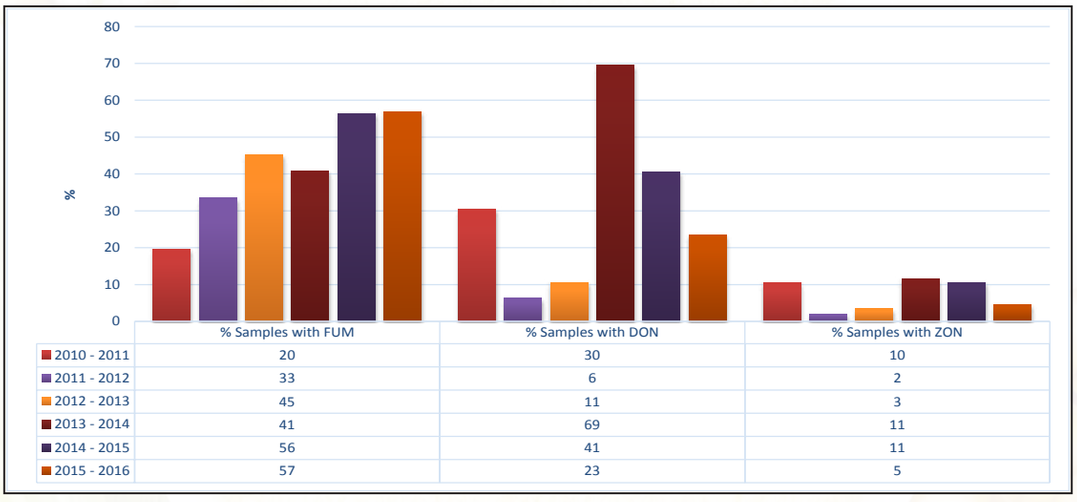
MYCOTOXINS

The annual maize crop quality surveys provide an ideal opportunity to evaluate the occurrence status of mycotoxins throughout all production regions in South Africa. Reliable analytical data is accumulated to establish a database to enable industry to comment on proposed legislative levels and to supply reliable data for targeted research projects to effectively manage the mycotoxin levels in maize.

A total number of 325 samples were analysed for mycotoxin residue levels in the 2010/2011 season. From the 2011/2012 season onwards to this, the 2015/2016 season, 350 samples were analysed annually. The samples were selected to represent all the production regions as well as both white and yellow maize proportionally.

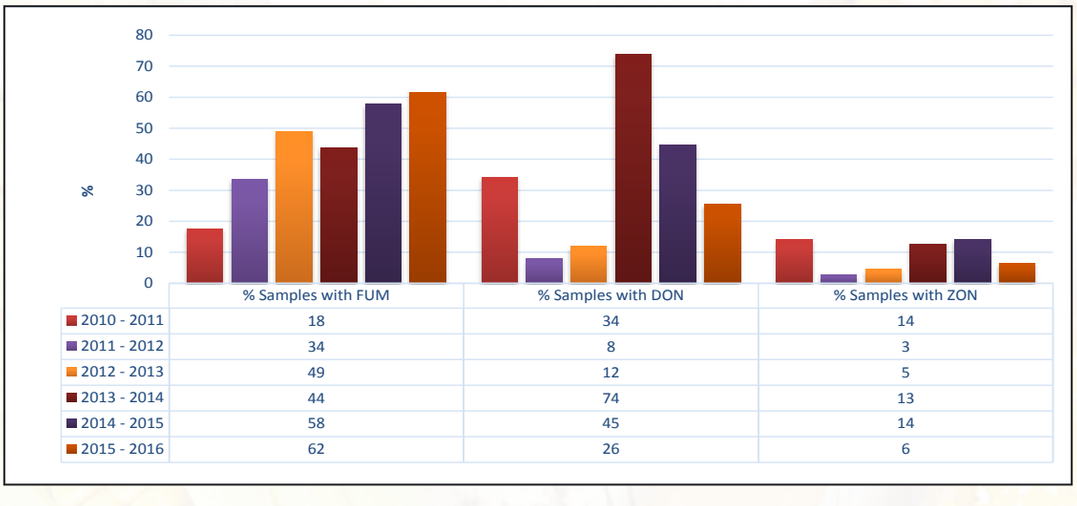
Graphs 49 to 51 provide a summary of the seasonal effect on the percentages white and yellow maize, white maize and yellow maize samples from the samples selected, that tested positive for Fumonisins (FUM), Deoxinyvalenol (DON) and Zearalenone (ZON).

Graph 49: Percentage white and yellow maize samples that tested positive for mycotoxins over six seasons



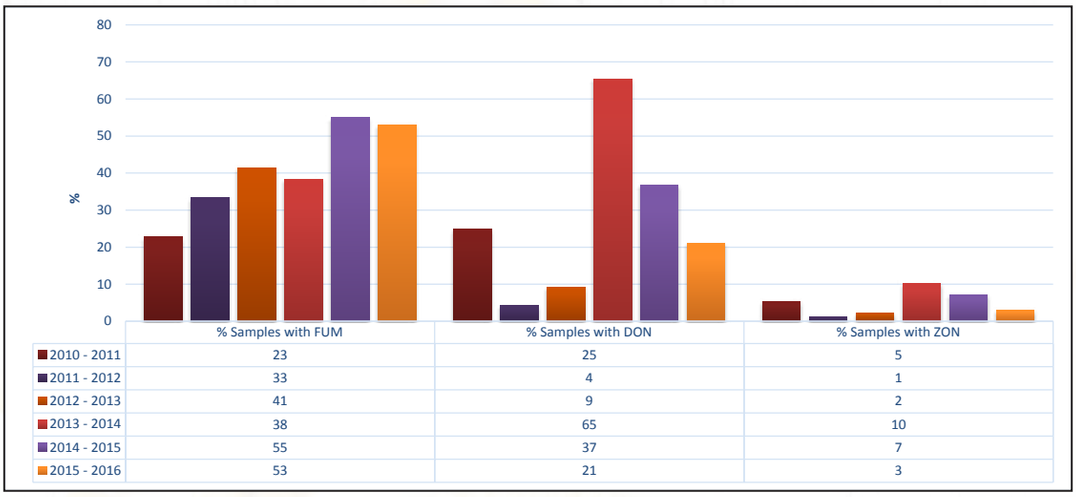
	% Samples with FUM	% Samples with DON	% Samples with ZON
2010 - 2011	20	30	10
2011 - 2012	33	6	2
2012 - 2013	45	11	3
2013 - 2014	41	69	11
2014 - 2015	56	41	11
2015 - 2016	57	23	5

Graph 50: Percentage white maize samples that tested positive for mycotoxins over six seasons



	% Samples with FUM	% Samples with DON	% Samples with ZON
2010 - 2011	18	34	14
2011 - 2012	34	8	3
2012 - 2013	49	12	5
2013 - 2014	44	74	13
2014 - 2015	58	45	14
2015 - 2016	62	26	6

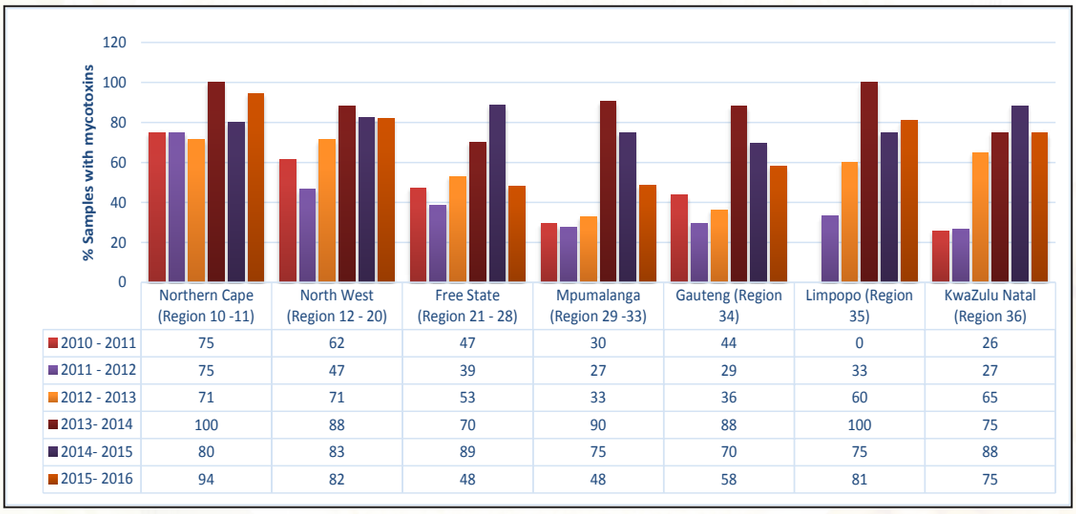
Graph 51: Percentage yellow maize samples that tested positive for mycotoxins over six seasons



	% Samples with FUM	% Samples with DON	% Samples with ZON
2010 - 2011	23	25	5
2011 - 2012	33	4	1
2012 - 2013	41	9	2
2013 - 2014	38	65	10
2014 - 2015	55	37	7
2015 - 2016	53	21	3

The percentage of samples that tested positive for mycotoxins from the samples selected per season in the different provinces, are provided in Graph 52. Three samples tested positive for Aflatoxin (Afla) residues in the 2014/2015 season. All three samples were white maize from regions in North West.

Graphs 52: Percentage of samples that tested positive for mycotoxins per province over six seasons



	Northern Cape (Region 10 -11)	North West (Region 12 - 20)	Free State (Region 21 - 28)	Mpumalanga (Region 29 -33)	Gauteng (Region 34)	Limpopo (Region 35)	KwaZulu Natal (Region 36)
2010 - 2011	75	62	47	30	44	0	26
2011 - 2012	75	47	39	27	29	33	27
2012 - 2013	71	71	53	33	36	60	65
2013- 2014	100	88	70	90	88	100	75
2014- 2015	80	83	89	75	70	75	88
2015- 2016	94	82	48	48	58	81	75

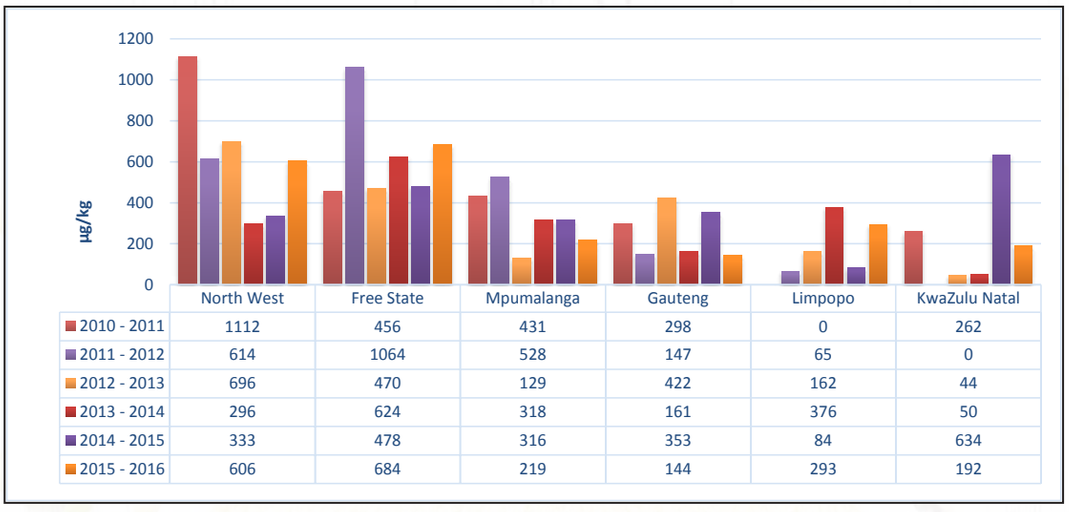
The annual BIOMIN World Mycotoxin Survey 2016 summarised the mycotoxin results of 16 511 agricultural commodity samples from 81 different countries analysed in 2016. The sixth monthly mycotoxin trends from January 2015 to December 2016 confirmed the influence of climate change patterns on the mycotoxin occurrence and levels.

Summaries of the regulated mycotoxins, aflatoxin, fumonisins, deoxynivalenol, ochratoxin A, zearalenone and T-2 toxin in the main commodities, finished feed, maize and cereals (including wheat, barley, oats and triticale) for Europe, Asia, Middle East, North America, South & Central America and Africa are included in this report.

In South & Central America, DON was present in 62% of the 715 maize samples with an average of 1 185 µg/kg of the positive samples and a maximum of 43 770 µg/kg ppb. 94% of the 1 117 maize samples from South & Central America was contaminated with FUM at an average level of 2 894 µg/kg. The highest FUM concentration in maize worldwide was detected in this region (171 920 µg/kg). The average FUM content in 56 maize sample from Africa was 1 872 µg/kg. 24% of the 2 483 maize samples from South & Central America contained aflatoxins, with an average of 8 µg/kg. In Africa, 14% of the 56 maize samples tested contained aflatoxins, with an average of 3 µg/kg and a maximum of 9 µg/kg.

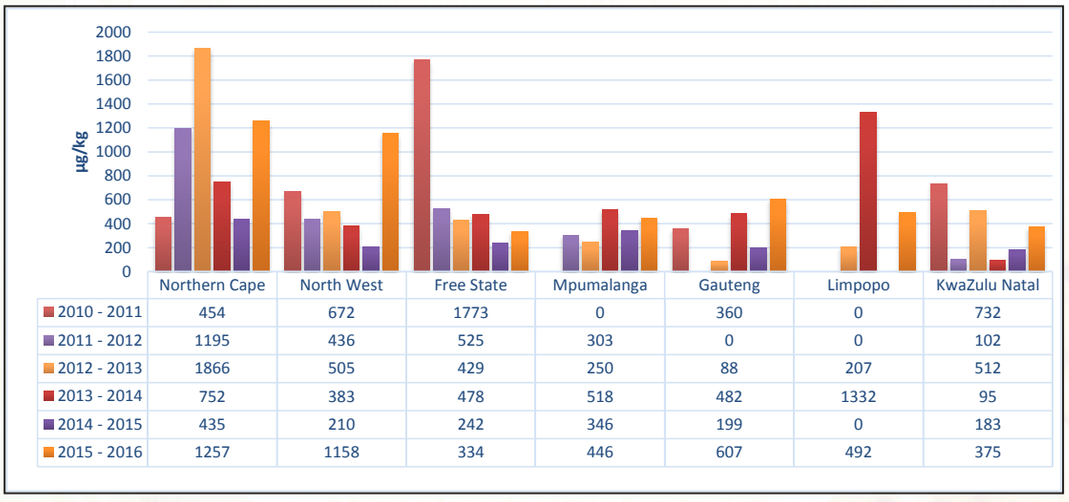
Locally, FUM and DON were found in samples from all the maize producing regions, except for Limpopo where no DON was found the past two seasons. Different patterns of occurrence are observed in different seasons. Mean concentration levels also differ over seasons. FUM tend to show higher mean concentrations on yellow maize compared to white maize from the same region. Please see Graphs 53 and 54.

Graph 53: Total Fumonisin mean concentration in white maize per province over six seasons



	North West	Free State	Mpumalanga	Gauteng	Limpopo	KwaZulu Natal
2010 - 2011	1112	456	431	298	0	262
2011 - 2012	614	1064	528	147	65	0
2012 - 2013	696	470	129	422	162	44
2013 - 2014	296	624	318	161	376	50
2014 - 2015	333	478	316	353	84	634
2015 - 2016	606	684	219	144	293	192

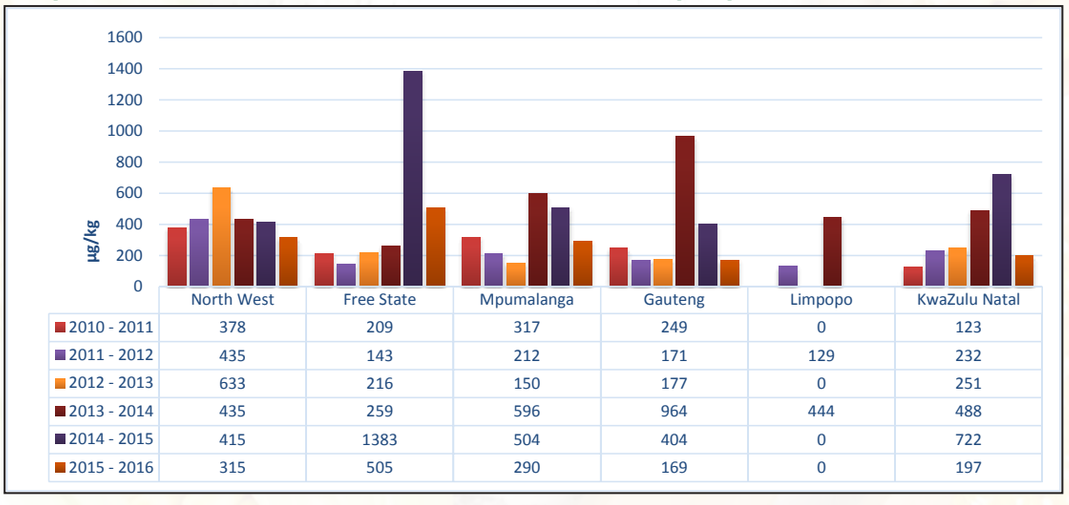
Graph 54: Total Fumonisin mean concentration in yellow maize per province over six seasons



	Northern Cape	North West	Free State	Mpumalanga	Gauteng	Limpopo	KwaZulu Natal
2010 - 2011	454	672	1773	0	360	0	732
2011 - 2012	1195	436	525	303	0	0	102
2012 - 2013	1866	505	429	250	88	207	512
2013 - 2014	752	383	478	518	482	1332	95
2014 - 2015	435	210	242	346	199	0	183
2015 - 2016	1257	1158	334	446	607	492	375

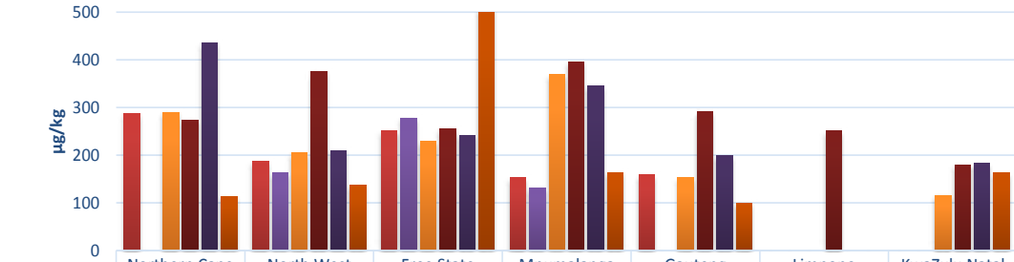
DON shows higher mean concentrations on white maize than yellow maize from the same region. Please see Graphs 55 and 56.

Graph 55: DON mean concentration in white maize per province over six seasons



	North West	Free State	Mpumalanga	Gauteng	Limpopo	KwaZulu Natal
2010 - 2011	378	209	317	249	0	123
2011 - 2012	435	143	212	171	129	232
2012 - 2013	633	216	150	177	0	251
2013 - 2014	435	259	596	964	444	488
2014 - 2015	415	1383	504	404	0	722
2015 - 2016	315	505	290	169	0	197

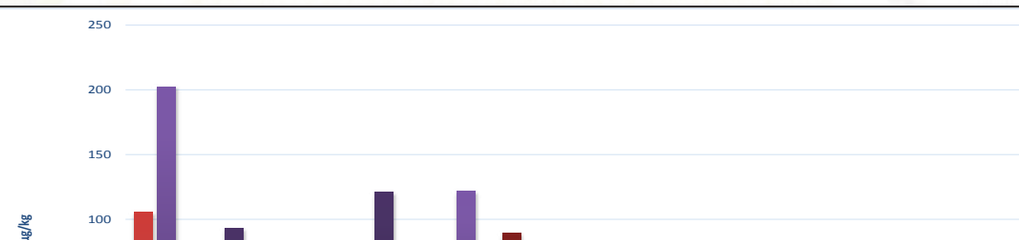
Graph 56: DON mean concentration in yellow maize per province over six seasons



	Northern Cape	North West	Free State	Mpumalanga	Gauteng	Limpopo	KwaZulu Natal
2010 - 2011	288	187	252	153	159	0	0
2011 - 2012	0	163	278	131	0	0	0
2012 - 2013	290	206	230	370	154	0	116
2013 - 2014	273	375	255	396	292	252	180
2014 - 2015	435	210	242	346	199	0	183
2015 - 2016	114	137	507	164	100	0	163

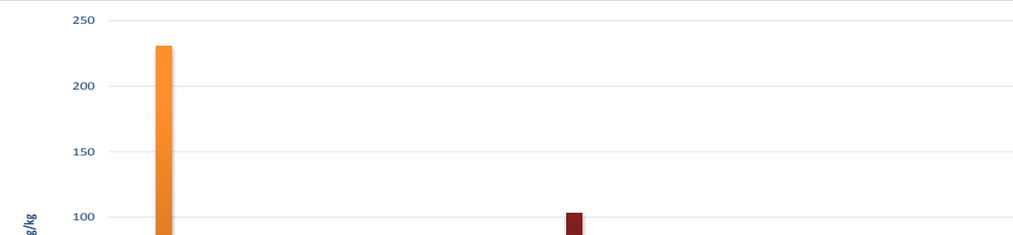
ZON mean concentrations tend to show better correlation between white and yellow maize from the same region, than FUM and DON. Please see Graphs 57 and 58.

Graph 57: ZON mean concentration in white maize per province over six seasons



	North West	Free State	Mpumalanga	Gauteng	Limpopo	KwaZulu Natal
2010 - 2011	106	32	35	69	0	35
2011 - 2012	203	38	122	0	0	0
2012 - 2013	36	20	0	20	0	75
2013 - 2014	43	54	89	51	0	44
2014 - 2015	93	121	63	33	0	27
2015 - 2016	0	25	71	0	0	65

Graph 58: ZON mean concentration in yellow maize per province over six seasons



	Northern Cape	North West	Free State	Mpumalanga	Gauteng	Limpopo	KwaZulu Natal
2010 - 2011	0	63	41	24	65	0	0
2011 - 2012	0	0	0	40	28	0	0
2012 - 2013	231	0	0	68	0	0	0
2013 - 2014	0	35	0	103	27	0	80
2014 - 2015	0	43	23	42	0	0	65
2016 - 2016	44	0	0	35	0	0	23

Table 22 on pages 76 to 87 provides the mycotoxin results of all 350 samples analysed for the 2015/2016 season. Table 23 on page 88 provides an overview of the mycotoxin results obtained from the 2004/2005 to 2015/2016 seasons.