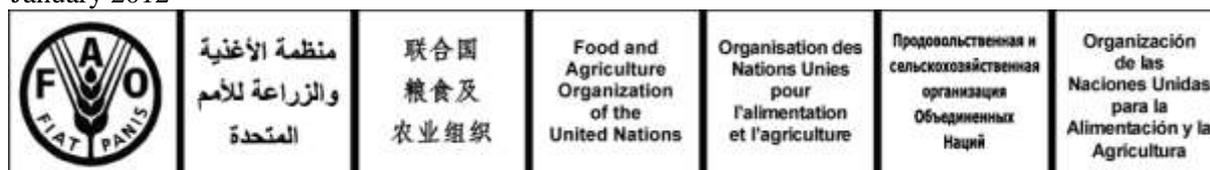


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**TEA TRADE AND QUALITY: IMPLEMENTATION OF ISO 3720 AND
MRLS IN MALAWI AND ZIMBABWE¹**

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Introduction

The International Organization for Standardization (ISO) oversees the preparation and implementation of various standards that would ensure the production and supply of commodities of acceptable standards on the international market. This is done through the ISO Technical committee, governmental and non-governmental organizations. For black tea, the supply of acceptable quality tea product is regulated through the request for each producing country to implement the Minimum Quality Standard (ISO 3720) and Maximum Residue Limits (MRLs) following the set black tea quality parameters and MRL requirements. These two standards are integral elements in the Hazard Analysis and Critical Control Points (HACCP) process adopted by all factories in Malawi and Zimbabwe in order to ensure the production of a safe tea product all the time.

The governments of Malawi and Zimbabwe, through their tea associations, are committed to fully comply with all the requirements on tea exports such as MRLs and ISO 3720. The two associations (Tea Association of Malawi (TAML) and Zimbabwe Tea Growers Association (ZTGA)), mandated their regional tea research organization, the Tea Research Foundation of Central Africa (TRFCA), to undertake the technical aspects whilst they liaise with their respective governments in formulation of relevant policies and overseeing the overall implementation process.. TRFCA has its Headquarters at Mimoso, Mulanje in Malawi and a satellite station at Chipinge in Zimbabwe.

At the FAO / IGG meeting held in New Delhi in India in April 2010, Malawi pledged to fully comply with the ISO 3720 by mid 2010. Malawi made a similar commitment on the requirements on maximum residue limits (MRLs) in tea at a meeting held in Sri Lanka. To ensure compliance on MRLs, TRFCA, which is the implementing body, engaged a consultant earlier on to undertake a survey on use of pesticides by tea growers in Malawi and Zimbabwe and advise them on the judicious use of chemicals in tea fields. The work resulted in the recommendation to avoid or minimize chemical control in the tea fields, and that where chemical control is inevitable only those chemicals that are safe to the consumers and the environment should be used, following good agriculture practices (GAPs). Only eight chemicals were thus recommended for use in Malawi and Zimbabwe.

Sampling Methods

Following these commitments, work on the implementation of both MRLs and ISO 3720 requirements in Malawi and Zimbabwe is at an advanced stage. Samples were collected from tea factories in Malawi and Zimbabwe, following the recommended procedure for ISO 3720 as described in Tea sampling for International standard ISO 1839-1980 (E). In Malawi, two sets of samples were collected. The first set comprised graded tea samples that were collected from all the factories, in June 2010 while the second set comprised dryer mouth (ungraded) samples collected from four factories only. The samples were sent to Tocklai Tea Research Station in India for the required analyses. Unfortunately, these samples were not analyzed by Tocklai due to logistical problems. As a result, a

new batch of dryer mouth samples was collected from 15 tea factories in April 2011 and sent to UPASI for analysis for both MRLs and ISO 3720 requirements.

In addition to the samples collected by TRFCA, individual estates collect and send samples to the Malawi Bureau of Standards for analysis for the required tests.

In Zimbabwe, black tea samples were collected from six factories in Chipinge in May 2011. The samples were sent to the Tea Quality Laboratory at UPASI Tea Research Foundation in Southern India for ISO 3720 analysis. Unfortunately, the samples were not analyzed for MRL standards.

The parameters that were analyzed for ISO 3720 were total ash (T Ash), water soluble ash (WSA), alkalinity of water soluble ash (AWSA), acid insoluble ash (AIA), water extract (WE), crude fibre content (CFC) and total polyphenols (TP). On MRLs, the samples were analysed for residues of sulphur, copper, cypermethrin, alpha-cypermethrin, deltamethrin, glyphosate, fipronil, Tralomethrin, Metolachlor and Terbutylazine.

Results and Discussion

Results for analysis of the MRLs and ISO 3720 are presented in tables below. There were significant differences in the parameters for the ISO 3720 among the factories. However, most of the factories were compliant to the requirements for international trade.

Maximum Residue Levels (MRLs)

The samples sent to UPASI were analysed for sulphur, copper, cypermethrin, deltamethrin and glyphosate residues in black tea. As shown in Table 1 below, teas from all the factories in Malawi were very free from residues of all the chemicals recommended for the control of weeds, insect pests and diseases in tea.

Table 1. Residues of various compounds in black tea samples from different factories in Malawi analysed at UPASI in July 2011

Estate	Sulphur (%)	Copper (mg/kg)	Cypermethrin	A-cypermethrin	Deltamethrin	Glyphosate
Bloomfield	0.25	13.44	<LoQ	<LoQ	<LoQ	<LoQ
Esperanza	0.18	14.13	<LoQ	<LoQ	<LoQ	<LoQ
Kasembereka	0.21	14.87	<LoQ	<LoQ	<LoQ	<LoQ
Limbuli	0.13	10.30	<LoQ	<LoQ	<LoQ	<LoQ
Lujeri	0.16	9.73	<LoQ	<LoQ	<LoQ	<LoQ
Mianga	0.17	11.43	<LoQ	<LoQ	<LoQ	<LoQ
Minimini	0.17	11.56	<LoQ	<LoQ	<LoQ	<LoQ
Ruo	0.16	11.87	<LoQ	<LoQ	<LoQ	<LoQ
Chisunga	0.11	13.02	<LoQ	<LoQ	<LoQ	<LoQ
Conforzi	0.13	11.28	<LoQ	<LoQ	<LoQ	<LoQ
Naming'omba	0.11	10.64	<LoQ	<LoQ	<LoQ	<LoQ
Nchima	0.13	11.62	<LoQ	<LoQ	<LoQ	<LoQ
STECO	0.10	11.48	<LoQ	<LoQ	<LoQ	<LoQ
Satemwa	0.18	12.94	<LoQ	<LoQ	<LoQ	<LoQ
Sayama	0.12	13.42	<LoQ	<LoQ	<LoQ	<LoQ
EU specification		150	0.5 mg/kg	0.5 mg/kg	5 mg/kg	2 mg/kg

In addition to the samples analysed by UPASI, some samples were also analysed in Japan by Japan Ecotech Co; Ltd for Glyphosate, Fipronil, Deltamethrin and Tralomethrin, Cypermethrin, Metolachlor and Terbutylazine residues (Table 2) in April 2010.

The results for the samples analysed in Japan also showed that teas from Malawi had residue levels of various compounds below harmful limits, implying that the teas were very safe for human consumption.

Table 2. Residues of various compounds in black tea samples from Malawi analysed at Japan Ecotech Company Ltd in April 2010

Agrochemical	Detected level*(ppm) (%)	LOQ** (ppm)	MRLs*** (Fermented tea)
Glyphosate	ND	0.05	1.0
Fipronil	ND	0.002	0.002
Deltamethrin	ND	0.05	10
Tralomethrin	ND	0.05	10
Cypermethin	ND	0.05	20
Metolachlor	ND	0.01	-
Terbutylazine	ND	0.01	-

Key: *ND=Not detected; **LOQ=Limit of quantification; ***MRLs=Maximum Residue Limits

ISO 3720 requirements

As shown in Table 3, all factories met the prescribed limits for alkalinity of water-soluble ash, water extract, crude fibre content and total polyphenol content. For total ash, water-soluble ash and acid insoluble ash all the factories, except one, met the prescribed specifications. Inspections to the factory showed that the recommended processing practices were being followed. However, the grower / processor was advised to avoid impurities (foreign matters) such as woody substances that can lead to increased total ash; insoluble substances that can lead to low water soluble ash; and siliceous materials like sand and mica that can lead to increased acid insoluble ash.

It is hoped that the next sampling will show that all the factories are compliant to the ISO 3720 standards.

Table 3. ISO 3720 parameters (%) for samples from different factories in Malawi

Code	Estate	T ash	WSA	AWSA	AIA	WE	CFC	TP
1	Bloomfield	7.50	55.04	1.96	0.76	39.11	11.69	12.46
2	Esperanza	7.23	55.26	1.86	0.62	39.76	11.51	15.16
3	Kasembereka	7.60	53.80	1.86	0.91	38.94	11.69	12.66
4	Limbuli	7.17	53.45	1.69	0.63	39.79	11.55	13.22
5	Lujeri	6.32	60.32	1.72	0.53	39.88	10.73	14.57
6	Mianga	7.46	55.28	1.75	0.60	38.75	11.29	14.37
7	Minimini	6.53	55.95	1.49	0.58	38.41	10.49	15.62
8	Ruo	8.52*	38.75*	1.69	1.87*	36.17	9.98	12.92
9	Chisunga	7.36	54.75	2.06	0.65	37.13	10.79	12.64
10	Conforzi	7.01	56.84	2.01	0.47	37.10	10.91	12.92

Code	Estate	T ash	WSA	AWSA	AIA	WE	CFC	TP
11	Naming'omba	7.91	53.87	1.98	0.90	35.63	12.34	12.10
12	Nchima	7.39	56.40	1.97	0.56	38.86	10.85	13.74
13	STECO	7.04	53.36	2.16	0.58	40.57	11.26	14.24
14	Satemwa	7.14	55.18	1.99	0.48	37.06	10.43	13.72
15	Sayama	6.69	55.13	1.89	0.57	39.06	9.98	14.17
Mean		7.191	54.22	1.871	0.715	38.39	11.091	1.633
P		0.001	0.001	0.002	0.001	0.001	0.001	0.001
CV%		6.4	3.6	8.4	15.6	1.9	2.2	3.2
LSD		0.7692	3.309	0.2631	0.1863	1.225	0.4014	0.7268
Maximum		8	-	3	1	-	16.5	-
Minimum		4	45	1	-	32	-	9
Key: * denotes specification not met								

There were highly significant differences ($p < .001$) in all the ISO 3720 parameters analyzed from the drier mouth samples collected from all the factories in Zimbabwe (Table 4). All factories under Southdown and Tanganda Estates met the prescribed limits of the ISO 3720 standard specifications in drier mouth samples collected.

Table 4. ISO 3720 parameters (%) for samples from different factories in Zimbabwe

ISO 3720 Standard Specifications							
Limit	T Ash	WSA	AWSA	AIA	WE	CFC	TP
Maximum	8	-	3	1	-	16.5	-
Minimum	4	45	1	-	32	-	9
Results of specifications analysis							
Factory	T Ash	WSA	AWSA	AIA	WE	CFC	TP
Roscommon	6.53	56.83	2.26	0.63	35.97	13.87	12.92
Southdown	6.53	60.70	2.25	0.54	39.63	11.41	14.12
Jersey	6.48	59.16	1.89	0.44	40.53	10.18	13.43
Ratelshoek	6.62	59.69	1.88	0.34	39.63	11.00	13.16
Tingamira	6.32	62.05	1.96	0.42	40.84	10.99	12.94
Zona	6.40	57.32	2.12	0.40	39.39	10.33	13.28
Mean	6.60	58.15	2.13	0.53	38.77	11.72	11.42
P	<.001						
CV%	1.6	1.8	2.4	18.7	1.7	4.6	8.1
LSD	0.1559	1.531	0.0737	0.1431	0.959	0.7807	1.482

Conclusion

Malawi and Zimbabwe have made very good progress in their efforts to fully comply with the international tea trade and quality requirements as demanded by consumers, producer- and importing-countries through the FAO/IGG. With regard to MRLs, it is expected that teas from Malawi and Zimbabwe will always meet the prescribed specifications because the tea industries are trying as much as possible to keep cultivation insecticide-free. Growers are also advised to fully adopt good agricultural practices (GAP) and good manufacturing practices (GMP) for the implementation of the HACCP process to ensure that safe tea is produced all the time.

Monitoring of these quality standards will be done regularly by sampling and analyzing the samples twice each year.