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Review

Aflatoxins: Producing-Molds, Structure, Health Issues and Incidence in Southeast Asian and Sub-Saharan African Countries

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Table S1. Key properties of aflatoxins and their metabolites. Data compiled from PubChem of the National Center for Biotechnology Information [1] and ChemSpider of the Royal Society of Chemistry [2] databases, unless references are indicated beside the data.

Aflatoxin	MW (g/mol)	Formula	Melting Point (°C) [a]	Toxicity			Adverse Health Effects [b]
				LD_{50} (mg/kg bw)	Test Organism	Route	
Aflatoxin B1	312.063	$C_{17}H_{12}O_6$	268.5	0.24–60 [3] 3.0	Various animals and chick embryo Human	Oral, intraperitoneal or injection in chick embryo In vitro experiments	Hepatotoxicity, genotoxicity, carcinogenicity, immuno-toxicity, teratogenicity
Aflatoxin B2	314.079	$C_{17}H_{14}O_6$	286–289 [3]	1.7	Duck	Oral	Week mutagenicity, hepatotoxicity, and carcinogenicity [4]
Aflatoxin $B2_a$	330.074	$C_{17}H_{14}O_7$	240 [3]	>400 μg showed a weak toxicity [5,6]	Ducklings	Oral	Low toxicity (200-fold less than B1) [6,7]
Aflatoxin M1	328.058	$C_{17}H_{12}O_7$	297–299	0.32 1.5	Duck Rat	Unreported Oral	Hepatotoxicity, nephrotoxicity, carcinogenicity
Aflatoxin M2	330.074	$C_{17}H_{14}O_7$	237–240	3.1 [8]	Ducklings [8]	Oral [8]	Same as M1 but to a lesser extent
Aflatoxin P1	298.048	$C_{16}H_{10}O_6$	240	>150 mg/kg > 190 ng/egg [3]	Mouse Chick embryo [3]	Intraperitoneal Injection [3]	Same as B1 but to a lesser extent
Aflatoxin Q1	328.058	$C_{17}H_{12}O_7$	250	207 ng/egg [9] NR	Chick embryo [9] Bacteria [4]	Injection [9] Ames' test [4]	Non-carcinogenic on fish [4] 50-fold less mutagenic than B1
Aflatoxicol (R_0) [c]	314.079	$C_{17}H_{14}O_6$	230–234 [3]	NA NR	NA Bacteria	NA Ames test	Hepatotoxicity, carcinogenicity and mutagenicity. Forms the same DNA-adduct as B1. Two to 18-fold less toxic than B1 [4,10–15]
Aflatoxicol M1 [d]	330.074	$C_{17}H_{14}O_7$	215.31 (predicted)	NA NR	NA Bacteria [16]	NA Ames' test [16]	Low toxicity, mutagenicity, and carcinogenicity [4,17]
Aflatoxicol H1 [d]	330.074	$C_{17}H_{14}O_7$	NA	Not toxic [18] NR	Chick embryo [18] Bacteria [18]	Injection 104] Ames' test [18]	Weekly toxic to inactive (A detoxified form of B1) [19]
Aflatoxin G1	328.058	$C_{17}H_{12}O_7$	244–246	0.8 [8]	Duckling	Oral	Hepatotoxicity, nephrotoxicity, Carcinogenicity (animals)

Aflatoxin G2	330.074	$C_{17}H_{14}O_7$	237–240 226–229	2.5 [8] Weekly mutagenic	Duckling *S. typhimurium*	Oral Ames' test	Low toxicity, no evidence for carcinogenicity in animals [4,19,20]
Aflatoxin G2a [d]	346.069	$C_{17}H_{14}O_8$	243.13 (Predicted)	NA	NA	NA	Low toxicity to inactive (a detoxified form of G1) [4,19]
Aflatoxin GM1	344.053	$C_{17}H_{12}O_8$	276	NA	NA	NA	NA
Aflatoxin GM2	346.069	$C_{17}H_{14}O_8$	270–272	NA	NA	NA	NA
Parasiticol	302.079	$C_{16}H_{14}O_6$	233.4– 234.1[17]	05.0 to 10.0 μg/egg 50.0 μg/duck [17]	Chick embryo Duckling [17]	Injection Oral [17]	Lower toxicity than G1 Same acute toxicity as B1. No or weak carcinogenicity [17]
Aspertoxin	354.074	$C_{19}H_{14}O_7$	NA	0.7 μg/egg [21]	Chick embryo [21]	Injection [21]	Teratogenic on chicken. Same fatality rate in chick embryo as B1[21]

[a] Data collected from ChemSpider website (http://www.chemspider.com) unless indicated by an imbedded citation; [b] In the latest classification of mycotoxins, the IARC stated that there is "sufficient evidence" for the carcinogenicity of aflatoxins B1, G1, and M1 in experimental animals, but there is "limited evidence" or "insufficient evidence" in experimental animals for the carcinogenicity of aflatoxins B2 and G2, respectively; however, in view of mechanistic studies showing the ability of the major aflatoxins (B1, G1, B2, G2, M1) to form DNA adducts as a first step in genotoxicity, they were classified in group 1 carcinogens [20]; [c] Usually designated as the aflatoxin B1 reservoir, as it readily converts back to B1 by action of a dehydrogenase; [d] Mutagenicity induced in *Salmonella typhimurium* is <1% that of aflatoxin B1 taken as a reference [4]. *Abbreviations:* NA: Not available; NR: Not relevant; bw: Body weight.

Table S2. Incidence (%) and concentrations (μg/kg) of aflatoxins in staple agricultural products of selected countries from Sub-Saharan Africa. Data are for total aflatoxins (B1+B2+G1+G2), unless otherwise stated in the footnotes.

Country	AEZ	Peanut/Groundnut		Maize		Millet		Sorghum		Sunflower		References
	(Climate type) [a]	Mean [b] (Range)	+ve (%)	Mean (Range)	+ve (%)	Mean (Range)	+ve (%)	Mean (Range)	+ve (%)	Mean (Range)	+ve (%)	
Uganda	Kioga planes [c] (Am)	7.3–221 (2.5–450)	20–60	25.4–71 (4.5–180)	50–80	-	-	61–170 (4–26)	80–100	-	-	[22]
	Western (Aw)	7.0 (3–13)	25	75.2 (3.5–248)	95	-	-	-	-	-	-	
	Savannah (Aw)	8.8 (5.5–12)	30	26.56 (3.3–105)	100	-	-	11.5 (29–472)	100	-	-	
	Grasslands (Aw)	85.4 (2.5–175)	30	46.0 (3.1–510)	95	-	-	102.3 (28–227)	100	-	-	
	South-East (Af)	-	-	-	-	14.0 (NS-NS)	100	-	-	-	-	[23]
	Commercial [d]	181 (0–849)	82	-	-	-	-	-	-	-	-	[24]
Kenya	Tharaka-Nithi (Cbw)	-	-	24[e(R)] (<1–537)	88[e(R)]	11[e(R)] (<1.0–152)	64[e(R)]	1.2[e(R)] (<1–18)	33[e(R)]	-	-	[25]
		-	-	23.9[e(D)] (<1.0–775)	75.4[e(D)]	66[e(D)] (<1–1658)	69[e(D)]	1.5[e(D)] (<1.0 – 23.1)	85[e(D)]	-	-	
	Kisii (Af and Cfb)	NS (1.6–591)	100	-	-	-	-	-	-	-	-	[26]
		-	-	4.0[e(R)] (<1–103)	46.8[e(R)]	0.1[e(R)] (<1–3.0)	21[e(R)]	0.9[e(R)] (<1–16.4)	11[e(R)]	-	-	[25]
		-	-	8.9[e(D)] (<1.0–372)	78[e(D)]	0.5[e(D)] (<1–2.9)	77[e(D)]	-	-	-	-	
		-	-	28.5[e] (<1.0–559)	76.3	-	-	-	-	-	-	[27]
	Migori (Am)	-	-	12.7[e] (0.98–121)	56	-	-	-	-	-	-	
	Bungoma (Cfb)	-	-	7.9[e(R)] (<1–218)	81[e(R)]	0.6[e(R)] (0–2.9)	98[e(R)]	3.5[e(R)] (<1–92)	97[e(R)]	-	-	[25]
		-		3.5[e(D)] (<1.0–39.3)	72[e(D)]	0.9[e(D)] (<1.0 – 13.8)	75[e(D)]	0.9[e(D)] (<1.0–12.3)	84[e(D)]			

Isiolo (Aw)	-	-	9.6[e(R)] (<1–121)	98[e(R)]	-	-	3.8[e(R)] (<1–12.8)	100[e(R)]	-	-	
	-	-	67.3[e(D)] (<1.0–1137)	50[e(D)]	-	-	2.0[e(D)] (<1.0–11.9)	57[e(D)]	-	-	
Kwale (As)	-	-	29[e(R)] (<1–394)	97[e(R)]	-	-	-	-	-	-	
	-	-	3.5[e(D)] (<1.0 – 19.2)	95[e(D)]	-	-	-	-	-	-	
Eldoret (Cfb)	1147 (NS-NS)	NS	-	-	-	-	-	-	1524 (NS-NS)	NS	[28]
Nandi (Aw)			1.3[f] (0–3.92)	-	-	-	-	-	-	-	[29]
	-	-	0.98 (0.1–5.3)	68	1.6 (0.14–11)	92	24.5 (0.15–210)	66	-	-	
Makueni (Aw)	-	-	24.8 (0.1–279)	80	17.2 (0.4–231)	82	17.8 (0–265)	86	-	-	[30]
Busia (Am)	NS (0.1–268)	97.1	-	-	-	-	-	-	-	-	[26]
	NS (>20–7525)	7.5	-	-	-	-	-	-	-	-	[31]
Homabay (Aw)	-	-	24.5[e] (0.98–722)	56	-	-	-	-	-	-	[27]
Kitale (Cfb)	-	-	9.7 (0–72)	70	-	-	-	-	-	-	[32]
Nakuru (Cfb)	-	-	4.2 (0–13)	97	-	-	-	-	-	-	
Makueni-Kitui (Aw, BSh)	-	-	9. 1[g(Gm)] (0–48,000)	35[h]	-	-	-	-	-	-	[33]
Korogocho (Cwb)	-	-	6.7 (0–89)	NS	-	-	8.1 (0.2–194)	NS	-	-	[34]
Dagoretti (Cfb)	-	-	3.0 (0–20)	NS	-	-	2.6 (0.1–15)	NS	-	-	
Makueni (BSh, Aw, Cwb)	-	-	52.9[g(Gm)] (<1–5400)	59[h]	-	-	-	-	-	-	[35]
	-	-	39[e] (0.01–1455)	68	-	-	-	-	-	-	[27]

		-	-	24.8 (0.05–279)	80	17.2 (0.4–231)	82	17.8 (0.04–265)	86	-	-	[36]
	Embu (Aw)	-	-	196.3[e] (0.95–9092)	64	-	-	-	-	-	-	[27]
	Kitui (BSh and Aw)	-	-	0.7 (0–13)	97	-	-	-	-	-	-	[32]
		-	-	35.3[g(Gm)] (<1–25,000)	45[h]	-	-	-	-			[35]
	Machakos (Cwb)	-	-	17.8[g(Gm)] (<1–3800)	52[h]	-	-	-	-	-	-	
		-	-	11[e] (1.3–71)	61	-	-	-	-	-	-	[27]
	Thika (Cwb)	-	-	7.52[g(Gm)] (<1.0–46,400)	25[h]	-	-	-	-	-	-	[35]
	Commercial[4]	NS (>4.0–32,328)	49	-	-	-	-	-	-	-	-	[37]
Tanzania	Long, Babati (Cwb)	-	-	2.6 (2.1–3.6)	17	-	-	-	-	-	-	[38]
	Sabilo, Babati (Cwb)	-	-	3.32 (2.2–26)	28	-	-	-	-	-	-	
	Seloto, Babati (Cwb)	-	-	2.62 (2.1–4.0)	13	-	-	-	-	-	-	
	Tabora (Aw)	-	-	NS (5–158)	37	-	-	-	-	-	-	[39]
	Kilimanjaro (Cwb)	-	-	NS (1.0–80)	20	-	-	-	-	-	-	
	Ruvuma (Aw)	-	-	NS (7–26)	6	-	-	-	-	-	-	
	Iringa (Cwb)	-	-	NS (13–58)	7	-	-	-	-	-	-	
	Kilosa (Aw)	-	-	106 (3.0–1081)	18	-	-	-	-	-	-	[40]
	Hanang' (Csb)	-	-	4.0 (3.0–5.0)	8	-	-	-	-	-	-	
	Rungwe (Cwb)	-	-	5 (2–8)	4	-	-	-	-	-	-	
	Chitego	21.9	NS	-	-	-	-	9.1	NS	19.0	NS	[41]

	(Aw)	(0–56)						(0–62.5)		(0–605)		
	Laikala (Bsh)	84.9 (0–427)	NS	0.76 (0–1.2)	NS	-	-	2.7 (0–29.8)	NS	61.1 (0–489)	NS	
	Mlali (Bsh)	85.4[e] (0–298)	NS	2.8[e] (0–22)	NS	-	-	25.7[e] (0–70)	NS	4.9[e] (0–44)	NS	
	Moleti (Bsh)	377.3[e] (0–3297)	NS	4.2[e] (0–43)	NS	-	-	9.4[e] (0–73.9)	NS	100[e] (0–425)	NS	
	Njoro (Csb)	289.7[e] (0–1179)	NS	2.5[e] (0–29.2)	NS	-	-	93.3[e] (0–138.7)	NS	82.0[e] (0–295)	NS	
	Babati (Cwb)	-	-	-	-	-	-	-	-	46.8[i] (1.8–162)	83	
	Singida (BSh)	-	-	-	-	-	-	-	-	45.8[i] (1.4–262)	83	
	Dodoma (BSh)	-	-	-	-	-	-	-	-	59.6[i] (1.7–281)	71	[42]
	Mbeya (Cfa)	-	-	-	-	-	-	-	-	21[i] (1.4–174)	89	
	Morogoro (Aw)	-	-	-	-	-	-	-	-	119[i] (2.8–663)	50	
Zambia	Chipata (Aw)	451 (>1–4000)	NS	-	-	-	-	-	-	-	-	
	Petauke (Cwa)	4.34 (>1–10)	NS	-	-	-	-	-	-	-	-	
	Ndola (Cwa)	242 (>1–1600)	NS	-	-	-	-	-	-	-	-	
	Katete (Cwa)	13.6 (>1–74)	NS	-	-	-	-	-	-	-	-	[43]
	Kitwe (Cwa)	499 (>1–11,100)	NS	-	-	-	-	-	-	-	-	

	Kabwe (Cwa)	21.4 (>1–145)	NS	-	-	-	-	-	-	-	-	
	Southern area[j] (BSh, Cwa)	22.0 (3.9–621)[k]	100[l]	12.0 (3.9–621)[k]	73[l]	-	-	-	-	-	-	[44]
	Central area[m] (Cwa)	90 (0–3420)[k]	51[l]	11.0 (0–3420)[k]	42[l]	-	-	-	-	-	-	
South Africa	Northen area[n] (Cwb)	6.0 (0–1416)[k]	27[l]	25 (0–1416)[k]	22[l]	-	-	-	-	-	-	[45]
	Limpopo (BSh)	-	-	48[e] (0–133)	20	-	-	-	-	-	-	
	Mpumalanga (Cfb)	-	-	1 (1–2)[e]	6.5	-	-	-	-	-	-	[45]
	Commercial[d]	14 (0–74)	90	-	-	-	-	-	-	-	-	[46]
	All regions	ND	0	-	-	-	-	-	-	-	-	[47]
Nigeria	Kano (BSh)	6.0[o(LB)] (<0.1–97)	26	-	-	-	-	-	-	-	-	[48]
	Lagos (Aw)	-	-	0.6[o(LB)] (0–5)	10	-	-	-	-	-	-	
	Sokoto (BSh)	96.0 (1–415)	-	-	-	-	-	-	-	-	-	[49]
	Isa (BSh)	64.0 (2.0–317)	-	-	-	-	-	-	-	-	-	
	Tambuwal (BSh)	92.9 (0.9–646)	-	-	-	-	-	-	-	-	-	
	Ogun (Aw)	-	-	300 (NS-NS)	NS	34.3 (NS-NS)	NS	221 (NS-NS)	NS	-	-	[50]
	Lagos (Aw)	-	-	603 (NS-NS)	NS	120.5 (NS-NS)	NS	1245 (NS-NS)	NS	-	-	
	South-East (Am, Aw)	-	-	43[(Gm)] (2.7–1460)	87.5[p]	-	-	-	-	-	-	[51]
	Western states (Aw)	-	-	200 (25–770)	45	-	-	-	-	-	-	[52]
	Suleja and Tafa (Aw)	-	-	-	-	-	-	225[e(ML)] (0–728)	64	-	-	[53]
	Borgu and Magama (Aw)	-	-	-	-	-	-	210[e(ML)] (0–712)	55	-	-	

	Minna Mokowa (Aw)	-	-	-	-	-	-	165[e(ML)] (0–721)	57	-	-	
	Mariga-Rafi-Wushishi (Aw)	-	-	-	-	-	-	198[e(ML)] (0–1164)	45	-	-	
Cameroun	South-West (Am, Af)	26[e] (6.0–125)	NS	100[e] (6–645)	NS	-	-	-	-	-	-	[54]
	South-East (Am)	22[e] (6.0–77)	NS	96[e] (6–216)	NS	-	-	-	-	-	-	
	Western highland (Aw)	22[e] (6.0–110)	NS	47[e] (6–210)	NS	-	-	-	-	-	-	
Ghana	Ashanti (Aw, HF)	2.2 (0–17)	NS	6 (0–135)	NS	-	-	-	-	-	-	[55]
	Brong Ahafo (Aw, HF)	5.5 (0–54)	NS	0.6 (0–9)	NS	-	-	-	-	-	-	
	Volta (Aw, HF)	42.4 (0–387)	NS	9.0 (0–83)	NS	-	-	-	-	-	-	
	Brong Ahafo (Aw, DS)	145.6 (0–1999)	NS	16.8 (0–226)	NS	-	-	-	-	-	-	
	Northern (Aw, DS)	78 (0–3868)	NS	15.9 (0–341)	NS	-	-	-	-	-	-	
	Upper East (Aw, SGS)	0.3 (0–1.0)	NS	15.4 (0–82)	NS	-	-	-	-	-	-	[56]
	Upper West (Aw, SGS)	15.9 (0–181)	NS	16.4 (0–190)	NS	-	-	-	-	-	-	
	Akomadan (Aw, FRT)	-	-	NS (0–112)	83	-	-	-	-	-	-	[57]
	Ejura (Aw, FRT)	-	-	NS (1–945)	100	-	-	-	-	-	-	
	Wenchi (Aw, SVT)	-	-	NS (0–23)	71	-	-	-	-	-	-	
	Fumesua (Aw, RFR)	-	-	NS (0–692)	78	-	-	-	-	-	-	
	Commercial[d]	-	-	38.7 (3–275)	42	-	-	14 (6–19)	25	-	-	[56]
Togo	Volta (Aw, DS)	0.3 (0–1.0)	NS	24.2 (0–157)	NS	-	-	-	-	-	-	[56]
	Northern (Aw, SGS)	34.9 (0–168)	NS	6.8 (0–59)	NS	-	-	-	-	-	-	

Benin	Littoral (Aw)	7.6[o(LB)] (<0.1–105)	19	-	-	-	-	-	-	-	-	[48]
	Borgou (Aw)	-	-	1.6[o(LB)] (<0.1–20)	32	-	-	-	-	-	-	
Mali	Bamako (Aw)	9.4[o(LB)] (<0.1–246)	15	-	-	-	-	-	-	-	-	
	Sikasso (Aw)	2.2[o(LB)] (<0.1–43)	29	-	-	-	-	-	-	-	-	
Mozambique	Amendo	362.2 (0–2740)	NS									[58]
	Mugovola (Aw)	230.7 (0–1382)	NS									
	Murrupuia (Aw)	750.8 (0–1320)	NS									
	Erati (Aw)	20.5 (0–167)	NS									[59]
	Manhica-Magude (Aw)	0.82 (NS-NS)	4.3									
	Massinga (Aw)	1.35 (NS-NS)	2.4									
	Morrumbene (Aw)	3.13 (NS-NS)	7.2									
	Inharrime (Aw)	3.50 (NS-NS)	5.2									
	Homoine-Maxixe (Aw)	5.12 (NS-NS)	13.4									
	Zavala (Aw)	6.62 (NS-NS)	11.9									

[a] The type of climate (in the parenthesis) is defined according to Köppen-Geiger classification [60]: Cfb: Warm temperate (C) fully humid (f) warm summer (b); Cwa: Warm temperate (C) winter dry (w) hot summer (a); Cwb: Warm temperate (C) winter dry (w) warm summer (b); Af: Tropical (A) fully humid (f); Aw: Tropical (A) winter dry (w); As: Tropical (A) steppe (s); Am: Tropical (A) monsoonal (m), Csb: Warm temperate (C) steppe (s) warm summer (b); BSh: Arid (B) steppe (S) hot (h), Cfa: Warm temperate (C) fully humid (f) hot summer (a), [b] Arithmetic mean as a default, geometric mean or median when followed by Gm or Md, respectively; [c] Different regions each has its own mean, minimum and maximum, and incidence values, [d] Commercial samples can be from different origins and, hence, their aflatoxin contents may reflect their origin and the storage conditions rather than the area where they are sold, [e] Data are relative to the occurrence of aflatoxin B1; either in the [(R)]rainy season or the [(D)]dry season; [f] Results field training for farmers with supervised application of the good agricultural practices; [g] Exceptionally high aflatoxin levels recorded in 2004 during a major aflatoxicosis in Kenia; [h] Percentage for samples containing more than 20 mg/kg of aflatoxins; [i] Samples collected from micro- and small-scale sunflower oil processors during the harvesting season of 2014; [j] Rainfall below 800 mm, high temperature (30 °C); [k] The highest and lowest aflatoxin concentrations were not discriminated between peanut and maize samples by the authors; [l] Percentages were calculated for samples containing more than 4.0 μg/kg of aflatoxins; [m] High rainfall (900–1300 mm),

moderate temperature (23–25 °C); [n] High rainfall, cool temperature (16 °C); Total aflatoxins (AFB1+AFB2+AFG1 = AFG2); [p] Percentage of samples contaminated with levels exceeding with more than 4 μg/kg after 4 months of storage. *Abbreviations and symbols*: AEZ: Argo-ecological zone; +ve; Positive samples (aflatoxin levels higher than the level of detection LOD unless specified otherwise); "-" no available data, 0 "zero": aflatoxin level below LOD; HF = Humid Forest, DS = Derived Savanna, and SGS = Southern Guinea Savanna. SVT = Savana Transition; RFR = Rain Forest; FRT = Forest Transition; ML: Mouldy samples (biased sampling procedure was used by the authors); LB: Lower bound (scenario where the concentration of non-detected analyte is zero and the concentration of detected but non-quantified analyte is the limit of detection)

Table S3. Incidence and concentrations (μg/kg) of aflatoxin contamination of staple crops in selected countries from the Southeast Asian region. Data are for total aflatoxins (B1+B2+G1+G2), unless otherwise stated in the footnotes.

Country	AEZ (Climate Type) [a]	Peanut/Groundnut		Maize		Rice		Sorghum		References
		Mean [b] (Range)	+ve (%)	Mean [b] (Range)	+ve (%)	Mean (Range)	+ve (%)	Mean (Range)	+ve (%)	
India	20 states (Various)	-	-	-	-	NS (0.1–308)[c]	68	-	-	[61]
	Karnataka (BSh, Aw)	510.7 [c] (NS-NS)	NS	67.3 [c] (201–714)	100	-	-	882 [c] (582–1250)	100	[62]
	Eastern region (Cwa, Aw)	-	-	<5[c(Md)] (0–120)	47 [d]	-	-	-	-	[63]
	Western region (BSh)	-	-	15[c(Mm)] (0–333)	53 [d]	-	-	-	-	
	North (BSh, Cwa)	-	-	30[c(Md)] (0–666)	69 [d]	-	-	-	-	
	Southern region (Aw)	-	-	<5[c(Md)] (0–400)	21 [d]	-	-	-	-	
	Mahashtra (BSh, Aw, Am)	-	-	-	-	-	-	NS (0.49–139)	82	[64]
	Rajasthan (BWh, BSh)	-	-	-	-	-	-	NS (0.1–15)	86	
	Tamil Nadu (Aw)	-	-	-	-	-	-	NS (0.01–264)	88	
	Punjab (Af)	-	-	-	-	NS (0->30.0)	91	-	-	[65]
Nepal	Eastern region	NS	34	NS	32	-	-	-	-	[66]

	(Cfa)	(54–1806)		(64–859)						
The Philippines	NS	58 (0–885)	65	76 (0.0–1152)	95	-	-	-	-	[67]
	Iloco (Aw)	-	-	22 (NS–30)	NS	-	-	-	-	[68]
		-	-	39 (NS–1215)	NS	-	-	-	-	
	South Catabato (Af, Aw)	-	-	68.0 (NS–178)	NS	-	-	-	-	
	Commercial	-	-	-	-	1.5 (0–8.7)	95	-	-	[69]
Thailand	Northeast (Aw)	-	-	-	-	0.8 0–13.4	63	-	-	[70]
	Central region (Aw)	-	-	-	-	1.7 (0–26.6)	53	-	-	
	Singburi (Aw)	245(R) (NS-NS)	56	-	-	-	-	-	-	[71]
		139(D) (NS-NS)	41	-	-	-	-	-	-	
		28(H) (NS-NS)	91	-	-	-	-	-	-	
	Ratburi (Aw)	329(R) (NS-NS)	63	-	-	-	-	-	-	
		71(D) (NS-NS)	63	-	-	-	-	-	-	
		99(H) (NS-NS)	72	-	-	-	-	-	-	
	Songkhla (Am)	207(R) (NS-NS)	47	-	-	-	-	-	-	
		96(D) (NS-NS)	70	-	-	-	-	-	-	
		62(H) (NS-NS)	68	-	-	-	-	-	-	
	Whole country	1563(R)	NS	-	-	-	-	-	-	[72]

		(0–12,256)								
		1811[D] (0–9500)	NS	-	-	-	-	-	-	
		1203[H] (0–7660)	NS	-	-	-	-	-	-	
	Commercial	1530 (0–12,256)	49	400 (0–2730)	39	67 (0–248)	2	-	-	
		47 (0–304)	80	196 (0–750)	NS	-	-	-	-	[73]
		31.5 (2.2–171)	NS	-	-	-	-	-	-	[74]
	Penang Island (Af)	NS (17–711)	43	-	-	-	-	-	-	[75]
		-	-	-	-	NS (1.1–5.2)	NS	-	-	[76]
	NS	NS (20–1000)	16	-	-	-	-	-	-	[77]
Malaysia	Commercial	11.3 (0–103)	79	-	-	-	-	-	-	[78]
	Commercial	-	-	-	-	NS (0.15–4.4)	25	-	-	[79]
	Commercial	4.3[c] (1.5–15.3)	85	-	-	1.75[c] (0.7–3.8)	70	-	-	[80]
	East Java (Aw)	-	-	149 (NS-390)	100	-	-	-	-	
Indonesia	Lampung (Af)	-	-	144 (0–350)	92	-	-	-	-	[77]
	Commercial	-	-	464 (NS-490)	100	-	-	-	-	
	Hanoi (Cwa)	9.28 (>0.1–16.0)	25	2.62 (>0.1–25.0)	35	0.42 (>0.1–13)	10			
Vietnam	Thanh Hoa (Cwa, Aw)	4.96 (>0.1–159)	26	5.39 (>0.1–94.5)	26.5	2.04 (>0.1–93)	12.5			[81]
	Ha Giang (Cwa)	16.57 (>0.1–362)	20.7	66.1 (>0.1–1572)	30	1.01 (>0.1–26)	5.4			

Captions and abbreviations are as defined in the footnotes of Table S2, unless otherwise specified herein ; [a] The type of climate (in the parenthesis) is defined according to Köppen-Geiger [60]. [b]Arithmetic mean as a default value or geometric mean[(Gm)] or median[(Md)]; [c] Percentage of samples containing more than 5.0 μg/kg of aflatoxin; [(R)] Rainy season; [(H)] Hot season; [(D)] Dry season.

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