

Supplementary Materials: Co-Occurrence and Levels of Mycotoxins in Fish Feeds in Kenya

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Table S1. Mycotoxins prevalence and levels in complete feeds, complementary feeds and feed ingredient samples.

Mycotoxin	Feed Type	Prevalence % (x)	Range $\mu\text{g}/\text{kg}$	Mean \pm SD $\mu\text{g}/\text{kg}$	10th Percentile $\mu\text{g}/\text{kg}$	25th Percentile $\mu\text{g}/\text{kg}$	Median $\mu\text{g}/\text{kg}$	75th Percentile $\mu\text{g}/\text{kg}$	90th Percentile $\mu\text{g}/\text{kg}$
AFB1	Complete	43 (10)	<14.7–43.6	13.4 \pm 11.8	<14.7	<14.7	<14.7	13.6	24.9
	Complementary	39 (9)	<14.7–16.6	8.4 \pm 3.1	<14.7	<14.7	<14.7	<14.7	9.2
	Ingredient	17 (4)	<14.7–17.3	7.4 \pm 17.3	<14.7	<14.7	<14.7	<14.7	9.8
AFG1	Complete	100 (1)	<155.8	77.9	<155.8	<155.8	<155.8	<155.8	<155.8
	Complementary	0 (0)	-	-	-	-	-	-	-
	Ingredient	0 (0)	-	-	-	-	-	-	-
AF	Complete	43 (10)	<14.7–93.6	21.2 \pm 28.1	<14.7	<14.7	<14.7	18.9	48.6
	Complementary	39 (9)	<14.7–16.6	8.4 \pm 3.1	<14.7	<14.7	<14.7	<14.7	9.2
	Ingredient	17 (4)	<14.7–17.3	7.4 \pm 17.3	<14.7	<14.7	<14.7	<14.7	9.8
DON	Complete	56 (33)	<40.4–465.1	80.2 \pm 107.8	<40.4	<40.4	<40.4*	82.8	205
	Complementary	27 (16)	<40.4–819.9	273.9 \pm 236.4	<40.4	<40.4	262.8	439.4	505.2
	Ingredient	17 (10)	<40.4–778.7	20.2 \pm 778.7	<40.4	129.9	208.2	208.2	439.9
DON3G	Complete	25 (5)	<46.8–72.8	33.3 \pm 22.1	<46.8	<46.8	<46.8	<46.8	53
	Complementary	45 (9)	<46.8–97.5	36.3 \pm 26.8	<46.8	<46.8	<46.8	<46.8	71.7
	Ingredient	30 (6)	<46.8	23.4	<46.8	<46.8	<46.8	<46.8	<46.8
ZEN	Complete	32 (10)	<38.0–367.8	76.0 \pm 119.2	<38.0	<38.0	<38.0	39.0	229.1
	Complementary	45 (14)	<38.0–757.9	174.3 \pm 209.9	<38.0	<38.0	98.4	225.5	392.1
	Ingredient	23 (7)	<38.0–424.1	19.0 \pm 424.2	30.6	48.6	111.6	111.6	181.8
α ZEL	Complete	26 (5)	<22.2–42.7	24.6 \pm 13.8	<22.2	<22.2	25.1	32.8	38.7
	Complementary	47 (9)	<22.2–288.4	82.9 \pm 99.4	<22.2	<22.2	<22.2	131.5	198.2
	Ingredient	26 (5)	<22.2–158.1	11.1 \pm 158.1	17.3	26.7	42.5	42.5	64.1
β ZEL	Complete	54 (14)	<16.0–64.5	23.6 \pm 19.5	<16.0	<16.0	14.7	34.7	50.2
	Complementary	35 (9)	<16.0–79.8	40.6 \pm 29.3	<16.0	<16.0	39.9	64.9	77.6
	Ingredient	12 (3)	<16.0–48.7	26.9 \pm 48.7	29.9	34.3	41.7	41.7	45.2
FUMB1	Complete	38 (16)	<63.0–311.2	100.7 \pm 95.4	<63.0	<63.0	<63.0	161.8	231.3
	Complementary	40 (17)	<63.0–1427.4	324.1 \pm 403.0	<63.0	<63.0	137.2	451.2	871
	Ingredient	21 (9)	<63.0–1239.3	31.5 \pm 1239.3	67.7	99.3	214.3	214.3	542.6
FUMB2	Complete	26 (6)	<68.9–91.4	43.9 \pm 23.3	<68.9	<68.9	<68.9	<68.9	62.9
	Complementary	48 (11)	<68.9–649.2	145.8 \pm 185.1	<68.9	<68.9	<68.9	197.1	232.8
	Ingredient	26 (6)	<68.9–495.2	34.5 \pm 495.2	<68.9	<68.9	79.7	79.7	157.5
FUMB	Complete	38 (16)	<63.0–345.7	117.2 \pm 113.9	<63.0	<63.0	<63.0*	219.5	267.3
	Complementary	40 (17)	<63.0–2076.6	418.4 \pm 553.2	<63.0	66.0	212.1	485.7	1099.4
	Ingredient	21 (9)	<63.0–1734.5	31.5 \pm 1734.5	67.7	99.3	248.8	248.8	667.5
ECO	Complete	55 (6)	37.6–49.5	41.5 \pm 4.2	38.2	39.1	40.5	42.0	45.9

Mycotoxin	Feed Type	Prevalence % (x)	Range µg/kg	Mean ± SD µg/kg	10th Percentile µg/kg	25th Percentile µg/kg	Median µg/kg	75th Percentile µg/kg	90th Percentile µg/kg
ECR	Complementary	36 (4)	38.9–64.3	55.5 ± 11.3	45.0	54.1	59.4	60.7	62.9
	Ingredient	9 (1)	51.3	51.3	51.3	51.3	51.3	51.3	51.3
	Complete	100 (1)	<24.9	<24.9	<24.9	<24.9	<24.9	<24.9	<24.9
ENV	Complementary	0 (0)	-	-	-	-	-	-	-
	Ingredient	0 (0)	-	-	-	-	-	-	-
	Complete	67 (2)	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9
ESN	Complementary	33 (1)	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9
	Ingredient	0 (0)	-	-	-	-	-	-	-
	Complete	80 (4)	<38.4–38.5	24.0 ± 9.7	<38.4	<38.4	<38.4	24.0	32.7
ETA	Complementary	20 (1)	144.2	144.2	144.2	144.2	144.2	144.2	144.2
	Ingredient	0 (0)	-	-	-	-	-	-	-
	Complete	100 (9)	<29.3–1895.6	301.5 ± 602.5	28.9	58.5	87.2	166.6	585.1
αECP	Complementary	0 (0)	-	-	-	-	-	-	-
	Ingredient	0 (0)	-	-	-	-	-	-	-
	Complete	100 (5)	<41.0–81.3	32.7 ± 27.2	<41.0	<41.0	<41.0	<41.0	57.0
ERG	Complementary	0 (0)	-	-	-	-	-	-	-
	Ingredient	0 (0)	-	-	-	-	-	-	-
	Complete	71 (15)	12.5–2055.3	217.1 ± 514.7	19.7	40.0	58.5	121.8	267.4
FUSX	Complementary	24 (5)	11.0–203.4	75.4 ± 74.6	22.1	38.9	59.5	64.3	147.8
	Ingredient	5 (1)	51.3	51.3	51.3	51.3	51.3	51.3	51.3
	Complete	0 (0)	-	-	-	-	-	-	-
HT2	Complementary	67 (2)	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0
	Ingredient	33 (1)	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0
	Complete	77 (10)	<41.6–411.8	63.5 ± 122.9	<41.6	<41.6	<41.6	<41.6	92.6
NEO	Complementary	8 (1)	<41.6	20.8	<41.6	<41.6	<41.6	<41.6	<41.6
	Ingredient	15 (2)	<41.6–112.3	20.8 ± 112.3	30.0	43.7	66.6	66.6	89.4
	Complete	75 (3)	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7
NIV	Complementary	0 (0)	-	-	-	-	-	-	-
	Ingredient	25 (1)	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7
	Complete	0 (0)	-	-	-	-	-	-	-
AOH	Complementary	56 (5)	<40.3–69.8	48.6 ± 26.0	<40.3	<40.3	64.4	68.4	69.2
	Ingredient	44 (4)	<40.3–76.0	20.2 ± 76.0	34.0	54.8	68.8	68.8	72.5
	Complete	67 (20)	<36.2–43.3	19.4 ± 5.6	<36.2	<36.2	<36.2	<36.2	<36.2
AME	Complementary	23 (7)	<36.2	<36.2	<36.2	<36.2	<36.2	<36.2	<36.2
	Ingredient	10 (3)	<36.2	<36.2	<36.2	<36.2	<36.2	<36.2	<36.2
	Complete	100 (1)	94.5	94.5	94.5	94.5	94.5	94.5	94.5
ENNA	Complementary	0 (0)	-	-	-	-	-	-	-
	Ingredient	0 (0)	-	-	-	-	-	-	-
	Complete	67 (2)	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1
ENNA1	Complementary	33 (1)	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1
	Ingredient	0 (0)	-	-	-	-	-	-	-
	Complete	40 (2)	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5
ENNB	Complementary	20 (1)	23.8	23.8	23.8	23.8	23.8	23.8	23.8
	Ingredient	40 (2)	<13.5–14.7	6.8 ± 14.7	7.5	8.7	10.7	10.7	12.7
	Complete	61 (43)	<38.8–136.3	49.5 ± 40.2	<38.8	<38.8	<38.8	72.2	121.9
	Complementary	25 (18)	<38.8–150.0	31.7 ± 31.7	<38.8	<38.8	<38.8	<38.8	52.0

Mycotoxin	Feed Type	Prevalence % (x)	Range µg/kg	Mean ± SD µg/kg	10th Percentile µg/kg	25th Percentile µg/kg	Median µg/kg	75th Percentile µg/kg	90th Percentile µg/kg
ENNB1	Ingredient	14 (10)	<38.8–53.2	19.4 ± 53.2	<38.8	<38.8	<38.8	<38.8	36.1
	Complete	44 (16)	<12.9–43.5	25.2 ± 10.0	12.3	19.1	26.6	30.8	35.7
	Complementary	39 (14)	14.4–37.7	21.1 ± 7.6	15.6	16.1	17.9	23.4	33.7
ENN	Ingredient	17 (6)	14.6–26.7	14.6 ± 26.7	14.8	16.9	23.2	23.2	24.9
	Complete	61 (43)	19.4–173.8	59.8 ± 47.8	19.4	19.4	42.3	88.3	132.3
	Complementary	25 (18)	19.4–186.7	50.2 ± 43.0	19.4	34.1	35.9	39.2	93.1
CUL	Ingredient	14 (10)	19.4–94.6	19.4 ± 94.6	19.4	19.4	34.2	34.2	60.7
	Complete	8 (1)	141.6	141.6	141.6	141.6	141.6	141.6	141.6
	Complementary	46 (6)	<42.3–187.1	121.5 ± 65.9	52.6	87.0	125.7	178	186.3
BEA	Ingredient	46 (6)	56.1–288.7	56.1 ± 288.7	65.7	84.9	132.5	132.5	205.4
	Complete	41 (15)	<15.9–841.8	77.0 ± 212.8	<15.9	<15.9*	<15.9*	39.9	71.3
	Complementary	41 (15)	<15.9–296.7	94.0 ± 94.2	13.5	23.3	42.5	131	237.5
STC	Ingredient	19 (7)	<15.9–219.5	8.0 ± 219.5	22.0	32.9	69.2	69.2	98.3
	Complete	43 (3)	<30.5–162.5	64.3 ± 85.0	<30.5	<30.5	<30.5	88.9	133.1
	Complementary	57 (4)	<30.5–3517.1	986.5 ± 1696.7	<30.5	<30.5	206.8	1178	2581.5
MON	Ingredient	0 (0)	-	-	-	-	-	-	-
	Complete	13 (1)	2583.4	2583.4	2583.4	2583.4	2583.4	2583.4	2583.4
	Complementary	63 (5)	109.5–1181.1	497.1 ± 429.1	168.7	257.6	296.2	641.3	965.2
	Ingredient	25 (2)	419.4–1225.9	419.4 ± 1225.9	500.1	621.0	822.7	822.7	1024.3

Key: µg/kg, micrograms per kilogram; %, per cent; x, number of positive samples; AFB1, aflatoxin B1; AFG1, aflatoxin G1; AF, total aflatoxins; DON, deoxynivalenol; DON3G, deoxynivalenol-3-glucoside; ZEN, zearalenone; αZEL, alpha zearalenol; βZEL, beta zearalenol; FUMB1, fumonisin B1; FUMB2, fumonisin B2; FUMB, total fumonisins B; ECO, ergocornine; ECR, ergocristine; ENV, ergonovine; ESN, ergosine; ETA, ergotamine; αECP, alpha ergocryptine; ERG, total ergot alkaloids; FUSX, fusarenon X; HT2, HT-2 toxin; NEO, neosolaniol; NIV, nivalenol; AOH, alternariol; AME, alternariol methyl ether; ENNA, enniatin A; ENNA1, enniatin A1; ENNB, enniatin B; ENNB1, enniatin B1; ENN, total enniatins; CUL, 15 hydroxy-culmorin; BEA, beauvericin; STC, sterigmatocystin; MON, moniliformin; *, $p \leq 0.05$.

Table S2. Mycotoxins prevalence and levels in rainbow trout and tilapia feeds samples.

Mycotoxin	Fish Type	Prevalence % (x)	Range µg/kg	Mean ± SD µg/kg	10th Percentile µg/kg	25th Percentile µg/kg	Median µg/kg	75th Percentile µg/kg	90th Percentile µg/kg
AFB1	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (23)	<14.7–43.6	10.8 ± 8.4	<14.7	<14.7	<14.7	<14.7	17.2
AFG1	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (1)	<155.8	<155.8	<155.8	<155.8	<155.8	<155.8	<155.8
AF	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (23)	<14.7–93.6	14.2 ± 19.2	<14.7	<14.7	<14.7	<14.7	21.7
DON	Rainbow trout	20 (12)	<40.4–162.6	36.0 ± 42.1	<40.4	<40.4	<40.4	<40.4	62.2
	Tilapia	80 (47)	<40.4–819.9	202.8 ± 212.7	<40.4	<40.4	122.8*	353	464.3
DON3G	Rainbow trout	5 (1)	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8
	Tilapia	95 (19)	<46.8–97.5	32.1 ± 21.4	<46.8	<46.8	<46.8	<46.8	66.7
ZEN	Rainbow trout	3 (1)	<38.0	<38.0	<38.0	<38.0	<38.0	<38.0	<38.0
	Tilapia	97 (30)	<38.0–757.9	139.9 ± 172.2	<38.0	<38.0	61.8	193.4	373.3
αZEL	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (19)	<22.2–288.4	61.6 ± 76.1	<22.2	<22.2	26.7	79.4	161.6
βZEL	Rainbow trout	15 (4)	<16.0–35.6	18.3 ± 13.2	<16.0	<16.0	14.7	25	31.3
	Tilapia	85 (22)	<16.0–79.8	33.7 ± 24.4	<16.0	<16.0	30.9	49.5	64.9
FUMB1	Rainbow trout	7 (3)	<63.0–154.4	72.5 ± 71.0	<63.0	<63.0	<63.0	93	129.8
	Tilapia	93 (39)	<63.0–1427.4	261.1 ± 340.6	<63.0	<63.0	118.4	313.1	664.9
FUMB2	Rainbow trout	4 (1)	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9
	Tilapia	96 (22)	<68.9–649.2	123.9 ± 161.0	<68.9	<68.9	<68.9	157.5	231.7
FUMB	Rainbow trout	7 (3)	<63.0–188.9	84.0 ± 90.8	<63.0	<63.0	<63.0	110.2	157.4
	Tilapia	93 (39)	<63.0–2076.6	331 ± 467.3	<63.0	<63.0	171.7	347.6	846.2
ECO	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (11)	37.6–64.3	47.5 ± 9.8	38.8	39.4	42.3	55.3	59.5
ECR	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (1)	<24.9	<24.9	<24.9	<24.9	<24.9	<24.9	<24.9
ENV	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (3)	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9
ESN	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (5)	<38.4–144.2	48.1 ± 54.4	<38.4	<38.4	<38.4	38.5	101.9
ETA	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (9)	<29.3–1895.6	301.5 ± 602.5	28.9	58.5	87.2	166.6	585.1
αECP	Rainbow trout	20 (1)	<41.0	<41.0	<41.0	<41.0	<41.0	<41.0	<41.0
	Tilapia	80 (4)	<41.0–81.3	35.7 ± 30.4	<41.0	<41.0	<41.0	35.7	63.1
ERG	Rainbow trout	5 (1)	20.5	20.5	20.5	20.5	20.5	20.5	20.5
	Tilapia	95 (20)	11.0–2055.3	183.2 ± 447.1	18.5	40.6	59	116.7	216.5
FUSX	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (3)	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0
HT2	Rainbow trout	31 (4)	<41.6–411.8	118.6 ± 195.5	<41.6	<41.6	<41.6	118.6	294.5

Mycotoxin	Fish Type	Prevalence % (x)	Range µg/kg	Mean ± SD µg/kg	10th Percentile µg/kg	25th Percentile µg/kg	Median µg/kg	75th Percentile µg/kg	90th Percentile µg/kg
NEO	Tilapia	69 (9)	<41.6–112.3	35.0 ± 31.4	<41.6	<41.6	<41.6	<41.6	68.1
	Rainbow trout	50 (2)	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7
NIV	Tilapia	50 (2)	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7
	Rainbow trout	0 (0)	-	-	-	-	-	-	-
AOH	Tilapia	100 (9)	<40.3–76	53.0 ± 24.8	<40.3	<40.3	66.3	69.8	72.2
	Rainbow trout	3 (1)	<36.2	<36.2	<36.2	<36.2	<36.2	<36.2	<36.2
AME	Tilapia	97 (29)	<36.2–43.3	19.0 ± 4.7	<36.2	<36.2	<36.2	<36.2	<36.2
	Rainbow trout	0 (0)	-	-	-	-	-	-	-
ENNA	Tilapia	100 (1)	94.5	94.5	94.5	94.5	94.5	94.5	94.5
	Rainbow trout	0 (0)	-	-	-	-	-	-	-
ENNA1	Tilapia	100 (3)	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1
	Rainbow trout	0 (0)	-	-	-	-	-	-	-
ENNB	Tilapia	100 (5)	<13.5–23.8	11.8 ± 7.6	<13.5	<13.5	<13.5	14.7	20.2
	Rainbow trout	23 (16)	<38.8–81.4	31.5 ± 20.5	<38.8	<38.8	<38.8	40.6	63.4
ENNB1	Tilapia	77 (55)	<38.8–150.0	44.9 ± 39.6	<38.8	<38.8	<38.8	57.5	121.9
	Rainbow trout	11 (4)	18.7–33.9	24.5 ± 7.1	18.9	19.1	22.8	28.2	31.6
ENN	Tilapia	89 (32)	<12.9–43.5	22.8 ± 8.8	14.6	16.3	23.2	27	36.4
	Rainbow trout	23 (16)	19.4–115.3	37.6 ± 26.9	19.4	19.4	19.4	49	63.4
CUL	Tilapia	77 (55)	19.4–186.7	59.9 ± 47.1	19.4	19.4	37.6	82.5	132.1
	Rainbow trout	0 (0)	-	-	-	-	-	-	-
BEA	Tilapia	100 (13)	<42.3–288.7	136.9 ± 73.5	59.9	84.1	141.6	185.4	216.1
	Rainbow trout	11 (4)	<15.9–19.8	10.9 ± 5.9	<15.9	<15.9	<15.9	10.9	16.2
STC	Tilapia	89 (33)	<15.9–841.8	93.3 ± 154.8	<15.9	16	37.3*	112.5	218.6
	Rainbow trout	0 (0)	-	-	-	-	-	-	-
MON	Tilapia	100 (7)	<30.5–3517.1	591.3 ± 1298.0	<30.5	<30.5	<30.5	280.4	1645.8
	Rainbow trout	0 (0)	-	-	-	-	-	-	-
	Tilapia	100 (8)	<218.9–2583.4	839.3 ± 818.5	213.2	286.6	530.4	1192.3	1633.2

Key: µg/kg, micrograms per kilogram; %, per cent; x, number of positive samples; AFB1, aflatoxin B1; AFG1, aflatoxin G1; AF, total aflatoxins; DON, deoxynivalenol; DON3G, deoxynivalenol-3-glucoside; ZEN, zearalenone; αZEL, alpha zearalenol; βZEL, beta zearalenol; FUMB1, fumonisin B1; FUMB2, fumonisin B2; FUMB, total fumonisins B; ECO, ergocornine; ECR, ergocristine; ENV, ergonovine; ESN, ergosine; ETA, ergotamine; αECP, alpha ergocryptine; ERG, total ergot alkaloids; FUSX, fusarenon X; HT2, HT-2 toxin; NEO, neosolaniol; NIV, nivalenol; AOH, alternariol; AME, alternariol methyl ether; ENNA, enniatin A; ENNA1, enniatin A1; ENNB, enniatin B; ENNB1, enniatin B1; ENN, total enniatins; CUL, 15 hydroxy-culmorin; BEA, beauvericin; STC, sterigmatocystin; MON, moniliformin; *, $p \leq 0.05$.

Table S3. Mycotoxins prevalence and levels in fish feeds samples from fish farmers and feed manufacturers.

Mycotoxin	Feed source	Prevalence % (x)	Range µg/kg	Mean ± SD µg/kg	10th Percentile µg/kg	25th Percentile µg/kg	Median µg/kg	75th Percentile µg/kg	90th Percentile µg/kg
AFB1	Fish farmer	87 (20)	<14.7–22.8	9.5 ± 4.6	<14.7	<14.7	<14.7	<14.7	16.7
	Feed Manufacturer	13 (3)	<14.7–43.6	19.4 ± 20.9	<14.7	<14.7	<14.7	25.5	36.4
AFG1	Fish farmer	100 (1)	<155.8	<155.8	<155.8	<155.8	<155.8	<155.8	<155.8
	Feed Manufacturer	0 (0)	-	-	-	-	-	-	-
AF	Fish farmer	87 (20)	<14.7–93.6	13.4 ± 19.4	<14.7	<14.7	<14.7	<14.7	17.9
	Feed Manufacturer	13 (3)	<14.7–43.6	19.4 ± 20.9	<14.7	<14.7	<14.7	25.5	36.4
DON	Fish farmer	81 (48)	<40.4–819.9	203.0 ± 209.8	<40.4	<40.4	122.9	350.7	464.1
	Feed Manufacturer	19 (11)	<40.4	<40.4	<40.4	<40.4	<40.4*	<40.4	<40.4
DON3G	Fish farmer	100 (20)	<46.8–97.5	31.7 ± 20.9	<46.8	<46.8	<46.8	<46.8	66
	Feed Manufacturer	0 (0)	-	-	-	-	-	-	-
ZEN	Fish farmer	90 (28)	<38.0–757.9	148.5 ± 175.2	<38.0	<38.0	74.5	200.2	384.4
	Feed Manufacturer	10 (3)	<38.0	<38.0	<38.0	<38.0	<38.0	<38.0	<38.0
αZEL	Fish farmer	100 (19)	<22.2–288.4	61.6 ± 76.1	<22.2	<22.2	26.7	79.4	161.6
	Feed Manufacturer	0 (0)	-	-	-	-	-	-	-
βZEL	Fish farmer	81 (21)	<16.0–79.8	32.1 ± 23.1	<16.0	<16.0	29.8	46.6	64.9
	Feed Manufacturer	19 (5)	<16.0–64.5	28.1 ± 27.8	<16.0	<16.0	<16.0	51.8	59.4
FUMB1	Fish farmer	88 (37)	<63.0–1427.4	270.3 ± 346.1	<63.0	<63.0	134.4	315	703.3
	Feed Manufacturer	12 (5)	<63.0–274.4	80.1 ± 108.6	<63.0	<63.0	<63.0	<63.0	177.2
FUMB2	Fish farmer	96 (22)	<68.9–649.2	123.9 ± 161.0	<68.9	<68.9	<68.9	157.5	231.7
	Feed Manufacturer	4 (1)	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9
FUMB	Fish farmer	88 (37)	<63.0–2076.6	343.9 ± 475.3	<63.0	<63.0	188.9	349.5	897.5
	Feed Manufacturer	12 (5)	<63.0–308.9	87.0 ± 124.0	<63.0	<63.0	<63.0	<63.0	197.9
ECO	Fish farmer	91 (10)	37.6–64.3	48.0 ± 10.1	38.7	39.2	45.3	57.2	60
	Feed Manufacturer	9 (1)	42.3	42.3	42.3	42.3	42.3	42.3	42.3
ECR	Fish farmer	100 (1)	<24.9	<24.9	<24.9	<24.9	<24.9	<24.9	<24.9
	Feed Manufacturer	0 (0)	-	-	-	-	-	-	-
ENV	Fish farmer	67 (2)	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9
	Feed Manufacturer	33 (1)	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9
ESN	Fish farmer	60 (3)	<38.4–144.2	67.3 ± 67.3	23.1	28.9	38.5	91.4	123.1
	Feed Manufacturer	40 (2)	<38.4	<38.4	<38.4	<38.4	<38.4	<38.4	<38.4
ETA	Fish farmer	67 (6)	<29.3–1895.6	392.4 ± 738.4	36.6	65.7	109.5	157.9	1031.1
	Feed Manufacturer	33 (3)	32.4–257.5	119.8 ± 120.7	39.8	50.9	69.4	163.5	219.9
αECP	Fish farmer	40 (2)	<41–81.3	50.9 ± 43.0	26.6	35.7	50.9	66.1	75.2
	Feed Manufacturer	60 (3)	<41.0	<41.0	<41.0	<41.0	<41.0	<41.0	<41.0
ERG	Fish farmer	76 (16)	11.0–2055.3	198.3 ± 498.6	25.6	40.6	59	98.4	204.9
	Feed Manufacturer	24 (5)	19.2–308.2	102.5 ± 120.9	19.7	20.5	52.9	111.7	229.6
FUSX	Fish farmer	100 (3)	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0
	Feed Manufacturer	0 (0)	-	-	-	-	-	-	-
HT2	Fish farmer	77 (10)	<41.6–112.3	33.6 ± 29.9	<41.6	<41.6	<41.6	<41.6	62.6

Mycotoxin	Feed source	Prevalence % (x)	Range µg/kg	Mean ± SD µg/kg	10th Percentile µg/kg	25th Percentile µg/kg	Median µg/kg	75th Percentile µg/kg	90th Percentile µg/kg
NEO	Feed Manufacturer	23 (3)	<41.6–411.8	151.1 ± 225.7	<41.6	<41.6	<41.6	216.3	333.6
	Fish farmer	50 (2)	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7
NIV	Feed Manufacturer	50 (2)	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7
	Fish farmer	100 (9)	<40.3–76.0	53.0 ± 24.8	<40.3	<40.3	66.3	69.8	72.2
AOH	Feed Manufacturer	0 (0)	-	-	-	-	-	-	-
	Fish farmer	87 (26)	<36.2–43.3	19.1 ± 4.9	<36.2	<36.2	<36.2	<36.2	<36.2
AME	Feed Manufacturer	13 (4)	<36.2	<36.2	<36.2	<36.2	<36.2	<36.2	<36.2
	Fish farmer	100 (1)	94.5	94.5	94.5	94.5	94.5	94.5	94.5
ENNA	Feed Manufacturer	0 (0)	-	-	-	-	-	-	-
	Fish farmer	100 (3)	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1
ENNA1	Feed Manufacturer	0 (0)	-	-	-	-	-	-	-
	Fish farmer	80 (4)	<13.5–23.8	13.0 ± 8.1	<13.5	<13.5	10.7	17.0	21.1
ENNB	Feed Manufacturer	20 (1)	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5
	Fish farmer	76 (54)	<38.8–150.0	43.5 ± 38.1	<38.8	<38.8	<38.8	56.3	121.9
ENNB1	Feed Manufacturer	24 (17)	6.8	6.8	6.8	6.8	6.8	6.8	6.8
	Fish farmer	89 (32)	<12.9–43.5	23.1 ± 8.5	15.0	16.6	21.4	27.2	36.4
ENN	Feed Manufacturer	11 (4)	19.4–118.4	36.7 ± 30.9	19.4	19.4	19.4	42.3	82.3
	Fish farmer	76 (54)	19.4–186.7	58.9 ± 47.5	19.4	19.4	37.2	80.2	132.8
CUL	Feed Manufacturer	24 (17)	<12.9–27.4	21.7 ± 10.2	12.4	21.3	26.6	27.0	27.2
	Fish farmer	100 (13)	<42.3–288.7	136.9 ± 73.5	59.9	84.1	141.6	185.4	216.1
BEA	Feed Manufacturer	0 (0)	19.4–118.4	42.2 ± 29.5	19.4	19.4	32.6	46.8	82.3
	Fish farmer	81 (30)	<15.9–841.8	99.8 ± 161.0	<15.9	20.3	36.5	120.2	222.8
STC	Feed Manufacturer	19 (7)	<15.9	<15.9	<15.9	<15.9	<15.9*	<15.9	<15.9
	Fish farmer	86 (6)	<30.5–3517.1	662.7 ± 1406.7	<30.5	<30.5	<30.5	302.5	1957.7
MON	Feed Manufacturer	14 (1)	8.0–46.5	18.4 ± 17.8	8.0	8.0	8.0	25.2	44.0
	Fish farmer	100 (8)	<218.9–2583.4	839.3 ± 818.5	213.2	286.6	530.4	1192.3	1633.2
	Feed Manufacturer	0 (0)	162.5	162.5	162.5	162.5	162.5	162.5	162.5

Key: µg/kg, micrograms per kilogram; %, per cent; x, number of positive samples; AFB1, aflatoxin B1; AFG1, aflatoxin G1; AF, total aflatoxins; DON, deoxynivalenol; DON3G, deoxynivalenol-3-glucoside; ZEN, zearalenone; αZEL, alpha zearalenol; βZEL, beta zearalenol; FUMB1, fumonisins B1; FUMB2, fumonisins B2; FUMB, total fumonisins B; ECO, ergocornine; ECR, ergocristine; ENV, ergonovine; ESN, ergosine; ETA, ergotamine; αECP, alpha ergocryptine; ERG, total ergot alkaloids; FUSX, fusarenon X; HT2, HT-2 toxin; NEO, neosolaniol; NIV, nivalenol; AOH, alternariol; AME, alternariol methyl ether; ENNA, enniatin A; ENNA1, enniatin A1; ENNB, enniatin B; ENNB1, enniatin B1; ENN, total enniatins; CUL, 15 hydroxy-culmorin; BEA, beauvericin; STC, sterigmatocystin; MON, moniliformin; *, $p \leq 0.05$.

Mycotoxin	Feed preparation	Prevalence	Range	Mean ± SD	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile
		% (x)	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
ENV	Homemade	0 (0)	-	-	-	-	-	-	-
	Commercial	67 (2)	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9
ESN	Homemade	33 (1)	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9	<21.9
	Commercial	60 (3)	<38.4–38.5	25.6 ± 11.1	<38.4	<38.4	<38.4	28.9	34.6
ETA	Homemade	40 (2)	<38.4–144.2	81.7 ± 88.4	31.7	50.5	81.7	113	131.7
	Commercial	89 (8)	<29.3–1895.6	328.3 ± 638.3	27.1	52.0	100.6	189.3	748.9
αECP	Homemade	11 (1)	87.2	87.2	87.2	87.2	87.2	87.2	87.2
	Commercial	100 (5)	<41.0–81.3	32.7 ± 27.2	<41.0	<41.0	<41.0	<41.0	57.0
ERG	Homemade	0 (0)	-	-	-	-	-	-	-
	Commercial	62 (13)	12.5–2055.3	243.3 ± 550.7	24.6	49.5	58.5	131.8	287.8
FUSX	Homemade	38 (8)	11.0–203.4	65.3 ± 61.0	16.7	33.9	49.2	70.0	122.1
	Commercial	33 (1)	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0
HT2	Homemade	67 (2)	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0	<56.0
	Commercial	85 (11)	<41.6–411.8	64.7 ± 118.4	<41.6	<41.6	<41.6	<41.6	112.3
NEO	Homemade	15 (2)	<41.6–57.1	39.0 ± 25.7	24.4	29.9	39.0	48.0	53.5
	Commercial	75 (3)	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7
NIV	Homemade	25 (1)	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7	<177.7
	Commercial	56 (5)	<40.3–76	60.7 ± 22.9	38.6	66.3	69.8	71.3	74.1
AOH	Homemade	44 (4)	<40.3–68.4	43.3 ± 26.8	<40.3	<40.3	42.3	65.4	67.2
	Commercial	67 (20)	<36.2–43.3	19.4 ± 5.6	<36.2	<36.2	<36.2	<36.2	<36.2
AME	Homemade	33 (10)	<36.2	<36.2	<36.2	<36.2	<36.2	<36.2	<36.2
	Commercial	100 (1)	94.5	94.5	94.5	94.5	94.5	94.5	94.5
ENNA	Homemade	0 (0)	-	-	-	-	-	-	-
	Commercial	67 (2)	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1
ENNA1	Homemade	33 (1)	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1
	Commercial	60 (3)	<13.5–14.7	9.4 ± 4.6	<13.5	<13.5	<13.5	10.7	13.1

Mycotoxin	Feed preparation	Prevalence	Range	Mean ± SD	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile
		% (x)	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
ENNB	Homemade	40 (2)	<13.5–23.8	15.3 ± 12.1	8.5	11.0	15.3	19.5	22.1
	Commercial	69 (49)	<38.8–136.3	43.0 ± 34.7	<38.8	<38.8	<38.8	61.3	90.3
ENNB1	Homemade	31 (22)	<38.8–150.0	39.4 ± 40.9	<38.8	<38.8	<38.8	37.8	119.5
	Commercial	56 (20)	<12.9–37.5	23.2 ± 7.2	14.9	18.6	23.6	27.0	30.3
ENN	Homemade	44 (16)	<12.9–43.5	22.7 ± 10.2	15.2	16.3	19.0	28.5	37.2
	Commercial	69 (49)	19.4–173.8	53.5 ± 40.0	19.4	19.4	38.6	80.8	115.9
CUL	Homemade	31 (22)	19.4–186.7	57.9 ± 53.3	19.4	22.7	35.9	61.1	161.1
	Commercial	54 (7)	56.1–288.7	150.0 ± 82.1	67.6	94.4	141.6	187.5	249.5
BEA	Homemade	46 (6)	<42.3–187.1	121.5 ± 65.9	52.6	87.0	125.7	178.0	186.3
	Commercial	57 (21)	<15.9–841.8	87.3 ± 184.0	<15.9	<15.9	31.4	69.2	214.8
STC	Homemade	43 (16)	<15.9–296.7	80.7 ± 87.3	<15.9	22.0	39.1	115.5	195.2
	Commercial	29 (2)	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5
MON	Homemade	71 (5)	<30.5–3517.1	821.7 ± 1514.9	<30.5	<30.5	162.5	398.3	2269.6
	Commercial	50 (4)	419.4–2583.4	1217.5 ± 972.1	486.0	585.8	933.6	1565.3	2176.2
	Homemade	50 (4)	<218.9–1181.1	461.1 ± 486.7	153.9	220.6	276.9	517.4	915.6

Key: µg/kg, micrograms per kilogram; %, per cent; x, number of positive samples; AFB1, aflatoxin B1; AFG1, aflatoxin G1; AF, total aflatoxins; DON, deoxynivalenol; DON3G, deoxynivalenol-3-glucoside; ZEN, zearalenone; αZEL, alpha zearalenol; βZEL, beta zearalenol; FUMB1, fumonisin B1; FUMB2, fumonisin B2; FUMB, total fumonisins B; ECO, ergocornine; ECR, ergocristine; ENV, ergonovine; ESN, ergosine; ETA, ergotamine; αECP, alpha ergocryptine; ERG, total ergot alkaloids; FUSX, fusarenon X; HT2, HT-2 toxin; NEO, neosolaniol; NIV, nivalenol; AOH, alternariol; AME, alternariol methyl ether; ENNA, enniatin A; ENNA1, enniatin A1; ENNB, enniatin B; ENNB1, enniatin B1; ENN, total enniatins; CUL, 15 hydroxy-culmorin; BEA, beauvericin; STC, sterigmatocystin; MON, moniliformin; *, $p \leq 0.05$.

Table S5. Prevalence of mycotoxins in fish feed samples containing particular ingredients.

Mycotoxin	Maize Bran	Wheat Bran	Dried Silver Cyprinid Fish	Fishmeal	Pollard	Freshwater Shrimp	Cotton Seed Cake	Sun Flower Seed Cake	Soya Bean Cake	Maize Germ	Canola Seed Cake	Cassava	Multi Vitamins	Bone Meal	Rice Bran	Dairy Meal	Wheat	Poultry Waste	Rice
	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)	% (x)
All Samples	53 (41)	47 (37)	35 (27)	35 (27)	32 (25)	28 (22)	27 (21)	27 (21)	26 (20)	14 (11)	8 (6)	8 (6)	6 (5)	5 (4)	4 (3)	2 (2)	3 (2)	3 (2)	1 (1)
AFB1	57 (13)	43 (10)	26 (6)	35 (8)	13 (3)	13 (3)	30 (7)	30 (7)	30 (7)	0 (0)	0 (0)	9 (2)	13 (3)	13 (3)	0 (0)	9 (2)	0 (0)	0 (0)	0 (0)
AFG1	100 (1)	0 (0)	0 (0)	100 (1)	0 (0)	0 (0)	0 (0)	100 (1)	100 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
AF	57 (13)	43 (10)	26 (6)	35 (8)	13 (3)	13 (3)	30 (7)	30 (7)	30 (7)	0 (0)	0 (0)	9 (2)	13 (3)	13 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
DON	47 (28)	44 (26)	27 (16)	29 (17)	24 (14)	19 (11)	22 (13)	22 (13)	20 (12)	14 (8)	8 (5)	2 (1)	8 (5)	7 (4)	5 (3)	2 (1)	2 (1)	0 (0)	2 (1)
DON3G	45 (9)	35 (7)	10 (2)	20 (4)	15 (3)	5 (1)	15 (3)	15 (3)	15 (3)	0 (0)	0 (0)	5 (1)	5 (1)	5 (1)	10 (2)	5 (1)	0 (0)	0 (0)	5 (1)
ZEN	48 (15)	42 (13)	19 (6)	23 (7)	23 (7)	19 (6)	19 (6)	23 (7)	19 (6)	0 (0)	0 (0)	10 (3)	6 (2)	3 (1)	10 (3)	3 (1)	3 (1)	6 (2)	3 (1)
αZEL	42 (8)	42 (8)	11 (2)	16 (3)	5 (1)	5 (1)	11 (2)	16 (3)	11 (2)	0 (0)	0 (0)	0 (0)	11 (2)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)	5 (1)
βZEL	50 (13)	42 (11)	31 (8)	31 (8)	19 (5)	19 (5)	15 (4)	19 (5)	19 (5)	12 (3)	0 (0)	4 (1)	15 (4)	12 (3)	4 (1)	0 (0)	0 (0)	8 (2)	0 (0)
FUMB1	50 (21)	43 (18)	19 (8)	24 (10)	17 (7)	14 (6)	19 (8)	19 (8)	17 (7)	5 (2)	2 (1)	5 (2)	10 (4)	7 (3)	7 (3)	2 (1)	2 (1)	2 (1)	2 (1)
FUMB2	52 (12)	35 (8)	13 (3)	17 (4)	9 (2)	9 (2)	9 (2)	13 (3)	13 (3)	0 (0)	0 (0)	4 (1)	9 (2)	4 (1)	13 (3)	0 (0)	0 (0)	4 (1)	0 (0)
FUMB	50 (21)	43 (18)	19 (8)	24 (10)	17 (7)	14 (6)	19 (8)	19 (8)	17 (7)	5 (2)	2 (1)	5 (2)	10 (4)	7 (3)	7 (3)	2 (1)	2 (1)	2 (1)	2 (1)
ECO	45 (5)	36 (4)	9 (1)	9 (1)	9 (1)	9 (1)	9 (1)	18 (2)	9 (1)	0 (0)	0 (0)	0 (0)	9 (1)	9 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
ECR	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
ENV	33 (1)	67 (2)	33 (1)	33 (1)	0 (0)	0 (0)	33 (1)	33 (1)	33 (1)	0 (0)	0 (0)	0 (0)	33 (1)	33 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
ESN	40 (2)	60 (3)	40 (2)	40 (2)	20 (1)	20 (1)	40 (2)	40 (2)	40 (2)	0 (0)	0 (0)	20 (1)	20 (1)	20 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
ETA	33 (3)	33 (3)	33 (3)	33 (3)	0 (0)	0 (0)	33 (3)	33 (3)	33 (3)	0 (0)	0 (0)	0 (0)	33 (3)	33 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
αECP	60 (3)	60 (3)	60 (3)	60 (3)	20 (1)	20 (1)	60 (3)	60 (3)	60 (3)	20 (1)	20 (1)	0 (0)	40 (2)	40 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
ERG	43 (9)	43 (9)	24 (5)	24 (5)	14 (3)	14 (3)	24 (5)	29 (6)	24 (5)	5 (1)	5 (1)	5 (1)	14 (3)	14 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
FUSX	67 (2)	33 (1)	33 (1)	33 (1)	33 (1)	0 (0)	33 (1)	33 (1)	33 (1)	0 (0)	0 (0)	0 (0)	33 (1)	33 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
HT2	54 (7)	62 (8)	46 (6)	38 (5)	38 (5)	31 (4)	38 (5)	38 (5)	31 (4)	15 (2)	8 (1)	8 (1)	15 (2)	15 (2)	0 (0)	8 (1)	0 (0)	0 (0)	8 (1)
NEO	75 (3)	75 (3)	50 (2)	75 (3)	75 (3)	50 (2)	75 (3)	75 (3)	75 (3)	50 (2)	50 (2)	0 (0)	0 (0)	0 (0)	0 (0)	25 (1)	0 (0)	0 (0)	25 (1)
NIV	44 (4)	44 (4)	22 (2)	11 (1)	22 (2)	0 (0)	22 (2)	11 (1)	11 (1)	0 (0)	0 (0)	0 (0)	22 (2)	11 (1)	11 (1)	11 (1)	11 (1)	0 (0)	11 (1)
AOH	40 (12)	43 (13)	27 (8)	27 (8)	13 (4)	10 (3)	27 (8)	27 (8)	23 (7)	0 (0)	0 (0)	3 (1)	17 (5)	13 (4)	3 (1)	3 (1)	0 (0)	0 (0)	3 (1)

AME	100 (1)	100 (1)	100 (1)	100 (1)	100 (1)	100 (1)	100 (1)	100 (1)	100 (1)	0 (0)	0 (0)	100 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
ENNA	0 (0)	0 (0)	0 (0)	0 (0)	33 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
ENNA1	60 (3)	60 (3)	40 (2)	40 (2)	60 (3)	40 (2)	40 (2)	40 (2)	40 (2)	0 (0)	0 (0)	40 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	20 (1)	0 (0)
ENNB	51 (36)	46 (33)	32 (23)	32 (23)	30 (21)	25 (18)	25 (18)	25 (18)	24 (17)	14 (10)	8 (6)	4 (3)	8 (6)	6 (4)	4 (3)	1 (1)	3 (2)	3 (2)	1 (1)
ENNB1	47 (17)	44 (16)	19 (7)	25 (9)	22 (8)	17 (6)	19 (7)	14 (5)	14 (5)	6 (2)	0 (0)	6 (2)	6 (2)	6 (2)	0 (0)	3 (1)	3 (1)	6 (2)	3 (1)
ENN	51 (36)	46 (33)	32 (23)	32 (23)	30 (21)	25 (18)	25 (18)	25 (18)	24 (17)	14 (10)	8 (6)	4 (3)	8 (6)	6 (4)	4 (3)	1 (1)	3 (2)	3 (2)	1 (1)
CUL	46 (6)	46 (6)	15 (2)	8 (1)	15 (2)	8 (1)	15 (2)	8 (1)	8 (1)	0 (0)	0 (0)	0 (0)	15 (2)	8 (1)	15 (2)	8 (1)	0 (0)	15 (2)	8 (1)
BEA	54 (20)	49 (18)	27 (10)	32 (12)	24 (9)	24 (9)	30 (11)	30 (11)	27 (10)	5 (2)	5 (2)	11 (4)	11 (4)	5 (2)	8 (3)	3 (1)	3 (1)	5 (2)	3 (1)
STC	14 (1)	29 (2)	14 (1)	14 (1)	14 (1)	14 (1)	14 (1)	14 (1)	14 (1)	0 (0)	0 (0)	14 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
MON	50 (4)	25 (2)	25 (2)	13 (1)	0 (0)	0 (0)	13 (1)	13 (1)	13 (1)	0 (0)	0 (0)	0 (0)	25 (2)	13 (1)	25 (2)	0 (0)	13 (1)	0 (0)	0 (0)

Key: %, per cent; x, number of positive samples; AFB1, aflatoxin B1; AFG1, aflatoxin G1; AF, total aflatoxins; DON, deoxynivalenol; DON3G, deoxynivalenol-3-glucoside; ZEN, zearalenone; α ZEL, alpha zearalenol; β ZEL, beta zearalenol; FUMB1, fumonisin B1; FUMB2, fumonisin B2; FUMB, total fumonisins B; ECO, ergocornine; ECR, ergocristine; ENV, ergonovine; ESN, ergosine; ETA, ergotamine; α ECP, alpha ergocryptine; ERG, total ergot alkaloids; FUSX, fusarenon X; HT2, HT-2 toxin; NEO, neosolaniol; NIV, nivalenol; AOH, alternariol; AME, alternariol methyl ether; ENNA, enniatin A; ENNA1, enniatin A1; ENNB, enniatin B; ENNB1, enniatin B1; ENN, total enniatins; CUL, 15 hydroxy-culmorin; BEA, beauvericin; STC, sterigmatocystin; MON, moniliformin.

Table S6. Median mycotoxin levels in fish feed samples containing particular ingredient.

Mycotoxin	Ingredient was	Maize bran	Wheat bran	Dried silver cyprinid fish	Fish meal	Pollard	Fresh water shrimp	Cotton seed cake	Sun flower seed cake	Soya bean cake	Maize germ	Canola seed cake	Cassava	Multi vitamins	Bone meal	Rice bran	Dairy meal	Wheat	Poultry waste	Rice
		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
AFB1	Present	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	-	-	<14.7	<14.7	<14.7	-	<14.7	-	-	-
	Absent	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7
AFG1	Present	<155.8	-	-	<155.8	-	-	-	<155.8	<155.8	-	-	-	-	-	-	-	-	-	-
	Absent	<155.8	<155.8	<155.8	-	<155.8	<155.8	<155.8	-	-	<155.8	<155.8	<155.8	<155.8	<155.8	<155.8	<155.8	<155.8	<155.8	<155.8
AF	Present	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	-	-	<14.7	<14.7	<14.7	-	<14.7	-	-	-
	Absent	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7	<14.7
DON	Present	121.3	<40.4	<40.4*	<40.4*	<40.4	<40.4*	<40.4	<40.4	<40.4	<40.4	<40.4	316.7	<40.4	<40.4	546.7	<40.4	262.9	-	778.7
	Absent	65.6	82.5	113.5	98.5	83.4	83.1	98.5	83.1	83.4	83.4	83.1	66.3	74.7	82.5	65.4	82.7	66.3	66.9	66.3
DON3G	Present	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	-	-	<46.8	<46.8	<46.8	<46.8	<46.8	-	-	<46.8
	Absent	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8	<46.8
ZEN	Present	<38	58.8	116.4	<38	<38	<38	38.9	<38	<38	-	-	<38	331.3	238.5	38.4	319.6	186.5	140.3	58.8
	Absent	61.8	78.7	58.8	74.5	74.5	64.8	64.8	74.5	64.8	58.8	58.8	61.8	45.7	52.3	61.8	52.3	52.3	45.7	55.3
αZEL	Present	18.1	18.9	126.4	25.1	26.7	<22.2	60.7	25.1	59.9	-	-	-	126.4	94.6	158.1	149.8	131.5	<22.2	26.7
	Absent	32.8	32.8	25.1	29.8	29.0	29.8	25.1	29.8	26.7	26.7	26.7	26.7	25.1	25.9	25.9	26.7	25.9	29.8	29.0
βZEL	Present	<16	21.4	25.6	14.7	<16	<16	40.8	29.8	29.8	<16	-	<16	50.3	51.8	48.7	78.5	-	17.5	-
	Absent	35.6	31.9	29.4	33.8	31.9	35.6	25.1	26.9	26.9	31.9	28.4	29.8	22.3	23.2	26.9	25.1	28.4	30.9	28.4
FUMB1	Present	115.2	71.4	<63	48.6	81.2	56.4	54.3	<63	<63	<63	<63	177.8	<63	<63	333.7	<63	118.4	232.4	99.3
	Absent	134.4	145.8	135.8	145.8	134.4	126.4	145.8	135.8	134.4	126.4	118.4	116.8	126.4	134.4	99.3	134.4	115.2	115.2	118.4
FUMB2	Present	<68.9	123.2	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	-	-	<68.9	<68.9	<68.9	<68.9	-	-	<68.9	-
	Absent	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9	<68.9
FUMB	Present	149.7	79.2	48.7	71.5	81.2	56.4	71.5	48.7	66.0	<63	<63	195.0	48.7	<63	368.2	<63	118.4	266.9	99.3
	Absent	188.9	200.5	200.5	200.5	212.1	180.3	215.3	200.5	188.9	180.3	171.7	160.7	180.3	188.9	118.4	188.9	171.7	149.7	171.7
ECO	Present	49.5	45.9	42.3	42.3	59.5	49.5	42.3	45.9	42.3	-	-	-	42.3	42.3	-	64.3	-	-	-

Mycotoxin	Ingredient was	Maize bran	Wheat bran	Dried silver cyprinid fish	Fish meal	Pollard	Fresh water shrimp	Cotton seed cake	Sun flower seed cake	Soya bean cake	Maize germ	Canola seed cake	Cassava	Multi vitamins	Bone meal	Rice bran	Dairy meal	Wheat	Poultry waste	Rice
		µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg	µg/kg
AME	Present	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	94.5	-	-	94.5	-	-	-	-	-	-	-
ENNA	Absent	-	-	-	-	-	-	-	-	-	94.5	94.5	-	94.5	94.5	94.5	94.5	94.5	94.5	94.5
	Present	-	-	-	-	<26.1	-	-	-	-	-	-	-	-	-	-	<26.1	-	-	-
ENNA1	Absent	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1	<26.1
	Present	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	-	-	<13.5	-	-	-	23.8	-	<13.5	-
ENNB	Absent	15.3	15.3	14.7	14.7	10.7	14.7	14.7	14.7	14.7	<13.5	<13.5	14.7	<13.5	<13.5	<13.5	<13.5	<13.5	<13.5	10.7
	Present	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	51.4	<38.8	<38.8	<38.8	<38.8	<38.8
ENNB1	Absent	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8	<38.8
	Present	19.6	25.4	26.8	26.3	26.6	26.6	22.8	26.8	26.8	30.1	-	18.2	22.9	22.9	-	16.0	19.6	19.8	22.8
ENN	Absent	23.5	19.4	19.9	22.8	19.8	21.4	23.5	22.8	22.8	21.4	23.2	23.2	23.2	23.2	23.2	23.5	23.5	23.2	23.5
	Present	35.6	37.8	32.6	37.8	32.6	26.0	40.1	35.2	37.8	19.4	19.4	32.6	42.3	65.1	19.4	35.4	29.2	42.5	64.4
CUL	Absent	49.8	36.1	37.2	36.3	37.7	37.8	35.8	36.8	36.4	37.6	37.6	37.2	36.0	35.8	37.7	37.2	36.8	36.8	36.4
	Present	153.7	132.5	117.8	84.1	149.5	155.9	98.8	84.1	84.1	-	-	-	117.8	84.1	113.4	185.4	-	222.3	113.5
BEA	Absent	113.5	141.6	141.6	146.6	141.6	127.6	151.5	146.6	146.6	141.6	141.6	141.6	141.6	146.6	141.6	127.6	141.6	113.5	146.6
	Present	28.2	35.0	21.2	<15.9	31.4	16.0	<15.9	16.0	22.6	<15.9	<15.9	39.9	21.2	152.3	34.4	31.4	137.7	54.4	69.2
STC	Absent	35.6	31.4	35.6	35.6	35.0	35.0	35.0	35.0	34.4	35.6	35.6	31.4	35.6	34.4	33.5	35.0	32.9	34.4	32.9
	Present	162.5	1839.8	162.5	162.5	162.5	162.5	162.5	162.5	162.5	-	-	162.5	-	-	-	<30.5	-	-	-
MON	Absent	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	<30.5	162.5	<30.5	<30.5	<30.5
	Present	719.4	741.8	741.8	257.6	-	-	257.6	257.6	257.6	-	-	-	741.8	257.6	761.1	641.3	<218.9	-	-
	Absent	530.4	530.4	530.4	641.3	530.4	530.4	641.3	641.3	641.3	530.4	530.4	530.4	530.4	641.3	530.4	419.4	641.3	530.4	530.4

Key: %, per cent; AFB1, aflatoxin B1; AFG1, aflatoxin G1; AF, total aflatoxins; DON, deoxynivalenol; DON3G, deoxynivalenol-3-glucoside; ZEN, zearalenone; αZEL, alpha zearalenol; βZEL, beta zearalenol; FUMB1, fumonisin B1; FUMB2, fumonisin B2; FUMB, total fumonisins B; ECO, ergocornine; ECR, ergocristine; ENV, ergonovine; ESN, ergosine; ETA, ergotamine; αECP, alpha ergocryptine; ERG, total ergot alkaloids; FUSX, fusarenon X; HT2, HT-2 toxin; NEO, neosolaniol; NIV,

nivalenol; AOH, alternariol; AME, alternariol methyl ether; ENNA, enniatin A; ENNA1, enniatin A1; ENNB, enniatin B; ENNB1, enniatin B1; ENN, total enniatins; CUL, 15 hydroxy-culmorin; BEA, beauvericin; STC, sterigmatocystin; MON, moniliformin; *, $p \leq 0.05$.

Table S7. Performance parameters of the multi-mycotoxin HPLC-HRMS method used.

Mycotoxins	LOD µg/kg	LOQ µg/kg	r^2	Recovery %	SSE %
Aflatoxins					
AFB1	14.7	49.1	0.9999	79.8	87.1
AFG1	155.8	519.3	0.9995	51.6	84.6
AFB2	18.1	60.4	0.9999	78.8	82.4
AFG2	152.9	509.7	0.9994	44.8	88.9
Deoxynivalenol and its analogues					
DON	40.4	134.8	0.9991	107.1	195.7
DON3G	46.8	156.1	0.9993	58.2	252.4
3ADON	36.0	119.9	1.0000	87.7	77.7
15ADON	122.7	409	0.9993	119.8	35.5
Zearalenone and its analogues					
ZEN	38.0	126.6	0.9995	119.1	78.2
αZEL	22.2	73.9	0.9995	132.6	68.4
βZEL	16.0	53.3	0.9994	133.8	69.7
Fumonisin					
FUMB1	63.0	209.9	0.9977	52.5	61.4
FUMB2	68.9	229.7	0.9995	57.2	68.1
Ergot alkaloids					
ECO	20.7	69.1	0.9993	129.7	172.6
ECR	24.9	83.0	0.9990	142.6	227.1
ENV	21.9	73.1	0.9999	84.2	49.6
ESN	38.4	128.2	0.9996	108.8	132.7
ETA	29.3	97.6	0.9987	122.1	160.8
αECP	41.0	136.6	0.9988	136.1	231.7
Other trichothecenes					
FUSX	56.0	186.6	0.9997	106.3	114.5
HT2	41.6	138.7	0.9992	119.7	89.1
T2	58.2	194.1	1.0000	120.2	103.2
T2 triol	122.7	409.0	0.9975	121.9	108.9
T2 tetraol	41.9	139.8	0.9998	78.5	100.0
NEO	177.7	592.4	0.9999	139.8	81.0
NIV	40.3	134.2	0.9995	43.7	285.4
DAS	33.9	113.1	0.9994	118.9	78.4
Alternariol and its analogues					
AOH	36.2	120.8	0.9953	81.6	59.3

Mycotoxins	LOD µg/kg	LOQ µg/kg	r ²	Recovery %	SSE %
AME	16.4	54.7	0.9953	81.6	66.7
Enniatins					
ENNA	26.1	87.2	0.9980	138	263.2
ENNA1	13.5	44.9	0.9988	141.3	282.4
ENNB	38.8	129.4	0.9993	128.6	165.9
ENNB1	12.9	43.1	0.9992	134.6	211.6
Other mycotoxins					
CUL	42.3	141.0	0.9998	120.3	83.4
BEA	15.9	53.2	0.9990	133.5	202.4
STC	30.5	101.6	0.9994	127.3	116.0
MON	218.9	729.6	0.9891	71.8	100.0
BUT	149.2	497.3	0.9998	145.4	100.0
AOD	30.9	103.0	0.9891	78.9	183.9
OTA	27.3	91.1	0.9999	103.4	123.4

Key: LOD, Limit of detection; LOQ, Limit of quantification; <, less than; r², calibration curve regression coefficient; SSE, Signal Suppression or Enhancement; µg/kg, micrograms per kilogram; %, per cent; AFB1, aflatoxin B1; AFG1, aflatoxin G1; AFB2, aflatoxin B2; AFG2, aflatoxin G2; DON, deoxynivalenol; DON3G, deoxynivalenol 3-glucoside; 3ADON, 3-acetyldeoxynivalenol; 15ADON, 15-acetyldeoxynivalenol; ZEN, zearalenone; αZEL, alpha zearalenol; βZEL, beta zearalenol; FUMB1, fumonisin B1; FUMB2, fumonisin B2; ECO, ergocornine; ECR, ergocristine; ENV, ergonovine; ESN, ergosine; ETA, ergotamine; αECP, alpha ergocryptine; FUSX, fusarenon X; HT2, HT-2 toxin; T2, T-2 toxin; NEO, neosolaniol; NIV, nivalenol; DAS, diacetoxyscirpenol; AOH, alternariol; AME, alternariol methyl ether; ENNA, enniatin A; ENNA1, enniatin A1; ENNB, enniatin B; ENNB1, enniatin B1; CUL, 15-hydroxy-culmorin; BEA, beauvericin; STC, sterigmatocystin; MON, moniliformin; BUT, 5-acetamido-butenolide; AOD, 2-amino-14,16-dimethyloctadecan-3-ol; OTA, ochratoxin.

