

Evaluation of Skretting Turkey Monitoring Program (Aquaculture feed) 2023

The report contains a summary of the results of undesirable substances in Skretting Aquaculture feed and raw materials analysed and reported in 2023, on both global list and on some local list analysis.

Some local list analyses are done because of customer and/or government requirements even though they are considered as low risk. Both data “Approved for Nutrace®” and data only approved for internal use are reported.

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General information:

The results in this report are in general compared to EU limits for complete feed (if results are above the limits for complete feed and the feed is registered as complementary feed, a comment is made in the report).

Some parameters have new proposed EU limits, in these cases results are compared to these new limits in brackets in relevant chapters.

EU has max limits for many substances and for some substances, EU has implemented action limits as well.

In EU legislation, are most of the limits based on 12% moisture. In this report the dioxins, dioxin like PCB's and non-dioxin like PCB's are reported as "calculated based 12%". All other results are reported as "as-is".

Definitions:

Lower bound: Results below detection limit is regarded as "zero".

Upper bound: Results below detection limit is regarded as the numeric value of the detection limit.

MRL: Maximum Residue Limit

Global list: Common Skretting division mandatory monitoring program

Local list: Local OpCo monitoring program

Salmonids: Salmon, trout, chars, freshwater whitefishes and graylings

For some substances, there are different limits for the feed used for Salmonids compared to the feed used for other species.

Summary Fish Feed:

Overall the results are at the same level as last year (2022). We did not receive any nonconformities in the results. We did not have any problems with our feeds in pesticide, dioxin, heavy metal, antibiotics, Crystal Vole & Malachite Green, Microbiological Analysis.

In the tables below, you can find the comparison of some analyzes.

Table 1: table of the analysis results of the monitoring planned fish feed

Fish Feed	Unit	EU limit /guidance	Result
Arsenic	mg/kg	10	0.7
Cadmium	mg/kg	1.0	0.15
Lead	mg/kg	5	0.15
Mercury	mg/kg	0.2	< 0.01
Dioxins (PCDD, PCDF) WHO-TEF 2005 pg/g WHO-TEQ	pg/g TEQ	1.75	0.11
Dioxin-like PCB's WHO-TEF 2005 pg/g WHO-TEQ	pg/g TEQ	2.5	0.17
Sum of dioxins and dioxin- like PCBs WHO-TEF 2005 pg/g WHO-TEQ	pg/g	5.5	0.28
Non dl-PCBs Sum 28, 52, 101, 138, 153, 180 (ICES-6) ppb (ug/kg)	ppb	40	0.281
Sum DDT	ng/g	50	3.755
b-HCH	ng/g	10	0.862
HCB	ng/g	10	0.786
Sum Toxaphene	ng/g	50	2
Ethoxyquin (Suspended in EU)	mg/kg	150	<1
BHT	mg/kg	150	47
BHA	mg/kg	150	49
Sum Antioxidants (BHA, BHT and ETQ)	mg/kg	150	97
Sum Antioxidants (BHA and BHT)	mg/kg	150	96
Aflatoxin B1	µg/kg	10	< 0.5
Deoxynivalenol (DON)	µg/kg	5000*	< 100
HT-2	µg/kg	-	
Sum Fumonisine (FUM)	µg/kg	10000*	< 100
T-2	µg/kg	-	
Ochratoxin (OTA)	µg/kg	-	< 10
Zearalenon (ZEN)	µg/kg	-	< 10

*EU guidance

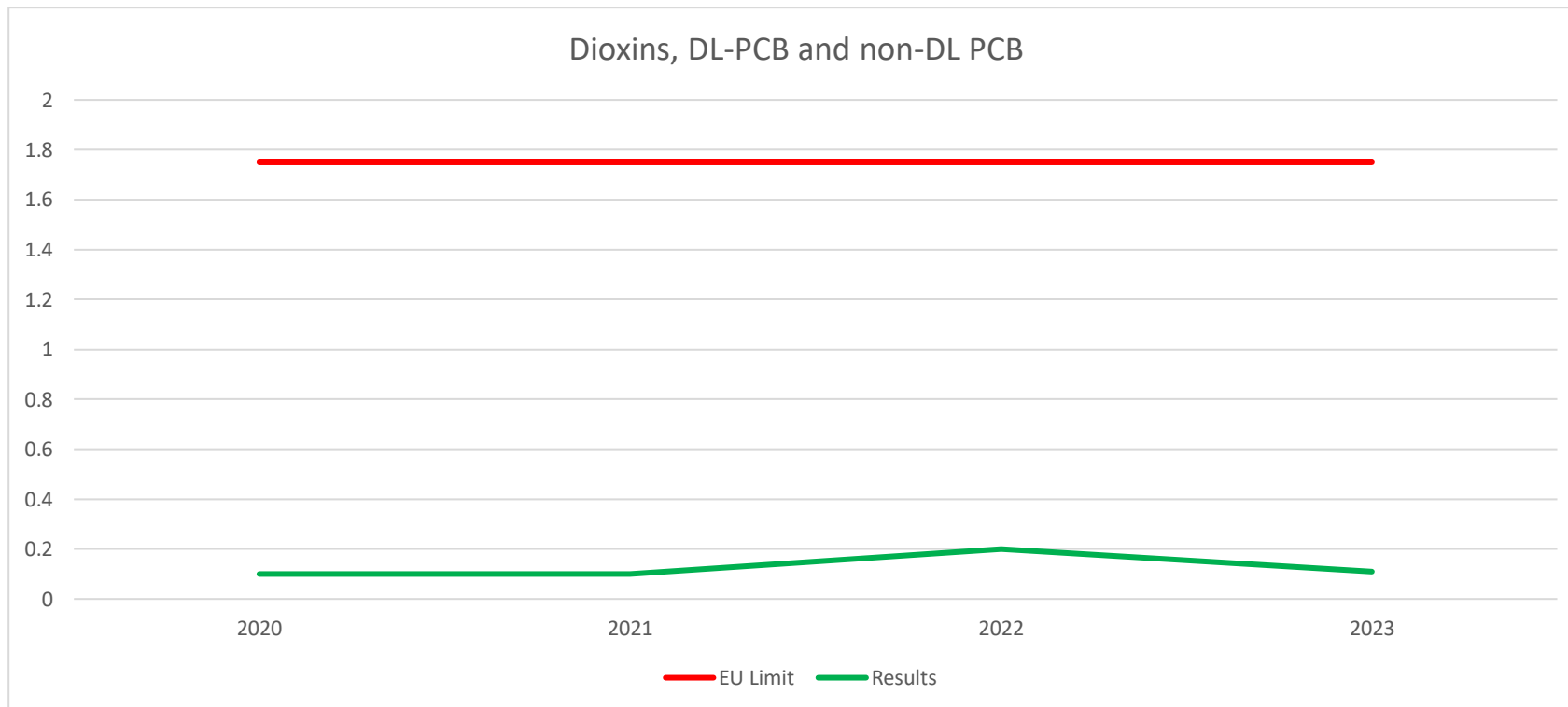
Dioxins, DL-PCB and non-DL PCB:

Dioxins in Fish Feed:

All tested Fish Feeds are within the EU limit for sum Dioxins (all feeds are also within new proposed limit of 1.00 pg TEQ(WHO)/g)

Dioxin

Unit: pg WHO-PCDD/F-TEQ/g | EU Limit: 1,75 pg/g |

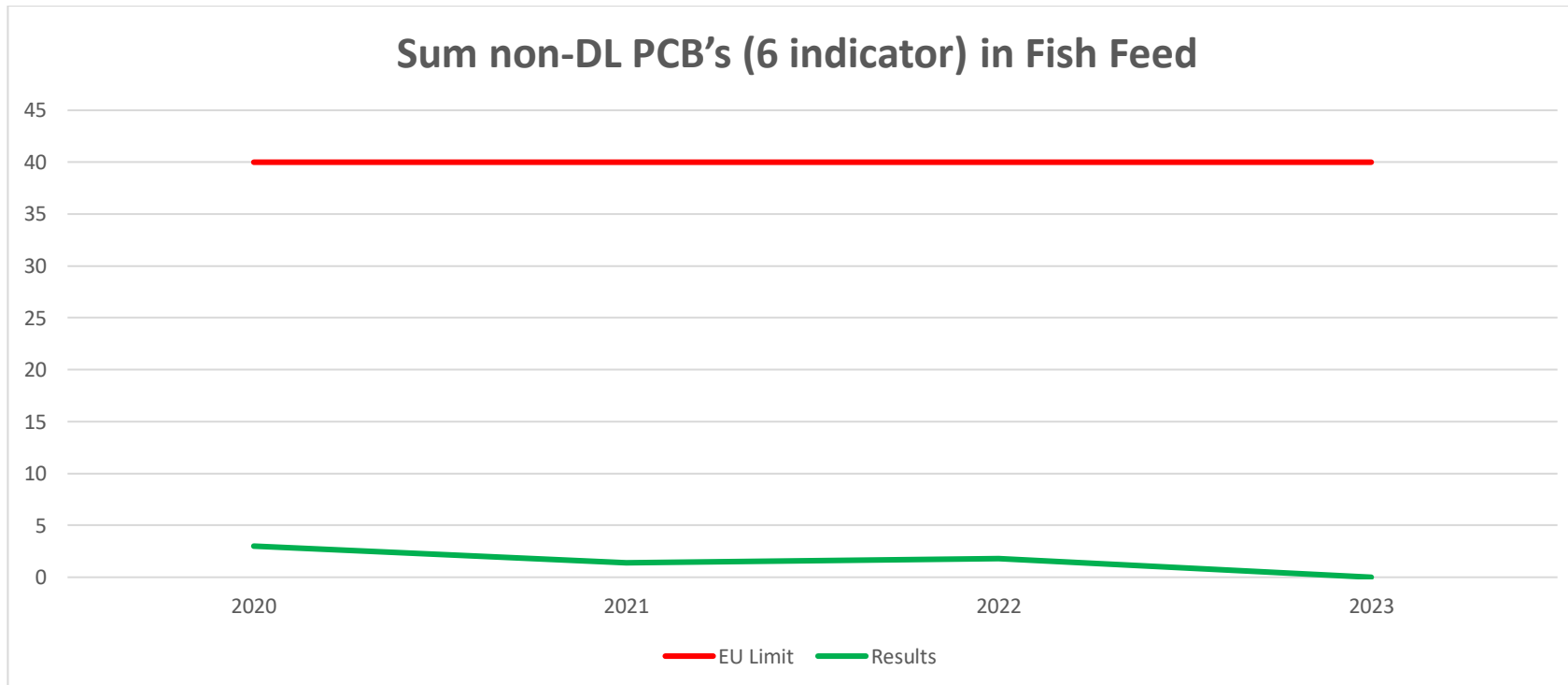


Sum non-DL PCB's (6 indicator) in Fish Feed:

All tested Fish Feeds are within the EU limit for Sum non dioxin like PCB's (sum 6 indicator PCB).

PCB 6 indicators

Unit: ng/g | EU Limit: 40 ng/g

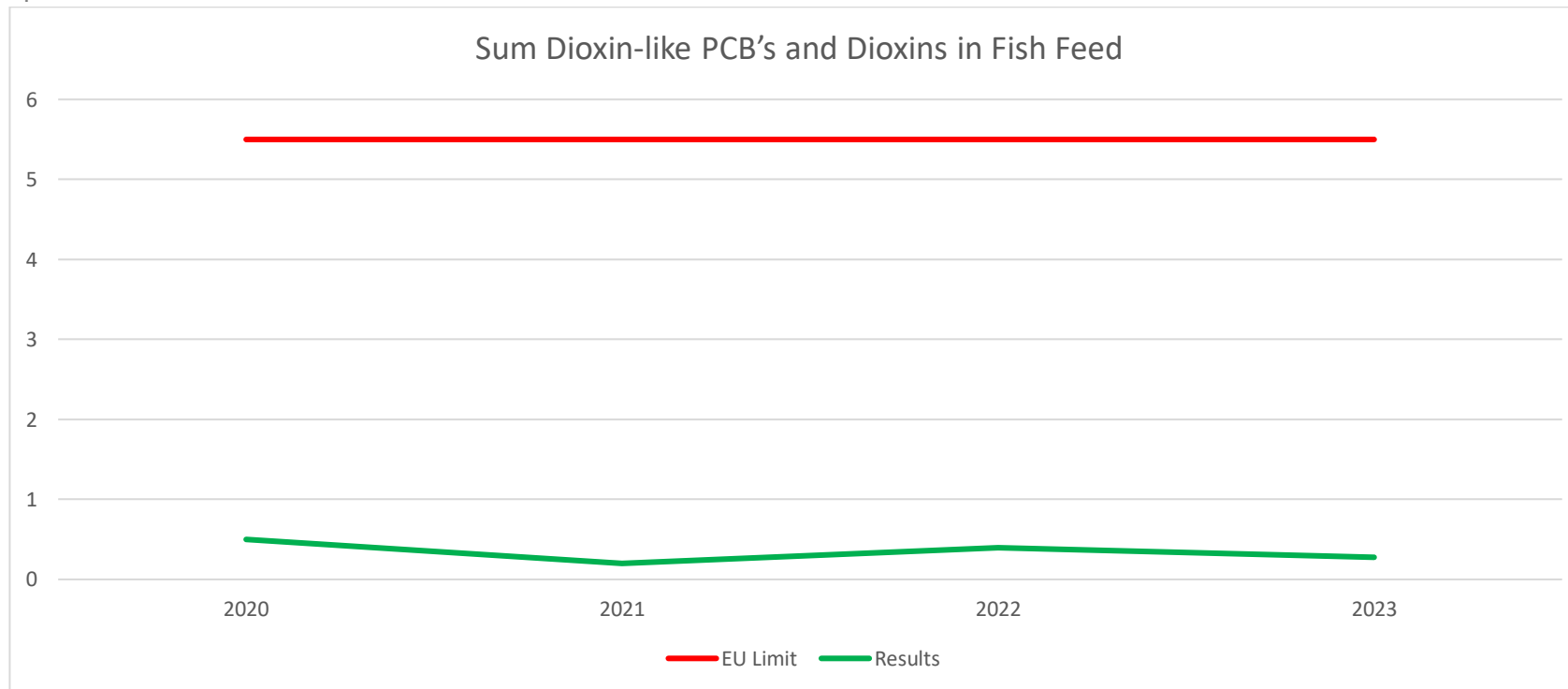


Sum Dioxin-like PCB's and Dioxins in Fish Feed:

All tested Fish Feeds are within the EU limit for sum Dioxin-like PCB's and Dioxins.

Dioxin like PCB and Dioxin

Unit: pg/g WHO-TEQ | EU Limit: 5,5 pg/g

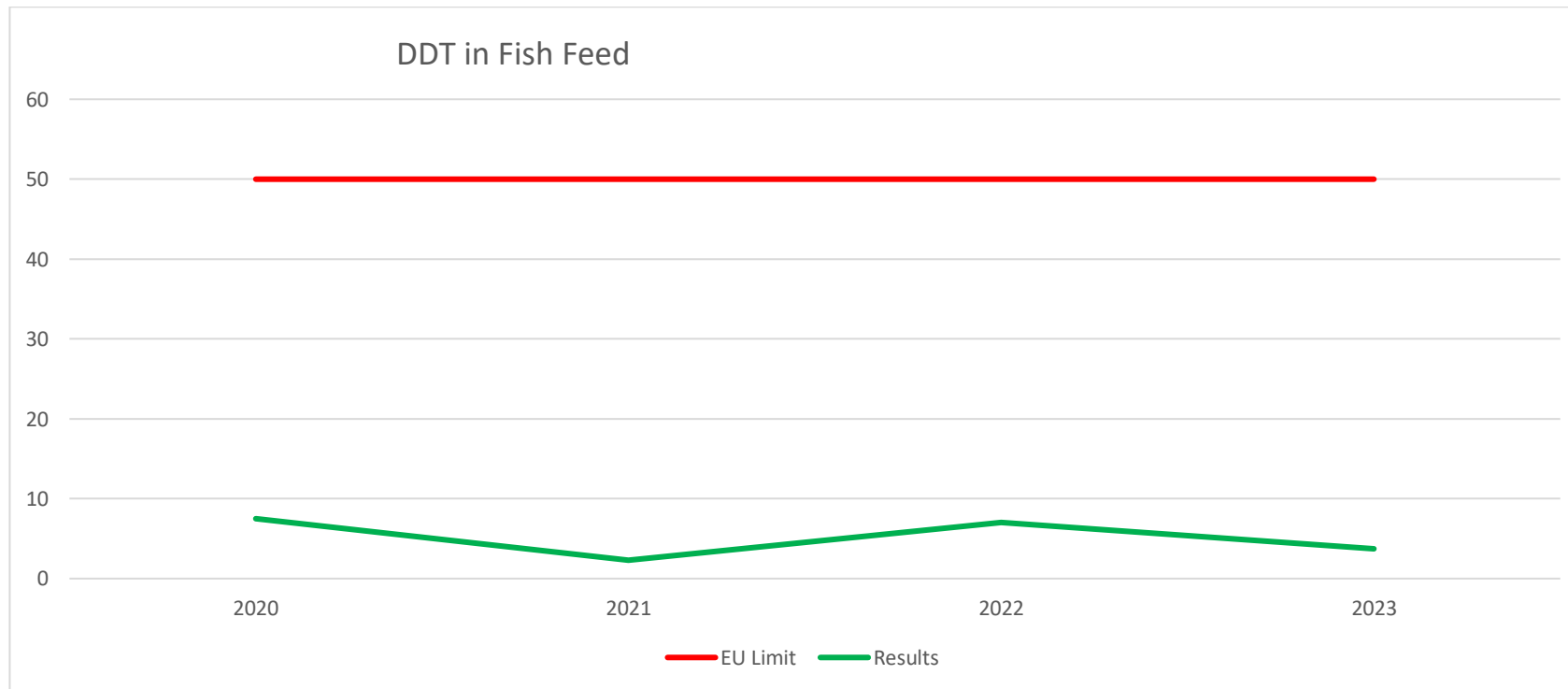


DDT in Fish Feed:

All tested Fish Feeds are within the EU limit for sum DDT.

DDT

Unit: ng/g | EU Limit: 50 ng/g

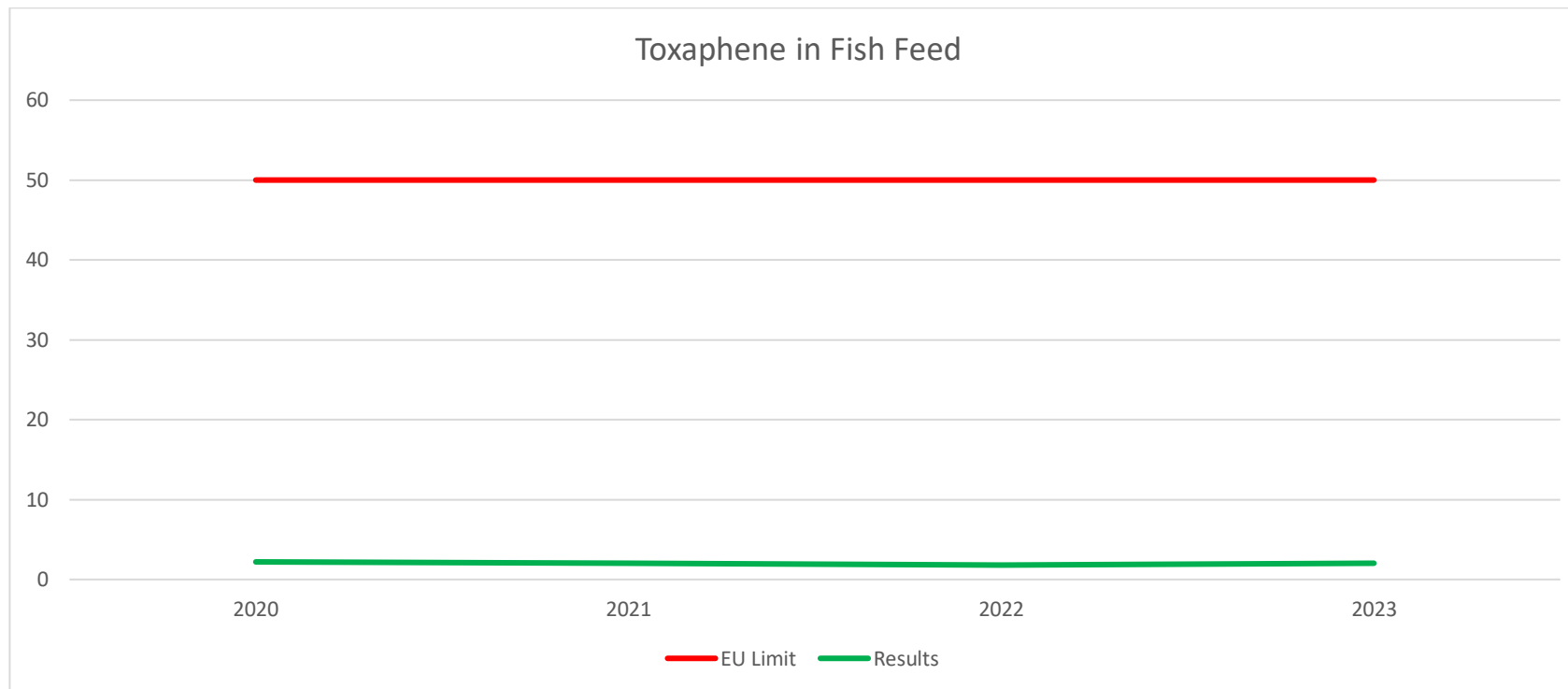


Toxaphene in Fish Feed:

All tested Fish Feeds are within the EU limit for Toxaphene.

Toxaphene (sum 26,50,62).

Unit: ng/g | EU Limit: 50 ng/g

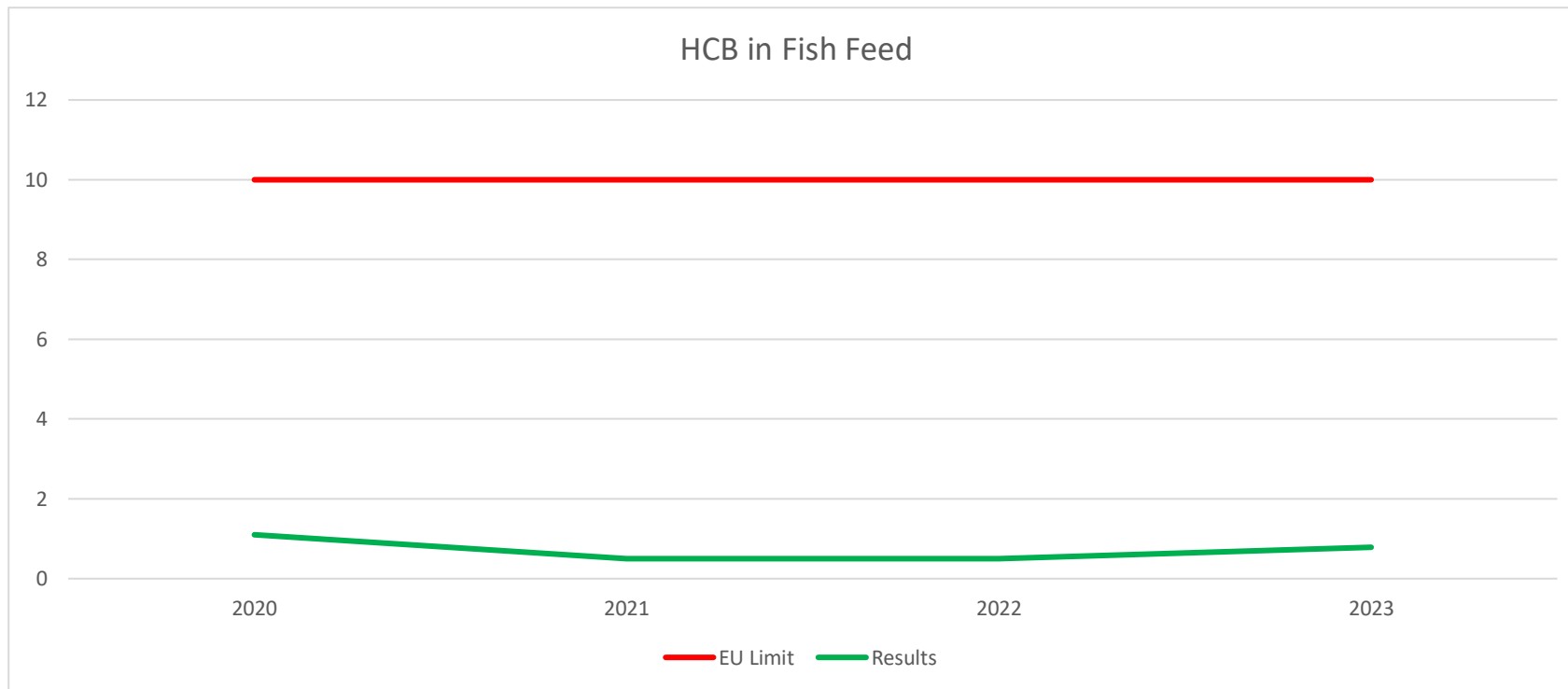


HCB in Fish Feed:

All tested Fish Feeds are within the EU limit for HCB.

HCB

Unit: ng/g | EU Limit: 10 ng/g

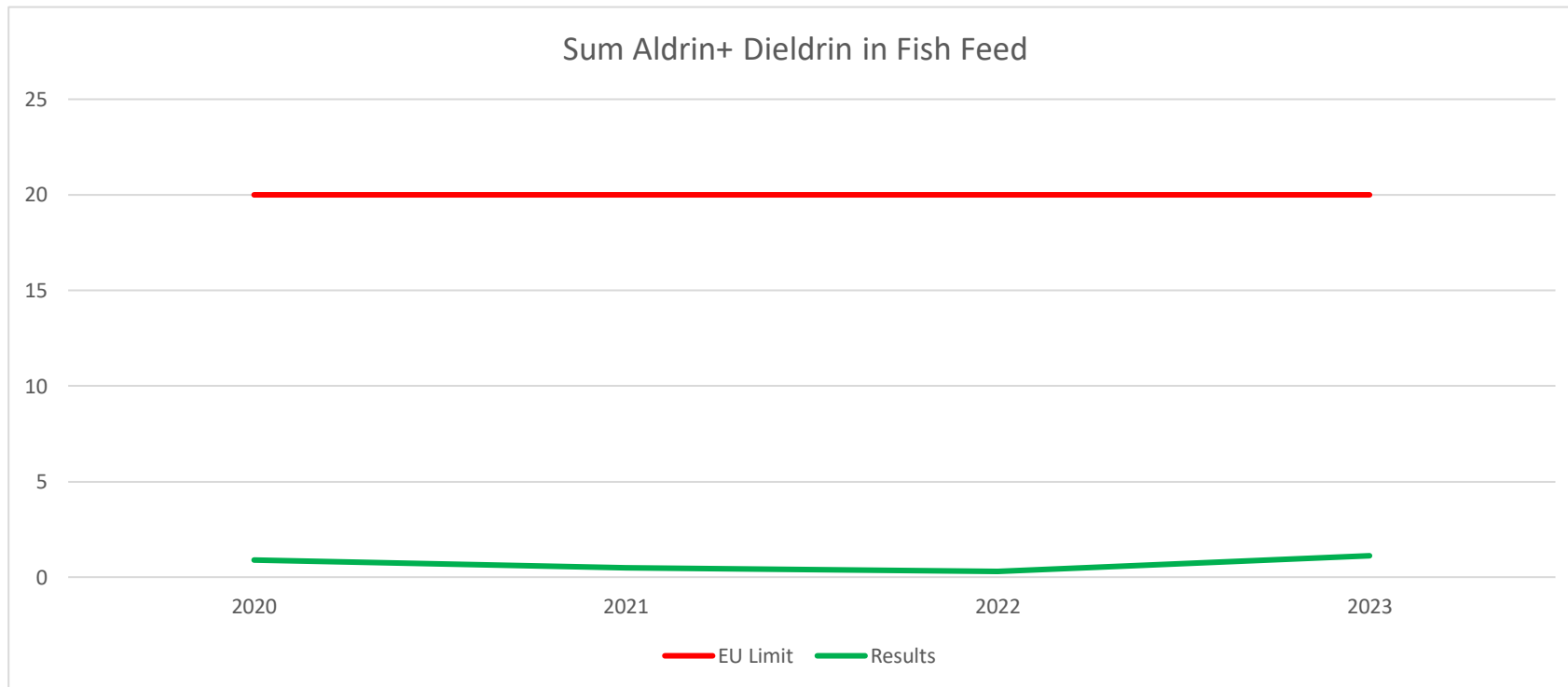


Sum Aldrin+ Dieldrin in Fish Feed:

All tested Fish Feeds are within the EU limit for Sum Aldrin+Dieldrin.

Sum Aldrin+Dieldrin

Unit: ng/g | EU Limit: 20 ng/g

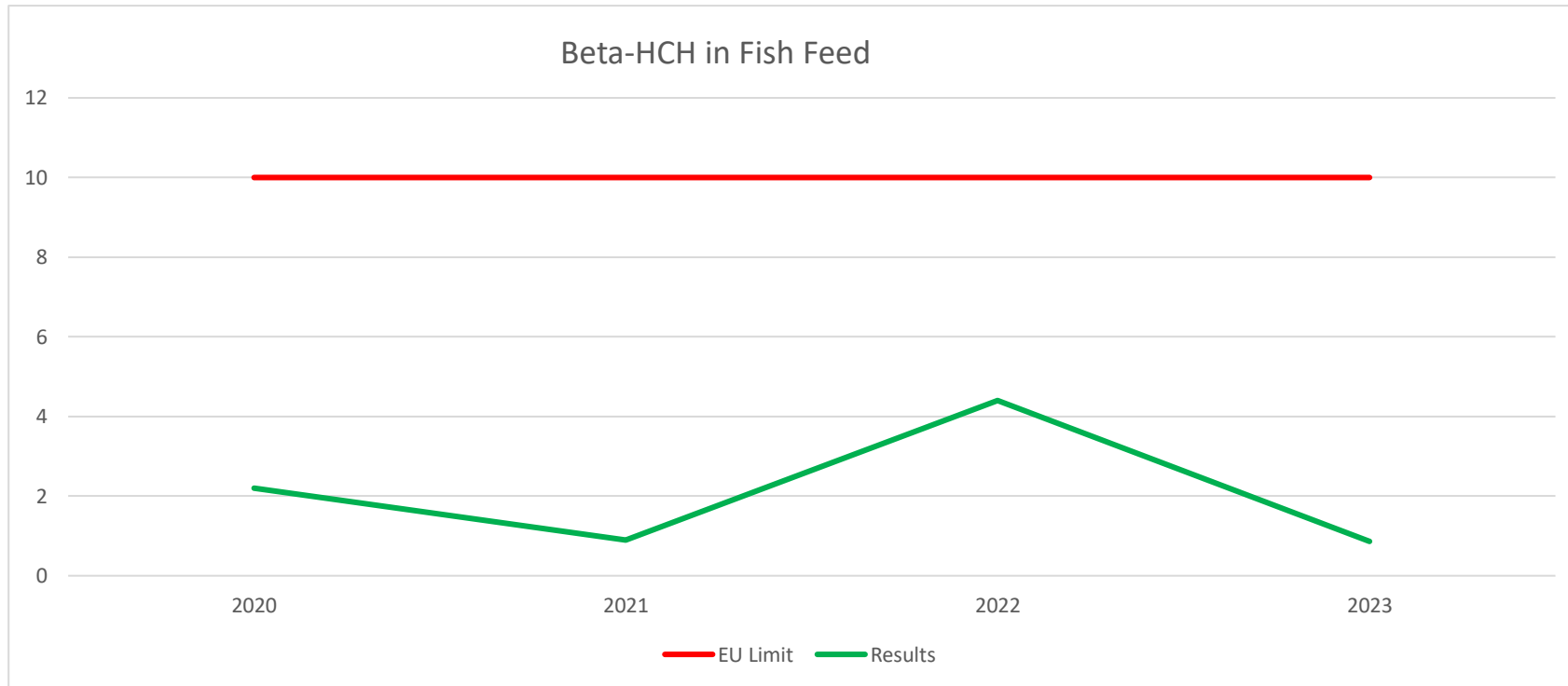


Beta-HCH in Fish Feed:

All tested Fish Feeds are within the EU limit for Beta-HCH.

Beta-HCH

Unit: ng/g | EU Limit: 10 ng/g

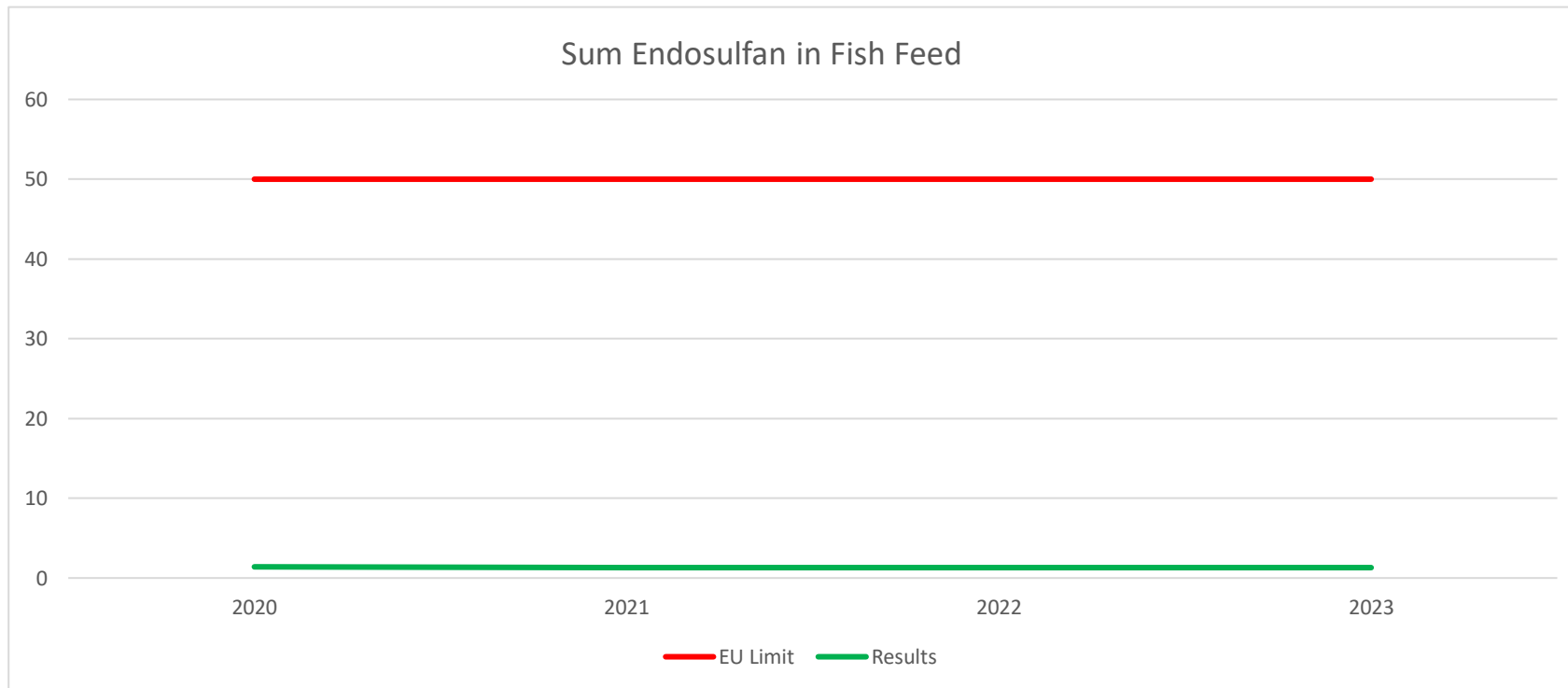


Sum Endosulfan in Fish Feed:

All tested Fish Feeds are within the EU limit for Sum Endosulfan.

Sum Endosulfan

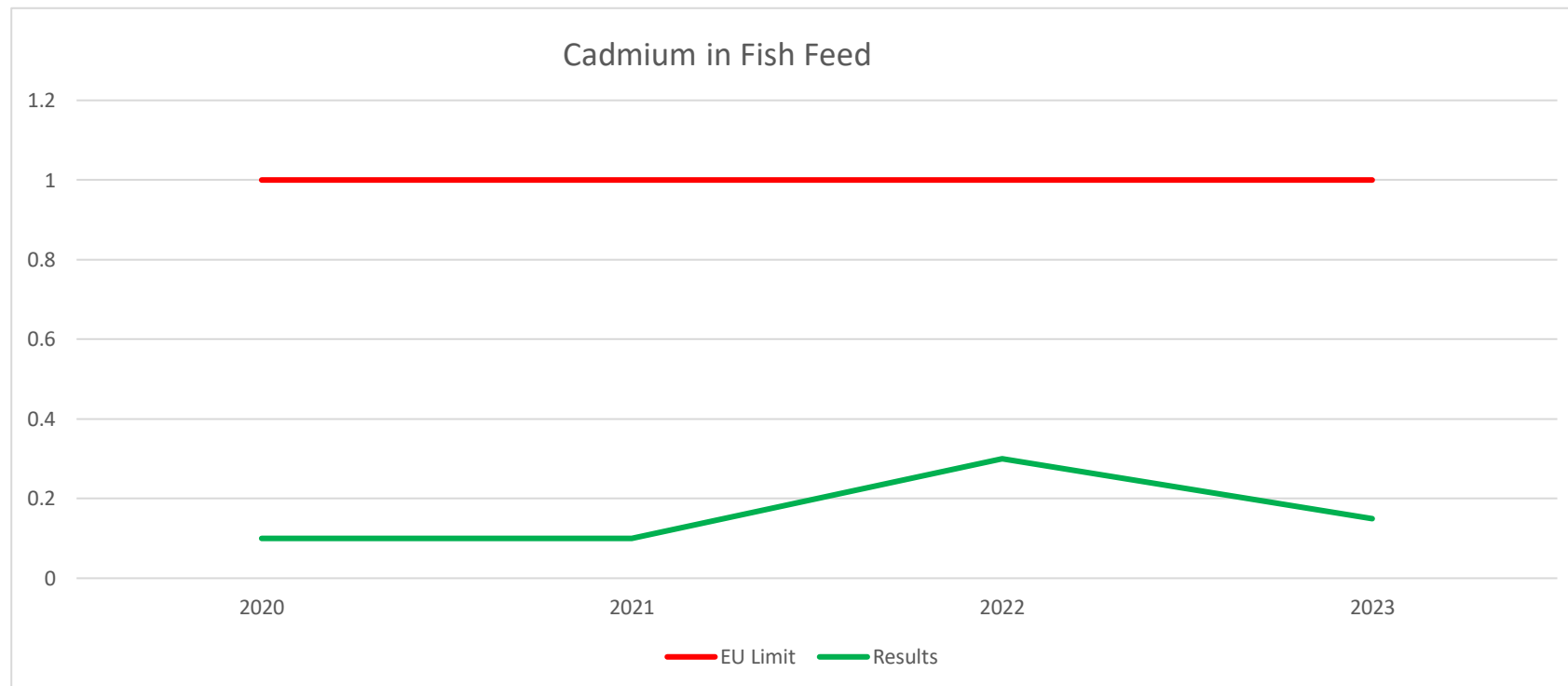
Unit: ng/g | EU Limit: 50 ng/g



Heavy Metal in Fish Feed :

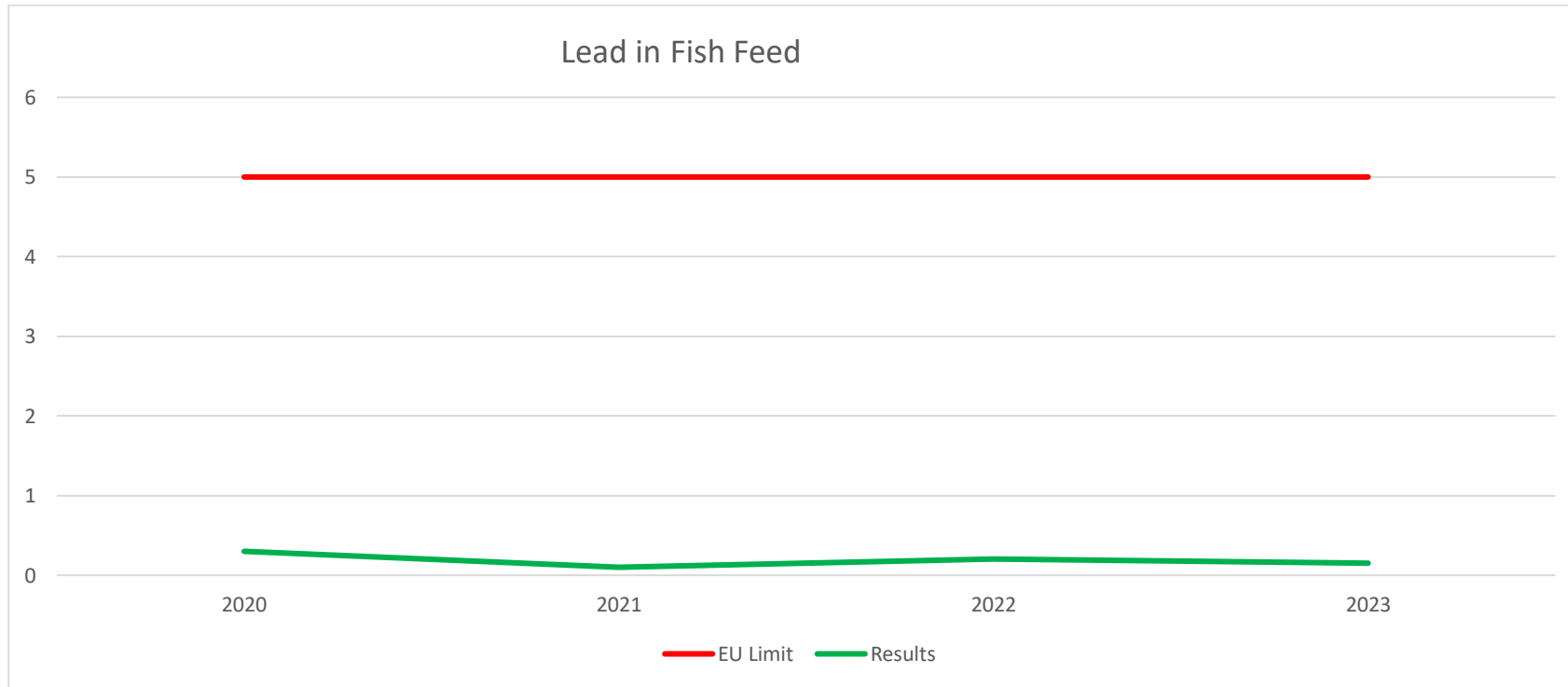
Cadmium

Unit: mg/kg | EU Limit: 1,0 mg/kg



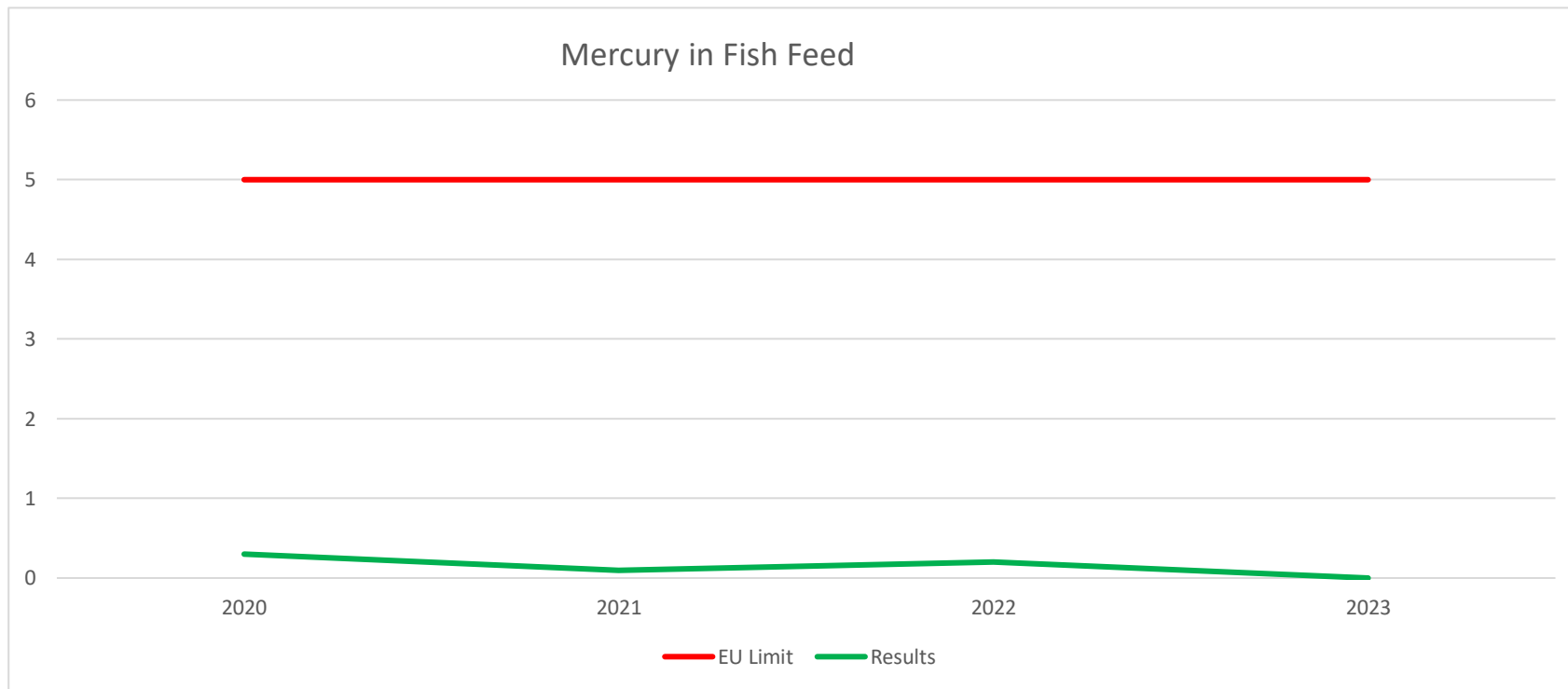
Lead

Unit: mg/kg | EU Limit: 5 mg/kg



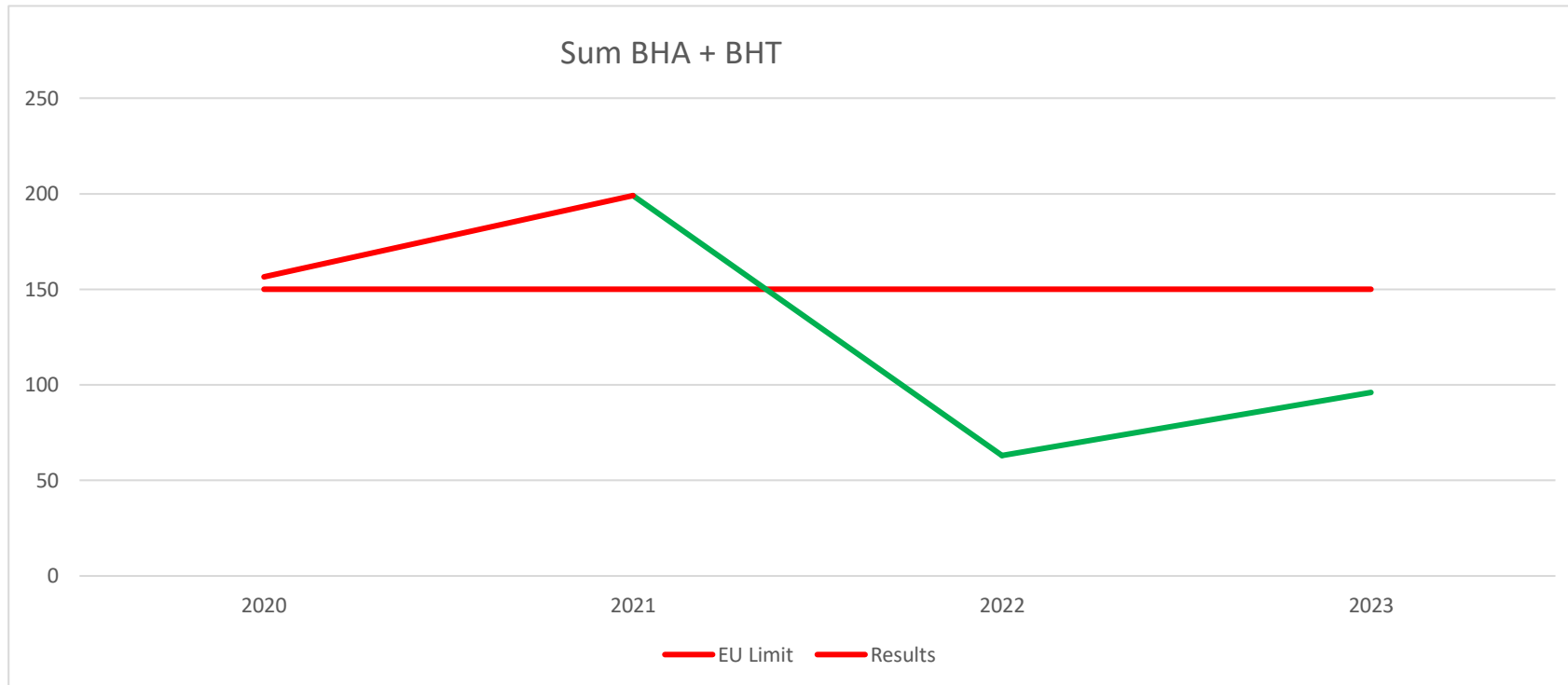
Mercury

Unit: mg/kg | EU Limit: 0,2 mg/kg



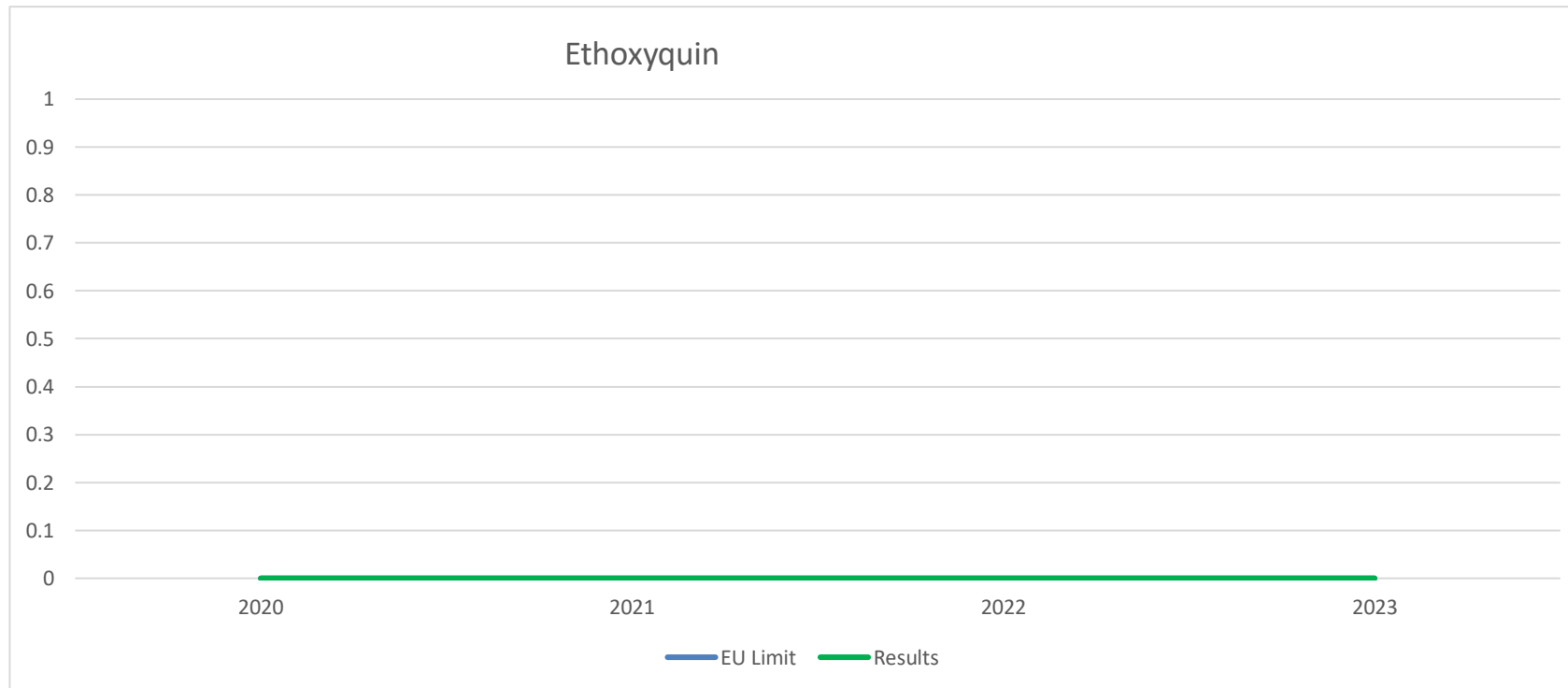
BHA+BHT

Unit: mg/kg | EU Limit: 150 mg/kg



Ethoxyquin

Unit: ng/g | EQ is suspended. After 31.03.2020 no ingredients containing EQ can be used in feed.



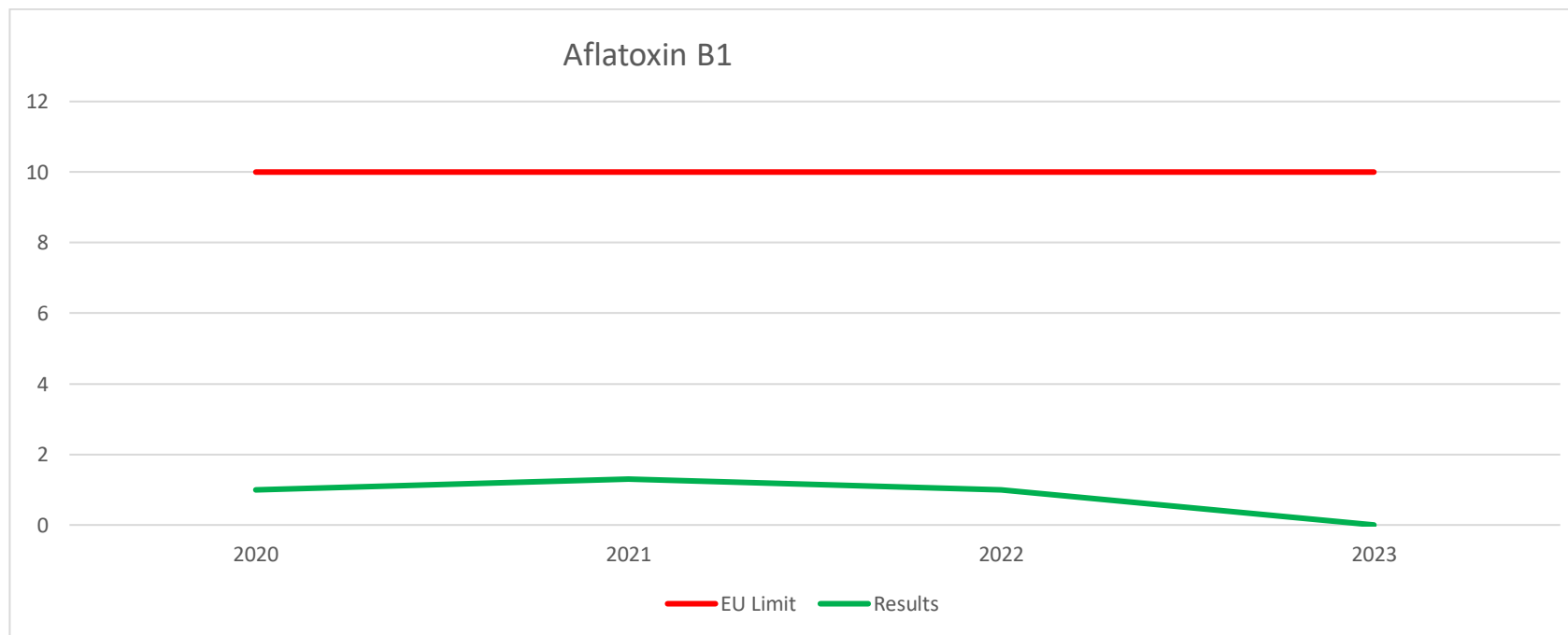
Mycotoxins:

Feed:

All mycotoxin results reported are below Skretting internal limits, below EU limits and EU guidance value, see table 10 for Fish Feed .

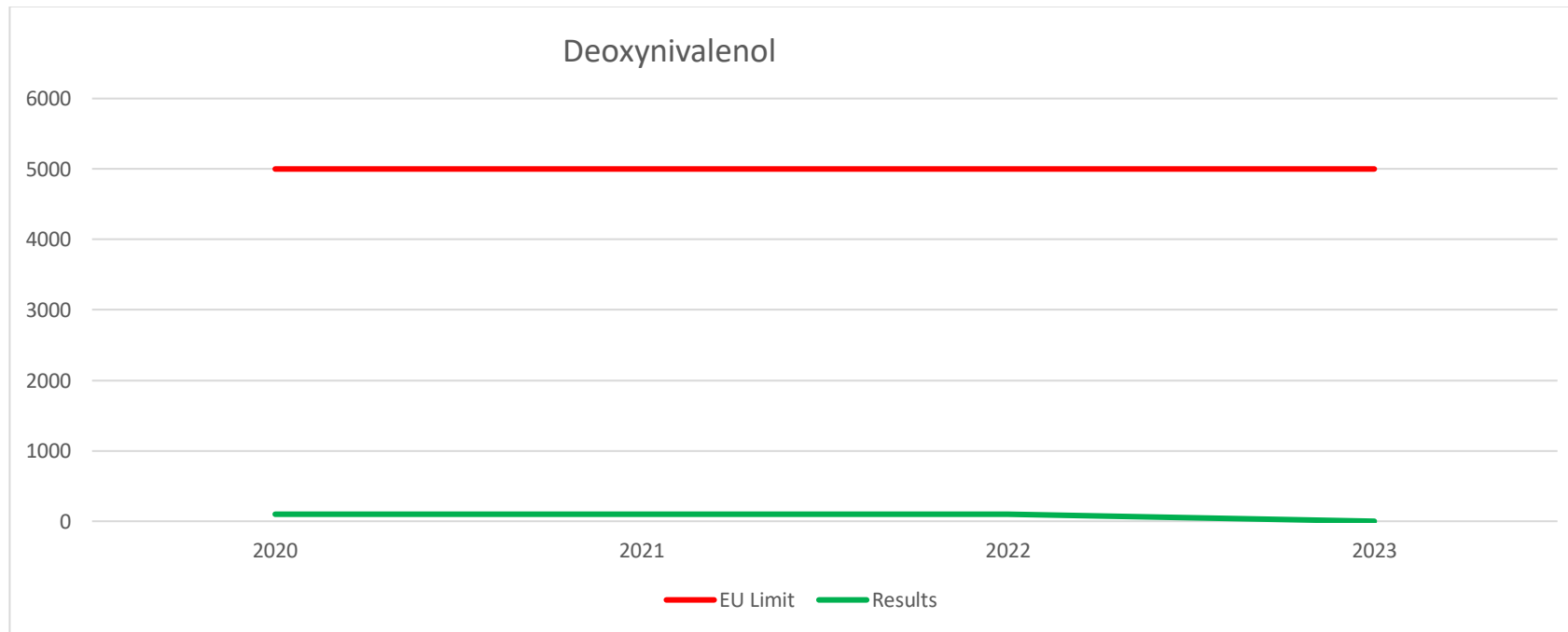
Aflatoxin B1

Unit: ng/g | EU Limit: 10 ng/g



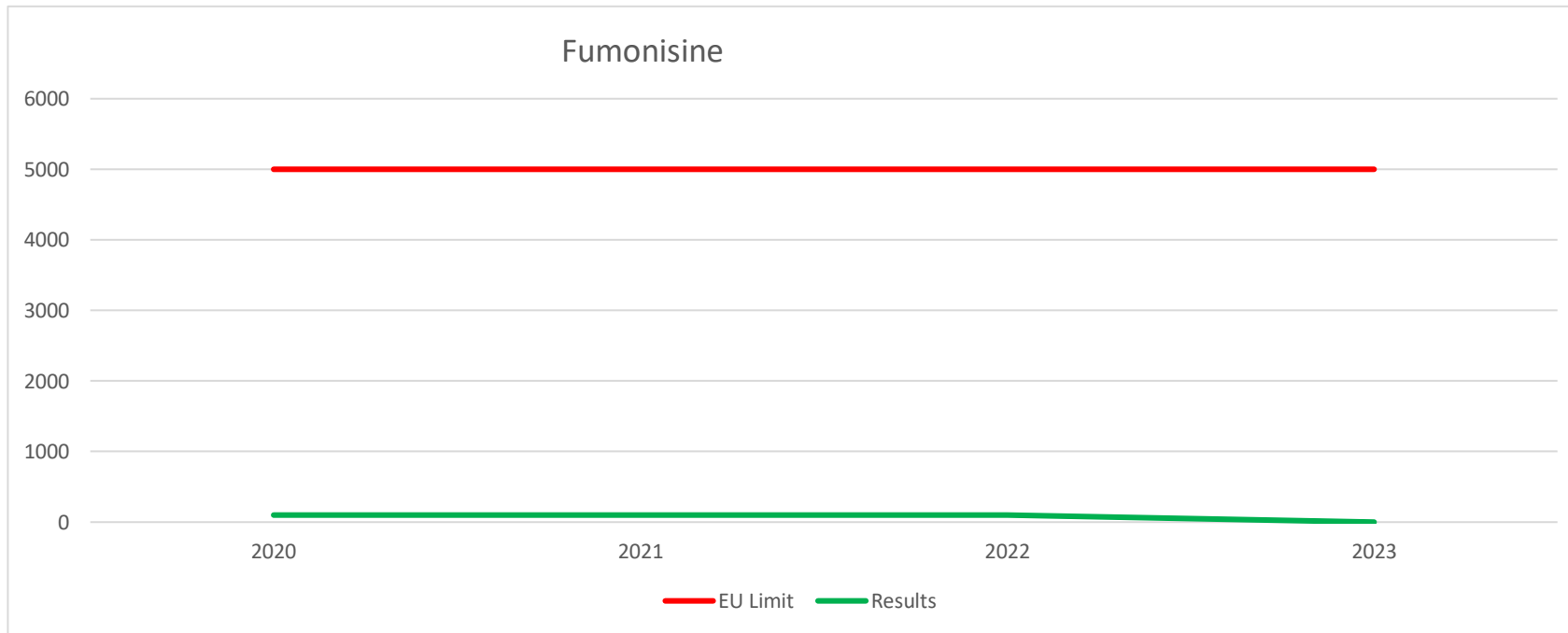
Deoxynivalenol

Unit: $\mu\text{g}/\text{kg}$ | EU guidance limit: 5000 $\mu\text{g}/\text{kg}$



Sum Fumonisine

Unit: $\mu\text{g}/\text{kg}$ | EU guidance limit: 10000 $\mu\text{g}/\text{kg}$



Crystal Violet, Malachite Green and Brilliant Green:

There is no actual EU limit for CV and MG, but there is a Zero tolerance for presence. Zero tolerance means that the substances shall not be detected, but there is no clear detection limit in EU. Detection limits varies a lot between the different laboratories (e.g. Masterlab had detection limit 0.2 µg/kg, but we have seen detection limits as high as 10 µg/kg)..

Feed:

Fish Feed sample analysed on global list in various OpCo for Crystal Violet, Malachite Green and some for Brilliant Green in 2023. All samples are below limit of detection. The limit of detection for all the dyes is 0.2 ug/kg (Masterlab) or 10 ug/kg (Eurofins). The Eurofins lab with detection limit 10 ug/kg is used by mistake, they should have been analysed with a method with LOQ 0.5 ug/kg.

See below table for Fish Feed.

Date		21.06.2023	
Lot No		20242144	
Sample ID:	Statutory Limits	F23310375	
Producer :		Skretting	
Suplier :		Skretting	
Crystal Violet		No	< 0.2 µg/kg
Leuco-Crytal Violet		No	< 0.2 µg/kg
Malachite Green	No	< 0.2 µg/kg	
Leuco-Malachite Green	No	< 0.2 µg/kg	
Brilliant Green	No	< 0.2 µg/kg	

Land animal protein:

1 land animal protein samples are analysed on global list in 2023.

Date		7.11.2023	7.11.2023
Lot No		404626101001	413394101001
Sample ID:		R23194647	R23296733
Producer :		Sonac	Sonac
Suplier :		Sonac	Sonac
Notes			
Crystal Violet	No	< 0.2 µg/kg	< 0.2 µg/kg
Leuco-Crytal Violet	No	< 0.2 µg/kg	< 0.2 µg/kg
Malachite Green	No	< 0.2 µg/kg	< 0.2 µg/kg
Leuco-Malachite Green	No	< 0.2 µg/kg	< 0.2 µg/kg
Brilliant Green	No	< 0.2 µg/kg	< 0.2 µg/kg

Fish oils:

2 animal oils are analysed with origin Turkey and Morocco. Results within the EU limits.

	Date	Statutory Limits	17.07.2023	7.11.2023
	Item Name		Fishoil Crude High	Fishoil crude low
	Lot No		404328201001	417619301001
	Sample ID:		R23147448	R23361670
	Producer :		Kardez	Seapride
	Supplier :		Kardez	Gulport
Notes				
Heavy Metal	Lead (Pb)	10 mg /kg	<0.05 mg/kg	<0.05 mg/kg
	Cadmium (Cd)	2 mg/kg	<0.01 mg/kg	<0.01 mg/kg
	Mercury (Hg)	0.5 mg /kg	<0.01 mg/kg	<0.01 mg/kg
	Arsenic (As)	25 mg /kg	8.7 mg/kg	8.4 mg/kg
Pesticides	DDT (Sum of DDT-, DDD- (or TDE-) and DDE- isomers, expressed as DDT)	0,5 mg/kg		
	o,p'-DDT		3.36 ng/g	0.357 ng/g
	p,p'-DDT		7.38 ng/g	0.827 ng/g
	o,p'-DDE		0.608 ng/g	< 0.25 ng/g
	p,p'-DDE		66.4 ng/g	9.17 ng/g
	o,p'-DDD		3.39 ng/g	0.418 ng/g
	p,p'-DDD		26.1 ng/g	2.98 ng/g
	HCB	0.2 mg /kg	5.03 ng/g	< 1.3 ng/g
	HCH delta		< 0.25 ng/g	< 0.25 ng/g
	HCH alpha	0.2 mg/kg	1.55 ng/g	< 0.25 ng/g
	HCH beta	0.1 mg/kg	79.7 ng/g	9.89 ng/g
	HCH gamma (lindane)	2 mg/kg	0.433 ng/g	< 0.25 ng/g
	Toxaphene	0.2 mg/kg		
	Toxaphene Parlar 26		< 1.3 ng/g	< 1.3 ng/g
	Toxaphene Parlar 50		< 1.3 ng/g	< 1.3 ng/g
	Toxaphene Parlar 62		< 2.5 ng/g	< 2.5 ng/g
	Endosulfan	0,1 mg/kg		
	Endosulfan - Alfa		< 1.3 ng/g	< 1.3 ng/g
	Endosulfan- beta		< 1 ng/g	< 1 ng/g
	Endosulfan - sulphate		< 1 ng/g	< 1 ng/g
Other Pesticids				
Dioxin	Dioxins (PCDD, PCDF) WHO-TEF 2005 pg/g WHO-TEQ	(Max:5 pg/g ,Action :4 pg/g)	2.2200 ng/kg	0.4210 ng/kg
	Dioxin-like PCB's WHO-TEF 2005 pg/g WHO-TEQ	11 pg/g	3.1600 ng/kg	0.6490 ng/kg
	Sum of dioxins and dioxin- like PCBs WHO-TEF 2005 pg/g WHO-TEQ	20 pg/g	5.3700 ng/kg	1.0700 ng/kg
	Non dl-PCBs Sum 28, 52, 101, 138, 153, 180 (ICES-6) ppb (ug/kg)	175 ppb	18.9000 µg/kg	3.2000 µg/kg

Fish Meals:

3 Fish Meal samples are analysed with origin Turkey and Morocco. Results within the EU limits.

	Date	Statutory Limits	9.06.2023	7.11.2023	7.11.2023
	Item Name		Fish Meal GQH min %70	Fish Meal GQH min64%CP NAF	Fish Meal GQH min70%CP BLS
	Lot No		387190201001	414953301001	406824801001
	Sample ID:		R23139974	R23281158	R23168806
	Producer :		Kardez	Copelit	Kardez
	Supplier :		Kardez	Gulport	Kardez
Heavy Metal	Notes				
	Lead (Pb)	10 mg /kg	0,08	0.33	0.10
	Cadmium (Cd)	2 mg/kg	0,2	0.92	0.21
	Mercury (Hg)	0.5 mg /kg	0,03	0.02	0.03
	Arsenic (As)	25 mg /kg	3,5	4,1	3,6
HCB	HCB	0.01 mg /kg	< 0.5 ng/g	< 0.5 ng/g	< 0.5 ng/g
	HCH delta		< 0.25 ng/g	< 0.25 ng/g	< 0.25 ng/g
	HCH alpha	0.02 mg/kg	< 0.25 ng/g	< 0.25 ng/g	< 0.25 ng/g
	HCH beta	0.01 mg/kg	9.41 ng/g	< 0.25 ng/g	9.05 ng/g
	HCH gamma (lindane)	0,2 mg/kg	< 0.25 ng/g	< 0.25 ng/g	< 0.25 ng/g
	Heptachlor	0,01 mg/kg	< 0.1 ng/g	< 0.1 ng/g	< 0.1 ng/g
	Pentachlorobenzene		< 0.5 ng/g	< 0.5 ng/g	< 0.5 ng/g
	Dieldrin	0,01 mg/kg	0.529 ng/g	< 0.15 ng/g	0.373 ng/g
	Endosulfan	0,1 mg/kg			
	Endosulfan - Alfa		< 0.5 ng/g	< 0.5 ng/g	< 0.736 ng/g
Endosulfan - Beta		< 0.4 ng/g	< 0.4 ng/g	< 0.4 ng/g	
Endosulfan - Sulphate		< 0.4 ng/g	< 0.4 ng/g	< 0.4 ng/g	
DDT (Sum of DDT-, DDD- (or TDE-) and DDE- isomers, expressed as DDT)	0.05 mg/kg				
o,p'-DDT		0.284 ng/g	< 0.1 ng/g	0.713 ng/g	
p,p'-DDT		0.533 ng/g	< 0.1 ng/g	0.699 ng/g	
o,p'-DDE		< 0.1 ng/g	< 0.1 ng/g	0.104 ng/g	
p,p'-DDE		5.38 ng/g	0.455 ng/g	5.32 ng/g	
o,p'-DDD		0.361 ng/g	< 0.1 ng/g	0.509 ng/g	
p,p'-DDD		2.04 ng/g	< 0.1 ng/g	0.669 ng/g	
Other Pesticids					
Dioxin	Dioxins (PCDD, PCDF) WHO-TEF 2005 pg/g WHO-TEQ	(Max:1.25 pg/g ,Action :0.75 pg/g)	0.1980 ng/kg	0.0649 ng/kg	0.2760 ng/kg
	Dioxin-like PCB's WHO-TEF 2005 pg/g WHO-TEQ	Action:2.0 pg/g	0.2990 ng/kg	0.1190 ng/kg	0.3700 ng/kg
	Sum of dioxins and dioxin- like PCBs WHO-TEF 2005 pg/g WHO-TEQ	4 pg/g	0.4970 ng/kg	0.1840 ng/kg	0.6470 ng/kg
	Non dl-PCBs Sum 28, 52, 101, 138, 153, 180 (ICES-6) ppb (ug/kg)	30 ppb	1.5100 µg/kg	1.1600 µg/kg	2.3500 µg/kg

Vegetable raw materials:

One Maize gluten meal with origin Turkey was measure to detected Aflatoxin B1 ,Fumo,Octh ,Zen and Don.But result was far below the EU limit.

All other samples measured on vegetable raw materials are within the EU limit and Skretting limit, in addition there is guidance limits for Deoxynivalenol, sum Fumonisine (only for corn), Ochratoxin and Zearalenone. EU guidance limits is the same as Skretting max limits for these toxins.

No negative results were obtained in the past years.

All mycotoxin results reported are below Skretting internal limits, below EU limits and EU guidance value, see below table for vegetable protein.

Date		17.07.2023	23.06.2023	7.11.2023	7.11.2023	17.07.2023	17.07.2023	17.07.2023	17.07.2023
Lot No		402310901001	402530001001	415493801001	404514901001	402981601001	404928401001	390370401001	400237501001
Product Name		Soybean Meal	Sunflower Meal	Maize Gluten Meal	Maize Gluten Meal	Wheat	Wheat Middlings	Wheat Gluten Meal	SPC
Producer :		Abalioglu	Tivatrade	Cargill	Omnia	Tınaz	Surucu	Royal Ingredients Group B.V.	SONIC BIOCHEM
Supplier :		Abalioglu	Cosmos	Cargill	Omnia	Tınaz	Surucu	TRI İc ve Dis Tic. San. Ltd. Sti.	SONIC BIOCHEM
Notes									
Aftatoxin	No								
Aftatoxin B1	0.02 mg/kg	< 0.5 µg/kg	< 0.5 µg/kg	< 0.5 µg/kg	< 0.5 µg/kg	< 0.5 µg/kg	< 0.5 µg/kg	< 0.5 µg/kg	< 0.5 µg/kg
Aftatoxin B2	No	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg
Aftatoxin G1	No	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg
Aftatoxin G2	No	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg	< 1.0 µg/kg
Fumonisine B1+B2	Action: 60 mg/kg								
Fumonisine B1		< 100 µg/kg	< 100 µg/kg	1090 µg/kg	399 µg/kg	< 100 µg/kg	< 100 µg/kg	< 100 µg/kg	< 100 µg/kg
Fumonisine B2		< 100 µg/kg	< 100 µg/kg	637 µg/kg	127 µg/kg	< 100 µg/kg	< 100 µg/kg	< 100 µg/kg	< 100 µg/kg
Ochratoxin	Action :0.25 mg/kg	< 10 µg/kg	< 10 µg/kg	< 10 µg/kg	21 µg/kg	< 10 µg/kg	< 10 µg/kg	< 10 µg/kg	< 10 µg/kg
Zearalenone	Action :2 mg/kg	< 10 µg/kg	< 10 µg/kg	58 µg/kg	819 µg/kg	< 10 µg/kg	11 µg/kg	15 µg/kg	< 10 µg/kg
Vomitoxin (DON)	Action :8 mg/kg = 8000µg/kg	< 100 µg/kg	< 100 µg/kg	200 µg/kg	566 µg/kg	< 100 µg/kg	< 100 µg/kg	< 100 µg/kg	< 100 µg/kg



