

Sanfed® series for Toxin Management



Group of Companies



Geohellas SA, is a member of the Constantakopoulos group of companies.

- Costamare Shipping CO. S.A.
- T.E.MES SA. (CostaNavarino)
- Faliro House Productions SA
- Geohellas SA



A unique source of Attapulgite in Europe

- Geohellas SA, developed the unique Attapulgite deposits in Europe discovered in Northern-Greece.
- The factory has a yearly production capacity of 160.000 MT.
- 350 final products in 11 applications / exports in 5 continents and > 50 countries.



Clientele

Operations and sales commenced in late 2004 giving primary emphasis on technical products.

Today Geohellas products are successfully employed in major multi-national and independent companies, in :

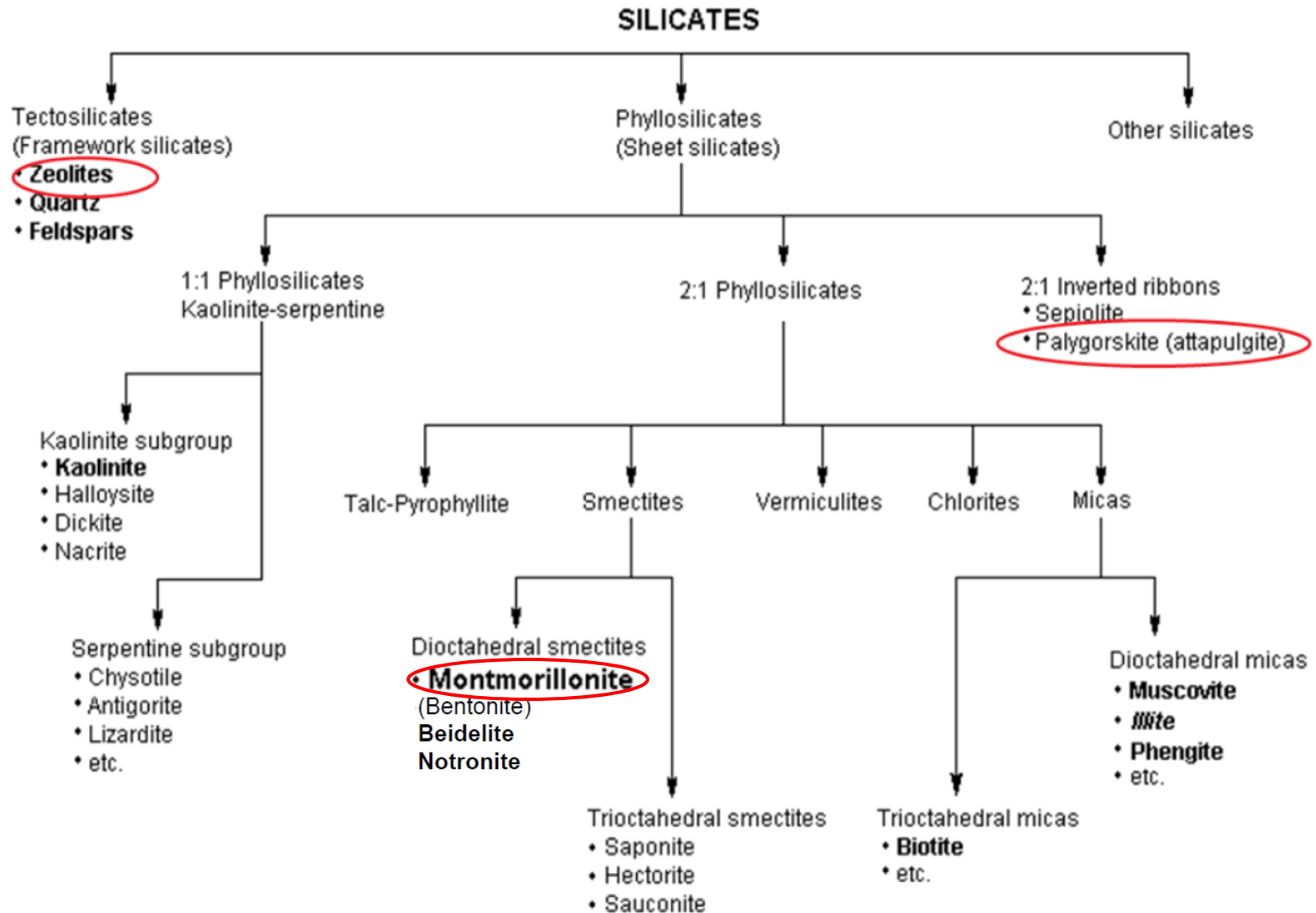
Western and Eastern Europe,
greater Mediterranean area,
Middle East,
Far East & Asia,
Canada, USA,
Central & South America.



Applications & Products

- Geohellas serves clients in several sectors with products that include:
 - ✓ soil improvers
 - ✓ agrochemical carriers,
 - ✓ bleaching earths used in the refining of edible oils and paraffins,
 - ✓ cat litter (high quality traditional lightweight as well as premium quality clumping),
 - ✓ complementary feeds & toxin binders for productive animals,
 - ✓ bedding conditioners for animal farming,
 - ✓ construction materials additives,
 - ✓ free flow and anti caking additives,
 - ✓ gelling/suspension aids,
 - ✓ industrial absorbents,
 - ✓ binders in molecular sieves/synthetic zeolites,
 - ✓ technical products for environmental applications and others.

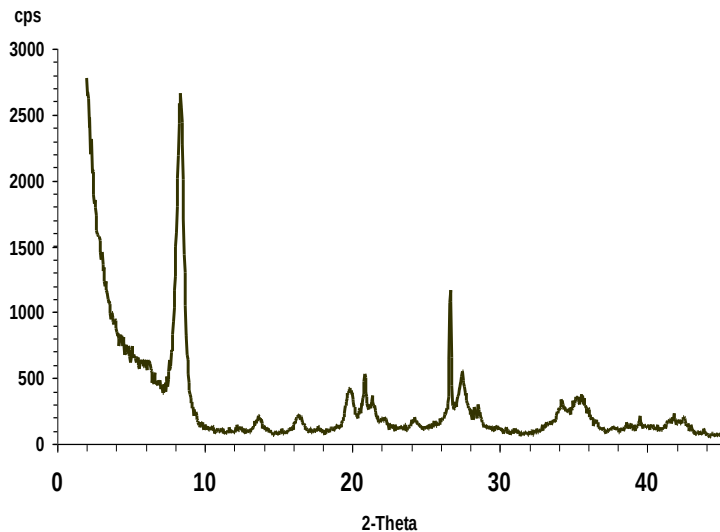
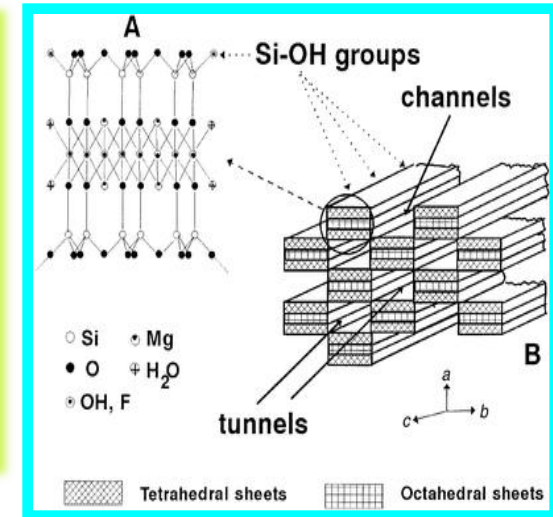
Group of Silicate Clays



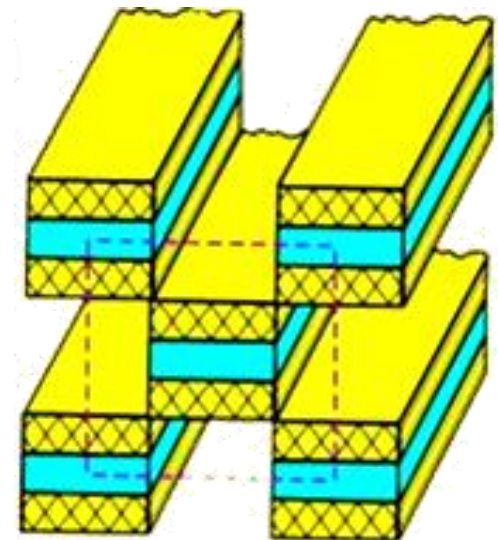
Most clays are natural blends of different silicates

Attapulgite - Palygorskite

- 2-D channel-type structure
- High specific surface area 350 m² /g
- High water absorption > 200 %
- Micro / Meso / Macroporosity
- Increased absorption of organic compounds (toxins) when mechanically / thermally activated



SiO ₂	56,00
MgO	15,05
Al ₂ O ₃	4,97
Fe ₂ O ₃	10,60
CaO	0,33
Na ₂ O	0,06
K ₂ O	0,30
(%) Loss on Ignition	10,95



Attapulgitite Unique EU Deposits Grevena-Greece



Geohellas SA production site in Greece





Mechanical Activation of Attapulgite

Mechanical Activation – Enhancing Hydrophilicity (anti-diarrhea effect)



Thermal Activation of Attapulgite - Enhancing toxin binding selectivity & efficiency



Production of granular products (carriers)



SANFED® ULTRA Innovative Production Process

1. Mechanical Activation of Attapulgite



2. Thermal Activation of Attapulgite

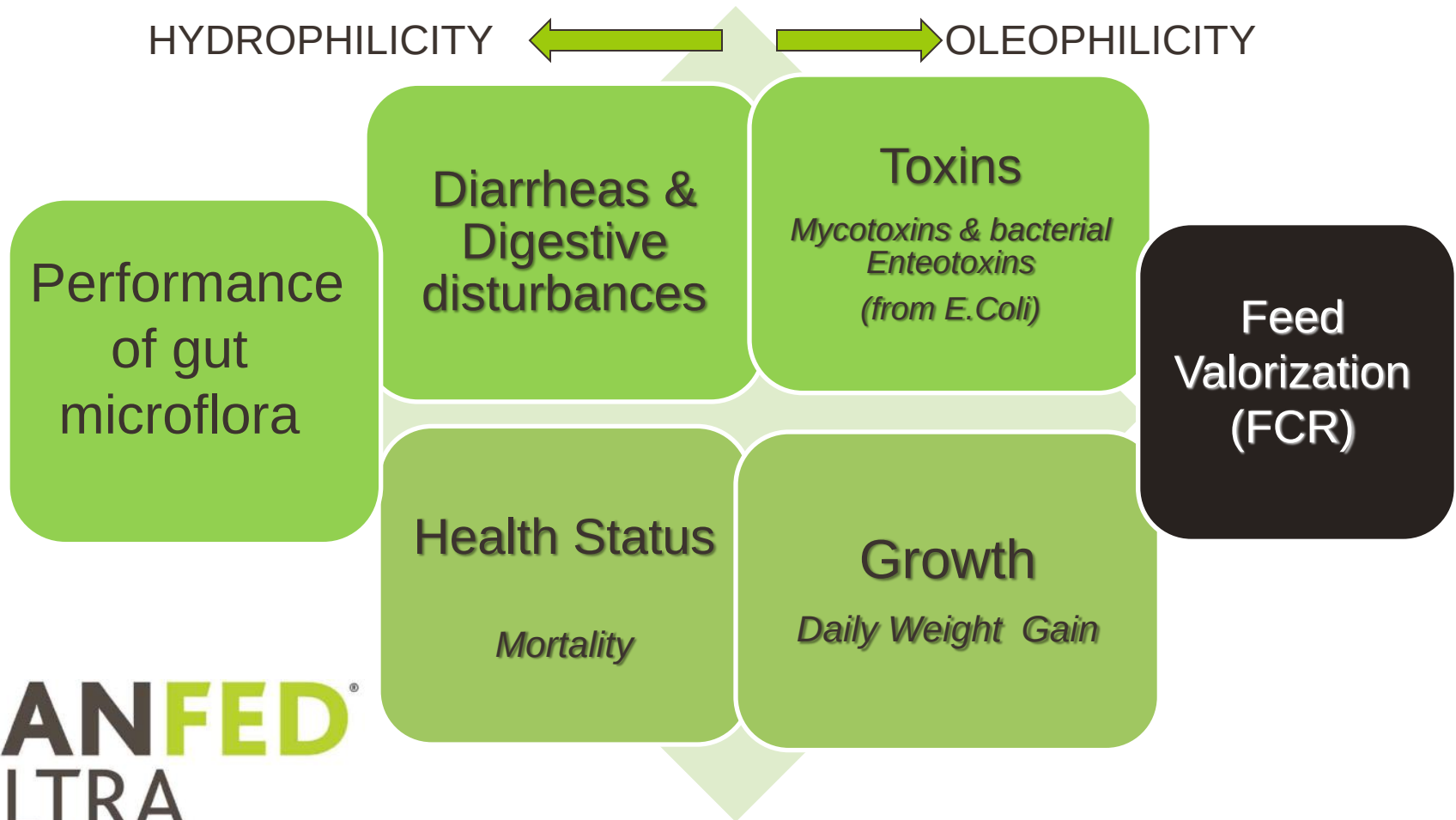


3. Ultrafine Milling for Attapulgite (HIM/PM/JM)



4. Air-Separation for Refining of Attapulgite particles

How to improve Farm Economics with Sanfed® Ultra



COMPARISON OF ATTAPULGITE WITH OTHER FEED ADDITIVES

Product	Type	Form	Water Binding	Pelleting Aid	Diarrhea Prevention	Intestine Retardant	Free Flowing Agent	Toxin Control	Odor Control
Bentonite	Absorben	P	++++	++	+++	++	+	++	+
Diatom. Earth	Diamol	P/G	++	++	++	++	+++	++	+
Kaolinite	KAS	P	+	++	++	++	-	-	-
Leonardite	HH40	P	+/-	++	++	++	-	++++	++
Sepiolite	60-100 mesh < 100 mesh	G	++	++	++	++	+++	-	+
		P	+++	+++	+++	+++	+	-	+
Attapulgite	60-100mesh > 100mesh	G	++	++	++	++	+++	++	+
		P	+++	+++	++++	+++	+	++++	+++
Silica	Amorphous	P	+++++	-	-	++	++++	-	-
Zeolite	Clinoptilolite	P/G	+	+	+	+	-	++	++

+++++ Excellent
 ++++ Very good
 +++ Good
 ++ Sufficient
 + Positive effect

G Granular
 P Powder
 - No positive effect

Applications in Feed production & Farms

Complete
Feed / Premix

SANFED[®]
Powder

SANFED[®]
Premix

Toxin binders

SANFED[®] 40

SANFED[®]
ULTRA

SANFED[®]
ULTRA
ANTITOX 3AC

Growth
Promoter

ULTRAFED[®]
PREMIUM

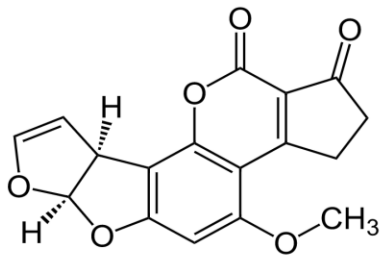
NEW special formula
with essential oils



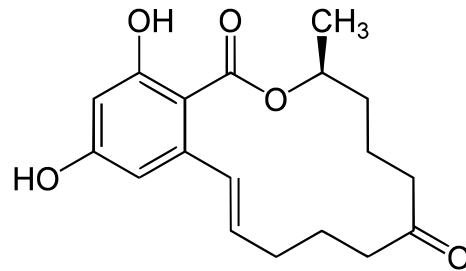
Market positioning : Toxin binders (Four product categories)



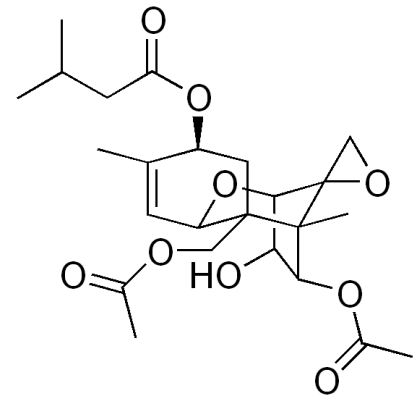
Mycotoxins produced by fungi



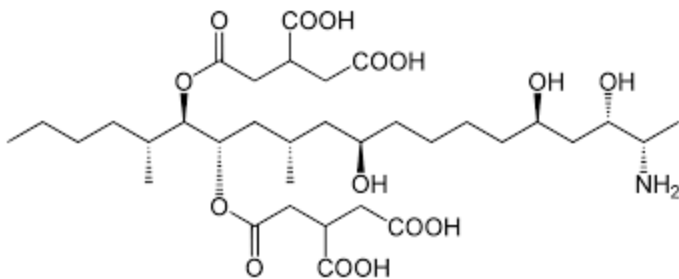
Aflatoxin (AFLA)



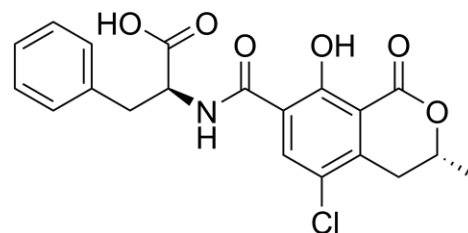
Zearalenone (ZEN)



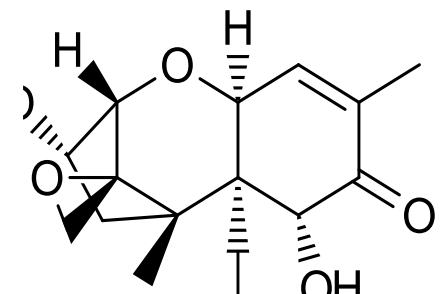
T2



Fumonisin (FUM)



Ochratoxin (OTA)



Deoxyvalenol (DON)

Global mycotoxin contamination levels in feed January - September 2024

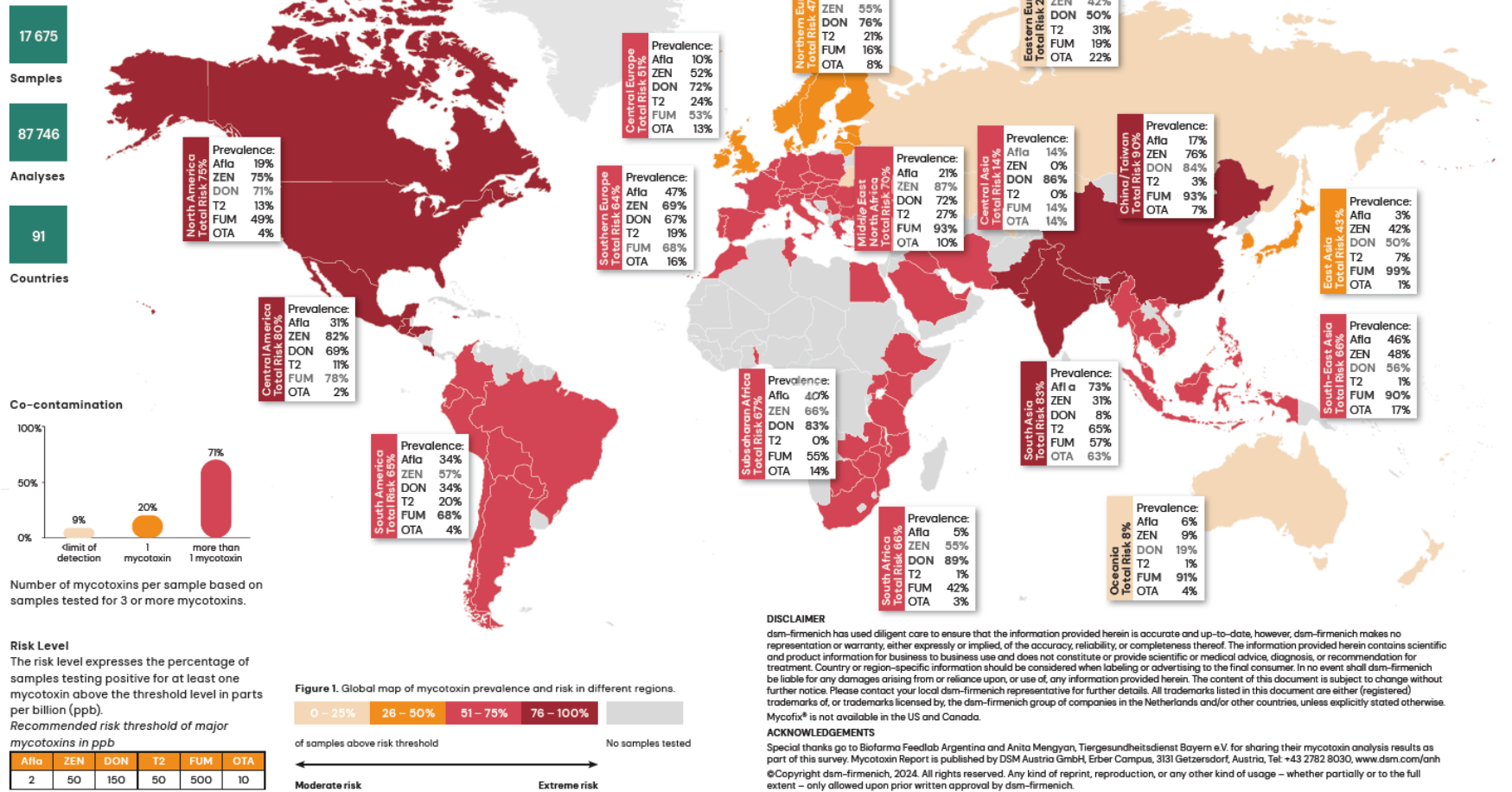


Risk Assessment
Validation of Sanfed® Ultra based toxin binders

January - September 2024 Survey

World Mycotoxin Survey

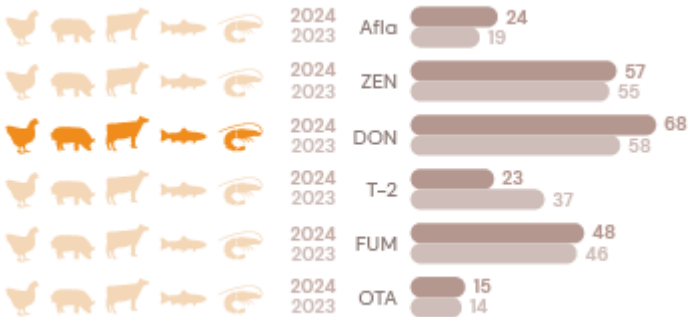
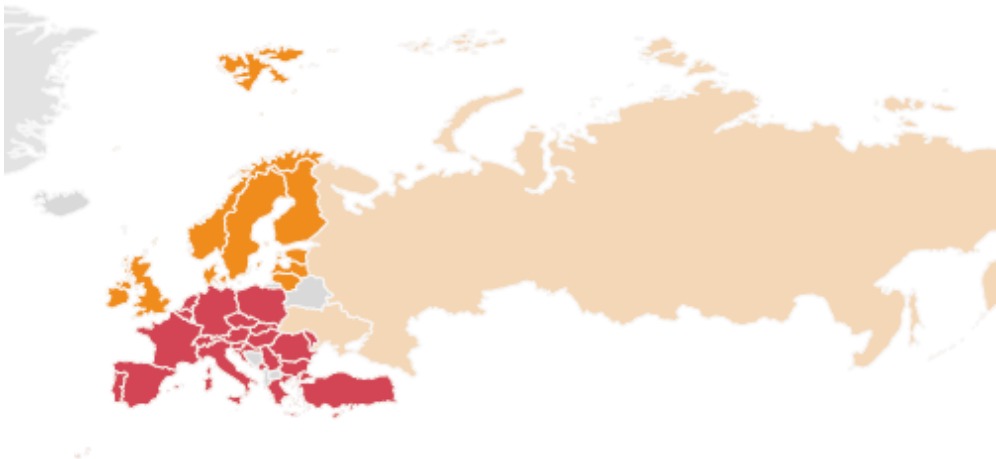
World Overview



Europe Report

January - September 2024

Europe



Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

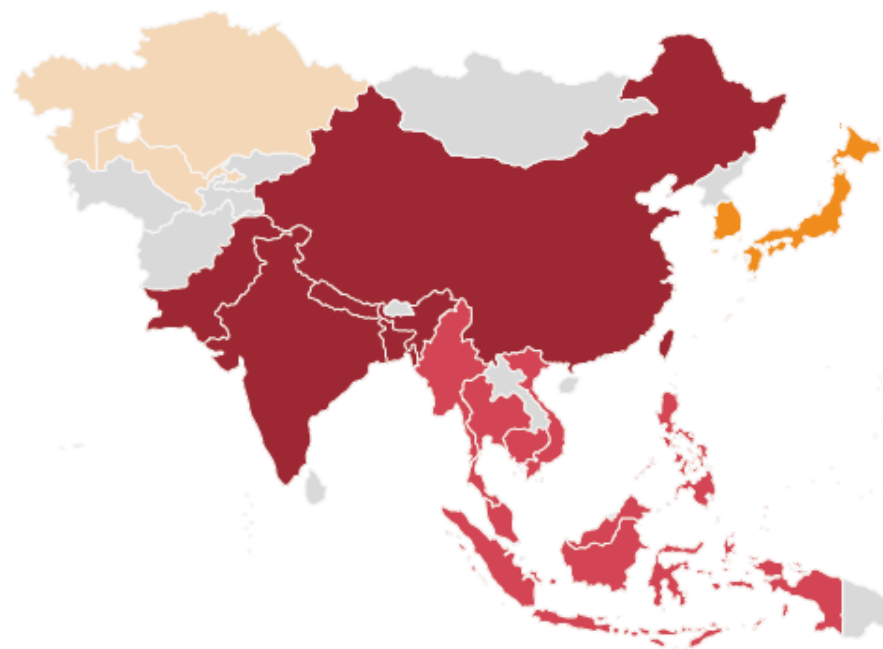
% Contaminated samples January – September 2024 ■ and January – September 2023 ■

Total samples: 7 733	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	5 543	7 308	7 409	5 272	5 082	4 922
% Contaminated samples	24%	57%	68%	23%	48%	15%
Average of positive (ppb)	8	81	519	30	288	9
Median of positive (ppb)	4	20	200	14	89	3
Maximum (ppb)	741	5000	43 891	1 731	12 368	928

Asia Report

January - September 2024

Asia



Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

% Contaminated samples January – September 2024 ■ and January – September 2023 ■

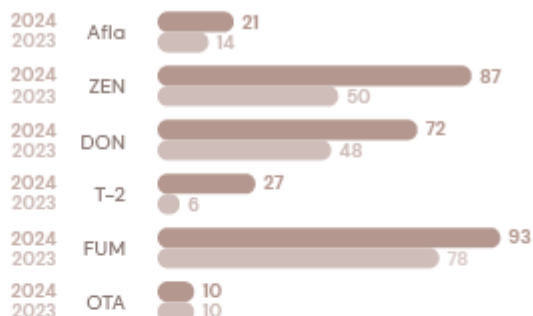
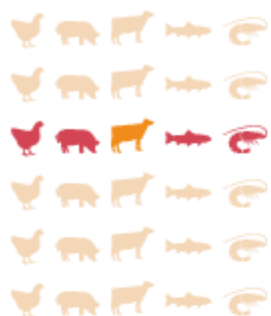
Total samples: 3 233	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	3 013	3 110	3 218	2 527	3 000	2 271
% Contaminated samples	42%	49%	47%	32%	78%	38%
Average of positive (ppb)	34	148	1 407	28	1 667	14
Median of positive (ppb)	15	47	372	24	686	5
Maximum (ppb)	517	25 373	476 954	385	489 698	579

ASIA LEVELS OF FEED CONTAMINATION WITH MYCOTOXINS

<https://www.dsm.com/anh/products-and-services/tools/mycotoxin-contamination/biomin-mycotoxin-survey.html>

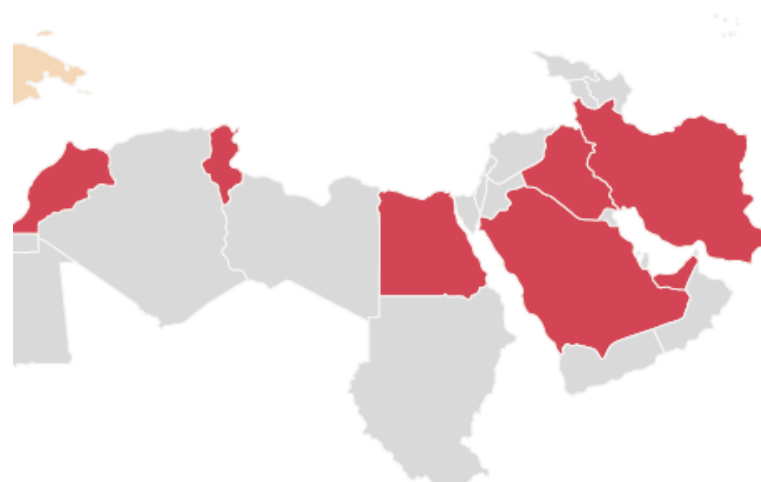
N. Africa & M. East Report January - September 2024

Middle East & North Africa



Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

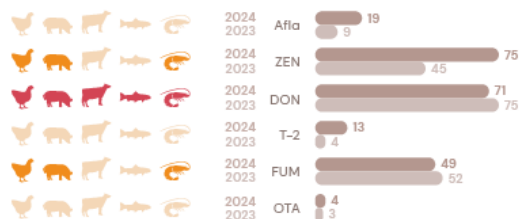
% Contaminated samples January – September 2024 ■ and January – September 2023 ■



Total samples: 149	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	149	149	149	145	149	145
% Contaminated samples	21%	87%	72%	27%	93%	10%
Average of positive (ppb)	3	40	399	15	526	3
Median of positive (ppb)	1	14	296	10	187	2
Maximum (ppb)	13	863	4 028	95	22 030	7

America Report January - September 2024

North America

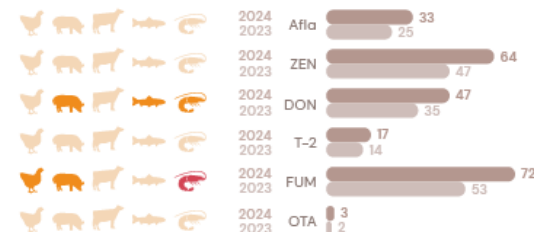


Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

% Contaminated samples January – September 2024 ■ and January – September 2023 ■

Total samples: 1 495	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	1 458	1 468	1 424	1 424	1 423	1 421
% Contaminated samples	19%	75%	71%	13%	49%	4%
Average of positive (ppb)	56	128	1 534	33	2 997	5
Median of positive (ppb)	1	34	650	11	1 000	3
Maximum (ppb)	1 767	6 513	32 220	481	96 316	62

Latin America



Animal colours indicate the risk posed to this species by the prevalence and concentration of each mycotoxin in all samples from this region (light orange=moderate to red=extreme see color code page 2)

% Contaminated samples January – September 2024 ■ and January – September 2023 ■

Total samples: 4 213	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	4 091	4 058	2 963	3 596	3 292	2 456
% Contaminated samples	33%	64%	47%	17%	72%	3%
Average of positive (ppb)	5	73	566	33	2 340	3
Median of positive (ppb)	2	37	316	29	1 349	2
Maximum (ppb)	306	2 599	11 190	200	244 701	15

Definition of contamination levels

	Trilogy Geohellas (ppb)	Trilogy - Pilmico (ppb)	Queens University of Belfast (ppb)	EU Legislation maximum levels * (ppb)	Average Contamination in Europe (ppb) Q1 – Q3 2024	Average Contamination in Asia (ppb) Q1 – Q3 2024
AFLA	4000	20	20	5-20	8	29
ZEA	500	200	250	100-500	81	148
OTA	500	50	50	50-100	9	14
FUM	500	1000	5000	5000-50000	288	1667
T2	500	500	250	250-500	30	28
DON	1000	1000	900	900-5000	519	1407

	Low Contamination (ppb)	Medium Contamination (ppb)	High Contamination (ppb)
AFLA	<5	5-20	20-500
ZEA	<100	100-200	200-5000
OTA	<10	10-50	50-900
FUM	<500	500 – 1000	1000-12300
T2	<40	40-500	500-1700
DON	<100	100 – 1000	1000-45000

* COMMISSION RECOMMENDATION of 17 August 2006 on the presence of deoxynivalenol, zearalenone, ochratoxin A, T-2 and HT-2 and fumonisins in products intended for animal feeding

1. Sanfed® Ultra series for toxin binding monitoring



1.1. Sanfed® Ultra's Toxin Binding (%) versus other binders

PRODUCT		% adsorption AFB1 200 g product 4000 ppb toxin	% adsorption ZEN 2 Kg product 500 ppb toxin	% adsorption OTA 2 kg product 500 ppb toxin
SANFED ULTRA – GEOHELLAS		96	96	75
PRODUCT A		94	73	77
PRODUCT B		94	40	75
PRODUCT C		86	38	76
PRODUCT D		85	45	77
PRODUCT E		69	26	76
PRODUCT F		19	65	79

1.1. Sanfed® Ultra's Toxin Binding Efficiency (%) versus other binders

PRODUCT	AFB1 (4000 ppb toxin) 200g product			ZEN (500 ppb toxin) 2 Kg product		
	% Adsorption average	% Desorption average	% Efficiency	% Adsorption average	% Desorption average	% Efficiency
SANFED ULTRA –  GEOHELLAS	99.6	0.2	99.4	96.6	9.3	87.3
PRODUCT A 	93.2	3.2	90.0	29.6	22.8	6.8
PRODUCT B 	99.8	0.2	99.6	39.6	17.5	22.1
PRODUCT C 	98.8	2.2	96.6	40.6	26.1	14.5
PRODUCT D 	98.5	1.0	97.5	47.1	22.1	25.0
PRODUCT E 	97.1	1.6	95.5	77.9	21.4	56.5
PRODUCT F 	99.8	0.8	99.0	42.9	26.5	16.4
PRODUCT G 	98.4	1.1	97.3	55.6	14.7	40.9
PRODUCT H 	96.7	1.8	94.9	43.6	26.4	17.2
PRODUCT I 	-	-	-	17.6	11.9	5.7
PRODUCT J 	-	-	-	36.0	18.2	17.8



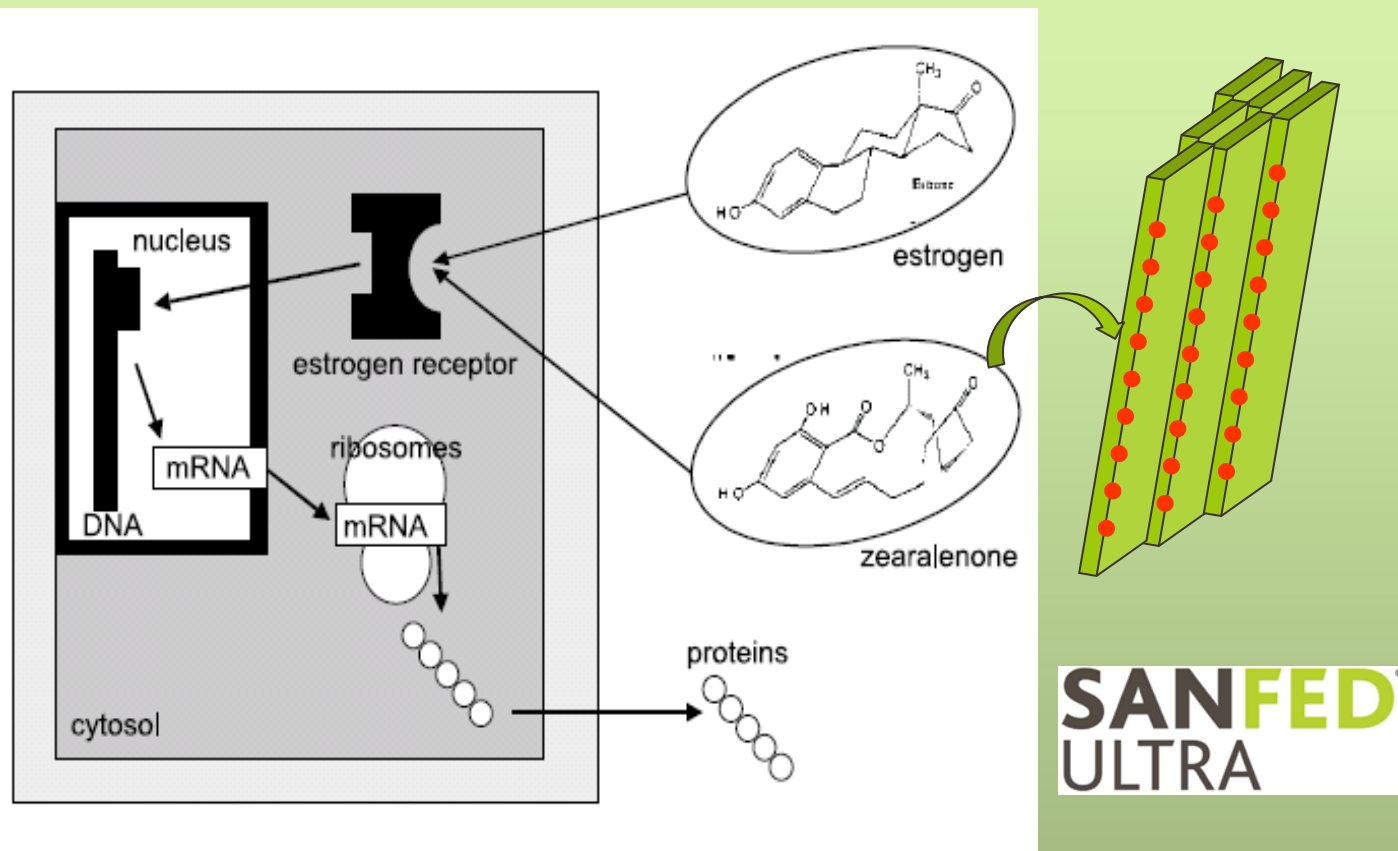
Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



Mechanism of action of Zearalenone (ZEN) in the animal body (RILEY 1998)

(I) FERTILITY IN SOWS & DAIRY ANIMALS



The solution :
SANFED[®]ULTRA
is binding ZEN and
eliminates the
problem

The problem: ZEN is competing with endogenous estrogens for binding to estrogen receptors, thus mimicking estrogenic actions, which then manifest themselves in hyperestrogenism → Reduction of Fertility, Increase of Return to Oestrus.

1.1. Sanfed® Ultra's Toxin Binding Efficiency (%) versus other binders

PRODUCT	T2 (500 ppb toxin) 2 kg product			Fumonisin (500 ppb toxin) 2 Kg product		
	% Adsorption average	% Desorption average	% Efficiency	% Adsorption average	% Desorption average	% Efficiency
SANFED ULTRA – GEOHELLAS 	77.5	19.7	57.8	99.9	38.8	61.1
PRODUCT A 	20.8	5.4	15.4	91.9	68.7	23.2
PRODUCT B 	16.2	4.6	11.6	89.5	57.2	32.3
PRODUCT C 	15.5	5.4	10.1	92.2	54.6	37.6
PRODUCT D 	45.7	5.0	40.7	88.4	22.6	65.8
PRODUCT E 	52.0	26.2	25.8	98.4	47.1	51.3
PRODUCT F 	14.7	8.8	5.9	97.1	69.7	24.7
PRODUCT G 	51.8	13.2	38.6	99.5	70.7	28.8



Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



1.1. Sanfed® Ultra's Toxin Binding Efficiency (%) versus other binders

PRODUCT	OTA (500 ppb toxin) 2 kg product			DON (100 ppb toxin) 2 Kg product		
	% Adsorption average	% Desorption average	% Efficiency	% Adsorption average	% Desorption average	% Efficiency
SANFED ULTRA – 	100	48.9	51.1	16.9	5.8	11.1
PRODUCT A 	64.9	47.8	17.1	10.9	1.7	9.2
PRODUCT B 	58.4	39.7	18.7	-	-	-
PRODUCT C 	83.9	63.5	20.4	13.6	1.8	11.8
PRODUCT D 	85.9	69.4	16.5	9	2.5	6.5
PRODUCT E 	95.3	50.7	44.6	0.7	0.7	0.0
PRODUCT F 	82.6	64.8	17.8	12.7	9.4	3.3
PRODUCT G 	89.3	52.8	36.5	5.5	1.2	4.3



Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



1.1. Sanfed® Ultra's Average Toxin Binding Efficiency (%) versus other binders

PRODUCT	Average % Efficiency (AFB1, ZEN, T2, FUM, OTA, DON)
SANFED ULTRA -  GEOHELLAS	61.30
PRODUCT A 	26.95
PRODUCT B 	30.71
PRODUCT C 	31.83
PRODUCT D 	42.00
PRODUCT E 	45.61
PRODUCT F 	27.85
PRODUCT G 	41,06



Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



1.2 Sanfed® Ultra's Toxin Binding Efficiency (%) versus other binders

Blind Testing - Japanese Market

PRODUCT	T2 (500 ppb toxin) 2 kg product			ZEN (500 ppb toxin) 2 Kg product			DON (1000 ppb toxin) 2 Kg product		
	% Adsorption average	% Desorption average	% Efficiency	% Adsorption average	% Desorption average	% Efficiency	% Adsorption average	% Desorption average	% Efficiency
SANFED ULTRA – GEOHELLAS 🇬🇷	77.5	19.7	57.8	96.6	9.3	87.3	16.9	5.8	11.1
PRODUCT A 🇺🇸	47.4	20.2	27.2	71.1	24.7	46.4	18.1	1.5	16.6
PRODUCT B 🇺🇸	63.3	26.6	36.7	88.5	19.7	68.8	18.4	2.5	15.9
PRODUCT C 🇺🇸	17.6	2.1	15.5	48.8	19.3	29.5	39.5	0.7	38.8



PRODUCT	Average % Efficiency (T2, ZEN, DON)
SANFED ULTRA - GEOHELLAS 🇬🇷	52
PRODUCT A 🇺🇸	30
PRODUCT B 🇺🇸	41
PRODUCT C 🇺🇸	28



Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



1.2 Sanfed® Ultra's Toxin Binding Efficiency (%) versus other binders Blind Testing - Vietnamese Market

PRODUCT	DON	FUM	ZEN	Average % Efficiency (DON, FUM, ZEN)
SANFED ULTRA  GEOHELLAS	16	47,7	89,2	51
PRODUCT A 	22,1	60,2	19,7	34
PRODUCT B 	21,4	23,2	5,3	17
PRODUCT C 	20,4	6,3	15,2	14

****Toxin Binder samples used by a feed producer in Vietnamese market (DABACO GROUP) measured by Trilogy Labs. Samples were sent and analyzed under batch no and with hidden product name. Correspondence of batch no. with product names was introduced in sealed envelopes that were opened once the results were given by the labs.



Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



1.2 Blind Testing - Pakistan and Cyprus market

		AFLA 4000 ppb	DON 1000 ppb	FUM 500 ppb	OTA 500 ppb	T2 500 ppb	ZEA 500 ppb	VITAMIN B5 10 ppm	AVERAGE EFFICIENCY
PRODUCT A		95,5	4,6	21,2	7,5	11	23,7	5,4	27,3
PRODUCT B		70,1	4,1	10,9	14,3	11,3	40,5	2,1	25,2
PRODUCT C		22,8	6,3	31,8	6,6	21,5	9,5	4,3	16,4
PRODUCT D		21,1	40,7	100	3,2	30,4	16,2	42,1	35,3
*Unable to perform desorption analysis. This is only adsorption									
PRODUCT E		99,8	2,2	22,2	11,5	5,4	20,9	1,2	27,0
PRODUCT F		99,8	18,8	4,5	9,5	33	15,6	2,9	30,2



Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



1.3 Sanfed® Ultra Antitox Toxin Binding Efficiency (%) Thailandese Market

Overall Binding Efficiency (%)

	AFB1 (20ppb) 2 Kg/MT	DON (1000ppb) 2 Kg/MT	FB1 (1000ppb) 2 Kg/MT	OTA (50ppb) 2 Kg/MT	T2 (500ppb) 2 Kg/MT	ZEN (200ppb) 2 Kg/MT	Average (%)
Sanfed Ultra Antitox*	100.0	13.0	48.2	83.3	75.8	86.1	67.7

*Sanfed Ultra Antitox = Sanfed Ultra + Activated Carbon

Klean Greentech Co., Ltd (Gold Coin Group)-Thailand



Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



1.4 Sanfed® Ultra advanced products

Toxin Binding Efficiency (%)

Mycotoxin Adsorption (%)							pH=3 (sorption)
Product	DON	ZEN	AFB1	OTA	T2	FB1	
Sanfed Ultra Plus	1.5	97.2	98.3	100.0	88.4	96.1	
Sanfed Ultra Antitox	8.2	99.9	98.5	100.0	95.7	96.0	
Mycotoxin Desorption (%)							pH=7 (desorption)
Product	DON	ZEN	AFB1	OTA	T2	FB1	
Sanfed Ultra Plus	0	4.0	0.6	17.8	9.5	9.5	
Sanfed Ultra Antitox	0	0	0.3	4.8	3.9	8.6	
Overall Binding Efficiency(%)							
Product	DON 900ppb	ZEN 250ppb	AFB1 20ppb	OTA 50ppb	T2 250ppb	FB1 5000ppb	
Sanfed Ultra Plus	1.5	93.2	97.7	82.2	78.9	86.6	 Average 73.3 % 80.1%
Sanfed Ultra Antitox	8.2	99.9	98.2	95.2	91.8	87.4	

*A multi mycotoxin contamination

Sanfed Ultra Plus = Sanfed Ultra + Live Yeast + MOS

Sanfed Ultra Antitox = Sanfed Ultra + Activated Carbon



**QUEEN'S
UNIVERSITY
BELFAST**

Gut simulation pH measurements (pH=3 & pH=7)



1.5. Sanfed® Ultra Antitox* optimized products for DON Binding Efficiency (%)

	Sanfed Ultra Antitox 1.0 AC (100ppb) 2 Kg/MT	Sanfed Ultra Antitox 2.0 AC (1000ppb) 2 Kg/MT	Sanfed Ultra Antitox 3.0 AC (1000ppb) 2 Kg/MT	Sanfed Ultra Antitox 4.0 AC (1000ppb) 2 Kg/MT
Efficiency in DON (%)	48.0	52.1	78.7	82.3
Average Efficiency in all toxins(%)	86	87.4	91.8	92.5

*Different dynamic milling treatment



Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



1.5. Sanfed® Ultra Antitox 3.0 AC, Toxin Binding Efficiency (%) Ghent University

Components - pH	% binding capacity	
	SANFED ULTRA ANTITOX 3.0.AC	CONTROL*
DON pH 3	67	97
DON pH 3-> pH 7	65	98
HT-2 pH 3	96	99
HT-2 pH 3-> pH 7	92	99
T-2 pH 3	96	99
T-2 pH 3-> pH 7	92	99
AFB1 pH 3	100	100
AFB1 pH 3-> pH 7	100	100
AFB2 pH 3	98	100
AFB2 pH 3-> pH 7	100	100
AFG1 pH 3	100	100
AFG1 pH 3-> pH 7	100	100
AFG2 pH 3	99	100
AFG2 pH 3-> pH 7	100	100
FUM B1 pH 3	99	100
FUM B1 pH 3-> pH 7	99	100
FUM B2 pH 3	95	98
FUM B2 pH 3-> pH 7	99	100
OTA pH 3	100	100
OTA pH 3-> pH 7	98	100
ZEN pH 3	100	100
ZEN pH 3-> pH 7	98	100
Enn B pH 3	99	100
Enn B pH 3-> pH 7	100	100

DON	100 ppb
AFLA	5 ppb
ZEN	25 ppb
OTA	12.5 ppb
FUM	100 ppb
HT-2	25 ppb
T-2	20 ppb

0,5% mycotoxin binder in buffer

1.5.1 SANFED ULTRA ANTITOX 3.0 AC's Toxin Binding Efficiency (%) versus other binders Blind Testing - French Market

PRODUCT	DON (1000 ppb)	ZEN (500 ppb)	Average Efficiency % (DON, ZEN)
SANFED ULTRA ANTITOX 3.0 AC	71,4	98,9	85,15
PRODUCT A	0,1	1,2	0,65
PRODUCT B	0,3	4,8	2,55
SANFED ULTRA ANTITOX 3.0 AC	74,2	99,1	86,65
PRODUCT A	2,8	14,1	8,45
PRODUCT B	0,2	17,5	8,85
SANFED ULTRA ANTITOX 3.0 AC	70,9	98,8	84,85
Wheat feed	0,6	4	2,3
PRODUCT B 	0,3	17,8	9,05
SANFED ULTRA ANTITOX 3.0 AC	63,9	98,6	8,55
PRODUCT A	3,1	14	81,25
SANFED ULTRA ANTITOX 3.0 AC	73,1	98,9	86
PRODUCT A 	0,1	13	6,6
PRODUCT B 	0,1	14,9	7,5

1.6 MULTI-MYCOTOXIN RESULTS SANFED series

	SANFED ULTRA (%)		SANFED ULTRA ANTITOX 3.0 AC (%)		BENTONITE 3.0 AC (%)	SANFED ACTIVE CARBON M-COMPLEX (%)	ULTRAFED PIGS PREMIUM ANTITOX 3.0 AC (%)
	SINGLE	MULTI - MYCOTOXIN	SINGLE	MULTI - MYCOTOXIN	MULTI - MYCOTOXIN	MULTI - MYCOTOXIN	MULTI - MYCOTOXIN
AFB1 (4000 ppb)	99,4	100	-	99,9	100	100	84,9
ZEN (500 ppb)	87,3	65,1	-	99,1	99,2	97,5	84,2
T2 (500 ppb)	57,8	50,8	-	99,5	99,1	86,5	84,5
FUM (500 ppb)	61,1	26,4	-	98,2	97,1	42,5	83,4
OTA (500 ppb)	51,1	32,7	-	98,3	97,4	89,6	83,5
DON (1000 ppb)	-	7,3	78,7	51,9	48,6	38,6	44,1
DON (100 ppb)	11,1	-	-	-			
OVERALL	61,3	47,1		91,2	90,2	75,8	77,5

	SANFED ULTRA (%)	SANFED ULTRA ANTITOX 3.0 AC (%)	BENTONITE 3.0 AC (%)
VITAMIN B5 (10ppm)	4,2	7,7	7,2



Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



1.6 MULTI-MYCOTOXIN RESULTS

SANFED series

	SANFED ULTRA PLUS ANTITOX 3.0 AC
	MULTI - MYCOTOXIN
AFB1 (4000 ppb)	100
ZEN (500 ppb)	98
T2 (500 ppb)	94,2
FUM (500 ppb)	92,5
OTA (500 ppb)	97
DON (1000 ppb)	62
OVERALL	90,6

	SANFED 40 F ANTITOX	SANFED 40 F PLUS
	MULTI - MYCOTOXIN	MULTI - MYCOTOXIN
AFB1 (4000 ppb)	100	100
ZEN (500 ppb)	71,3	8,7
T2 (500 ppb)	35,7	15,4
FUM (500 ppb)	50,2	44,6
OTA (500 ppb)	42,9	6.6
DON (1000 ppb)	7,4	0,2
OVERALL	51,3	29,3



Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



1.7 ALKALOIDS & BIOGENIC AMINES

EFFICIENCY (%) in Alkaloids				
Efficiency %	ERGOTAMIN (2.1 ppm)	PATULIN (2.1 ppm)	CYCLOPIAZONIC ACID (2.1 ppm)	STERIGMATOCYSTIN (2.1 ppm)
SANFED ULTRA ANTITOX 3.0 AC	98,4	63,8	100	100

EFFICIENCY (%) in Toxinogen in Rumen Fluid	
	SPERMINE (5 ppm)
SANFED ULTRA ANTITOX 3.0 AC	73,3
EFFICIENCY (%) in Toxinogen in Phosphate Buffer	
	SPERMINE (5 ppm)
SANFED ULTRA ANTITOX 3.0 AC	65,5

1.6 Results from Hungarian trial – KleenTox[®] products*

■ Trial in Ruminants with KleenTox[®] Plus

- In vitro dairy fluid protocol of mycotoxin elimination using KleenTox[®] Plus (Prof. Dr. Endre Brydl, January 14, 2020. Veterinary University Budapest. 1078 Budapest, Istvan utca 2)

■ Trial in Poultry with KleenTox[®] Advance

- In vitro method protocol of mycotoxin elimination using KleenTox[®] Advance (Prof. Dr. Endre Brydl, December 2017. Veterinary University Budapest. 1078 Budapest, Istvan utca 2.)

* Private label products of Sanfed Ultra

1.6.1 Results from Hungary trial – KleenTox® Plus – in vitro mycotoxin elimination in rumen fluid - RUMINANTS

KleenTox® Plus: Sanfed Ultra with selected yeast cell walls

- 3 Kg KleenTox Plus /t TMR concentration results in 99% aflatoxin and ZEN deactivation in the bovine rumen during 24-hour residence time.
- Recommended mixing ratio is 3 Kg/t TMR.

Added Mycotoxin level:

Toxin	Rumen fluid pH 7.0	Rumen fluid pH 5.0
Aflatoxin (µg/kg)	100	50
Aflatoxin (µg/kg)	500	200
Zearalenone(µg/kg)	2000	1000
Zearalenone (µg/kg)	1000	500

The test incubation time is 0, 6 and 24 hours. Two pH value were tested, pH=7.0 and pH=5.0. Each tested points were analyzed in three parallel analyses. The tested KleenTox Plus quantity: 1, 2, and 3kg / t TMR.

Summary of the AFB1 and ZEA adsorption and elimination results for KleenTox Plus (24h time and 1,2,3kg KleenTox Plus/t TMR level).

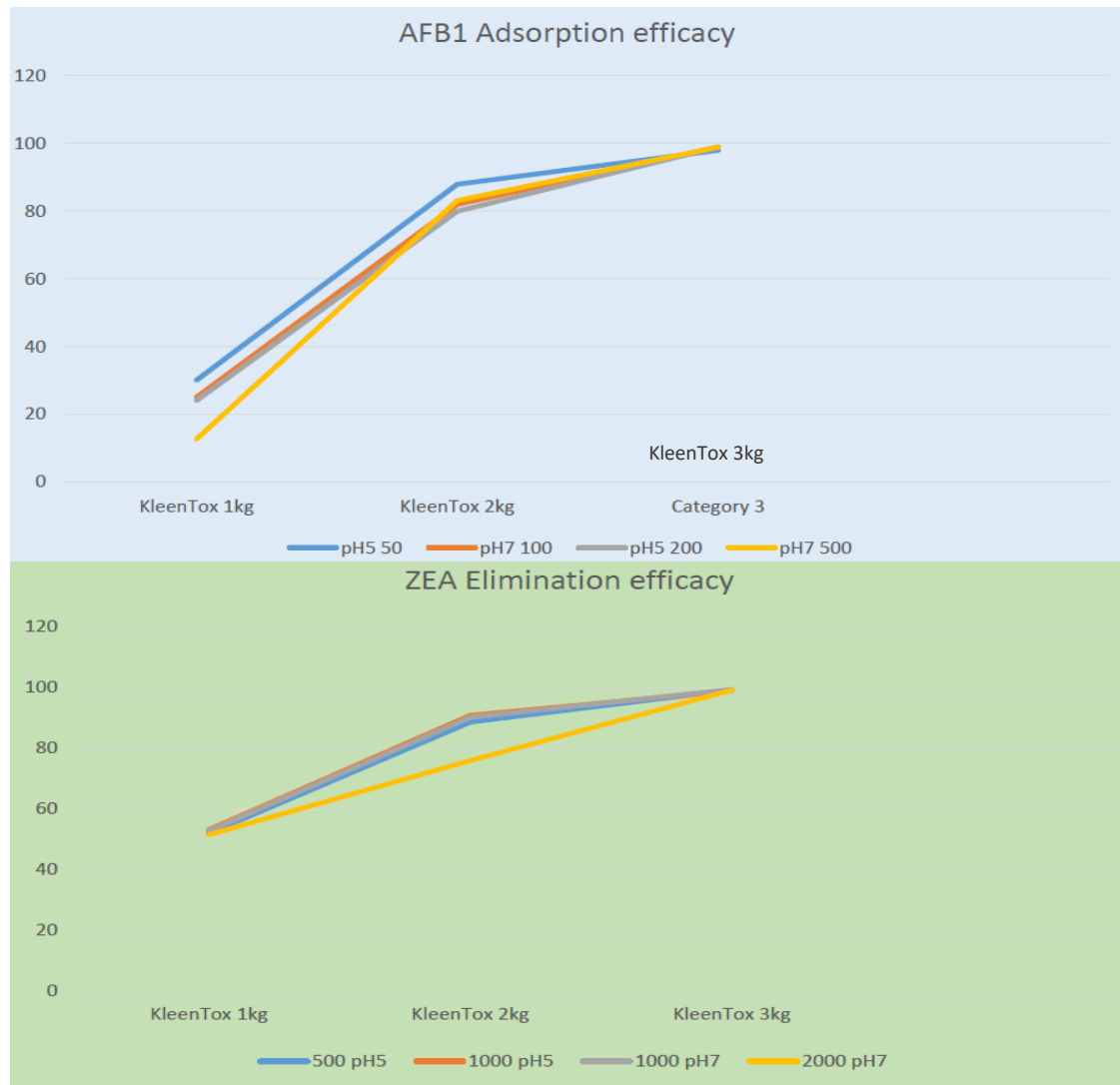
AFB1 adsorption capacity at different KleenTox Plus level after 24h.

pH=5						pH=7					
50 µg/kg			200 µg/kg			100 µg/kg			500 µg/kg		
1kg/t	2kg/t	3kg/t	1kg/t	2kg/t	3kg/t	1kg/t	2kg/t	3kg/t	1kg/t	2kg/t	3kg/t
30%	88%	98%	24%	80%	99%	25%	82%	99%	12.6%	83.2%	99%

ZEA elimination capacity at different KleenTox Plus level after 24h.

pH=5						pH=7					
500 µg/kg			1000 µg/kg			1000 µg/kg			2000 µg/kg		
1kg/t	2kg/t	3kg/t	1kg/t	2kg/t	3kg/t	1kg/t	2kg/t	3kg/t	1kg/t	2kg/t	3kg/t
52%	86.6%	92.2%	53.2%	90.8%	98.9%	52.8%	90.2%	99.3%	51.5%	75.9%	99.1%

AFB1 & ZEN elimination efficacy versus products dosage contamination level and pH



1.6.2. Results from Hungary trial – KleenTox® Advance – in vitro mycotoxin elimination in broiler / layer breeder feed

- **KleenTox® Advance:**
 - Sanfed Ultra®,
 - specific enzymes,
 - selected plant extracts,
 - selected yeast cell wall.
- KleenTox® Advance was used in artificial gastric Juice and artificial intestinal juice in broiler and layer feed contaminated with mycotoxins.
- The measurement of the adsorption in the first 30 minutes show that the aflatoxin concentration was decreased by more than 95%.
- In case of all tested mycotoxin the elimination efficiency is higher than 90%.

Added Mycotoxin level:

Toxin	Broiler feed	Layer br. feed
DON ppb	2.000	500
FUM ppb	10.000	5000
OTA ppb	100	50
AF 1 ppb	100	50
T-2 ppb	500	200

The test incubation time is 0, 30, 60, 120, 240 and 300 minutes. Two pH value were tested, pH=4.5 and pH=7.5. each tested points were analyzed in three parallel analysis

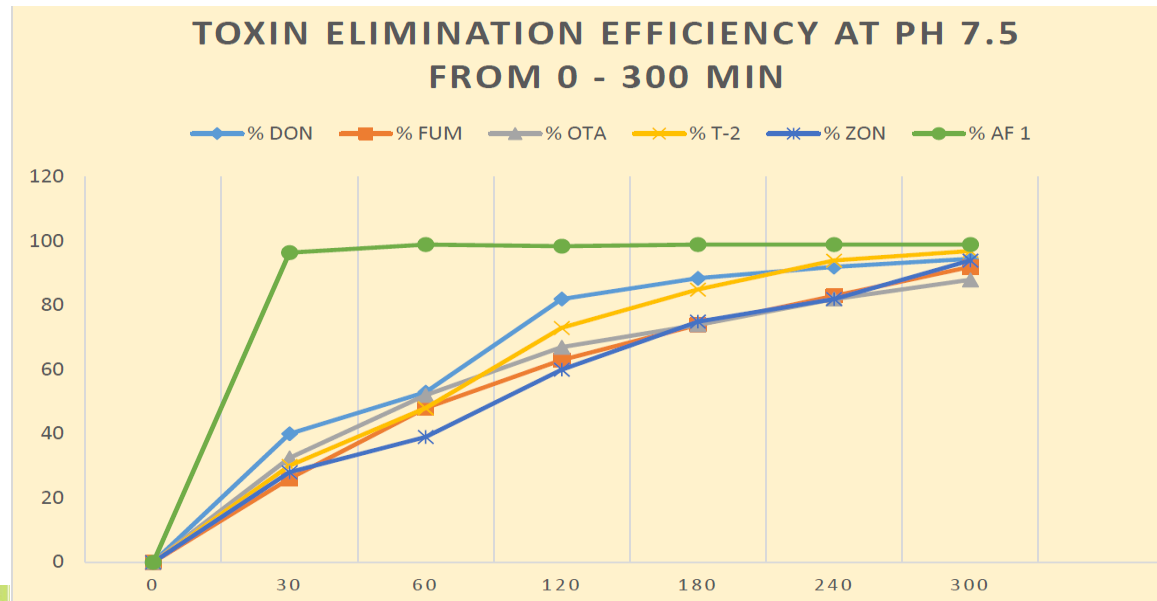
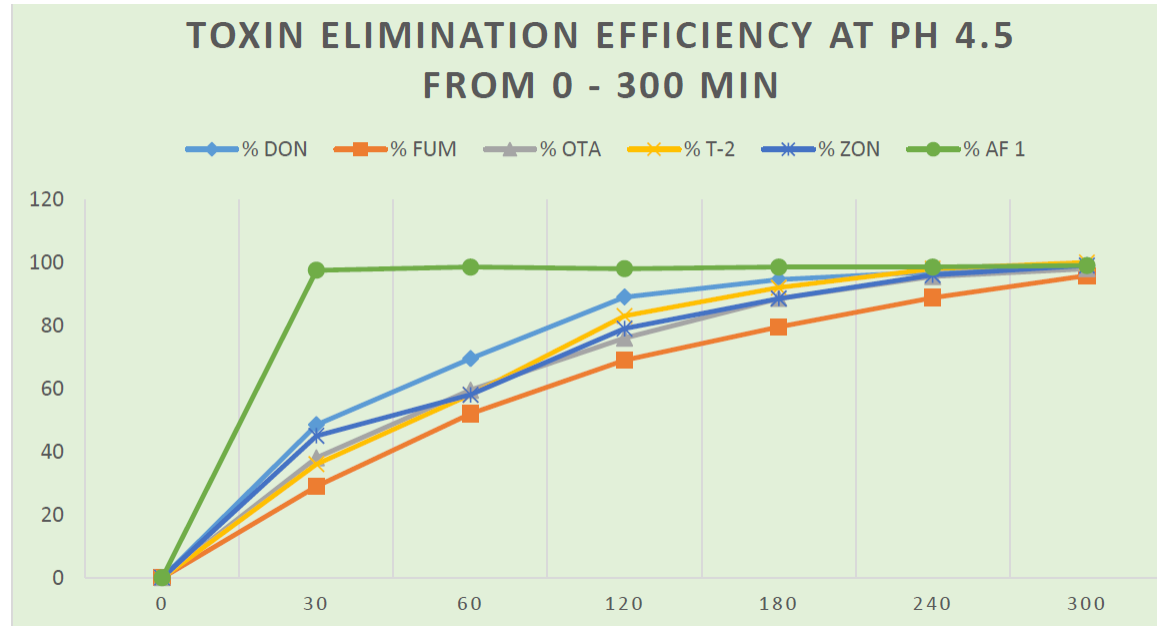
Broiler Feed

Mycotoxin	Elim. % pH 4.5	Elim. % pH 7.5
DON	99.0	94.5
FUM	95.8	92.0
OTA	98.0	88.0
T-2	100	98.0
ZON	98.0	94.0
AF 1	99.0	99.0

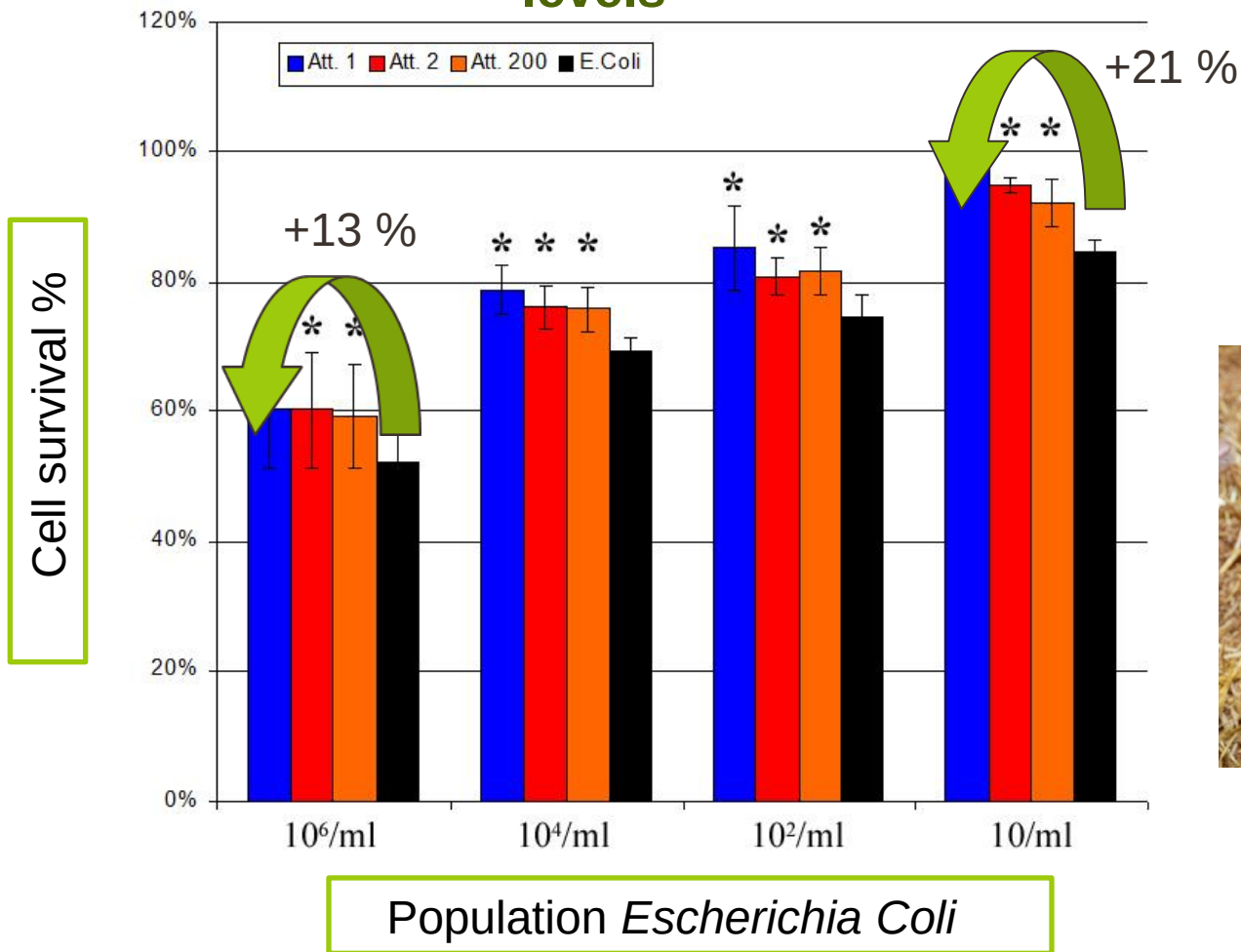
Layer Breeder Feed

Mycotoxin	Elim. % pH 4.5	Elim. % pH 7.5
DON	97.5	94.0
FUM	94.5	90.8
OTA	97.5	89.5
T-2	100	96.0
ZON	99.0	90.0
AF 1	99.0	99.0

Toxins elimination kinetics versus time & pH (broiler feed)

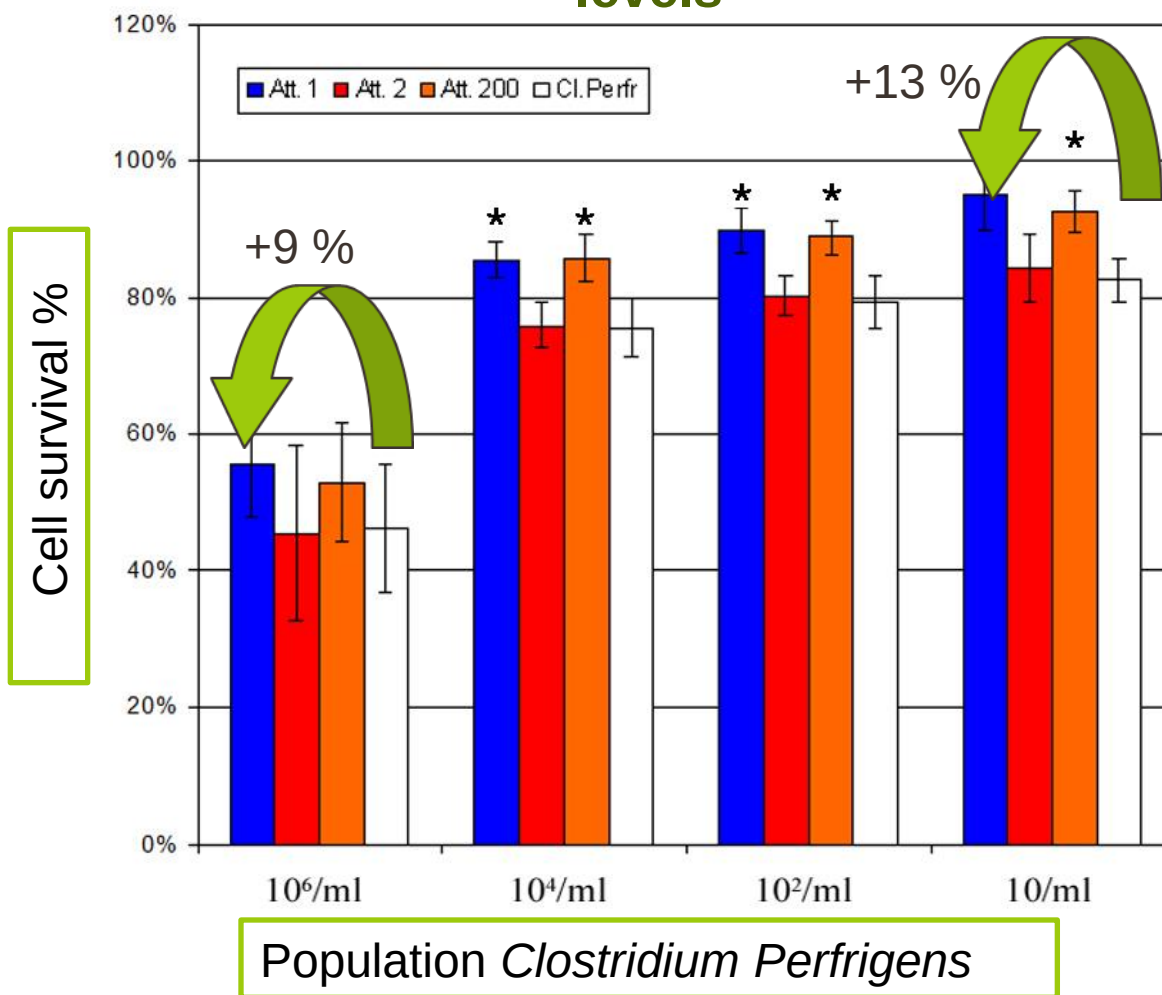


2. Sanfed® Ultra is Binding Endotoxins (produced by *E.Coli*) improving piglet's intestinal cell survival % even at high contamination levels



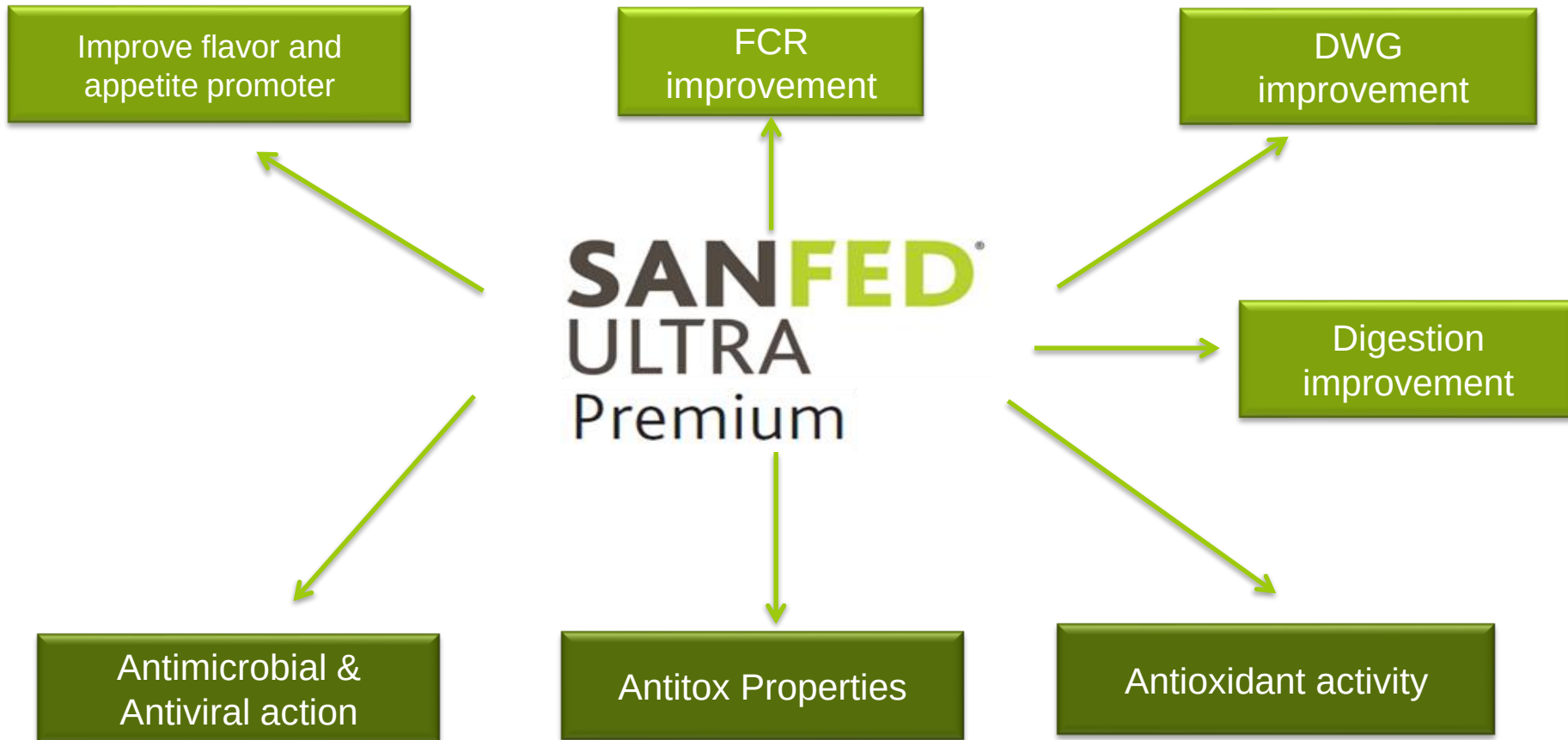
* Three commercial Attapulgit forms of Geohellas offering statistically significant difference on piglet intestinal cell survival versus control with *E.Coli* contamination, $P < 0.05$

2. Sanfed® Ultra is Binding Endotoxins (produced by C.Perfringens) improving broiler's intestinal cell survival % even at high contamination levels



* Three commercial Attapulgit forms of Geohellas offering statistically significant difference on broiler intestinal cell survival versus control with *C.Perfringens* contamination, P<0.05

3.SANFED® ULTRA Premium



- ✓ Sanfed Ultra Premium with essential of *Oregano Vulgare* (Carvacrol > 85 %)
- ✓ Steam-distilled oregano with no solvents or preservatives, or additives.

4. ULTRAFED® product category

Aminoacids

Positive nutritional effect

Essential oils

Antibacterial, Antiviral, Antioxidant, growth promotional effects

Sanfed® Ultra

Anti-diarrheal, mycotoxin and microbial enterotoxin binding effect

Saccharomyces Cerevisiae & MOS

Improve the functioning of gut microflora

Enzymes

*Optimal breakdown of carbohydrates
Increased feed digestibility*

Vitamins– Trace elements – Elecrolytes

Boost the immune system, enhance digestion and metabolism, stabilize intestinal pH

4.1.ULTRAFED® Production Process

1. Mechanical Activation of Attapulgite



2. Thermal Activation of Attapulgite



3. Ultrafine Milling for Attapulgite (HIM/PM/JM)



4. Air-Separation for Refining of Attapulgite particles



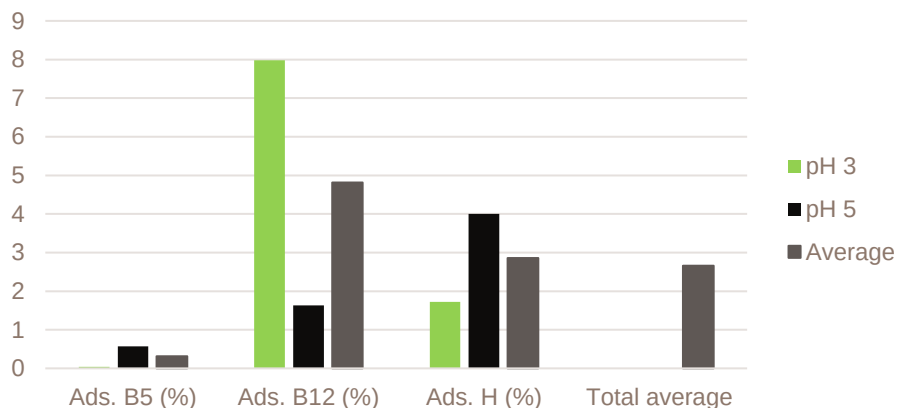
5. Attapulgite Feed Composites



6. Dynamic treatment of Attapulgite Feed Composites (JM)

Composition : Attapulgite, Sacharomyces Cerevisiae, Enzymes, Lysine, Methionine, MgO, Electrolytes, Vitamins A,D,E, Essential Oil of oregano, Activated Carbon

Adsorption (%) of vitamins by SANFED® ULTRA



	pH 3	pH 5	Average
Ads. B5 (%)	0,04	0,57	0,31
Ads. B12 (%)	7,98	1,63	4,81
Ads. H (%)	1,72	4	2,86
Total average			2,66

Test Conditions: 10.0µg/ml Vit B5, 4.0µg/ml Vit B12, 4.0µg/ml Vit H -- 0,2%(w/v) Sanfed® Ultra (*German Lab)

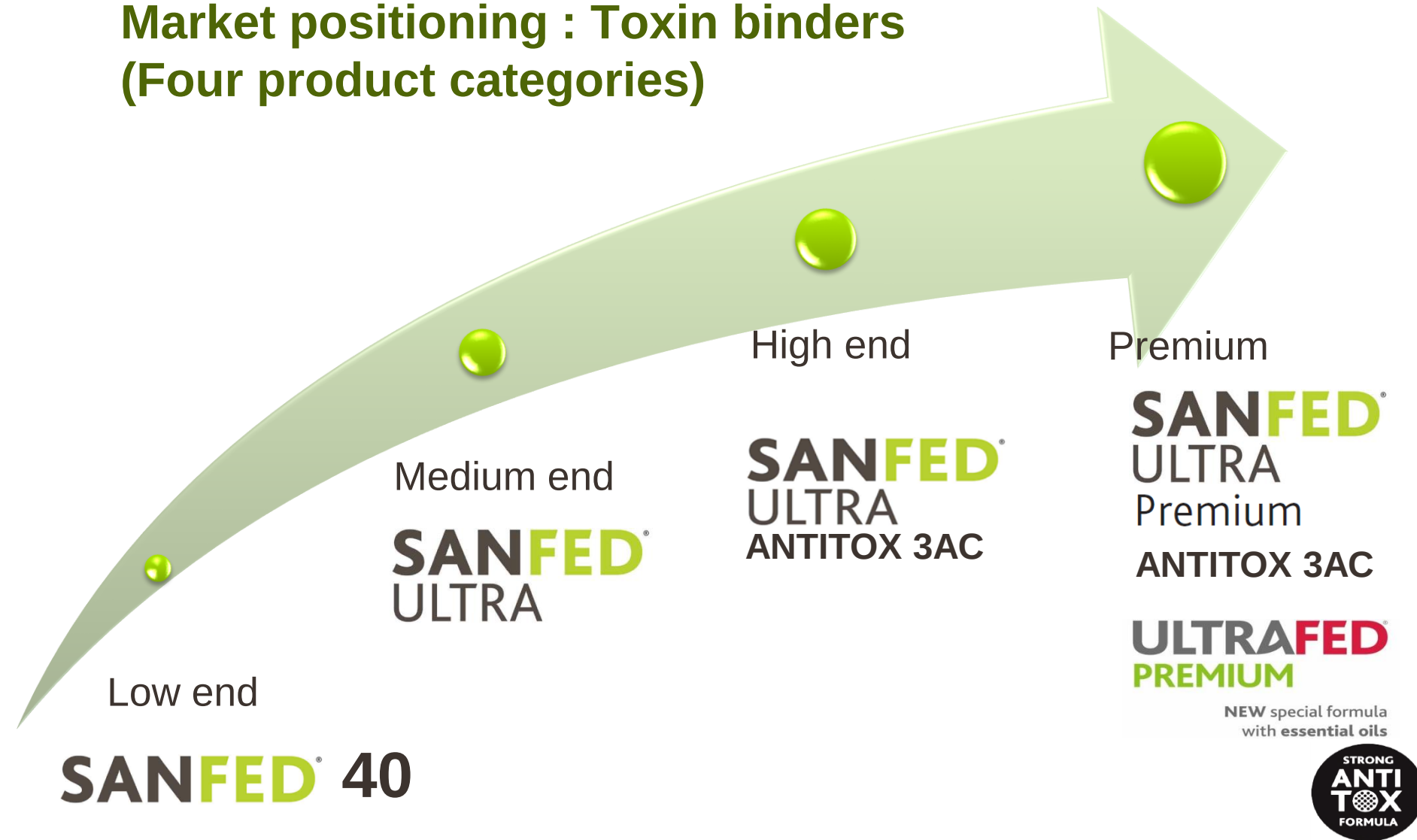
VITAMIN B5 EFFICIENCY (SINGLE MEASUREMENT)	
TOXIN BINDER	VITAMIN B5 EFFICIENCY (10 ppm) %
SANFED ULTRA	0,1
SANFED ULTRA ANTITOX 3.0AC	6,8

*Trilogy Analytical Laboratory, Inc U.S.A.

Gut simulation pH measurements (pH=3 & pH=6,5)



Market positioning : Toxin binders (Four product categories)





THANK YOU



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