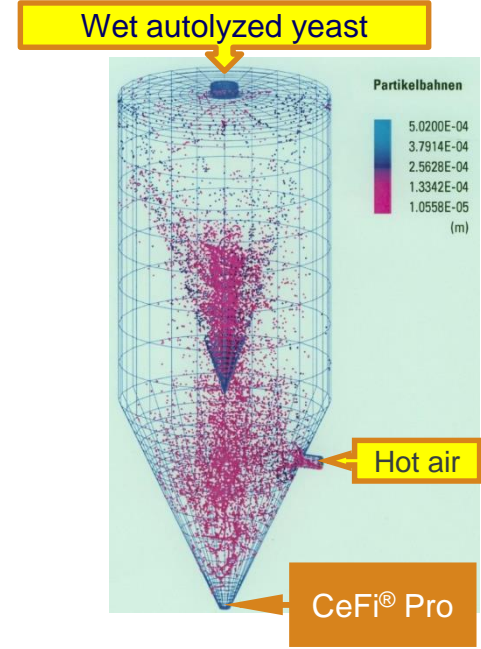
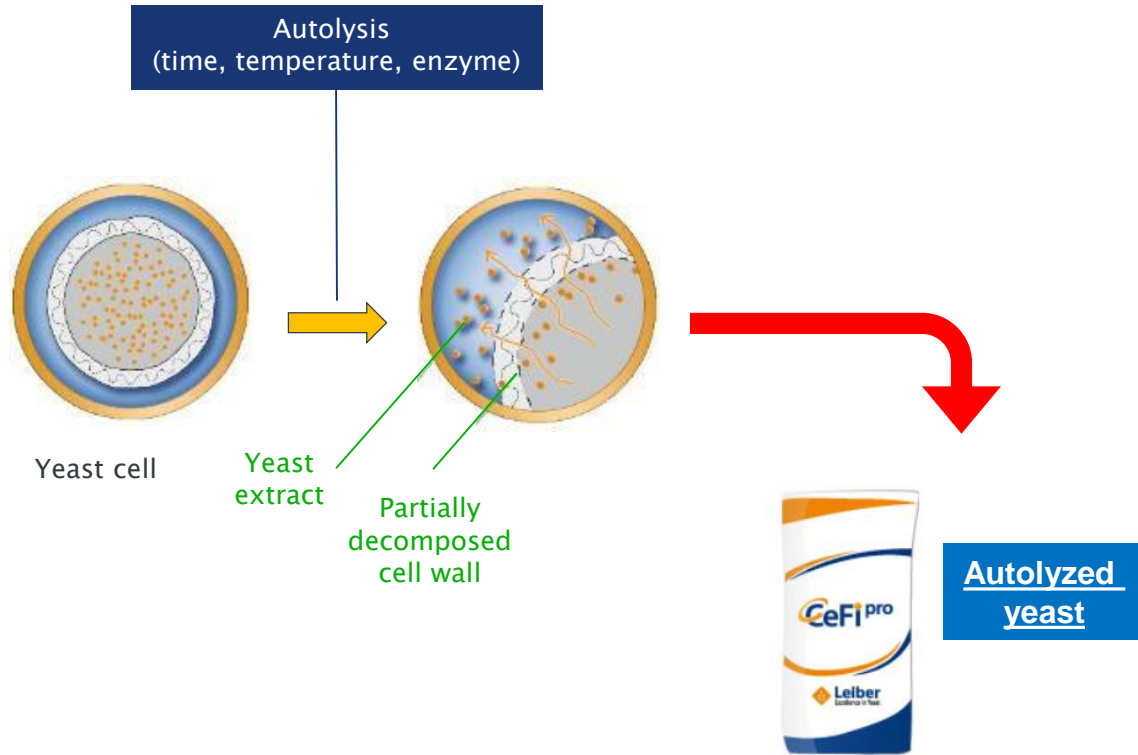


**Leiber CeFi® Pro: autolyzed brewer's yeast for aquaculture
Product properties and functionalities**

Production, product properties and mode of action

Autolyzed brewer's yeast



Inner workings of a counterflow spray dryer

- ❖ Autolyzed yeast from 100% brewer's yeast (*Saccharomyces cerevisiae*)

	Leiber® Brewers' Yeast unextracted	CeFi® Pro
Crude protein, CP (%)	46	50
Lysine (%)	3.2	3.6
Methionine (%)	0.6	0.8
Oils and fats (%)	2.7	3.0
Nucleic acid protein (% in CP)		12
Dosage (kg/to feed)	10 - 50	2 – 5

Modes of action

- ❖ CeFi® Pro consists of both the yeast cell wall and the cell contents
- ❖ The yeast cell contents are released by a gentle and effective autolysis („perforating the cell wall“)
 - ❖ The cell contents consist of high levels of valuable nutrients incl. amino acids, nucleic acid protein, vitamins, etc.
 - ❖ Therefore, CeFi® Pro has a high attractability and palatability effect
 - ❖ The autolysis renders the cell contents remarkably faster and easier available (high bioavailability)
 - ❖ High native levels of natural RNA components, the nucleotides, nucleosides and the pyrimidine and purine bases
→ support and accelerate cell division, cell regeneration and cell repair)
 - ❖ Higher demand for nucleotides during high physiological stress (e.g. reproduction, high growth, immunological stress)
 - ❖ Certain cell types (e.g. lymphoid tissue & epithelial cells of the gut mucosa) can produce nucleotides only insufficiently
- ❖ In addition, the yeast cell walls result in the well-known gut health promoting effects
 - ❖ Prebiotic effect, pathogen/mycotoxin binding, immunity support, biofilm formation, improvements in gut morphology
- ❖ Bacteriostatic effect due to bioactive hops components – only in brewer's yeast products!!

Benchmarking shrimp trial

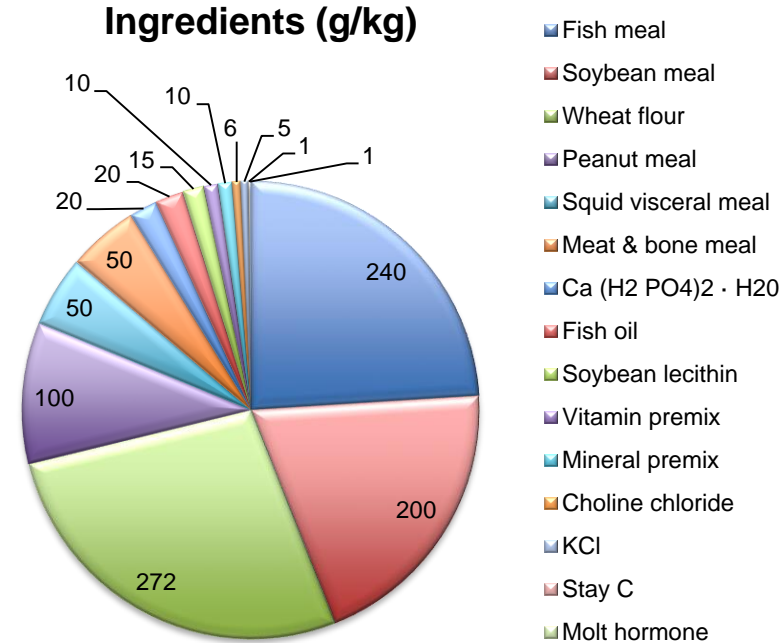
Autolyzed brewer's yeast

Heizuo ^a, Cheng ^b and Kühlwein ^c, 2016

^a Chinese Academy of Fishery Sciences, ^b Vitamex Shanghai Ltd. Nuscience, ^c Leiber GmbH

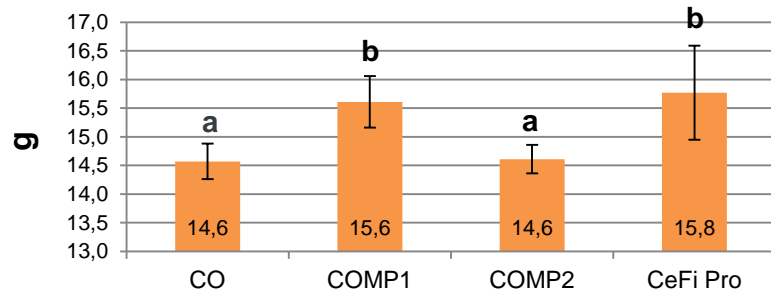
- ❖ 2 weeks acclimatization in holding tanks
- ❖ 480 *L. vannamei* stocked in sixteen 800 L tanks
- ❖ 30 shrimp/tank (initial body weight 2.38 ± 0.24 g)
- ❖ 4 replicate tanks per treatment
- ❖ Isonitrogenous & isocaloric diets
42.4% crude protein, 6.4% crude fat, 13.2% crude ash
- ❖ Feeding 3 times daily for 8 weeks
- ❖ Autolyzed yeast supplemented to control diet: 0.2%

CO	COMP 1	COMP 2	CeFi [®] Pro
Control (no yeast)	2 kg/to feed Competitor 1	2 kg/to feed Competitor 2	2 kg/to feed Leiber [®] product

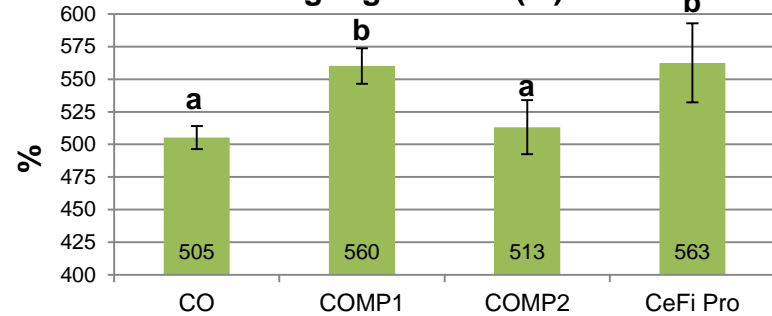


Growth performance and feed conversion week 8 ($n = 4$)

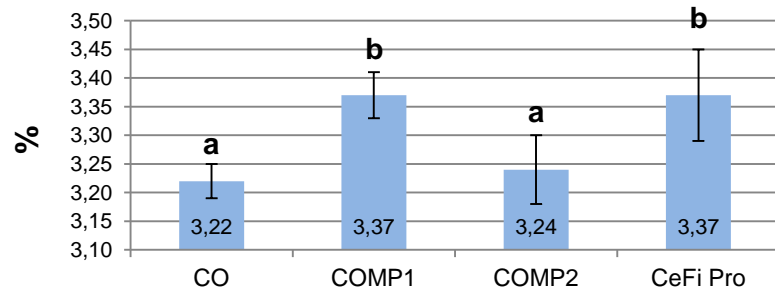
Final body weight (g)



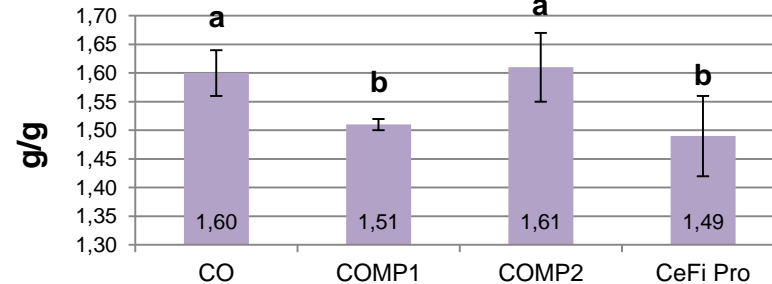
Weight gain ratio (%)



Specific growth rate (%)



Feed conversion ratio



Relative difference of yeast autolysate treatments vs. control

	COMP1	COMP2	CeFi Pro
Final body weight (g)	+ 6.7 %	+ 0.3 %	+ 8.2 %
Weight gain ratio (%)	+ 10.9 %	+ 1.6 %	+ 11.3 %
Specific growth rate (%)	+ 4.7 %	+ 0.6 %	+ 4.7 %
Feed conversion ratio	- 5.6 %	+ 0.6 %	- 6.9 %

Conclusions

- ❖ Leiber CeFi[®] Pro
- ❖ ... outperforms all other treatments regarding growth performance & feed conversion
- ❖ ... significantly increased growth performance & feed conversion vs. control and competitor 2
- ❖ ... numerically improved growth performance & feed conversion vs. competitor 1 (FCR improved by 1.32%)

Preliminary field trial data from shrimp hatcheries in Ecuador 2020

Original comments and explanations by distributor ChemTech S.A.:

- ❖ The different hatcheries used different methods to top-coat CeFi[®] Pro onto the feed
- ❖ For survival and size (PL's/g) mean values of all tanks per treatment are listed
- ❖ At harvest, hatcheries usually deliver 10 - 20% of the ordered quantity to customers as free of charge bonus on top, i.e. the real survival is 10 - 20% more
- ❖ Same applies to shrimp nauplius suppliers
- ❖ Control tank feeds generally contain already certain top-coated ingredients (various immunostimulants, vitamins, etc.), which have been established and routinely used in the respective hatchery

Autolyzed brewer's yeast

DOBLE "O" HATCHERY											
ZONE: LA DIABLICA (SALINAS)											
TANK	SRTART DATE	FINISH DATE	TONS	DENSITY/L	SOURCE	SURVIVAL	SIZE/G	# SIZE	DOSIS/KG	PRODUCT	OBSERVATIONS
1	10.11.2019	26.11.2019	15	133	TEXCUMAR	72%	250	2	10g	CEFI PRO	BETTER GROWTH
2	10.11.2019	26.11.2019	15	133	TEXCUMAR	72%	250	2	10g	CEFI PRO	LOW SIZE DISPERSION
3	10.11.2019	28.11.2019	15	133	TEXCUMAR	65%	300	4	10g	CONTROL	MORE DAYS OF CULTIVATION
4	10.11.2019	28.11.2020	15	133	TEXCUMAR	65%	300	4	10g	CONTROL	LESS SURVIVAL
OCEANLAB HATCHERY											
ZONE: RIO CHICO (SANTA ELENA)											
TANK	SRTART DATE	FINISH DATE	TONS	DENSITY/L	SOURCE	SURVIVAL	SIZE/G	# SIZE	DOSIS/KG	PRODUCT	OBSERVATIONS
1	06.02.2020	24.02.2020	10	125	SHRIMPLAB	80%	280	2	20g	CEFI PRO	BETTER GROWTH
2	06.02.2020	24.02.2020	10	125	SHRIMPLAB	80%	280	2	20g	CEFI PRO	LOW SIZE DISPERSION
3	06.02.2020	24.02.2020	10	125	SHRIMPLAB	80%	280	2	20g	CEFI PRO	LESS DAYS OF CULTIVATION
4	06.02.2020	24.02.2020	10	125	SHRIMPLAB	80%	280	2	20g	CEFI PRO	MORE SURVIVAL
5	06.02.2020	24.02.2020	10	125	SHRIMPLAB	80%	280	2	20g	CEFI PRO	BETTER GROWTH
6	06.02.2020	24.02.2020	10	125	SHRIMPLAB	80%	280	2	20g	CEFI PRO	LOW SIZE DISPERSION
7	06.02.2020	24.02.2020	10	125	SHRIMPLAB	80%	280	2	20g	CEFI PRO	PL 12 CULTIVATION STAGE
8	06.02.2020	24.02.2020	10	125	SHRIMPLAB	80%	280	2	20g	CEFI PRO	HEALTHIER
9	06.02.2020	24.02.2020	10	125	SHRIMPLAB	80%	280	2	20g	CEFI PRO	MORE LIPIDS
10	06.02.2020	24.02.2020	10	125	SHRIMPLAB	80%	280	2	20g	CEFI PRO	BETTER APPEARANCE
M1	06.02.2020	28.02.2020	10	125	SHRIMPLAB	78%	300	4	20g	CONTROL	PL 12 CULTIVATION STAGE
M2	06.02.2020	28.02.2020	10	125	SHRIMPLAB	78%	300	5	20g	CONTROL	MORE SIZE DISPERSION
M3	06.02.2020	28.02.2020	10	125	SHRIMPLAB	78%	300	4	20g	CONTROL	MORE DAYS OF CULTIVATION
M4	06.02.2020	28.02.2020	10	125	SHRIMPLAB	78%	300	5	20g	CONTROL	MORE SIZE DISPERSION
M5	06.02.2020	28.02.2020	10	125	SHRIMPLAB	78%	300	4	20g	CONTROL	LESS GROTH
M6	06.02.2020	28.02.2020	10	125	SHRIMPLAB	78%	300	5	20g	CONTROL	MORE SIZE DISPERSION
M7	06.02.2020	28.02.2020	10	125	SHRIMPLAB	78%	300	4	20g	CONTROL	LESS SURVIVAL

Autolyzed brewer's yeast

ROTTY S.A. HATCHERY											
ZONE: MAR BRAVO (SALINAS)											
TANK	SRTART DATE	FINISH DATE	TONS	DENSITY/L	SOURSE	SURVIVAL	SIZE/G	# SIZE	DOSIS/KG	PRODUCT	OBSERVATIONS
5	08.01.2020	26.01.2020	22	95	TEXCUMAR	82%	250	2	8g	CEFI PRO	BETTER GROWTH
6	08.01.2020	26.01.2020	22	95	TEXCUMAR	82%	250	2	8g	CEFI PRO	LOW SIZE DISPERSION
1	08.01.2020	28.02.2019	22	95	TEXCUMAR	75%	330	4	8g	CONTROL	PL 12 CULTIVATION STAGE
2	08.01.2020	28.02.2019	22	95	TEXCUMAR	75%	330	4	8g	CONTROL	LESS SURVIVAL
3	08.01.2020	29/2/2019	22	95	TEXCUMAR	75%	330	5	8g	CONTROL	MORE SIZE DISPERSION
4	08.01.2020	29/2/2019	22	95	TEXCUMAR	75%	330	4	8g	CONTROL	MORE DAYS OF CULTIVATION
PABLO CISNEROS HATCHERY											
ZONE: SAN PABLO (SANTA ELENA)											
TANK	SRTART DATE	FINISH DATE	TONS	DENSITY/L	SOURSE	SURVIVAL	SIZE/G	# SIZE	DOSIS/KG	PRODUCT	OBSERVATIONS
6	08.01.2020	26.01.2020	20	150	TEXCUMAR	85%	250	2	10g	CEFI PRO	BETTER GROWTH
7	08.01.2020	26.01.2020	20	150	TEXCUMAR	85%	250	2	10g	CEFI PRO	LOW SIZE DISPERSION
1	08.01.2020	28.02.2019	20	150	TEXCUMAR	78%	300	4	10g	CONTROL	PL 12 CULTIVATION STAGE
2	08.01.2020	28.02.2019	20	150	TEXCUMAR	78%	300	4	10g	CONTROL	LESS SURVIVAL
3	08.01.2020	29/2/2019	20	150	TEXCUMAR	78%	300	5	10g	CONTROL	MORE SIZE DISPERSION
4	08.01.2020	29/2/2019	20	150	TEXCUMAR	78%	300	4	10g	CONTROL	MORE DAYS OF CULTIVATION
5	08.01.2020	29/2/2019	20	150	TEXCUMAR	78%	300	4	10g	CONTROL	LESS GROTH
MBL HATCHERY											
ZONE: LA DIABLICA (SALINAS)											
TANK	SRTART DATE	FINISH DATE	TONS	DENSITY/L	SOURSE	SURVIVAL	SIZE/G	# SIZE	DOSIS/KG	PRODUCT	OBSERVATIONS
8	08.03.2020	24.03.2020	15	120	TEXCUMAR	78%	220	2	8g	CEFI PRO	BETTER GROWTH
9	08.03.2020	24.03.2020	15	120	TEXCUMAR	79%	220	2	10g	CEFI PRO	MORE SURVIVAL
10	08.03.2020	26.03.2020	15	120	TEXCUMAR	75%	280	4	10g	CONTROL	MORE DAYS OF CULTIVATION

Conclusions

- ❖ CeFi Pro administered to shrimp larvae overall...
- ❖ ... increased growth performance and reduced the cultivation period for about 2-4 days
- ❖ ... improved survival rates by 2-7%
- ❖ ... led to a more uniform size distribution (number of size classes reduced from about 4-5 down to 2)

Enrichment diets for turbot larvae

Miest & Arndt, 2014/15

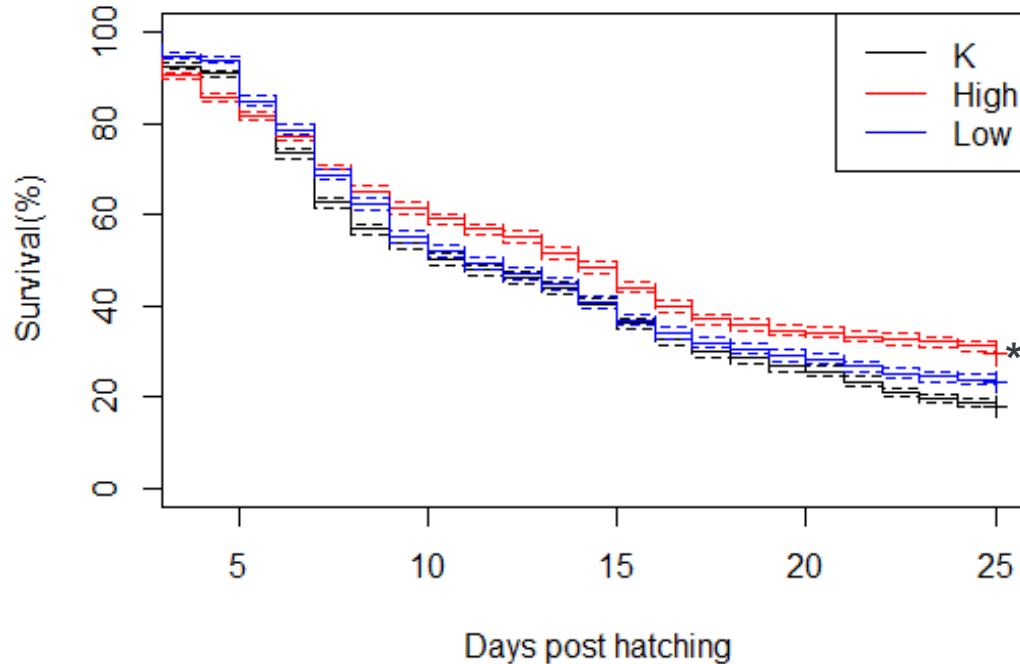
GeoMAR, Germany

- ❖ Turbot larvae (*Scophthalmus maximus*) reared in twelve 75L-tanks filled with 30L FSW at $16 \pm 1^\circ \text{C}$
- ❖ Stocking density 80 larvae/L
- ❖ Feeding daily with 3 prey items/mL (rotifers enriched for 3 hours with the treatments)
- ❖ From 13 dph larvae additionally fed enriched *Artemia* sp. nauplii (1 nauplius/mL)
- ❖ 4 replicate tanks per treatment (randomly distributed)
- ❖ 20 larvae sampled in the morning before feeding to analyze growth, RNA:DNA ratio and tryptic activity

CO	LOW	HIGH
Control (S.presso, INVE, Belgium)	S.Presso + 1 g/L CeFi® Pro	S.Presso + 3 g/L CeFi® Pro

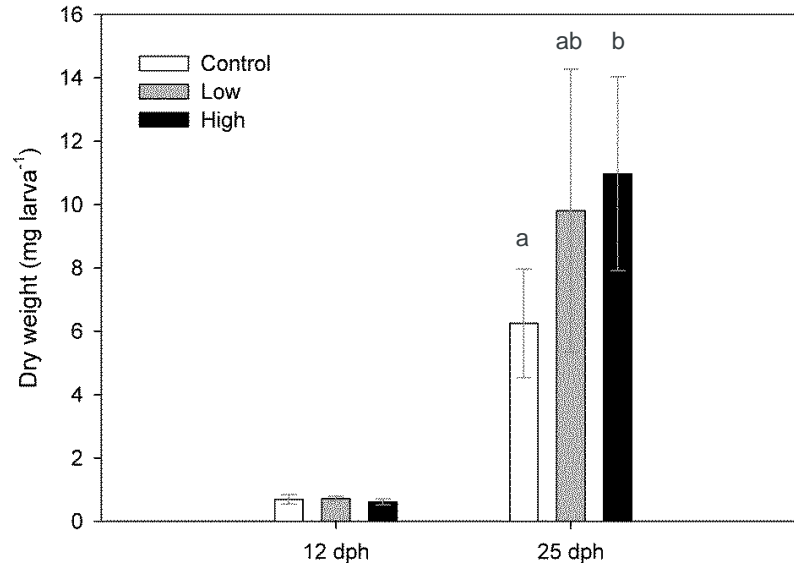
Survival rates

- ❖ Survival was significantly increased due to administration of *Brachionus* fed the high dose of CeFi Pro!



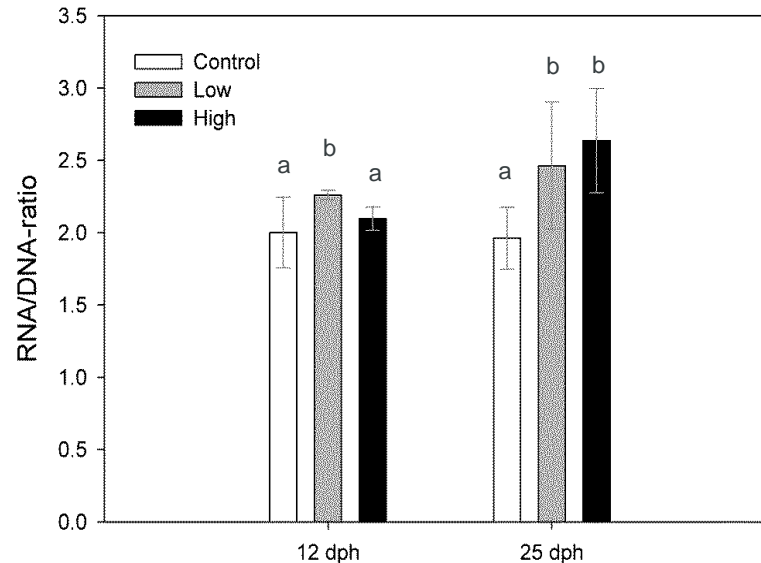
Final body weight

- ❖ No difference in dry weight of larvae at 12 dph, but significantly increased at 25 dph with CeFi Pro!
CO = 6.25 ± 0.64 mg vs. LOW = 9.08 ± 1.19 mg ($p = 0.058$) vs. HIGH = 10.97 ± 1.28 mg ($p \leq 0.01$)
- ❖ No significant difference in larval length



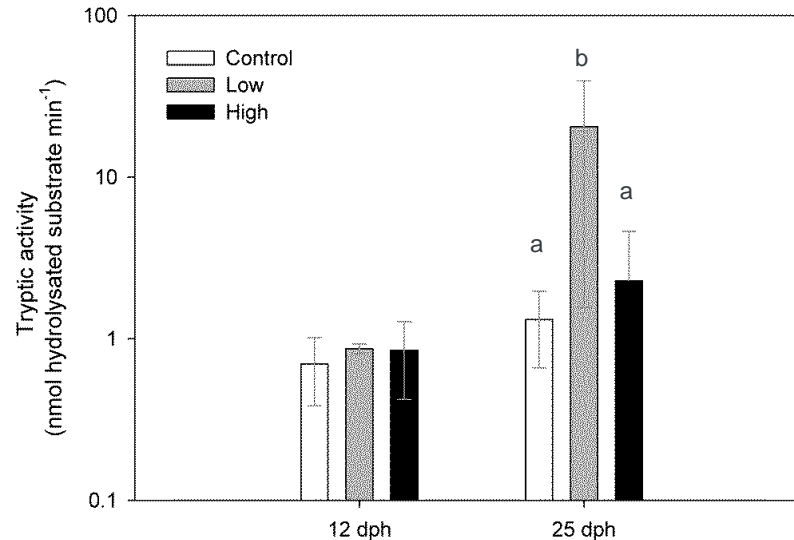
RNA/DNA ratio

- ❖ 12 dph: significantly higher with LOW (2.26±0.05) compared to CO (2.00±0.08) and HIGH (2.10±0.09)
- ❖ 25 dph: significantly higher with LOW (2.45±0.13; $p \leq 0.01$) and HIGH (2.63±0.10; $p \leq 0.001$) compared to CO (1.96±0.09)



Tryptic activity

- ❖ Not affected at 12 dph
- ❖ At 25 dph: significantly higher with LOW (20.41±7.24 nmol/min) compared to CO (1.34±0.34 nmol/min) and HIGH (2.28±0.77 nmol/min) (both $p \leq 0.0001$)



Conclusions

- ❖ CeFi Pro administered to turbot larvae via enriched live feeds...
- ❖ ... significantly increases survival up to 25 dph
- ❖ ... significantly improves growth at 25 dph
- ❖ ... significantly increases RNA/DNA-ratio up to 25 dph (marker for nutritional status, metabolism)
- ❖ ... significantly increases tryptic activity at 25 dph (marker for protein metabolism)

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ORIGINAL ARTICLE



WILEY

Dietary supplementation of autolysed yeast enhances growth, liver functionality and intestinal morphology in African catfish

Ayodeji A. Adeoye¹  | Sam O. Obasa¹ | Femi J. Fawole²  | Alex H. L. Wan³ |
Simon J. Davies⁴

Experimental design

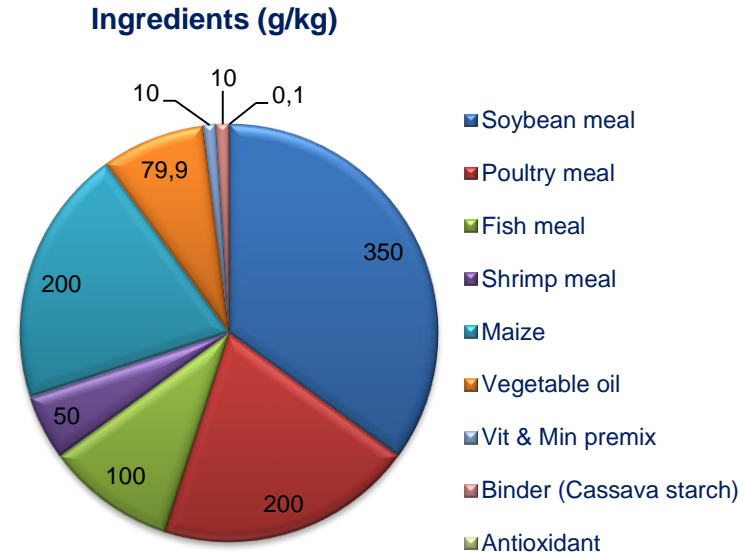
- ❖ 240 African catfish (*Clarias gariepinus*) stocked in 12 rearing tanks
- ❖ 20 fish per tank (water volume 33 L)
- ❖ Initial body weight 22.5 ± 1.15 g per fish
- ❖ 3 replicate tanks per treatment, randomly allocated
- ❖ Feeding twice a day to apparent satiation for 7 weeks
- ❖ Weekly batch-weighing
- ❖ Water temperature 29.0 ± 0.29 °C, pH 6.85 ± 0.34 , $O_2 > 5$ mg/L, ammonia 0.34 ± 0.1 mg/L
- ❖ Leiber CeFi[®] Pro (AY – autolyzed yeast) supplementation:

CO	0.3 % AY	0.6 % AY	1.0 % AY
Control (no yeast)	3 kg/to feed Leiber CeFi [®] Pro	6 kg/to feed Leiber CeFi [®] Pro	10 kg/to feed Leiber CeFi [®] Pro

Experimental design

- ❖ Ingredients of the basal diet and proximate analysis of test diets (% of dry weight)
- ❖ Leiber CeFi® Pro supplemented at the expense of shrimp meal
- ❖ Isonitrogenous and isolipidic diets, pellet size 2 mm

	CO	0.3 % AY	0.6 % AY	1.0 % AY
Moisture	9.33 ± 0.12	9.13 ± 0.21	9.53 ± 0.17	9.27 ± 0.12
Crude Protein	38.9 ± 0.1	38.9 ± 0.3	38.6 ± 0.0	39.2 ± 0.1
Crude Lipid	13.6 ± 0.1	13.7 ± 0.0	13.3 ± 0.2	13.9 ± 0.1
Crude Ash	6.55 ± 0.02	6.84 ± 0.13	6.96 ± 0.06	6.79 ± 0.12
Crude Fibre	4.39 ± 0.09	4.35 ± 0.15	4.94 ± 0.11	4.02 ± 0.11
NfE	36.1 ± 0.3	35.6 ± 0.5	35.6 ± 0.1	35.7 ± 0.4



Growth performance, FCR and general survival after 7 weeks ($n = 3$)

	CO	0.3 % AY	0.6 % AY	1.0 % AY
IBW (g)	22,0 ± 0,7	22,2 ± 0,9	23,5 ± 1,4	22,3 ± 0,5
FBW (g)	91,0 ± 1,9 ^a	106,1 ± 6,5 ^b	98,1 ± 8,2 ^{ab}	98,0 ± 8,2 ^{ab}
SGR (%)	2,90 ± 0,03	3,19 ± 0,11	2,92 ± 0,12	3,01 ± 0,19
MGR (g/kg ^{0.8} /day)	14,5 ± 0,1 ^a	16,0 ± 0,5 ^b	14,8 ± 0,5 ^{ab}	15,1 ± 0,9 ^{ab}
FCR	1,25 ± 0,12	1,08 ± 0,02	1,15 ± 0,10	1,14 ± 0,06
PER (%)	1,53 ± 0,15	1,82 ± 0,06	1,67 ± 0,18	1,70 ± 0,13
HSI	1,06 ± 0,11	1,12 ± 0,16	1,30 ± 0,12	1,18 ± 0,22
VSI	10,2 ± 1,2 ^a	11,6 ± 1,4 ^{ab}	10,9 ± 1,7 ^{ab}	13,0 ± 0,5 ^b
Survival (%)	91,7 ± 4,7	98,3 ± 2,4	95,0 ± 0,0	86,7 ± 8,5



Growth performance,
nutrient utilisation
and somatic indices
within optimum range
of African catfish!

Values with different superscripts indicate significant differences ($P < 0.05$). IBW, initial mean body weight; FBW, final mean body weight; MWG, mean weight gain; PWG, percentage weight gain; SGR, specific growth rate; MGR, metabolic growth rate; FCR, feed conversion ratio; PER, protein efficient ratio; HSI, hepatosomatic index; VSI, viscerosomatic index.

Relative difference (in %) of Leiber CeFi® Pro treatments vs. control

	0.3 % AY	0.6 % AY	1.0 % AY
Final body weight (g)	+ 16,5	+ 7,8	+ 7,7
Specific growth rate (%)	+ 10,0	+ 0,7	+ 3,8
Metabolic growth rate (g/kg ^{0,8} /day)	+ 10,3	+ 2,1	+ 4,1
Feed conversion ratio	- 13,6	- 8,0	- 8,8
Protein efficiency ratio (%)	+ 19,0	+ 9,2	+ 11,1
Survival (%)	+ 7,3	+ 3,6	- 5,5

Haemato-biochemistry after 7 weeks ($n = 6$)

	0% AY	0.3% AY	0.6% AY	1.0% AY
Haematocrit (% PCV)	35.0 ± 2.78	36.3 ± 1.76	35.5 ± 1.00	37.3 ± 1.04
Haemoglobin (g dL ⁻¹)	11.7 ± 0.98	12.3 ± 0.65	11.9 ± 0.36	12.5 ± 0.31
RBC (10 ¹² L ⁻¹)	2.50 ± 0.45	2.55 ± 0.13	2.40 ± 0.18	2.86 ± 0.43
WBC (10 ⁹ L ⁻¹)	143 ± 24.4	101 ± 64.8	208 ± 82.2	113 ± 66.9
Neutrophil (%)	24.6 ± 6.45	23.2 ± 7.77	24.4 ± 3.61	27.0 ± 11.7
Lymphocytes (%)	72.2 ± 6.43	68.3 ± 8.13	71.5 ± 3.12	70.5 ± 11.4
Basophil (%)	0.67 ± 0.76	0.33 ± 0.58	0.67 ± 0.76	0.33 ± 0.58
Eosinophil (%)	1.50 ± 1.32	2.00 ± 1.50	2.00 ± 1.73	1.00 ± 0.76
Monocytes (%)	3.50 ± 1.80	2.17 ± 1.76	3.83 ± 0.76	2.83 ± 0.29
MCV (fL)	144 ± 23.1	142 ± 0.40	149 ± 9.77	133 ± 16.3
MCH (pg)	48.4 ± 7.38	48.2 ± 0.26	50.0 ± 3.58	44.8 ± 5.51
MCHC (g dL ⁻¹)	33.6 ± 0.54	33.8 ± 0.26	33.5 ± 0.24	33.6 ± 0.15
AST (IU L ⁻¹)	160 ± 19.7	174 ± 14.6	146 ± 19.6	185 ± 32.0
ALT (IU L ⁻¹)	24.9 ± 2.17 ^a	15.7 ± 3.9 ^c	16.8 ± 1.53 ^{bc}	22.4 ± 2.67 ^{ab}
ALP (IU L ⁻¹)	60.0 ± 8.40	62.7 ± 12.5	75.7 ± 15.2	69.8 ± 11.6

Results show that fish were in good health!



Values with different superscripts indicate significant differences ($P < 0.05$). PCV, packed cells volume; RBC, red blood cells; WBC, leucocytes; MCV, mean corpuscular volume; MCH, mean corpuscular haemoglobin; MCHC, mean corpuscular haemoglobin concentration; AST, aspartate transaminase; ALT, alanine transaminase; alkaline phosphatase.

Gut histology after 7 weeks ($n = 6$)

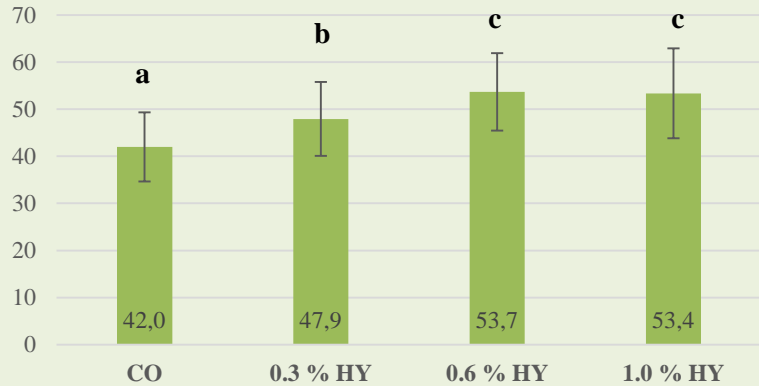
	CO	0.3 % AY	0.6 % AY	1.0 % AY
Goblet cells (per 100 μm)	4,78 \pm 0,87 ^a	5,75 \pm 1,49 ^b	6,32 \pm 1,28 ^c	6,62 \pm 1,28 ^c
IELs (per 100 μm)	42,0 \pm 7,3 ^a	47,9 \pm 7,9 ^b	53,7 \pm 8,2 ^c	53,4 \pm 9,6 ^c

Gut sections showed intact epithelial barriers!

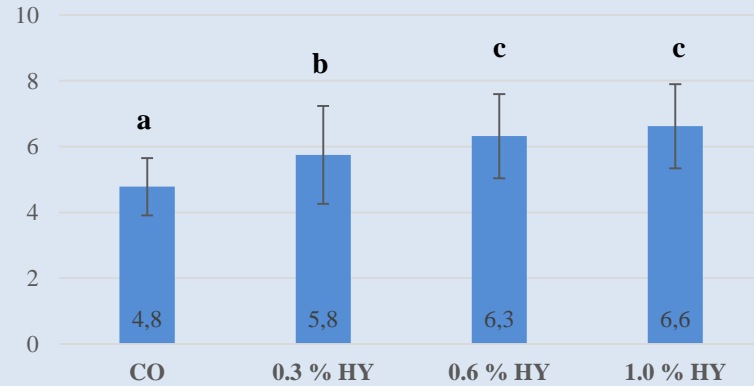
Goblet cell & IEL abundance within normal range

Values with different superscripts indicate significant differences ($P < 0.05$). IELs, Intraepithelial leucocytes.

IELs (per 100 μm)



Goblet cells (per 100 μm)



Conclusions

- ❖ ... significantly increased growth performance at 0.3% supplementation
 - final body weight by 16.5 % and metabolic growth rate by 10.3 %
- ❖ ... and numerically increased specific growth rate, FCR, protein efficiency ratio and general survival
- ❖ ... significantly decreased ALT levels in blood at 0.3 % and 0.6% supplementation
 - indicating a protective effect on membrane integrity of liver cells
- ❖ ... significantly increased mucus-producing gut goblet cells at all supplementation levels
 - indicating an enhanced intestinal barrier function
- ❖ ... significantly increased gut IEL's at all supplementation levels
 - indicating stimulation of the gut-associated lymphoid tissue (GALT),
 - thereby protecting and preventing pathogen invasion

The bacteriostatic effect

Bacteriostatic effects

- ❖ Hops – only in brewer's yeast → through hop ingredients (α -acids, β -acids, polyphenols – flavonoids)
- ❖ Hop effects:
 - ❖ calming
 - ❖ antioxidative
 - ❖ adstringent
 - ❖ bacteriostatic



Hildegard von Bingen (12. Jahrhundert)

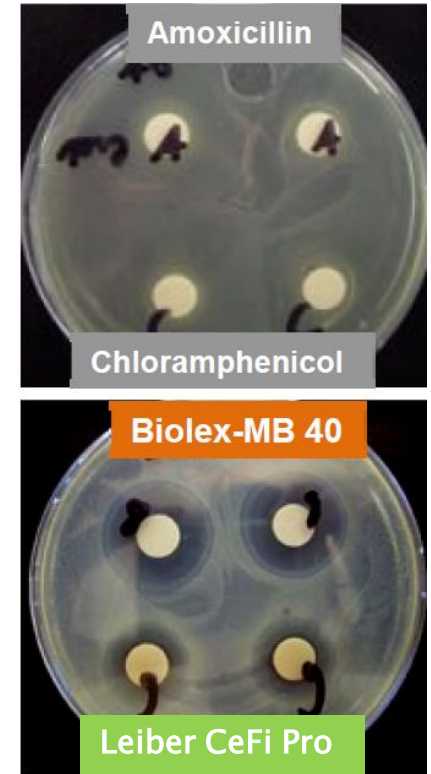
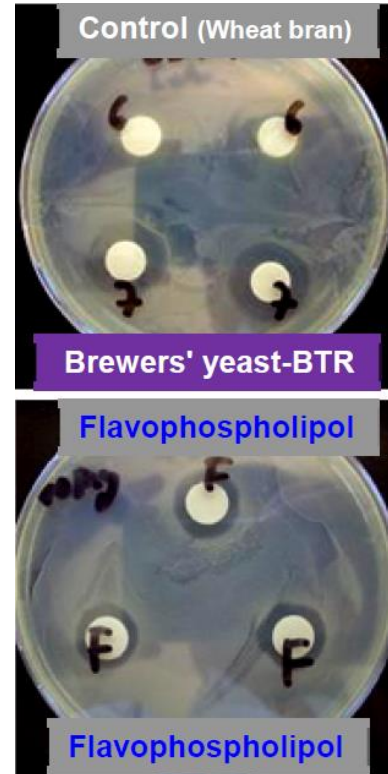
„Der Hopfen trockne die Eingeweide aus, mache traurig und betrübt. Aber durch seine Bitterkeit bewirke er immerhin, dass sich Getränke, denen er zugesetzt ist, lange halten“



Autolyzed brewer's yeast

Bacteriostatic effects

- ❖ Inhibitor test results
 - ❖ Inhibition of *Staphylococcus aureus*
 - ❖ Bacteriostatic effects
 - ❖ Resistant antibiotics
- ❖ Conclusion
 - ❖ Mode of action against resistant pathogens



Sample concentration $\triangleq 0.2\%$ in feed

Conclusions and recommendations for use

Conclusions

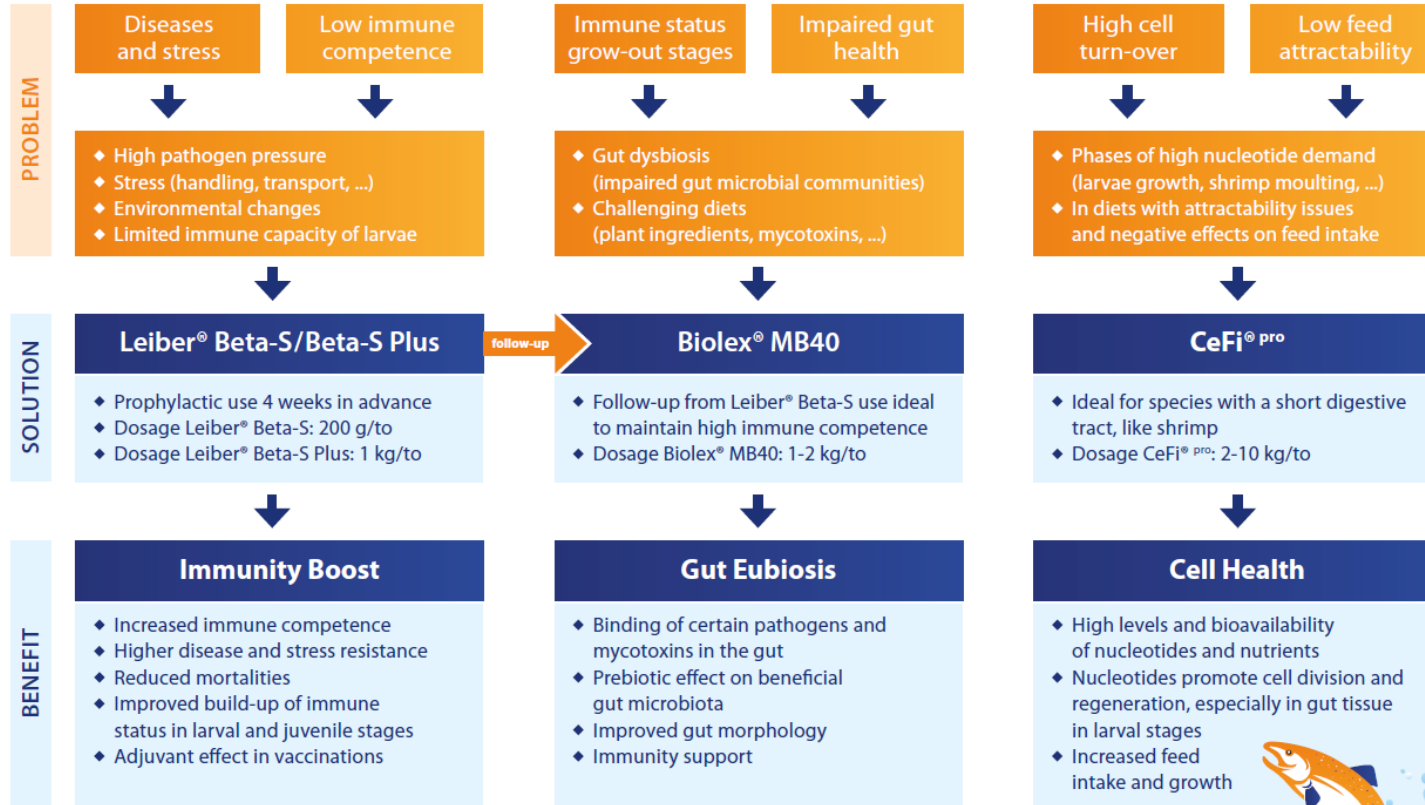
- ❖ CeFi® Pro has high levels and high bioavailability of nutrients and nucleotides
- ❖ CeFi® Pro can increase growth performance and feed conversion
- ❖ CeFi® Pro promotes cell division, regeneration and repair through nucleotides
- ❖ CeFi® Pro also achieves gut-health promoting effects through both nucleotides & yeast cell walls
- ❖ CeFi® Pro has a strong bacteriostatic effect against highly antibiotic-resistant pathogens

Recommended usage

- ❖ 2 – 5 kg/to in feed (0.1 – 0.5%) → usually 3 kg/to feed
- ❖ To ensure and maintain high feed intake and growth performance
 - in diets with attractability and palatability issues
 - where challenging diets are used (high levels of plant ingredients, mycotoxins, etc.)
- ❖ Ideal for species with a short digestive tract (e.g. shrimp) through high bioavailability of nutrients
- ❖ Use during phases of high nucleotide demand (rapid larvae growth, reproduction, immune challenges, ...)

Leiber® Beta-S, Beta-S Plus, Biolex® MB40 and CeFi® pro

General recommendation guideline for conceptual use in fish and shrimp



For more information please contact:
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Thanks a lot for your attention!

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