Food and feed safety aspects of mussel- and insect-based feed

Report from fish and poultry trials

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About

Baltic Blue Growth is a three-year project financed by the European Regional Development Fund. The objective of the project is to remove nutrients from the Baltic Sea by farming and harvesting blue mussels. The farmed mussels will be used for the production of mussel meal, to be used in the feed industry. 18 partners from 7 countries are participating, with representatives from regional and national authorities, research institutions and private companies. The project is coordinated by Region Östergötland (Sweden) and has a total budget of 4,7 M€.

Partners

- *Region Östergötland (SE)*
- *County Administrative Board of Kalmar County (SE)*
- *East regional Aquaculture Centre VCO (SE)*
- *Kalmar municipality (SE)*
- *Kurzeme Planning Region (LV)*
- *Latvian Institute of Aquatic Ecology (LV)*
- *Maritime Institute in Gdańsk (PL)*
- *Ministry of Energy, Agriculture, Environment, Nature and Digitalization of Schleswig-Holstein (DE)*
- *Municipality of Borgholm (DK)*
- *SUBMARINER Network for Blue Growth EEIG (DE)*
- *Swedish University of Agricultural Sciences (SE)*
- *County Administrative Board of Östergötland (SE)*
- *University of Tartu Tartu (EE)*
- *Coastal Research and Management (DE)*
- *Orbicon Ltd. (DK)*
- *Musholm Inc (DK)*
- *Coastal Union Germany EUCC (DE)*
- *RISE Research institutes of Sweden (SE)*

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Executive summary

The eutrophication of the Baltic Sea is an issue that concerns all the countries surrounding the brackish water sea. Through HELCOM (Helsinki convention) all countries agreed to take action on national level. However there is also a need for transnational cooperation and coordination of efforts and measures. The Baltic Sea Regional Programme has enabled cooperation for the use of blue biomass and sustainable economic growth.

The Baltic Blue Growth project has a broad approach towards the measure of large scale mussel farming in the Baltic Sea, investigating issues of negative environmental effects, possible hazardous substances, payment schemes, spatial planning, and use for the mussels.

This report presents the issue of investigating whether mussels could be a safe ingredient in fish and poultry feed possibly creating a nutrient loop in the Baltic. The result indicates that farmed mussels does contain non-detectable or beneath regulation limits of any substance. Furthermore it is shown that the substances do not accumulate in the food chain.

The development of feed and feed trials has been conducted in cooperation with the associated project partner and feed producer Swedish Agro. They conclude that the use of mussel meal as an ingredient in feed is interesting if some issues are addressed in the future, such as bulk access, price and guaranteed levels and control of hazardous substances.

Chicken trials – from mussels to chicken

To understand and evaluate the trofic transfer of toxins through the food web, two studies on performance of mussels as ingredient in chicken feed were performed. The aim of the study was to demonstrate potential breeders and the chicken feed industry how mussels from the Baltic Sea proper could work as protein source in feed to limit the imported soy protein or fish meal in the feed. This part of the Baltic Blue Growth project has therefore had a close cooperation with the associated project partner and the local feed factory, Swedish Agro, in order to continuously receive feedback regarding the results and associated questions that may arise.

Figure 1. Frozen mussels of harvest April 2016.

Analysis of unwanted substances has been performed throughout the food chain, as well as some additional mussel samples from Sweden and Estonia. The analysis programme has been set up from EU and national regulation of Sweden regarding food, i.e. the project had the aim to map possible hazardous substances through the food chain. List of substances can be found in Appendix 1.

Analyses were performed on mussel meat, two different mussel meal and chicken tissue (muscle and liver). The chickens' behaviour and weight was monitored and registered. Through associated projects crushed mussels and mussel meal were tested on laying hens and further analysis of BMAA (beta-N-methylamino-L-alanine) was performed on chicken tissue. The main results from those studies are briefly reported.

The result of the chicken studies is reported in Swedish by the procured facility Ölands Kyckling. Below follows the main result and recommendations translated from these reports.

Mussels

The mussels of trial one and two were harvested from the archipelago of Västervik on the Swedish southeast coast, late April 2016 and 2018 (Minnhagen, 2017), immediately frozen at -18°C and stored in a freezing facility at the same temperature, see Figure 1.

The mussels had grown about two years at the time for harvest. In March and October 2018 the mussels were analysed by procured laboratory, Eurofins. None of the investigated bacteria, algae toxins, metals, dioxins or PAH were either detected or over regulation limits.

Mussel meal – one product two processes

The mussel meal of trial #1, Figure 2, was procured by RISE and SLU through GoA 4.2 and processed at Nofima facility of Trondheim, Norway as described in a separate project report. In the first process 2 975 kg mussels were lysed by addition of a proteolytic enzyme (alcalase) and the lysate was spray dried into 90 kg of mussel meal.

Figure 2. Mussel meal of trial #1

The mussel meal of trial #2, Figure 3, was procured through an associated project lead by Municipality of Borgholm. The meal was processed by Musselfeed, Orust, Sweden in November-December 2018. The process and results are described in a separate project report in Swedish to be published later in 2019. In the second process approximately 2 000 kg mussels were rinsed in fresh water, naturally lysed and dried into about 70 kg of mussel meal.

Figure 3. Mussel meal of trial #2

The analysis was performed by Eurofins in March (Nofima) and November (Musselfeed), 2018, and no bacteria or algae toxins were detected. Some substances showed elevated values, such as PAH (polycyclic aromatic hydrocarbons) and arsenic. However, no limits in either food or feed regulation were exceeded.

Poultry chicken feed and trial #1

Development facility at Ölands Kyckling

The company Ölands Kyckling which provided the test facilities are active in breeding broiler chickens. The company also tests developed feed for chickens in association with Swedish Agro. These developments are conducted in a small, separate stable called “Development stable” and the studies described in this report were conducted there.

The development facility contains of 24 compartments with room for approximately 450 chickens in each compartment. Different compartments are given different developed feed and some compartments are control groups for comparison of growth and health results.

Implementation

The first study was conducted May 22nd to June 25th, 2018, lasting for 34 days. It included 200 chickens in total, divided in two groups of 100:

- Group 1 fed feed blend with mussel meal
- Group 2 fed reference diet

Parameters temperature, moist and water consumption are described in Appendix 2.

Feed

During the whole trial all chickens were given a standard meal feed that was provided by Swedish Agro. At the facility the mussel meal was mixed with the standard meal feed in a cement mixer, Figure 4, and was given to group 1.

Figure 4. Blending of feed with mussel meal trial #1

The inclusion level of mussel meal was set to 10-15 % of the feed. However the mussel meal was characterised by very fine particle size (like starch powder) and texture and quality of the meal had hygroscopic properties. It quickly absorbed moisture from the air and turned into a glue-like substance that was difficult to handle in a conventional way. After 30-60 minutes when the feed had been placed in the compartment it had changed properties and tainted the beaks and feet of the chickens in a way that is not acceptable for the welfare of the chicken, Figure 5. In consultation with the municipality the trial was paused for 1,5 days as a method for decreasing the hygroscopic attributes was tried out.

Figure 5. Stained beak of the chicken.

The mussel meal was blended with approximately 0,5-1 dl rape seed oil per kg mussel meal before it was mixed into the feed. The texture of the mussel meal feed would change within an hour or less transform to an inedible mass sticking to the feed cups with risk of harmful microbial growth, Figure 6. Therefore feed was regularly discarded as the oil mix was developed.

Figure 6. Test of different rape seed oil mix in the stable.

Consumption of feed

The consumption of feed is shown in Table 1. There is some uncertainty regarding the amount of feed that was consumed because parts of feed had to be discarded and was not weighed. The blend of mussel meal was approximately 4-5 %.

Table 1. Consumption of mussel meal and standard meal feed in the two boxes of the study (30-50 kg incl. in the total amount of feed was discarded from box 1). Feed that was discarded was not weighed.

Feed consumption	Box 1 mussel meal (kg)	Box 2 Reference (kg)
Mussel meal	17	-
Standard meal feed	372	330

Based on the behavioural observations regarding the eagerness and interest of chickens in the mussel containing feed it can be concluded that the mussel meal can act as a taste enhancing raw material for use chicken feed.

Chicken growth and health

The chickens were weighed on days 7, 14 and 21 as well as the slaughter weight, see Table 2. The weight of the chickens fed mussel meal did not differ from the reference group. The 7-day weight was somewhat lower than expected. The probable reason for that is that both groups were fed a meal feed instead of pelleted feed. Box 1 had problems eating in the beginning of the study due to the hygroscopic attributes of the mussel meal.

Figure 7. A ten day old chicken eating mussel meal feed.

Table 2. Weight of the chickens during breeding and slaughter in the two boxes of the study.

Day of weighing	Box 1 mussel meal feed (g)	Box 2 Reference standard meal feed (g)	Weight interval boxes 3-24
7	173	178	175-203
14	503	443	450-558
21	2260	2210	N/A

The health of the chickens has been good during breeding, Figure 7. The total mortality was 2 %, which counts as normal to low. Veterinarian conducted visual inspection at two occasions without any remarks.

Control and sampling after terminated breeding

On the 26th of June, 2018, the chickens were euthanized and sampled for tissues (liver and muscle) that were later sent for analysis. The sampling was conducted by veterinarian.

Quality of the mussel meal

The feed producer's, Swedish Agro, point of view is that sea water probably has led to a high share of sodium (Na) and chloride (Cl). This in turn has led to the hygroscopic features of the mussel meal. This also limits the use of this mussel meal as protein source in feed. Corresponding share of Na and Cl in fish meal is about half compared to this mussel meal, see Table 3.

Table 3. Comparison between Na, Cl and Ca values of chicken feed, laying hens, mussel meal and fish meal.

	Sodium (%)	Chloride (%)	Calcium (%)
Complete feed for chicken	0,16	0,16-0,20	0,9
Complete feed for laying hen	0,16	0,16-0,20	3,5-4,0
Mussel meal	2,28	3,83	0,39
Fish meal	1,1	2,6	2,2

Recommendations

In order for mussel meal to be an interesting raw material for feed Ölands Kyckling and Swedish Agro recommends:

1. The tested meal is not suitable for feed even after mixing with rape seed oil. The Na and Cl share must decrease, possibly by rinsing the mussels in freshwater before processing.
2. The feature of the mussel meal is not suitable for large scale handling. In order to successfully be incorporated into poultry feed the particles should be larger and preferably rougher or pelleted. Dry feed ingredient need to be suitable for long-term storage in e.g. silos and easily relocated without clogging. This aspect is important for the production flow, extended shelf life and prevention of possible contamination of by pathogens.
3. The result of the analysis programme conducted by Eurofins should be compared to equivalent analysis on fish meal and/or eggs.

4. The raw material needs to be available all year round in large volumes to maintain a stable feed production.

Beta-N-methylamino-L-alanine – BMAA

An associated project at Stockholm University investigates the possible presence of BMAA (beta-N-methylamino-L-alanine) in chicken fed on mussel meal. This compound is produced by the phytoplankton groups cyanobacteria, diatoms and dinoflagellates. Studies earlier performed in the Baltic Sea show a bioaccumulation of BMAA from the producers, cyanobacteria and diatoms, to aquatic animals higher up in the food web e.g. mussels and fish (Jonasson et al 2010). BMAA has been linked to the development of devastating neurodegenerative diseases such as Amyotrophic Lateral Sclerosis and Alzheimer's disease.

During the present study, performed by Dr Sara Rydbergs team at SU, a possible transfer of BMAA from mussel meal to the chicken is investigated. Extracted chicken tissues are muscle, brain, eye and liver. The results can later be used to map the bigger picture and the impact on food and feed from the Baltic (S. Rydberg, pers. comm. 21st of March, 1019).

Laying hen study

An associated project at Linnaeus University called Algoland, evaluate algae and algae blends as feed ingredient for laying hen. At the same time crushed mussels, including shells, and the first processed mussel meal were fed to the hens. Feed blend that were used in trial:

- Trial #1: crushed mussels (incl. shells): 10 %
- Trial #2: mussel meal 10 %
- Trial #3: dried algae 15 %

The result (E. Lindehoff and A. Thore, pers. comm. 1st, 4th and 14th of March, 2019) indicates that the crushed mussels were tasty an interesting to the hens and also reduced bad behaviour, such as attacking and injuring other hens, possibly because of the heterogeneity of the mussels. The mussels were consistently chosen first as they were fed.

When mussel meat and mussel meal were served the hens reacted differently. The consistency of the meal made it unappetising and the study experienced the hygroscopic features to aggravate foraging. The conclusion is that the mussel meal needs another feature in order to work as a laying hen feed.

The project also analysed eggs from the laying hens and the preliminary result is no accumulation of unwanted substances (metals, pesticides, PAH or dioxins) either with crushed nor mussel meal feed. There was no difference in nutrient composition or production (number of eggs per hen per day) compared to the control group.

Chicken feed and trial #2

To be able to compare the two trials the same facility, Ölands Kyckling was used to perform the second chicken study. For description of the facility, please see above.

Implementation

The second study was conducted January 3rd to February 4th, 2019, lasting for 33 days. It included 100 chickens in total with boxes 2-6 as reference. These boxes are also the reference for the rest of the separate feed studies conducted in the facility.

Parameters temperature, moist and water consumption are described in Appendix 3.

Feed

The chickens have been fed a standard growth feed for laying hens (standard crushed pellet feed) provided by Swedish Agro, Figure 8. The feed composition is presented in Table 4. The mussel meal provided by the Municipality of Borgholm has been mixed into the feed using a cement mixer. The inclusion level of mussel meal was set to approximately 10 %. Salt content was lower in the second mussel meal: Na 1 % and Cl 1,7 %.

Table 4. Composition of raw material in growth feed Box 1

Raw material	Percentage
Oat	15
Wheat	40
Maize	15
Rape seed meal	10
Soy meal	10
Peas	3
Calcium	3
Pollard	2
Vitamins, amino acids, salt	2

Consumption of feed

The consumption of feed is described in Table 5. The taste of the mussel meal is assessed to be a good raw material for chicken feed.

The chickens were seemingly less interested in this feed compared to trial #1 (M. Algotsson pers. comm. 25th January, 2019).

Table 5. Consumption of mussel meal and crushed pellet feed in the box of the study.

Feed consumption	Box 1 Mussel meal feed (kg)
Mussel meal	25
Crushed pellet	250

Chicken growth and health

The chickens were weighed on days 7, 14 and 21 as well as the slaughter weight, see Table 6. The weights are not deviating from the reference group.

Veterinarian, has performed visual inspection at two occasions during breeding and also examined dead chickens. The mortality was higher than expected in the mussel meal box (24 %), compared to the reference group (14,2 %). One reason could be contamination by pathogenic bacteria from other boxes and also that the feed did not contain

Figure 8. Chicken eating mussel meal feed of trial #2.

coccidiostats and in addition had quite high protein content. As a result the chickens' mortality increased due to intestinal inflammation. The mussel meal is not regarded as the cause of increased mortality.

Table 6. Weight of the chickens during breeding and slaughter in the box fed mussel meal feed and reference boxes.

Day of weighing	Box 1 mussel meal feed (g)	Box 2-6 Reference standard crushed pellet feed (g)	Weight interval boxes 2-24 (g)
7	193	197	179
14	475	499	450-486
21	940	1 042	961-1 037
33	1 970	1 977	1 869-1 944

Control and sampling after terminated breeding

On the 4th of February, 2019, the chickens were euthanized and sampled for tissues that were later sent for analysis. The sampling was conducted by veterinarian. Assistance, sample vessels and instructions were provided by the Municipality of Borgholm.

Quality of the mussel meal

Ölands Kyckling and Swedish Agro mean that the mussel meal of the second chicken study has been working well. This means that it is possible to handle in silos and funnels of pelleting facilities if the production is scaled up. The difference from the first study is most likely the lowered sodium and chloride content (lowered by half in study #2). On the other end the lipid content has increased about 10 times, which may have resulted in increased levels of dioxins. These levels are still below limits for food and feed.

The second mussel meal had a different texture than trial #1. This had a more flaky and rough structure and worked well to mix with the standard feed. However, the flakes separated from the crushed pellet as the feed blend reached the feed cups. As this happened, the chickens had more of a choice on what to eat. The handling of the mussel meal was easy and no hygroscopic tendency was detected.

There is however, an important aspect of the mussel meal as a future plausible feed ingredient as there has been an ongoing national discussion in Sweden about toxin levels in organic eggs. The Swedish Agro and Ölands Kyckling would like to address the importance of the issue, even though it might not concern chicken feed since muscle or liver did not show any detectable levels of dioxins. Fish meal is used in organic laying hen feed and is not produced from Baltic Sea fish. The fish meal that is used in chicken feed today has low dioxin levels.

Final remarks

The main impression of the mussel meal as a whole is that it is an interesting raw material if the unwanted substances are handled accordingly. In addition, the raw material needs to be in access year-round, enough quantities and at a competing price level.

Analysis of mussels, mussel meals and chicken tissue

The project *Baltic Mussel Feed* (Dolmer *et. al* 2015) mapped the regulation and national legislation and listed substances that needed to be analysed with regard to mussels from the Baltic Sea as raw material for feed. The focus of that project was to identify the differences in occurring substances between

Swedish and Danish east and west coast. For example, the algae toxins that could be present in the Baltic Sea, as well as the differences in legislation on food and feed on chemical substances' limits.

This substance list, Appendix 1, was established within the BBG network by the Municipality of Borgholm during the first phase of the project and was used to procure analysis for the Baltic Blue Growth project. It was decided that analysis of unwanted substances should be conducted throughout the food chain; mussels – mussel meal – chicken tissue, in order to identify any accumulation of unwanted substances.

At two regional dialogue meetings with Swedish board of agriculture and Swedish food agency, the legal issues of using Baltic mussels for feed were discussed. These meetings resulted in the need for industry guidelines and an HACCP (Hazard Analysis and Critical Control Points) for food and feed entrepreneurs, which is beyond the scope of the project. However, there was a clear interest for the result and further investigations of the project in order for the national institutions to be able address the subject in the future.

The conducted analyses through the food chain are presented in Table 7. Additional analyses have been conducted on mussels in order to map possible occurrence of unwanted substances at different times of the year and in different parts of the Baltic Sea, see Table 8.

Table 7. Conducted analyses through the food chain; mussels – mussel meal – chicken tissue.

Tissue	Analysis conducted	Bacteria	PAH	Metals and toxins
Västervik mussels harvest April 2016	March 2018	X	X	X
Mussel meal (Västervik mussels 2016)	March 2018	X	X	X
Chicken liver (June 2018)	July 2018		X	X
Chicken muscle (June 2018)	July 2018		X	X
Chicken liver reference group (June 2018)	July 2018		X	X
Chicken muscle reference group (June 2018)	July 2018		X	X
Västervik mussels harvest April 2018	Oct 2018	X	X	X
Mussel meal (Västervik mussels 2018)	Nov 2018	X	X	X
Chicken liver (January 2019)	Feb 2019		X	X
Chicken muscle (January 2019)	Feb 2019		X	X

The bacterial analyses have been omitted for chicken tissue because a) no bacteria have been detected in either mussels or mussel meal and b) the sampling routine would have been rigorous with little use of the result.

Table 8. Additional conducted analyses to map unwanted substances.

Tissue	Analysis conducted	Bacteria	PAH	Metals and toxins
Mussels Grankullavik, Aug 2017	Feb 2019	X	X	X
Mussels St Anna Jun 2018	Dec 2018	X	X	X
Mussels St Anna Sept 2018	Dec 2018	X	X	X
Mussels Byxelkrok, Oct 2018	Oct 2018	X	X	X
Mussels Vormsi Agar, Jun 2018	Nov 2018	X	X	X
Mussels Vormsi Agar, Jun 2018	Nov 2018	X	X	X

Conclusions and recommendations

National and international efforts must be designated to developing this industry, there is no industry based initiation but there is, together with payment schemes, a possibility for rural development and real nutrient circulation in the Baltic.

The uncertainties regarding the presence of unwanted substances (which, where and when) needs to be further investigated to prove the quality of the raw material for feed and for the industry to be interested in the mussels as a feed ingredient.

The supply chain for even quantity and secure raw material needs to be developed and described.

Fish trial - Mussels and larvae as feed ingredients to fish

The aim of the fish trial was to assess the Baltic blue mussel meal (MM) and black soldier fly larvae meal (LM) as feed ingredients in diets for rainbow trout by evaluating the nutrient digestibility, growth performance and fatty acid deposition in the fillets. The production of base material and diets used in this trial is described in detail in the project report ''Processing and storage of mussels: mussels to feed through fly larvae''.

Figure 9. Aquatic facility at Swedish University of Agricultural Sciences (SLU)

Aquatic facility and fish

The trial was performed at the Swedish University of Agricultural Sciences, aquatic facility, Uppsala. This facility has been built in 2014 and is a part of Department for Animal Nutrition and Management. The facility is furnished with 16 experimental tanks, each 200 litres in volume and equipped with a partial recirculating aquaculture system (RAS). Each experimental tank was equipped with feed waste and faeces collectors and an automatic belt-feeder. Facility also contains a holding tank with a volume of 3500 litres and a RAS unit, Figure 9.

Rainbow trout used in this trial originated from a commercial producer Vilstena fiskodling AB (Fjärdhundra, Sweden) and were acquired several months before the start of the trial. During this time, the fish were kept in the holding tank at the aquatic facility. Two days prior to the start of the trial, 192 rainbow trout with a start body weight (SBW) of 65.9±21.9g (mean ± SD) were netted from the holding tank and lightly anesthetized with MS-222, before being randomly distributed to 16-200L experimental tanks (12 fish per tank). During the experiment, water temperature and dissolved oxygen levels were checked daily in 4 random tanks and maintained at 11± 1℃ and 10.5 ± 1 mg/L, respectively. Lighting was automatically controlled and maintained on a 12:12 diurnal cycle. The experiment was conducted according to the laws and regulations overseen by the Swedish Board of Agriculture and approved by the Ethical Committee for Animal Experiments in Uppsala, Sweden (dnr 5.8.18-16347/2017).

Feed ingredients and substrates

Two materials relevant for the project were tested as ingredients in diets to rainbow trout at aquatic facility of Swedish University of Agricultural Sciences in Uppsala, namely Baltic blue mussel meal (MM) and the black soldier fly larvae meal (LM). The mussel meal used in fish trial was identical to the meal used in the first poultry trial described earlier in this report. The side by side proximate chemical composition of the fishmeal and both feed ingredients is shown in table 9. For detailed amino acid profile of feed ingredients, see Appendix 4.

The batch of 200 kg of blue mussels was acquired in June 2018 from Sankt Anna farm, mussels were transported on ice to Uppsala (SLU) and kept on ice for 24 hours until the further transfer to RISE for processing. The processed material was transferred to SLU's black soldier fly composting facility and fed to black soldier fly (BSF) larvae for several weeks. Larvae were then harvested, frozen and transported to

RISE for drying. Following drying, larvae were processed into a meal at SLU. More detailed information regarding processing of mussels and black soldier fly larvae production can be found in a report ''Process line-mussels to feed through fly larvae''.

Table 9. Proximate chemical composition of fish meal and test ingredients. Values expressed as g/kg on as is basis.

	Feed ingredients		
	Fish meal	**Mussel meal**	**Larvae meal**
Crude protein	762.7	666	433
Sum of amino acids	713	526	336.1
Crude lipid	100	77	262
Ash	148	117	198
Gross energy (MJ kg^{-1})	22.1	19.1	24.6

Feed formulation and feeding

Feed was formulated to fulfil the nutritional requirements of rainbow trout according to recommendations by National research council, (NRC, 2011).

In total 4 different diets were formulated; a commercial-looking control diet with high inclusion of fish meal, one test diet with mussel meal (MD) and one test diet with larvae meal (LD), Figure 10. Both mussel meal and larvae meal were added in the amount to supply approximately 20 % of total protein in the diet (table 10). Additionally, second control diet was produced where the fishmeal has been completely exchanged with pea-protein concentrate. The aim was to use this diet as a negative control and reveal potential effects of pea-protein concentrate on feed intake in rainbow trout.

Table 10. Formulation of diets used in the fish trial. Values are expressed as g/kg on as is basis.

Ingredients	Control diet	MD	LD	Control 2
Fish meal	280.0	-	-	-
Fish oil	50.0	55.0	20.0	50.0
Pea protein concentrate	280.0	395.0	425.0	550.0
Wheat meal	160.0	140.0	135.0	155.0
Larvae meal	-	-	**200.0**	-
Mussel meal	-	**165.0**	-	-
Alpha cellulose	30.0	30.0	25.0	30.0
Titanium dioxide	5.0	5.0	5.0	5.0
Rapeseed oil	115.0	130.0	110.0	130.0
Mineral/ vitamin premix	20.0	20.0	20.0	20.0
Gelatin	60.0	60.0	60.0	60.0

Proximate chemical composition of all four test diets is shown in table 11. Diets were formulated to contain equal amounts of crude protein, lipids and gross energy. Dietary content of amino acids is available in the appendix 5. All diets contained 5g/kg titanium dioxide (TiO_2) as an indigestible marker to determine the nutrient digestibility. In order to avoid effects of handling stress on feed intake, the fish had a 2-day acclimation period. After two days, the feeding period began and fish were fed at 10:00am every day by automatic belt- feeders until the satiation levels were established. After adjusting feeding rations, all fish finally were fed 1.5% of their body weight. The feeding trial lasted for 9 weeks.

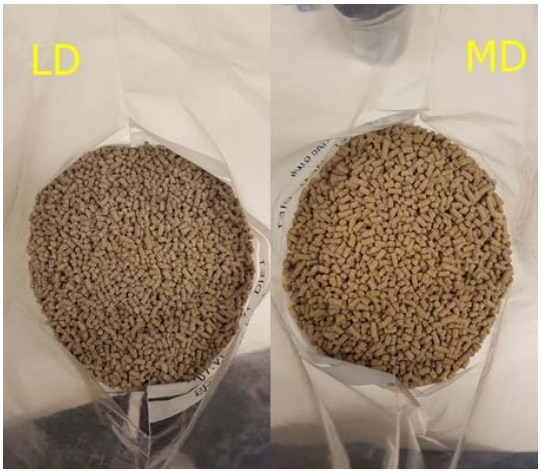

Figure 10. Pelleted larvae diet (LD) and mussel diet (MD)

After feeding, uneaten feed pellets collected by faeces collectors were gathered and stored at 12:00 every day and faeces collection was performed at 8:00 am on the following days. Both feed waste and faeces were separately stored at -25℃ until analysis.

Table 11. Proximate chemical composition of diets used in the fish trial. Values expressed as g/kg on as is basis.

	Control diet	MD	LD	Control 2
Dry matter (%)	93.9	94.2	94.2	95.1
Crude protein	519.0	508.0	505.0	523.0
Sum of amino acids	467.8	427.8	443.4	495.5
Crude lipid	215.0	223.0	225.0	240.0
Ash	55.0	38.0	58.0	30.0
Gross energy (MJ/kg^{-1})	24.5	24.6	24.8	25.5

Sampling

The experiment lasted for nine weeks and was divided into three periods. In the beginning of the trial and after each period, the fish were weighed individually.

At the termination of the trial, five fish from the holding tank were taken for the reference whole-body analysis and five fish for fillet fatty acid analysis. Additionally, 10 fish from each experimental tank were randomly selected and euthanized with and overdoes of MS-222 solution. Out of these 10 fish, five for taken for whole-body analysis and five for collecting data on relative body indices. The whole gastrointestinal tract and liver from latter five fish were removed and weighed. The remaining two fish from each experimental tank were placed back into the holding tank after weighing.

Analysis

Several analysis were performed following the trial, most of which at SLU laboratory. Feed, feed ingredients, faeces samples and whole fish body samples were analysed for proximate chemical composition, including crude protein (CP), crude lipids (CL), gross energy (GE), ash content and dry matter content. Amino acid profiles of feed ingredients, feed, faeces and whole fish body was conducted by an

authorized laboratory (Eurofins) using HPLC method. Fatty acid analysis was performed at SLU using gas chromatography on samples of feed, feed ingredients and fish fillets.

Results

Feed ingredients and diets

Chemical analysis of feed ingredients revealed that both mussel meal (66 %) and larvae meal (43 %) contain relatively high protein content. Although the protein levels in both ingredients were lower than that of fish meal (76 %), the content is rather comparable to other, commercially available fish meal alternatives such as soy bean meal and soy protein concentrate. Compared with fishmeal, methionine levels in both mussel meal and larvae meal was lower. This is a challenge for modern day protein sources and is often reflected in the growth performance of the fed animal. In addition, larvae meal contained much higher CL levels (26%) than fishmeal (10%) and blue mussel meal (7.7 %). Main reason for this is the lack of lipid separation during preparation of the larvae meal since the intention was to follow up on the fatty acid profile accumulation from larvae. The gross energy content varied between 19.1 for mussel meal and 24.6 MJ/kg DM for larvae meal. The highest and lowest ash content was found in larvae meal (198 g/kg DM) and mussel meal (117 g/kg DM).

Feed intake and growth

In terms of feed intake, 75.4 g of control feed was consumed on average per fish during the whole period, but only average 48.5 g for MD, 34.23 g for LD and 26.8 g for ctrl 2 were consumed, respectively. After 9 weeks of feeding, results show poor growth based on final body weight (FBW) and specific growth rate (SGR) when approximately 20 % of the total protein was provided by mussel meal and larvae meal (Table 12). The SGR values from 1.3 % for ctrl diet gradually decreased to 0.26 % for ctrl 2 diet. This was followed by an increase in feed conversion ratio from 0.93 for control diet to 2.79 for ctrl 2 diet. The primary reason for such poor growth performance may be explained by the low feed intake. The SGR results seem to be a direct consequence of gradually decreasing feed intake (Figure 11).

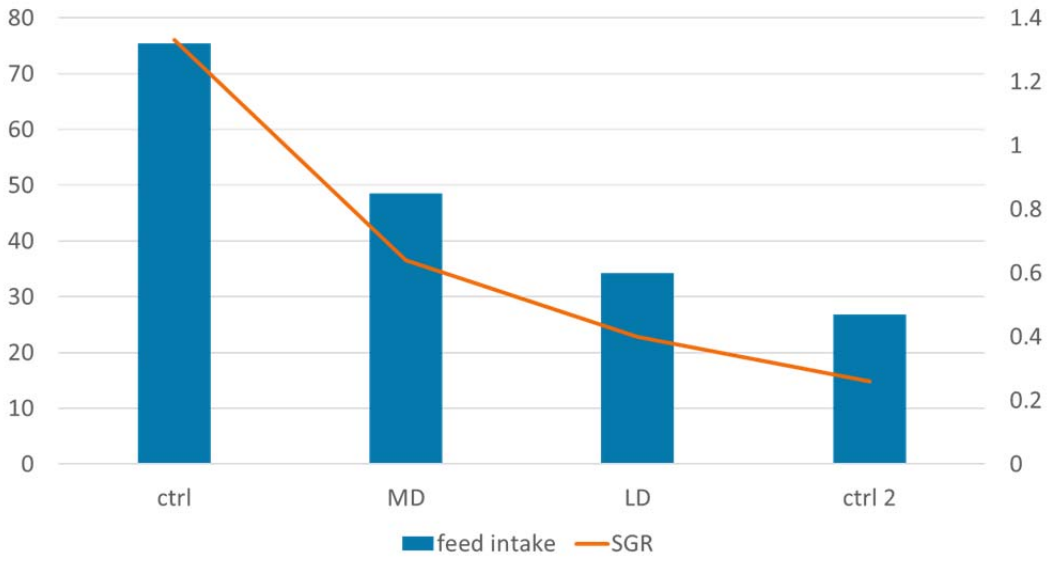

Figure 11. Comparison of specific growth intake (%/day) and feed conversion ratio (g/day) of fish fed four experimental diets

Various previous studies have demonstrated that when fish meal was completely absent in fish diets, the growth was affected negatively (Médale *et. al*, 1998, Teskeredzic *et. al*, 1995, Tibaldi *et. al*, 2005). Most likely reason for lack of good performance in fish fed diets MD and LD is the bitter taste of pea protein concentrate, which lowered the feed intake and consequently, growth performance. Feed acceptance of pea protein concentrate may be affected by antinutritional factors (sinapine, tannins and glucosinolates), and the bitter, astringent taste (Thiessen *et. al*, 2003).

Table 12. Growth performance, relative organ weights and nutrient retention.

	Control	MD	LD	Control 2	P-value
SBW (g)	65.3^{a}	72.3^{a}	66.3^{a}	59.7^{a}	0.1457
FBW (g)	146.6^{a}	106.6^{b}	84.4^{c}	69.5^{cd}	<0.0001
SGR (%/day)	1.33^{a}	0.64^{b}	0.40^{c}	0.26^{d}	<0.0001
FCR (g/g)	0.93^{c}	1.9^{b}	1.4^{bc}	2.79^{a}	<0.0001
HIS (%)	1.23^{a}	1.17^{a}	1.10^{a}	1.22^{a}	0.4693
VSI (%)	12.36^{a}	11.72^{a}	11.70^{a}	10.92^{a}	0.0353
Nutrient and energy retention (%)					
CP	36.96^{a}	22.20^{b}	12.19^{c}	-	<0.0001
GE	35.65^{a}	22.66^{b}	5.63^{c}	-	<0.0001
CF	52.29^{a}	30.80^{b}	-8.92^{c}	-	<0.0001
Mortality (%)	0	0	0	4.2%	

Accordingly, nutrient retention for CP, GE and CF was highest for ctrl, followed by MD and LD diet. The only mortality occurred in fish fed ctrl 2 diet, likely as a malnourishment due to lowest feed intake in this trial. There were no marked effects of any diet on relative organ weight (HIS and VSI), indicating no physiological disturbances in fish in the current trial.

Apparent nutrient digestibility

Apparent nutrient digestibility coefficients (ADC) were comparable for most of the nutrients between the diets (Table 13). However, ADC values for CL, GE and DM were lower for LD diet. The reason behind this may be in high chitin content of the larvae meal. High chitin content in larvae meal has previously been associated with low lipid digestibility values (ST-Hilaire *et. al*, 2007). Similar results were seen in other fish species and one group of authors reported that rainbow trout may be specifically challenged as the levels of chitin related enzyme, chitinase, are rather low in this species (Lindsay *et. al*, 1984).

However, it can be concluded that the ADC levels of DM, CP, GE, CL and all amino acids for MD diet are comparable to the fish meal based control diet. Despite the lower ADC values for LD diet for some

nutrients, the overall digestibility of CP and amino acids seems to be rather high and comparable to the fish meal-based control diet.

Table 13. Apparent digestibility coefficients for selected nutrients

	Control diet	MD	LD	P-value
Dry matter	78.0[b]	80.1[a]	75.2[c]	<0.0001
Crude protein	94.4[b]	96.3[a]	93.5[b]	0.0001
Gross energy	81.68[a]	82.9[a]	77.85[b]	0.0001
Crude fat	86.75[a]	85.43[a]	77.03[b]	0.0009
Lysine	97.2[a]	97.5[a]	96.0[b]	0.0019
Methionine	95.0[ab]	96.1[a]	94.0[b]	0.0102
Sum of essential amino acids	96.0[a]	96.7[a]	94.8[b]	0.0014

Fatty acid retention

Since the BSF larvae have been fed on the substrate of mussels, it was expected that the larvae meal would retain and contain some of the highly valuable omega-3 fatty acids from the substrate. Eicosapentaenoic (EPA) and Docosahexaenoic acid (DHA) are omega-3 fatty acids (FA) belonging to a group of polyunsaturated fatty acids (PUFA) and are traditionally derived from marine lipid sources in food and feed, typically fish oil. Their content in Baltic mussels may be limited but since the BSF larvae are known to accumulate fat from the substrate rather than synthesize their own during their growth, we hypothesized that the portion of these valuable FA will be detectable in the larvae meal. This would provide for an added value for the use of BSF larvae in animal feed and a potential benefit for the primary producers.

Upon analysis of the prepared meals, it was revealed that the proportion of fatty acids (FA) varied distinctly between the tests ingredients (figure 12). While the mussel meal contained equal proportion of SFA, MUFA and PUFA, the larvae meal had highest proportion of MUFA, followed by PUFA and SFA. Such results served as a basis for a decision to exclude the portion of fish oil from the LD recipe, as this could potentially be compensated for by the larvae fat content.

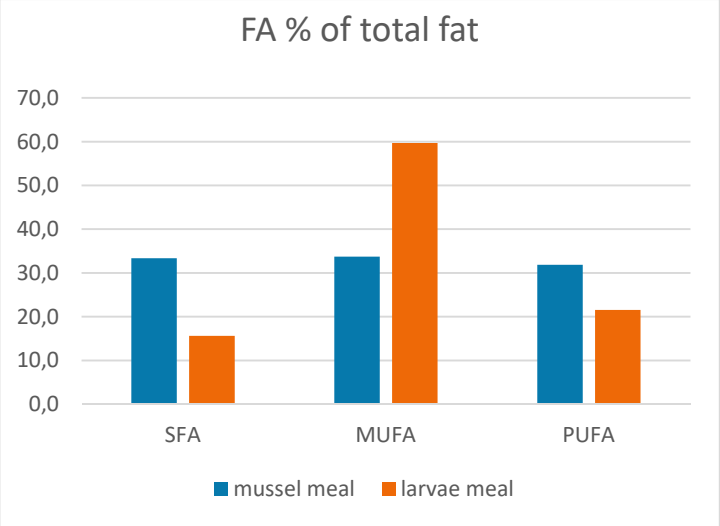

Figure 12. Composition of major fatty acid groups in mussel meal and larvae meal.

After the trial, the analysis of fillet composition of fish fed experimental diets revealed that despite lower ADC values for crude fat, fillets of fish fed LD diet contained the highest levels of PUFA (Figure 13). It is unclear, in light of poorer growth of LD fed fish, weather such high levels of PUFA are the result of any unlikely misbalance in fat metabolism in this group of fish. However, it can be concluded that even under

poor growth conditions, such as the one observed for fish fed LD diet, BSF larvae seem to act as a good source of PUFA for rainbow trout.

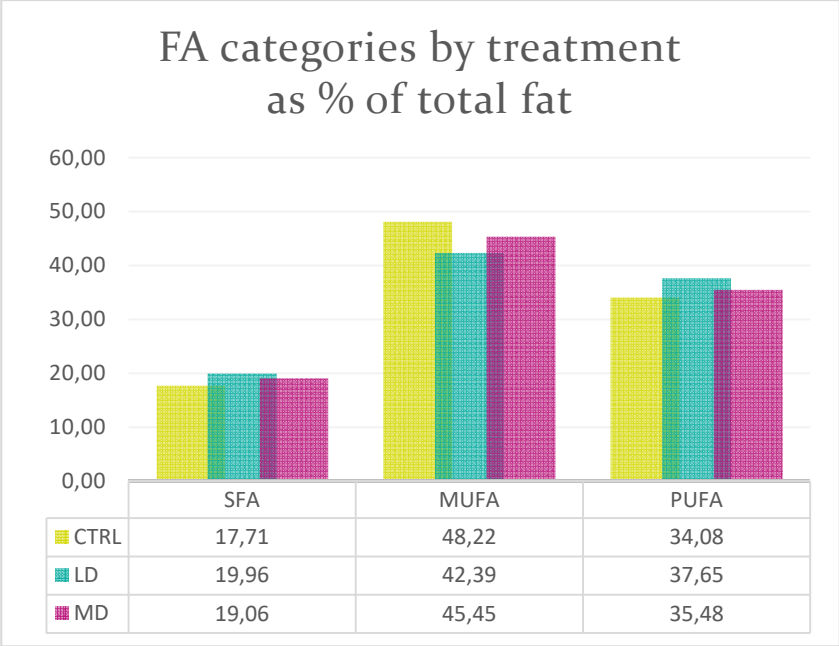

Figure 13. Major FA groups detected in the fillets of fish fed 3 test diets

Unwanted substances in mussels and larvae

As a part of the investigation on the flow of bio toxins from blue mussels further up the production process, an additional trial was conducted. In this trial, west coast blue mussels were used as substrate for black soldier fly larvae and the analysis was conducted on initial material, the substrate residue and the black soldier fly larvae.

The results of the analysis are available in the appendix 6.

According to the results provided by Eurofins, the BSF larvae contained lower levels of all analysed toxins compared to the initial material. Further interpretation of the data available in the appendix will be conducted at a later time and will be a part of a scientific publication.

Conclusions and recommendations

The results of the fish trial show that both mussel meal and larvae meal based on Baltic mussels, have high potential for their use in commercial aqua feeds. Further efforts should be directed towards development of the feed recipes for farmed fish if these ingredients are to be used.

Black soldier fly larvae production, using Baltic mussel as substrate, is a process that should be optimized further in relation to accumulation of specific fatty acid groups in the larvae if the produced larvae meal is to have a higher proportion of PUFA.

Accordingly, the larvae production seems to decrease the levels of most toxins from the starting material, and should be developed further in the context of its potential use for industrial applications.

Further reading

For additional information regarding the production process of BSF larvae and fish diets, please see the project report ''Process line-mussels to feed through fly larvae''. Information on economic aspects of using Baltic blue mussels to produce fish feed through a processing step of BSF larvae composting can be found in a separate project report 'Cost and benefit analysis of mussel farming in the Baltic Sea region'.

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About

Baltic Blue Growth is a three-year project financed by the European Regional Development Fund. The objective of the project is to remove nutrients from the Baltic Sea by farming and harvesting blue mussels. The farmed mussels will be used for the production of mussel meal, to be used in the feed industry. 18 partners from 7 countries are participating, with representatives from regional and national authorities, research institutions and private companies. The project is coordinated by Region Östergötland (Sweden) and has a total budget of 4,7 M€.

Partners

- *Region Östergötland (SE)*
- *County Administrative Board of Kalmar County (SE)*
- *East regional Aquaculture Centre VCO (SE)*
- *Kalmar municipality (SE)*
- *Kurzeme Planning Region (LV)*
- *Latvian Institute of Aquatic Ecology (LV)*
- *Maritime Institute in Gdańsk (PL)*
- *Ministry of Energy, Agriculture, Environment, Nature and Digitalization of Schleswig-Holstein (DE)*
- *Municipality of Borgholm (DK)*
- *SUBMARINER Network for Blue Growth EEIG (DE)*
- *Swedish University of Agricultural Sciences (SE)*
- *County Administrative Board of Östergötland (SE)*
- *University of Tartu Tartu (EE)*
- *Coastal Research and Management (DE)*
- *Orbicon Ltd. (DK)*
- *Musholm Inc (DK)*
- *Coastal Union Germany EUCC (DE)*
- *RISE Research institute of Sweden (SE)*

Attachment 1 Procurement of analyses
Mussel meat, mussel meal, chicken tissue and larvae for feed

All substances in unit per dry weight/dry substance:

Chlorinated pesticides mg/kg
hexachlorbenzene
alfa-HCH
beta-HCH
gamma-HCH (lindan)
aldrine
dieldrine
endrine
heptachlorine
o,p-DDT
alfa-endosulfonic

Metals mg/kg
As
Cd
Hg
Pb

Polychorinated biphenyls: PCB pg/g
PCB 28
PCB 52
PCB 101
PCB 118
PCB 138
PCB 153
PCB 180

Dioxins och furanes pg/g
2,3,7,8-tetraCDD
1,2,3,7,8-pentaCDD
1,2,3,4,7,8-hexaCDD
1,2,3,6,7,8-hexaCDD
1,2,3,7,8,9-hexaCDD
1,2,3,4,6,7,8-heptaCDD
oktaklordibensodioxin
2,3,7,8-tetraCDF
1,2,3,7,8-pentaCDF
2,3,4,7,8-pentaCDF
1,2,3,4,7,8-hexaCDF
1,2,3,6,7,8-hexaCDF
1,2,3,7,8,9-hexaCDF
2,3,4,6,7,8-hexaCDF
1,2,3,4,6,7,8-heptaCDF
1,2,3,4,7,8,9-heptaCDF
oktaklordibensofuran

Dioxin-like PCB:s
PCB 77
PCB 126
PCB 169
PCB 81
PCB 105
PCB 114
PCB 123
PCB 156
PCB 157
PCB 167
PCB 189

Brominated flame retardants mg/kg
Toxafen
BDE-47
BDE-99
BDE-100
BDE-209

Other substances (unit?):
PAH:er bens(a)pyren+Σ(bens(a)pyren+bens(a)antracen+bens(a)flouranten+krysen)
Nodularin
PSP (paralythic shellfish poisoning)
DSP
AZT
YTX
PTX
AZA
ASP

Bacteria
E-coli
Salmonella

Temperatur och fuktschema, omgång 4 insatta 2018-05-22

Dag	Temp. mål *	Temp (°C) inställt	Temp (°C) avläst	Fukt (Rh) inställt	Fukt (Rh) avläst	Anmärkning/ besökande
Ins	33-34					
1	33	32,8	33,1	48,3	39	
2		31,7	30,9	48,3	38,9	CO_2 1048 ppm
3		31	29,0	48,7	34,8	07:15
4		30,8	31,4	49	48,5	
5		30,3	30,6	49,3	50,6	Temp diff 1,8°2
6		30	30,2	49,7	47,3	— " — 2,2
7	30	29,7	29,8	50	51,8	— " 2,1
8		29,2	29,1	50,3	48,8	
9		28,6	29,2	50,6	48,7	
10		28,4	29,0	50,8	53,7	
11		28,1	28	51,1	53,4	
12		27,9	27,6	51,4	51,3	
13		27,7	27,7	51,7	54,9	
14	27	27,5	27,6	52,0	52,1	
15		27,2	27,1	52,6	50,3	
16		26,9	27,8	53,1	54,9	CO_2 1042 ppm
17		26,6	27,0	53,7	52,1	
18		26,3	26,7	54,3	50,6	
19		26,0	26,2	54,9	57,0	
20		25,7	25,8	55,4	61,7	
21	24	25,4	25,7	56,0	56,3	
22		24,9	25,2	56,6	64,3	
23		24,4	24,4	57,1	58,3	
24		23,9	24,1	57,7	61,4	
25		23,5	25,2	58,3	51,6	
26		23	23,1	58,9	65	
27		22,6	22,9	59,4	55,2	
28	21	22,2	23,6	60	61,9	
29		21,9	21,3	60,7	55,2	
30		21,6	23,2	61,4	70,5	
31		21,3	22,3	62,1	59,3	
32		20,9	21,1	62,9	63,2	
33		20,6	20,6	63,6	60,9	
34						

*Kycklingar från mödrar yngre än 30 veckor + 1°C

Vattenförbrukning, omgång 4 insatta 2018-05-22

Dag	1 Box 1-6	2 Box 7-12	3 Box 19-24	4 Box 13-18	Anmärkning
Ins					
1	73001	75411	76861	78850	spolat
2	73098	75542	76968	78985	spolat
3	73226	75716	77114	79150	spolat 2 07 15
4	73376	75895	77282	79338	159, 179, 168, 188 08 30
5	73484	76031	77414	79473	108, 136, 132, 135 08 15 (dag 4)
6	73608	76187	77566	79628	124, 156, 152, 155
7	73766	76385	77758	79825	158, 198, 192, 197 07:30
8	73949	76678	77981	80053	183, 233, 223, 228
9	74168	76895	78245	80320	219, 277, 264, 267
10	74391	77179	78511	80586	223, 284, 266, 266
11	74637	77492	78815	80893	266, 348, 333, 338
12	74903	77840	79148	81231	
13	75189	78215	79505	81600	
14	75494	78616	79876	81991	305, 404, 371, 391
15	75813	79035	80264	82400	319, 419, 388, 409
16	76185	79514	80719	82888	372, 479, 455, 488
17	76625	79810	81176	83375	240, 296, 457, 487
18	76846	80351	81677	83904	421, 541, 501, 529
19	77291	80922	82194	84446	445, 571, 517, 542
20	77775	81551	82783	85044	
21	78242	82163	83365	85631	467, 612, 582, 587
22	78715	82780	83954	86189	473, 617, 589, 558
23	79190	83412	84578	86820	475, 632, 624, 631
24	79681	84069	85222	87474	491, 657, 644, 654
25	80172	84743	85886	88159	491, 674, 664, 685
26	80697	85467	86600	88893	525, 724, 714, 734
27	81250	86216	87348	89643	553, 749, 748, 750
28	81815	86963	88095	90390	565, 747, 747, 747
29	82403	87772	88844	91160	588, 809, 749, 770
30	83001	88580	89607	91958	598, 808, 763, 798
31	83657	89483	90454	92830	656, 903, 844, 998 10.00
32	84263	90228	91143	93563	606, 745, 692, 607
33	84869	91096	91898	94370	606, 868, 755, 807
34	85149	91470	92250	94726	Kl 10[45]

Temperatur och fuktschema, UTV insatta 2019-01-03

Dag	Temp. luft mål * **	Temp (°C) inställt	Temp (°C) avläst	Fukt (Rh) inställt	Fukt (Rh) avläst	Anmärkning/ besökande
Ins	34-35	35	35	48	26,8	
1	32-34	34,2	34,2	48,3	30,4	
2		33,1	33	48,3	36,6	
3		32	32	48,7	34,5	
4		31,5	31,3	49	42,9	Vet Magnus
5		31	30,9	49,3	43,1	
6		30,5	30,4	49,7	37,4	Kristin Berlilius
7	29-30	30	30,1	50	45,4	
8		29,6	29,5	50,3	44,9	
9		29,1	29,3	50,6	48,3	
10		28,7	28,8	50,8	48,8	
11		28,3	28,2	51,1	47,3	
12		27,9	27,9	51,4	43,8	
13		27,4	27,5	51,7	48,2	
14	27	27	26,8	52	54,2	Sänkt fukt mål till 51%
15		26,7	27,1	51,3	53,1	Regina, GF 2st
16		26,4	27,2	51,6	53,1	
17		26,1	27	51,9	52,7	
18		25,9	26,4	52,1	53,9	
19		25,6	26,8	52,4	54,9	Salmonella provtagning
20		25,3	26,4	52,7	54,0	
21	24	25,0	24,4	53,0	51,3	Best från SA, DA 6st
22		24,6	25,1	53,3	54,2	
23		24,1	23,7	53,6	54,9	
24		23,7	24,2	53,9	55,5	
25		23,3	22,8	54,1	51,8	
26		22,9	24,4	54,4	54,2	
27		22,4	23	54,7	52,5	
28	21	22,0	21	55	52,1	
29		21,7	22,4	55,6	62,2	
30		21,4	21,3	56,1	56,6	
31		21,1	20,9	56,7	56,6	
32		20,9	20,5	57,3	58,4	Vet Magnus, Regina, Kamilla, Kristin
33						
34						

*Kycklingar från mödrar yngre än 30 veckor + 1°C vid insättning

**Dag 1, sänk till 32-33 grader när ky nått 40,4-40,6 °C

Appendix 3

Ölands Kyckling AB | Vattenförbrukning | 2019-01-03

Vattenförbrukning, UTV insatta 2019-01-0[illegible]

Dag	1 Box 1-6	2 Box 7-12	3 Box 19-24	4 Box 13-18	Daglig förbrukning			
Ins	129615	136299	135225	138932				
1	129633	136323	135250	138957				
2	129745	136456	135371	139085				
3	129871	136614	135512	139227				
4	130000	136770	135660	139385	105	129	115	119
5	130105	136899	135775	139504	140	173	162	168
6	130245	137072	135937	139672	167	209	194	203
7	130412	137281	136131	139875	189	239	219	232
8	130601	137520	136350	140107	222	279	262	275
9	130823	137799	136612	140382	218	290	287	294
10	131041	138089	136899	140676	259	329	316	331
11	131300	138418	137215	141007	263	325	312	324
12	131563	138743	137527	141331	296	363	343	352
13	131859	139106	137870	141683	311	387	357	373
14	132170	139493	138227	142056	339	413	387	413
15	132509	139906	138614	142469	352	439	421	445
16	132861	140345	139035	142914	393	475	449	485
17	133254	140820	139484	143399	411	504	473	500
18	133665	141324	139957	143899	419	524	475	515
19	134084	141848	140432	144414	455	564	512	551
20	134539	142412	140944	144965	480	601	540	577
21	135019	143013	141484	145542	509	627	570	603
22	135528	143640	142054	146145	523	633	582	620
23	136051	144273	142636	146765	549	664	623	659
24	136600	144937	143259	147424	587	718	682	728
25	137187	145655	143941	148152	501	629	604	633
26	137688	146284	144545	148785	554	704	671	699
27	138242	146988	145216	149484	561	744	706	735
28	138803	147732	145922	150219	566	779	769	768
29	139369	148511	146691	150987	574	752	747	812
30	139943	149263	147438	151799	602	804	780	804
31	140545	150067	148218	152603	643	837	830	860
32	141188	150904	149048	153463				
33								
34								

645
800

Chemical composition (g/kg DM) and energy content (MJ/kg DM) of fish meal, blue mussel (*Mytilus edulis*) and black solider fly (*Hermetia illucens*) larvae

	Feed ingredients		
	Fish meal	Mussel meal	Larvae meal
Crude protein	762.7	666	433
Sum of amino acids	713	526	336.1
Crude lipid	100	77	262
Ash	148	117	198
Gross energy	22.1	19.1	24.6
Indispensable amino acids			
Arginine	44.0	36.4	15.8
Histidine	15.3	10.8	10.3
Isoleucine	30.9	23.4	16.2
Leucine	59.6	36.7	24.0
Lysine	59.9	41.4	22.9
Methionine	22.6	12.0	7.2
Phenylalanine	30.9	23.1	15.6
Threonine	34.0	27.9	14.5
Valine	37.8	27.1	22.6
Sum	335	238.8	149.1
Dispensable amino acids			
Alanine	47.5	30.8	27.1
Aspartic acid	72.9	63.0	34.3
Cystein+Cystine	6.7	6.4	3.3
Glutamic acid	109.7	71.7	38.7
Glycine	47.3	35.0	19.9
Ornithine	<0.01	9.2	1.1
Proline	32.6	23.9	19.9
Serine	33.1	26.1	14.5
Tyrosine	27.8	21.4	28.2
Sum	377.6	287.5	187.0

Table 5 Chemical compositions of experimental diets expressed as g/kg DM; amino acids expressed as g/kg DM; energy content expressed as MJ/kg DM

	Control diet	MD	LD	PPD
Dry matter (%)	93.9	94.2	94.2	95.1
Crude protein	519.0	508.0	505.0	523.0
Sum of amino acids	467.8	427.8	443.4	495.5
Crude lipid	215.0	223.0	225.0	240.0
Ash	55.0	38.0	58.0	30.0
Gross energy	24.5	24.6	24.8	25.5
Indispensible amino acids				
Arginine	31.0	29.3	27.8	33.8
Histidine	9.6	8.6	9.5	10.2
Isoleucine	19.7	18.5	19.4	21.9
Leucine	37.9	33.7	36.4	41.5
Lysine	34.1	30.1	29.9	34.6
Methionine	9.2	6.9	6.3	7.3
Phenylalanine	22.4	21.9	23.2	27.0
Threonine	20.8	18.8	20.1	21.2
Valine	24.1	22.0	24.1	25.8
Sum	208.8	189.8	196.7	223.3
Dispensable amino acids				
Alanine	27.8	22.9	25.7	25.0
Aspartic acid	47.9	49.3	50.6	57.7
Cystein + Cystine	4.6	4.7	5.5	5.8
Glutamic acid	71.7	61.7	60.7	71.5
Glycine	37.2	31.6	32.8	34.1
Proline	28.7	25.5	26.5	29.4
Serine	22.0	22.1	22.7	26.3
Tyrosine	19.1	19.0	21.8	22.4
Ornithine	< 0.1	1.2	0.4	< 0.1
Sum	259.0	238.0	246.7	272.2

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Rapport utfardad av ackrediterat laboratorium

Report issued by Accredited Laboratory

Eurofins Food & Feed Testing Sweden (Lidkoping)
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Scanfjord Mollbsund AB
Anders Granhed
Gamla vagen 17
474 70 MOLLOSUND

AR-18-LW-036262-01

EUSELI-00198970

Kundnummer: LW9902090

Analysrapport

Provnummer: 525-2018-06260238
Provmarkning: E2. Provta ningsdatum 25.6. 18. Egenkontroll
Provet ankom: 2018-0S:26
Analysrapport klar: 2018-06-27
Analyserna pab6rjades: 2018-0 6 13:15

Provtagningsdatum: 2018-06-25
Provtagare: Anders Granhed

Testkod		Parameter	Resultat	Enhet	Mato.	Metod/ref.	Lab
LW042	[a]	DST-total	280	µg OA eq/kg		SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	AZA-total	<30	µg AZA eq/kg		SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	PTX-total	<30	µg PTX eq/kg		SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	YTX-total	0.17	mg YTX eq/kg		SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	Okadasyra	200	µg OA eq/kg	± 40%	SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	DTX-1	<30	µg OA eq/kg	± 50%	SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	DTX-2	<30	µg OA eq/kg	± 60%	SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	OA-acyl	82	µg OA eq/kg	± 65%	SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	DTX1-acyl	<30	µg OA eq/kg	± 50%	SLV K1-f5-m602.1 2009	EUSEL/
LW042	[a]	DTX2-acyl	<30	µg OA eq/kg	± 60%	SLV K1-f5-m602.1 2009	EUSEL/
LW042	[a]	AZA-1	<30	µg AZA eq/kg	± 55%	SLV K1-f5-m602.1 2009	EUSEL/
LW042	[a]	AZA-2	<30	µg AZA eq/kg	± 10%	SLV K1-f5-m602.1 2009	EUSEL/
LW042	[a]	AZA-3	<30	µg AZA eq/kg	± 20%	SLV K1-f5-m602.1 2009	EUSELI
LW042		PTX-1	<30	µg PTX eq/kg	± 60%	SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	PTX-2	<30	µg PTX eq/kg	± 60%	SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	YTX	0.17	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	EUSELI
LW042		45-0H-YTX	<0.10	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	EUSELI
LW042		Homo-YTX	<0.10	mg YTX eq/kg	± 30%	SLV K1-f5-m602.1 2009	EUSELI
LW042		45-0H-homo-YTX	<0.10	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	EUSELI
LW042		Carboxy-YTX	<0.10	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	EUSELI
LW042		45-0H-carboxy-YTX	<0.10	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	SPX-1	<30	µg/kg	± 30%	SLV K1-f5-m602.1 2009	EUSELI
LW042	[a]	Domorinsyra (Screening)	<3.0	µg/g		SLV K1-f5-m602.1 2009	EUSELI

Rapportkommentar:

F6rklaringar

AR-003 v81
2.0

Mato: Matosakerhet

Matosakerheten, om inget annal anges, redovisas som utvidgad matosakerhet med tackningsfaktor 2. Undantag relaterat till analyser utforda utanfor Sverige kan forekomma. Ytterfigare upplysningar kan lamnas pa begaran. Upplysning om matosakerhet och detektionsnivaer for mikrobiologiska analyser lamnas pa begaran.

DTX2, AZ.A2, AZ.A3 och 45-0H-homo-YTX ar korrigerade med toxicitetsfaktorer enligt The EFSA Journal (2008), 589, 162 och 723, 1-52.
Matosakerheten presenteras vid tva nivaer, LOQ och 5 LOQ, dar 5 LOQ ar brytpunkt.

Eventuella toxinhalter i Metod AOAC 2005.06 har en matosakerhet i intervallet 15-45%.
I de fall da toxin endast ar pavisade, presenteras PSP-total som den totala summan av de pavisade toxinernas LOQ.

Kopia till:
Info (info@scanfjord.se)

Jonas Renhult, Analysansvarig

Denna rapport ar elektroniskt signerad.

Forklaringar till vilka laboratorier som utfort analyserna och till ackreditering/erkannanden

Lab	Namn	Mark.	Ackreditering/Erkannande
EUSELI	Eurofins Food & Feed Testing Sweden (Lidkoping)	[a]	ISO/IEC 17025:2005 SWEDAC 1977 [a] fore

en parameter indikerar ackrediterad analys

Forklaringar AR-003 v81 2.0

Mato: Matosakerhet

Matosakerheten, om inget annat anges, redovisas som utvidgad matosakerhet med tackningsfaktor 2. Undantag relaterat till analyser utforda utanfor Sverige kan forekomma. Ytterligare upplysningar kan lamnas pa begaran. Upplysning om matosakerhet och detektionsnivaer for mikrobiologiska analyser lamnas pa begaran.

Denna rapport far endast aterges i sin helhet, om inte utforande laboratorium i forvag skriftligen godkant annat. Resultaten relaterar endast till de! insanda prove!.

Förklaringar AR-003 CLAM v17 2.0

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

Denna rapport får endast återges i sin helhet, om inte utförande laboratorium i förväg skriftligen godkänt annat. Resultaten relaterar endast till det insända provet.

Rapport utfärdad av
ackrediterat laboratorium

Report issued by
Accredited Laboratory

Ackred. nr. 1977
Provning
ISO/IEC 17025

Eurofins Food & Feed Testing Sweden (Lidköping)
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AR-19-LW-023219-01

EUSELI-00230768

Kundnummer: LW8412219

Uppdragsmärkn.
006-10511-168572

Analysrapport

Provnummer:	525-2019-04080142	Produkt	musslor (mest skal)
Provmärkning:	musslor 1		
Provet ankom:	2019-04-08		
Analysrapport klar:	2019-04-10		
Provets kod:	1		
Analyserna påbörjades:	2019-04-08 10:30		

Testkod		Parameter	Resultat	Enhet	Mäto.	Metod/ref.	Lab
LW042	[a]	DST-total	**54**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-total	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	PTX-total	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	YTX-total	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	Okadasyra	**54**	µg OA eq/kg	± 65%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX-1	**<30**	µg OA eq/kg	± 50%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX-2	**<30**	µg OA eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	OA-acyl	**<30**	µg OA eq/kg	± 65%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX1-acyl	**<30**	µg OA eq/kg	± 50%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX2-acyl	**<30**	µg OA eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-1	**<30**	µg AZA eq/kg	± 55%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-2	**<30**	µg AZA eq/kg	± 10%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-3	**<30**	µg AZA eq/kg	± 20%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		PTX-1	**<30**	µg PTX eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	PTX-2	**<30**	µg PTX eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		Homo-YTX	**<0.10**	mg YTX eq/kg	± 30%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-homo-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		Carboxy-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*

Förklaringar

AR-003 CLAM v17
2.0

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

LW042		45-OH-carboxy-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	SPX-1	**<30**	µg/kg	± 30%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	Domorinsyra (Screening)	**<3.0**	µg/g		SLV K1-f5-m602.1 2009	*EUSELI*
LW0ED	[a]	PSP-total	**Ej påvisad**			AOAC 2005.06	*EUSELI*

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

EUSELI-00230768

LW0ED	[a]	STX	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	STX	**<42**	µg STXdiHCL eq/kg	± 25%	AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcSTX	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcSTX	**<41**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcGTX2/3	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcGTX2/3	**<125**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	C1/2	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	C1/2	**<40**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX2/3	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX2/3	**<80**	µg STXdiHCL eq/kg	± 40%	AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX5	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX5	**<8.0**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	NEO	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	NEO	**<167**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX1/4	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX1/4	**<330**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcNEO	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcNEO	**<160**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*

Rapportkommentar:

DTX2, AZA2, AZA3 och 45-OH-homo-YTX är korrigerade med toxicitetsfaktorer enligt The EFSA Journal (2008), 589, 162 och 723, 1-52.
Mätosäkerheten presenteras vid två nivåer, LOQ och 5 LOQ, där 5 LOQ är brytpunkt.

Eventuella toxinhalter i Metod AOAC 2005.06 har en mätosäkerhet i intervallet 15-45%.
I de fall då toxin endast är påvisade, presenteras PSP-total som den totala summan av de påvisade toxinernas LOQ.

Jonas Renhult, Analysansvarig

Denna rapport är elektroniskt signerad.

Förklaringar till vilka laboratorier som utfört analyserna och till ackreditering/erkännanden

Lab	Namn	Mark.	Ackreditering/Erkännande
EUSELI	Eurofins Food & Feed Testing Sweden (Lidköping)	[a]	ISO/IEC 17025:2005 SWEDAC 1977

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

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Rapport utfärdad av ackrediterat laboratorium

Report issued by Accredited Laboratory

SWEDAC ACKREDITERING
Ackred. nr. 1977
Provning
ISO/IEC 17025

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AR-19-LW-023221-01

EUSELI-00230768

Kundnummer: LW8412219

Uppdragsmärkn.
006-10511-168572

Analysrapport

Provnummer:	525-2019-04080144	Produkt	musslor (mest skal)
Provmärkning:	musslor 3		
Provet ankom:	2019-04-08		
Analysrapport klar:	2019-04-10		
Provets kod:	3		
Analyserna påbörjades:	2019-04-08 10:30		

Testkod		Parameter	Resultat	Enhet	Mäto.	Metod/ref.	Lab
LW042	[a]	DST-total	**38**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-total	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	PTX-total	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	YTX-total	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	Okadasyra	**38**	µg OA eq/kg	± 65%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX-1	**<30**	µg OA eq/kg	± 50%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX-2	**<30**	µg OA eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	OA-acyl	**<30**	µg OA eq/kg	± 65%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX1-acyl	**<30**	µg OA eq/kg	± 50%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX2-acyl	**<30**	µg OA eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-1	**<30**	µg AZA eq/kg	± 55%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-2	**<30**	µg AZA eq/kg	± 10%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-3	**<30**	µg AZA eq/kg	± 20%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		PTX-1	**<30**	µg PTX eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	PTX-2	**<30**	µg PTX eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		Homo-YTX	**<0.10**	mg YTX eq/kg	± 30%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-homo-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		Carboxy-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-carboxy-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*

Förklaringar

AR-003 CLAM v17
2.0

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

LW042	[a]	SPX-1	**<30**	µg/kg	± 30%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	Domorinsyra (Screening)	**<3.0**	µg/g		SLV K1-f5-m602.1 2009	*EUSELI*
LW0ED	[a]	PSP-total	**Ej påvisad**			AOAC 2005.06	*EUSELI*

Förklaringar

AR-003 CLAM v17
2.0

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

EUSELI-00230768

LW0ED	[a]	STX	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	STX	**<42**	µg STXdiHCL eq/kg	± 25%	AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcSTX	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcSTX	**<41**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcGTX2/3	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcGTX2/3	**<125**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	C1/2	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	C1/2	**<40**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX2/3	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX2/3	**<80**	µg STXdiHCL eq/kg	± 40%	AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX5	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX5	**<8.0**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	NEO	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	NEO	**<167**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX1/4	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX1/4	**<330**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcNEO	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcNEO	**<160**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*

Rapportkommentar:

DTX2, AZA2, AZA3 och 45-OH-homo-YTX är korrigerade med toxicitetsfaktorer enligt The EFSA Journal (2008), 589, 162 och 723, 1-52.
Mätosäkerheten presenteras vid två nivåer, LOQ och 5 LOQ, där 5 LOQ är brytpunkt.

Eventuella toxinhalter i Metod AOAC 2005.06 har en mätosäkerhet i intervallet 15-45%.
I de fall då toxin endast är påvisade, presenteras PSP-total som den totala summan av de påvisade toxinernas LOQ.

Jonas Renhult, Analysansvarig

Denna rapport är elektroniskt signerad.

Förklaringar till vilka laboratorier som utfört analyserna och till ackreditering/erkännanden

Lab	Namn	Mark.	Ackreditering/Erkännande

Förklaringar

AR-003 CLAM v17
2.0

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

Rapport utfärdad av ackrediterat laboratorium

Report issued by Accredited Laboratory

Ackred. nr. 1977 Provning ISO/IEC 17025

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AR-19-LW-023222-01

EUSELI-00230768

Kundnummer: LW8412219

Uppdragsmärkn.
006-10511-168572

Analysrapport

Provnummer:	525-2019-04080145	Produkt	musslor (mest skal)
Provmärkning:	musslor 4		
Provet ankom:	2019-04-08		
Analysrapport klar:	2019-04-10		
Provets kod:	4		
Analyserna påbörjades:	2019-04-08 10:30		

Testkod		Parameter	Resultat	Enhet	Mäto.	Metod/ref.	Lab
LW042	[a]	DST-total	**55**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-total	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	PTX-total	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	YTX-total	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	Okadasyra	**55**	µg OA eq/kg	± 65%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX-1	**<30**	µg OA eq/kg	± 50%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX-2	**<30**	µg OA eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	OA-acyl	**<30**	µg OA eq/kg	± 65%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX1-acyl	**<30**	µg OA eq/kg	± 50%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX2-acyl	**<30**	µg OA eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-1	**<30**	µg AZA eq/kg	± 55%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-2	**<30**	µg AZA eq/kg	± 10%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-3	**<30**	µg AZA eq/kg	± 20%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		PTX-1	**<30**	µg PTX eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	PTX-2	**<30**	µg PTX eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		Homo-YTX	**<0.10**	mg YTX eq/kg	± 30%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-homo-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		Carboxy-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-carboxy-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	SPX-1	**<30**	µg/kg	± 30%	SLV K1-f5-m602.1 2009	*EUSELI*

Förklaringar

AR-003 CLAM v17
2.0

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

LW042	[a]	Domorinsyra (Screening)	**<3.0**	µg/g	SLV K1-f5-m602.1 2009	*EUSELI*
LW0ED	[a]	PSP-total	**Ej påvisad**		AOAC 2005.06	*EUSELI*

Appendix 6

Förklaringar

AR-003 CLAM v17 2.0

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

EUSELI-00230768

LW0ED	[a]	STX	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	STX	**<42**	µg STXdiHCL eq/kg	± 25%	AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcSTX	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcSTX	**<41**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcGTX2/3	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcGTX2/3	**<125**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	C1/2	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	C1/2	**<40**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX2/3	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX2/3	**<80**	µg STXdiHCL eq/kg	± 40%	AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX5	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX5	**<8.0**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	NEO	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	NEO	**<167**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX1/4	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX1/4	**<330**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcNEO	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcNEO	**<160**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*

Rapportkommentar:

DTX2, AZA2, AZA3 och 45-OH-homo-YTX är korrigerade med toxicitetsfaktorer enligt The EFSA Journal (2008), 589, 162 och 723,1-52.
Mätosäkerheten presenteras vid två nivåer, LOQ och 5 LOQ, där 5 LOQ är brytpunkt.

Eventuella toxinhalter i Metod AOAC 2005.06 har en mätosäkerhet i intervallet 15-45%.
I de fall då toxin endast är påvisade, presenteras PSP-total som den totala summan av de påvisade toxinernas LOQ.

Jonas Renhult, Analysansvarig

Denna rapport är elektroniskt signerad.

Förklaringar till vilka laboratorier som utfört analyserna och till ackreditering/erkännanden

Lab	**Namn**	**Mark.**	**Ackreditering/Erkännande**
EUSELI	Eurofins Food & Feed Testing Sweden (Lidköping)	[a]	ISO/IEC 17025:2005 SWEDAC 1977

Förklaringar

AR-003 CLAM v17
2.0

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

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Rapport utfärdad av ackrediterat laboratorium

Report issued by Accredited Laboratory

SWEDAC ACKREDITERING
Ackred. nr. 1977
Provning
ISO/IEC 17025

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750 07 UPPSALA

AR-19-LW-023223-01

EUSELI-00230768

Kundnummer: LW8412219

Uppdragsmärkn.
006-10511-168572

Analysrapport

Provnummer:	525-2019-04080146	Produkt	musslor (mest skal)
Provmärkning:	musslor 5		
Provet ankom:	2019-04-08		
Analysrapport klar:	2019-04-10		
Provets kod:	5		
Analyserna påbörjades:	2019-04-08 10:30		

Testkod		Parameter	Resultat	Enhet	Mäto.	Metod/ref.	Lab
LW042	[a]	DST-total	**34**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-total	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	PTX-total	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	YTX-total	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	Okadasyra	**34**	µg OA eq/kg	± 65%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX-1	**<30**	µg OA eq/kg	± 50%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX-2	**<30**	µg OA eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	OA-acyl	**<30**	µg OA eq/kg	± 65%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX1-acyl	**<30**	µg OA eq/kg	± 50%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	DTX2-acyl	**<30**	µg OA eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-1	**<30**	µg AZA eq/kg	± 55%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-2	**<30**	µg AZA eq/kg	± 10%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	AZA-3	**<30**	µg AZA eq/kg	± 20%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		PTX-1	**<30**	µg PTX eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	PTX-2	**<30**	µg PTX eq/kg	± 60%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		Homo-YTX	**<0.10**	mg YTX eq/kg	± 30%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-homo-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		Carboxy-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042		45-OH-carboxy-YTX	**<0.10**	mg YTX eq/kg	± 40%	SLV K1-f5-m602.1 2009	*EUSELI*

Förklaringar

AR-003 CLAM v17
2.0

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

LW042	[a]	SPX-1	**<30**	µg/kg	± 30%	SLV K1-f5-m602.1 2009	*EUSELI*
LW042	[a]	Domorinsyra (Screening)	**<3.0**	µg/g		SLV K1-f5-m602.1 2009	*EUSELI*
LW0ED	[a]	PSP-total	**Ej påvisad**			AOAC 2005.06	*EUSELI*

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

EUSELI-00230768

LW0ED	[a]	STX	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	STX	**<42**	µg STXdiHCL eq/kg	± 25%	AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcSTX	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcSTX	**<41**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcGTX2/3	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcGTX2/3	**<125**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	C1/2	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	C1/2	**<40**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX2/3	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX2/3	**<80**	µg STXdiHCL eq/kg	± 40%	AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX5	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX5	**<8.0**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	NEO	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	NEO	**<167**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX1/4	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	GTX1/4	**<330**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcNEO	**Ej påvisad**			AOAC 2005.06	*EUSELI*
LW0ED	[a]	dcNEO	**<160**	µg STXdiHCL eq/kg		AOAC 2005.06	*EUSELI*

Rapportkommentar:

DTX2, AZA2, AZA3 och 45-OH-homo-YTX är korrigerade med toxicitetsfaktorer enligt The EFSA Journal (2008), 589, 162 och 723,1-52.
Mätosäkerheten presenteras vid två nivåer, LOQ och 5 LOQ, där 5 LOQ är brytpunkt.

Eventuella toxinhalter i Metod AOAC 2005.06 har en mätosäkerhet i intervallet 15-45%.
I de fall då toxin endast är påvisade, presenteras PSP-total som den totala summan av de påvisade toxinernas LOQ.

Jonas Renhult, Analysansvarig

Denna rapport är elektroniskt signerad.

Förklaringar till vilka laboratorier som utfört analyserna och till ackreditering/erkännanden

Lab	**Namn**	**Mark.**	**Ackreditering/Erkännande**
EUSELI	Eurofins Food & Feed Testing Sweden (Lidköping)	[a]	ISO/IEC 17025:2005 SWEDAC 1977

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska analyser lämnas på begäran.

[a] före en parameter indikerar ackrediterad analys

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AR-19-LW-023224-01

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Kundnummer: LW8412219

Uppdragsmärkn.
006-10511-168572

Analysrapport

Provnummer:	525-2019-04080147	Produkt	larver
Provmärkning:	6 larver		
Provet ankom:	2019-04-08		
Analysrapport klar:	2019-04-10		
Provets kod:	6		
Analyserna påbörjades:	2019-04-08 10:29		

Testkod	Parameter	Resultat	Enhet	Mäto.	Metod/ref.	Lab
LW0XC	DST-total	**42**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-total	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-total	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	YTX-total	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Okadasyra	**42**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX-1	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX-2	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	OA-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX1-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX2-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-1	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-2	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-3	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-1	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-2	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Homo-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-homo-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Carboxy-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*

Förklaringa

AR-003 CLAM
v17

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska

LW0XC	45-OH-carboxy-YTX	**<0.10**	mg YTX eq/kg	SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	SPX-1	**<30**	µg/kg	SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	ASP-Toxin, Domorinsyra	**<3.0**	µg/g	SLV K1-f5-m602.1 2009	*EUSELI*
LW0V3	PSP-total	**Ej påvisad**		AOAC 2005.06	*EUSELI*

Förklaringa

AR-003 CLAM
v17

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska

EUSELI-00230768

LW0V3	STX	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	STX	**<42**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcSTX	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcSTX	**<41**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcGTX2/3	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcGTX2/3	**<125**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	C1/2	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	C1/2	**<40**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX2/3	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX2/3	**<80**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX5	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX5	**<8.0**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	NEO	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	NEO	**<167**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX1/4	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX1/4	**<330**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcNEO	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcNEO	**<160**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*

Rapportkommentar:

DTX2, AZA2, AZA3 och 45-OH-homo-YTX är korrigerade med toxicitetsfaktorer enligt The EFSA Journal (2008), 589, 162 och 723, 1-52.
Mätosäkerheten presenteras vid två nivåer, LOQ och 5 LOQ, där 5 LOQ är brytpunkt.

Eventuella toxinhalter i Metod AOAC 2005.06 har en mätosäkerhet i intervallet 15-45%.
I de fall då toxin endast är påvisade, presenteras PSP-total som den totala summan av de påvisade toxinernas LOQ.

Jonas Renhult, Analysansvarig

Denna rapport är elektroniskt signerad.

Förklaringar till vilka laboratorier som utfört analyserna och till ackreditering/erkännanden

Lab	**Namn**	**Mark.**	**Ackreditering/Erkännande**

[a] före en parameter indikerar ackrediterad analys

EUSELI Eurofins Food & Feed Testing Sweden (Lidköping)

Förklaringa

AR-003 CLAM v17

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska

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750 07 UPPSALA

AR-19-LW-023225-01

EUSELI-00230768

Kundnummer: LW8412219

Uppdragsmärkn.
006-10511-168572

Analysrapport

Provnummer:	525-2019-04080148	Produkt	larver
Provmärkning:	7 larver		
Provet ankom:	2019-04-08		
Analysrapport klar:	2019-04-10		
Provets kod:	7		
Analyserna påbörjades:	2019-04-08 10:30		

Testkod	Parameter	Resultat	Enhet	Mäto.	Metod/ref.	Lab
LW0XC	DST-total	**67**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-total	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-total	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	YTX-total	**0.11**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Okadasyra	**67**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX-1	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX-2	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	OA-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX1-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX2-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-1	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-2	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-3	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-1	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-2	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	YTX	**0.11**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Homo-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-homo-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Carboxy-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-carboxy-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	SPX-1	**<30**	µg/kg		SLV K1-f5-m602.1 2009	*EUSELI*

Förklaringa

AR-003 CLAM v17

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska

LW0XC	ASP-Toxin, Domorinsyra	**<3.0**	µg/g	SLV K1-f5-m602.1 2009	*EUSELI*
LW0V3	PSP-total	**Ej påvisad**		AOAC 2005.06	*EUSELI*

Appendix 6

Förklaringa

AR-003 CLAM
v17

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska

EUSELI-00230768

LW0V3	STX	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	STX	**<42**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcSTX	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcSTX	**<41**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcGTX2/3	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcGTX2/3	**<125**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	C1/2	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	C1/2	**<40**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX2/3	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX2/3	**<80**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX5	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX5	**<8.0**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	NEO	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	NEO	**<167**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX1/4	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX1/4	**<330**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcNEO	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcNEO	**<160**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*

Rapportkommentar:

DTX2, AZA2, AZA3 och 45-OH-homo-YTX är korrigerade med toxicitetsfaktorer enligt The EFSA Journal (2008), 589, 162 och 723, 1-52.
Mätosäkerheten presenteras vid två nivåer, LOQ och 5 LOQ, där 5 LOQ är brytpunkt.

Eventuella toxinhalter i Metod AOAC 2005.06 har en mätosäkerhet i intervallet 15-45%.
I de fall då toxin endast är påvisade, presenteras PSP-total som den totala summan av de påvisade toxinernas LOQ.

Jonas Renhult, Analysansvarig

Denna rapport är elektroniskt signerad.

Förklaringar till vilka laboratorier som utfört analyserna och till ackreditering/erkännanden

Lab	**Namn**	**Mark.**	**Ackreditering/Erkännande**

[a] före en parameter indikerar ackrediterad analys

EUSELI Eurofins Food & Feed Testing Sweden (Lidköping)

Förklaringa

AR-003 CLAM v17

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska

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AR-19-LW-023226-01

EUSELI-00230768

Kundnummer: LW8412219

Uppdragsmärkn.
006-10511-168572

Analysrapport

Provnummer:	525-2019-04080149	Produkt	larver
Provmärkning:	8 larver		
Provet ankom:	2019-04-08		
Analysrapport klar:	2019-04-10		
Provets kod:	8		
Analyserna påbörjades:	2019-04-08 10:30		

Testkod	Parameter	Resultat	Enhet	Mäto.	Metod/ref.	Lab
LW0XC	DST-total	**63**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-total	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-total	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	YTX-total	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Okadasyra	**63**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX-1	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX-2	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	OA-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX1-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX2-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-1	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-2	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-3	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-1	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-2	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Homo-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-homo-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Carboxy-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-carboxy-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	SPX-1	**<30**	µg/kg		SLV K1-f5-m602.1 2009	*EUSELI*

Förklaringa

AR-003 CLAM v17

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska

LW0XC	ASP-Toxin, Domorinsyra	**<3.0**	µg/g	SLV K1-f5-m602.1 2009	*EUSELI*
LW0V3	PSP-total	**Ej påvisad**		AOAC 2005.06	*EUSELI*

Appendix 6

Förklaringa

AR-003 CLAM
v17

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EUSELI-00230768

LW0V3	STX	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	STX	**<42**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcSTX	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcSTX	**<41**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcGTX2/3	**Ej påvisad**		AOAC 2005.06	*EUSELI*
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LW0V3	GTX2/3	**<80**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX5	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX5	**<8.0**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	NEO	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	NEO	**<167**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX1/4	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX1/4	**<330**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcNEO	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcNEO	**<160**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*

Rapportkommentar:

DTX2, AZA2, AZA3 och 45-OH-homo-YTX är korrigerade med toxicitetsfaktorer enligt The EFSA Journal (2008), 589, 162 och 723, 1-52.
Mätosäkerheten presenteras vid två nivåer, LOQ och 5 LOQ, där 5 LOQ är brytpunkt.

Eventuella toxinhalter i Metod AOAC 2005.06 har en mätosäkerhet i intervallet 15-45%.
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[a] före en parameter indikerar ackrediterad analys

EUSELI Eurofins Food & Feed Testing Sweden (Lidköping)

Förklaringa

AR-003 CLAM v17

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska

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AR-19-LW-023227-01

EUSELI-00230768

Kundnummer: LW8412219

Uppdragsmärkn.
006-10511-168572

Analysrapport

Provnummer:	525-2019-04080150	Produkt	larver
Provmärkning:	9 larver		
Provet ankom:	2019-04-08		
Analysrapport klar:	2019-04-10		
Provets kod:	9		
Analyserna påbörjades:	2019-04-08 10:30		

Testkod	Parameter	Resultat	Enhet	Mäto.	Metod/ref.	Lab
LW0XC	DST-total	**46**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-total	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-total	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	YTX-total	**0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Okadasyra	**46**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX-1	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX-2	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	OA-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX1-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	DTX2-acyl	**<30**	µg OA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-1	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-2	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	AZA-3	**<30**	µg AZA eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-1	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	PTX-2	**<30**	µg PTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	YTX	**0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Homo-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-homo-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	Carboxy-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	45-OH-carboxy-YTX	**<0.10**	mg YTX eq/kg		SLV K1-f5-m602.1 2009	*EUSELI*
LW0XC	SPX-1	**<30**	µg/kg		SLV K1-f5-m602.1 2009	*EUSELI*

Förklaringa

AR-003 CLAM v17

Mäto: Mätosäkerhet

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LW0XC	ASP-Toxin, Domorinsyra	**<3.0**	µg/g	SLV K1-f5-m602.1 2009	*EUSELI*
LW0V3	PSP-total	**Ej påvisad**		AOAC 2005.06	*EUSELI*

Appendix 6

Förklaringa

AR-003 CLAM
v17

Mäto: Mätosäkerhet

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EUSELI-00230768

LW0V3	STX	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	STX	**<42**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcSTX	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcSTX	**<41**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcGTX2/3	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcGTX2/3	**<125**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	C1/2	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	C1/2	**<40**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX2/3	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX2/3	**<80**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX5	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX5	**<8.0**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	NEO	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	NEO	**<167**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	GTX1/4	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	GTX1/4	**<330**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*
LW0V3	dcNEO	**Ej påvisad**		AOAC 2005.06	*EUSELI*
LW0V3	dcNEO	**<160**	µg STXdiHCL eq/kg	AOAC 2005.06	*EUSELI*

Rapportkommentar:

DTX2, AZA2, AZA3 och 45-OH-homo-YTX är korrigerade med toxicitetsfaktorer enligt The EFSA Journal (2008), 589, 162 och 723, 1-52.
Mätosäkerheten presenteras vid två nivåer, LOQ och 5 LOQ, där 5 LOQ är brytpunkt.

Eventuella toxinhalter i Metod AOAC 2005.06 har en mätosäkerhet i intervallet 15-45%.
I de fall då toxin endast är påvisade, presenteras PSP-total som den totala summan av de påvisade toxinernas LOQ.

Jonas Renhult, Analysansvarig

Denna rapport är elektroniskt signerad.

Förklaringar till vilka laboratorier som utfört analyserna och till ackreditering/erkännanden

Lab	**Namn**	**Mark.**	**Ackreditering/Erkännande**
EUSELI	Eurofins Food & Feed Testing Sweden (Lidköping)		

[a] före en parameter indikerar ackrediterad analys

Förklaringa

AR-003 CLAM
v17

Mäto: Mätosäkerhet

Mätosäkerheten, om inget annat anges, redovisas som utvidgad mätosäkerhet med täckningsfaktor 2. Undantag relaterat till analyser utförda utanför Sverige kan förekomma. Ytterligare upplysningar kan lämnas på begäran. Upplysning om mätosäkerhet och detektionsnivåer för mikrobiologiska