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Safety and efficacy of APSA PHYTAFEED® (6-phytase) as a feed additive for laying hens and other laying birds

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Abstract

Following a request from the European Commission, the EFSA Panel on Additives and products or Substances used in Animal Feed (FEEDAP) was asked to deliver a scientific opinion on the safety and efficacy of APSA PHYTAFEED® 20,000 GR/L (6-phytase) as a zootechnical feed additive for laying hens and other poultry species for laying. The additive is a preparation of 6-phytase produced by a genetically modified strain of *Komagataella phaffii* and has been previously assessed by the FEEDAP Panel in the context of three applications for its use in different species/categories. The Panel concluded in those opinions that the production strain is safe, and that the use of the additive as a feed additive would raise no safety concerns for the consumers and the environment. The additive was also considered not to be irritant to skin or eyes or a dermal sensitiser but it should be considered as a respiratory sensitiser. The Panel considered that the new use in laying hens and other poultry species for laying would not modify the previously drawn conclusions with respect to the consumers, users and the environment. A tolerance trial in laying hens and a subchronic oral toxicity study were made available to support the safety of the additive for the target species/categories subject of this new application; from the results obtained, the Panel concluded that the additive is safe for laying hens at the recommended level of use (300 U/kg feed) with a wide margin of safety and therefore the conclusion was extrapolated to other laying birds. The FEEDAP Panel concluded that the additive has the potential to be efficacious in laying hens at the level of 300 U/kg feed and this conclusion was extrapolated to other laying birds.

Keywords: zootechnical additives, digestibility enhancers, 6-phytase, safety, efficacy, hens

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Question number: EFSA-Q-2019-00461

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1. Introduction

1.1. Background and Terms of Reference

Regulation (EC) No 1831/2003[1] establishes the rules governing the Community authorisation of additives for use in animal nutrition. In particular, Article 4(1) of that Regulation lays down that any person seeking authorisation for a feed additive or for a new use of a feed additive shall submit an application in accordance with Article 7.

The European Commission received a request from Andrés Pintaluba S.A.[2] for authorisation of the product APSA PHYTAFEED® (6-phytase), when used as a feed additive for laying hens and other laying birds (category: zootechnical additive; functional group: digestibility enhancer).

According to Article 7(1) of Regulation (EC) No 1831/2003, the Commission forwarded the application to the European Food Safety Authority (EFSA) as an application under Article 4(1) (authorisation of a feed additive or new use of a feed additive). EFSA received directly from the applicant the technical dossier in support of this application. The particulars and documents in support of the application were considered valid by EFSA as of 29 August 2019.

According to Article 8 of Regulation (EC) No 1831/2003, EFSA, after verifying the particulars and documents submitted by the applicant, shall undertake an assessment in order to determine whether the feed additive complies with the conditions laid down in Article 5. EFSA shall deliver an opinion on the safety for the target animals, consumer, user and the environment and on the efficacy of the product APSA PHYTAFEED® (6-phytase), when used under the proposed conditions of use (see Section 3.1).

1.2. Additional information

The FEEDAP Panel adopted four opinions on the product, one on the safety and efficacy of APSA PHYTAFEED® 20,000 GR/L (6-phytase) as a feed additive for chickens for fattening or reared for laying and minor poultry species for fattening or reared for laying (EFSA FEEDAP Panel, 2019a), the second on the use in turkeys for fattening or reared for breeding (EFSA FEEDAP Panel, 2019b) and a third one regarding its use in weaned piglets and minor porcine species (EFSA FEEDAP Panel, 2019c) and the fourth on its use in pigs for fattening (EFSA FEEDAP Panel, 2020).

The additive is authorised for use in chickens for fattening, chickens reared for laying/breeding and minor poultry species for fattening or reared for laying or for breeding purposes.[3]

2. Data and methodologies

2.1. Data

The present assessment is based on data submitted by the applicant in the form of a technical dossier[4] in support of the authorisation request for the use of APSA PHYTAFEED® 20,000 GR/L (6-phytase) as a feed additive for laying hens and laying birds.

The FEEDAP Panel used the data provided by the applicant together with data from other sources, such as previous risk assessments by EFSA.

The European Union Reference Laboratory (EURL) considered that the conclusions and recommendations reached in the previous assessment regarding the methods used for the control of the APSA PHYTAFEED® 20,000 GR/L (6-phytase) in animal feed are valid and applicable for the current application.[5]

[1] Regulation (EC) No 1831/2003 of the European Parliament and of the Council of 22 September 2003 on additives for use in animal nutrition. OJ L 268, 18.10.2003, p. 29.
[2] Andrés Pintaluba S.A. Polígono Industrial Agro-Reus, Prudenci Bertrana, 5, Reus, Spain.
[3] Commission Implementing Regulation (EU) 2020/150 of 4 February 2020 concerning the authorisation of the preparation of 6-phytase produced by *Komagataella phaffii* CGMCC 12056 as a feed additive for chickens for fattening, chickens reared for laying and for breeding and minor poultry species for fattening or reared for laying or for breeding purposes (holder of authorisation Andrés Pintaluba S.A.). OJ L 33, 5.2.2020, p. 9.
[4] FEED dossier reference: FAD-2019-0045.
[5] The full report is available on the EURL website: https://ec.europa.eu/jrc/sites/jrcsh/files/fin_report_fad-2018-0031_phytafeed.pdf

2.2. Methodologies

The approach followed by the FEEDAP Panel to assess the safety and the efficacy of APSA PHYTAFEED® 20,000 GR/L (6-phytase) is in line with the principles laid down in Regulation (EC) No 429/2008[6] and the relevant guidance documents: Guidance on the assessment of the safety of feed additives for the target species (EFSA FEEDAP Panel, 2017) and Guidance on the assessment of the efficacy of feed additives (EFSA FEEDAP Panel, 2018).

3. Assessment

The additive APSA PHYTAFEED® 20,000 GR/L contains 6-phytase activity (EC 3.1.3.26; phytase) and is intended to be used in feed for laying hens and other laying birds as a zootechnical additive (functional group: digestibility enhancers).

3.1. Characterisation

The phytase present in the additive is produced by a genetically modified strain of the yeast *Komagataella phaffii* that has been deposited in the China General Microbiological Culture Collection Centre (CGMCC) with the deposit number 12056.[7] The additive is available in two formulations, a solid one APSA PHYTAFEED® 20,000 GR and a liquid one APSA PHYTAFEED® 20,000 L. The two formulations of the additive ensure a guaranteed minimum phytase activity of 20,000 U[8] /g or mL of product. In previous opinions, the Panel characterised the additive and its manufacturing process including the production strain (EFSA FEEDAP Panel, 2019a,b).

The additive is to be used in feed for laying hens and laying birds at a minimum recommended enzyme activity of 300 U/kg feed.

3.2. Safety

The safety aspects regarding the use of this additive in feed including the safety of the genetic modification of the production strain, the safety for the consumers, for the user and for the environment have been previously assessed (EFSA FEEDAP Panel, 2019a). The Panel concluded that the use of the product as a feed additive raises no concerns for consumer safety and for the environment. Regarding the safety for the user the Panel concluded that additive was not irritant for skin or eye and it is not a dermal sensitiser, but it was considered a respiratory sensitiser.

The FEEDAP Panel is not aware of any new information that would lead it to reconsider the conclusions drawn previously and considers that the extension of use to the new species for which the application is made would not have an impact on the safety aspects already evaluated. However, the safety for the new target species/categories sought in the current application needs to be addressed.

3.2.1. Safety for the target species

The enzyme is obtained from a production strain that belongs to a species that qualifies for the Qualified Presumption of Safety (QPS) approach to safety assessment and the qualifications were met (EFSA, 2007; EFSA BIOHAZ Panel, 2020). Considering this fact, no concerns for the target species would raise from the fermentation product, but the phytase requires assessment.

The applicant provided a tolerance/efficacy trial in laying hens.[9] A total of 144 21-week-old hens (Hy-Line Brown) were distributed in 72 cages with two hens each and allocated to six dietary treatments (12 replicates (cages) per treatment). A basal diet based on maize and soya bean meal was either not supplemented (control, total phosphorus 3.7 (non-phytic 2.0) g/kg feed and calcium 38.8 g/kg feed) or supplemented with APSA PHYTAFEED® to provide 150, 300 (1× recommended level), 450 (1.5×) or 45,000 (150×) U/kg feed (confirmed by analysis). A positive control diet containing total phosphorus 6.0 g/kg (non-phytic phosphorus 4.3 g/kg) and calcium 38.8 g/kg was also included. The feed was offered in mash form and *ad libitum* for 56 days.

[6] Commission Regulation (EC) No 429/2008 of 25 April 2008 on detailed rules for the implementation of Regulation (EC) No 1831/2003 of the European Parliament and of the Council as regards the preparation and the presentation of applications and the assessment and the authorisation of feed additives. OJ L 133, 22.5.2008, p. 1.

[7] Technical dossier/Section II/Annex II.2.1.2

[8] One Unit (U) is defined as the amount of enzyme that releases 1 μmol of inorganic phosphate from phytate per minute at pH 5.5 and 37 °C.

[9] Technical dossier/Section III/Annex III.1.1.1.

Mortality and general health were monitored throughout the study. Body weight per replicate (cage) was recorded at the beginning, day 28 and at the end of the trial. Feed consumption was monitored throughout the study per cage. Egg production per cage was recorded and weighed daily (including incidence of broken-dirty-soft shell eggs). The feed to egg mass ratio was calculated. On day 1 of the study, a total of eight hens were sampled for blood collection on random basis. On day 56, other eight hens per treatment were also sampled. Blood was analysed for haematological[10] and biochemical[11] parameters. The study included also measurements related to the utilisation of phosphorus and bone mineralisation (see Section 3.3). An analysis of variance (ANOVA) was done with the performance data (cage basis) and considering the treatment as the effect. Group means were compared with Tukey's test. The significance level was set at $p < 0.05$.

A total of 16 hens died (from 10 replicates) due to a failure in the water supply, but no differences were found between treatments. The overall average laying rate of the hens was 89%, with a mean daily egg mass production of 48 g and a feed to egg mass ratio of 2.13. No significant differences were recorded in any of the laying performance (see Table 1 in Section 3.3.1) or in the number of broken, dirty and soft-shell eggs. No significant differences between the treatments were identified in the haematological/blood chemistry parameters measured, except for haemoglobin, heterophil counts and alkaline phosphatase. Haemoglobin content was lower in the 150-fold dose compared to 450 U/kg feed (9.6 vs. 10.9 g/dL) but the values were not different to the control group; heterophil counts were higher in the 150-fold dose compared to the control (2.0 vs. $0.9 \times 10^4/\mu L$), and a alkaline phosphatase was higher in the 150-fold dose compared to 300 U/kg feed (1.7 vs. 0.4 U/L) with no differences to the control group. Therefore, no adverse effects were identified in this study resulting from the supplementation of the hens' diets up to 150-fold the recommended level of the additive (300 U/kg complete feed).

The results of a subchronic oral toxicity study in rats, already assessed by the FEEDAP Panel (EFSA FEEDAP Panel, 2019a), may also be used to support the safety for the target species. In that study a no adverse effects level (NOAEL) of 119,228 U/kg body weight and day in rats was identified. Using this NOAEL, and applying the procedure detailed in the guidance on the safety for the target species (EFSA FEEDAP Panel, 2017), the maximum safe level for laying hens is calculated to be 19,796 U/kg feed. This value is approximately 65 times higher than the proposed use level in laying hens and would support the conclusion that the additive is safe for laying hens at the minimum recommended level of 300 U/kg with a wide margin of safety.

3.2.1.1. Conclusions on safety for the target species

Considering the data available, the FEEDAP Panel concludes that the additive is safe for laying hens at the recommended level, with a wide margin of safety. Therefore, the conclusions can be extrapolated to other birds for laying.

3.3. Efficacy

The applicant provided four efficacy trials, two trials were short-term studies and other two were designed to provide data on the laying performance as well as on the phosphorus utilisation.

3.3.1. Short-term trials

The first short-term trial is the tolerance trial (described in Section 3.2.1) which included a balance study and bone mineralisation determinations.[12] From day 54 to 56 of study, the excreta from the hens was collected by placing a plate below the cage; diets received prior and during the collection period included an external marker (titanium dioxide). On day 56, one hen per cage was killed and the tibia bone was collected to determine bone mineralisation. No data were provided on the content of phosphorus in egg. The results are provided in Tables 1 and 2. There were no effects on the performance during the tolerance trial (see Table 1). A significant and positive effect was found on the phosphorus utilisation from 300 U/kg feed with no significant effect on the bone ash content (in per cent dry matter (DM)), see Table 2.

[10] Total red blood cells, white blood cells (and differential counts), haemoglobin, haematocrit.
[11] Aspartate aminotransferase, alanine aminotransferase, gamma-glutamyltransferase, uric acid, albumin, total protein.
[12] Technical dossier/Section III/Annex III.1.1.1 and Supplementary information April 2020/Annex 4.

In the second trial,[13] a total of 150 20-week-old Lohmann LSL-classic hens were individually caged. Replicates consisted of three cages and five treatments were allocated to the replicates (representing ten replicates per treatment, and three hens per replicate). A basal diet based on maize, wheat and soya bean meal was either not supplemented or supplemented with APSA PHYTAFEED® 20,000 GR to provide 150, 300 or 450 U/kg feed (confirmed by analysis). A positive control diet was also considered. The feed contained an external marker (titanium dioxide) and was offered in mash form and *ad libitum* for 31 days. Mortality and general health were monitored throughout the study. Body weight was recorded at the beginning and at the end of the trial. Feed consumption was monitored throughout the study. Egg production was recorded and the weight of the eggs was recorded one day per week. No data was provided on the egg content of phosphorus. Feed to egg mass ratio was calculated. From day 25 to 28, the excreta were collected and then analysed for phosphorus utilisation. The collection of samples was done in 15 cages only, arbitrarily selected and samples were pooled per replicate. On day 31, bones from all birds were collected to determine bone mineralisation (ash and phosphorus are presented). An ANOVA was done with the performance data and considering the treatment as the effect. Group means were compared against the control with Dunnett's test, with the exception of bone mineralisation parameters for which Tukey's test was used. The significance level was set at $p < 0.05$.

The results are provided in Tables 1 and 2. The data on the phosphorus utilisation showed significant improvements with the supplementation starting from 300 U/kg feed compared to the control diet. No differences were observed in the bone mineralisation of the hens. The FEEDAP Panel notes that the laying performance of the birds was low for the hens under study (laying rate (%) ranging 41–62 and daily egg mass produced (g/day) ranging 20–30). Similarly, the daily feed intake of the hens ranged 75–84 g which is low compared to the standards. The animals used were very young (20-week-old), presented low body weights and with high variability in terms of body weight at start of the study (ranging from 900 to 1,500 g). Albeit the limitations seen in the trial on the performance of the hens the Panel considers that the results on the phosphorus utilisation could be used as supporting evidence of the efficacy.

Table 1: Effect of APSA PHYTAFEED® 20,000 GR on the laying performance of the hens in the short-term trials

Trial	Phytase (units/kg feed)	Daily feed intake (g)	Laying rate (%)	Daily egg mass (g/hen)	Feed to egg mass ratio
1	0	102	89.0	48.9	2.1
	150	103	91.0	49.4	2.1
	300	96	84.4	44.0	2.2
	450	103	91.1	49.0	2.1
	45,000	100	89.2	48.1	2.1
	Positive control	99	87.5	46.4	2.2
2	0	75	41	20.1	5.1
	150	83	55	27.9*	3.1*
	300	84	62*	30.3*	2.8*
	450	79	41	19.9	4.2
	Positive control	80	44	21.7	3.9

*: Values are significantly different ($p < 0.05$) to the control group.

[13] Technical dossier/Section IV/Annex IV.4.2.1 and Supplementary information April 2020/Annex 6 and 7.

Table 2: Effect of APSA PHYTAFEED® 20,000 GR on the utilisation of phosphorus and tibia mineralisation parameters in the short-term trials

Trial	Diets		Utilisation of phosphorus (%)	Bone content (% DM)	
	Phytase (units/kg feed)	Total P/Ca (g/kg feed)(1)		Ash	Phosphorus
1	0	4.6/45.5	27.7[b]	46.5[ab]	–
	150	4.4/47.2	41.9[ab]	47.8[ab]	–
	300	4.4/46.0	47.0[a]	48.1[ab]	–
	450	4.5/42.4	51.6[a]	45.4[b]	–
	45,000	4.7/42.1	46.9[a]	47.2[ab]	–
	Positive control	4.6/45.8	34.5[ab]	49.9[a]	–
2	0	3.0/35	18	50.4[ab]	16.1
	150	3.0/36	20	48.9[b]	16.2
	300	3.1/34	27*	51.3[a]	16.2
	450	3.1/36	29*	52.1[a]	16.1
	Positive control	3.7/36	32*	50.6[ab]	16.2

(1): Intended values for the diets administered during the period in which collection of excreta was done.
*: Values are significantly different ($p < 0.05$) to the control group (0 U/kg feed).
a,b: Values within the same trial and column with different superscript are significantly different ($p < 0.05$).

3.3.2. Long-term trials

In the first long-term trial,[14] a total of 360 27-weeks-old Hy-Line hens were caged in a total of 60 cages in groups of six hens and six treatments were allocated to the replicates (representing 10 replicates per treatment). A basal diet based on maize and soya bean meal was either not supplemented or supplemented with APSA PHYTAFEED® 20,000 GR to provide 150, 300, 450 or 600 U/kg feed (confirmed by analysis); a positive control diet was also included. The feed was offered in mash form and *ad libitum* for 91 days. Mortality and general health were monitored throughout the study. Body weight was recorded at the beginning and at the end of the trial. Feed consumption was monitored throughout the study per cage. Egg production per cage was recorded daily and the weight of the eggs was recorded three times per week. Feed to egg mass ratio was calculated. From day 89 to 91 the excreta were collected from each cage and then analysed for phosphorus utilisation; the diet contained an external marker (titanium dioxide). On day 91, tibia bones from one hen per replicate were collected to determine bone mineralisation. Eggs collected on day 91 were analysed for phosphorus content. An ANOVA was done with the performance data (cage basis) and considering the treatment as the effect. Group means were compared with Tukey's test. The significance level was set at $p < 0.05$.

A total of four hens died during the study (one for the control and 150 U/kg feed and two for 450 U/kg feed). The laying rate of the hens (see Table 3) showed significant improvements in the 150 and 450 U/kg groups compared to the control, but the effect was not found in groups receiving 300 or 600 FTU/kg feed. The data on the utilisation of phosphorus and egg phosphorus content (see Table 4) showed no differences between the groups and only improvements in the bone ash and bone phosphorus content were found from 300 and 150 U/kg feed, respectively.

In the second long-term trial,[15] a total of 120 22-weeks-old Hy-Line Pink hens were caged in groups of two and four treatments were allocated to the replicates (representing 15 replicates per treatment). A basal diet based on maize and soya bean meal was either not supplemented or supplemented with APSA PHYTAFEED® 20,000 GR to provide 150 or 300 FTU/kg feed (confirmed by analysis). A positive control diet was also considered. The feed was offered in mash form and *ad libitum* for 84 days. Mortality and general health were monitored throughout the study. Body weight was recorded at the beginning and at the end of the trial and during the balance trial. Feed consumption was monitored throughout the study per cage. Daily egg production and daily egg mass were recorded. Egg quality parameters (albumen height, yolk colour, Haugh Units, egg-shell strength and thickness) were determined in eggs laid on days 28 and 84. No data was provided on the egg

[14] Technical dossier/Section IV/Annex 4.2.2 and Supplementary information April 2020/Annex 9, 10 and 11.
[15] Technical dossier/Section IV/Annex IV.4.2.3.

content of phosphorus. From day 25 to 28, the excreta were collected and then analyzed for phosphorus utilisation, the diet contained an external marker (titanium dioxide). On day 84, six hens from each treatment were killed and the tibia bones were collected to study the mineralisation. An analysis of variance (ANOVA) was done with the performance data (cage basis) and considering the treatment as the effect. Group means were compared with Tukey's test. Significance level was set at $p < 0.05$.

No hens died during the study. No differences were observed in the laying performance of the hens during the study (Table 3). Improvements were observed in the shell strength and shell thickness of the eggs in the hens receiving 300 U/kg feed compared to the control (data not shown) and shell index from 150 U/kg feed. The utilisation of phosphorus and bone mineralisation (Table 4) showed significant improvements in the phosphorus utilisation from the level of 150 U/kg feed.

Table 3: Effect of APSA PHYTAFEED® 20,000 GR on the laying performance of the hens

Trial	Phytase (units/kg feed)	Daily feed intake (g)	Laying rate (%)	Daily egg mass (g/hen)	Feed to egg mass ratio
1	0	101.1	91.3^{b}	56.6	1.79
	150	102.0	95.3^{a}	58.7	1.74
	300	101.0	93.2^{ab}	57.1	1.77
	450	100.6	95.6^{a}	56.7	1.78
	600	99.9	93.7^{ab}	57.1	1.75
	Positive control	101.8	94.6^{a}	57.8	1.76
2	0	112.5	90.6	55.4	2.04
	150	108.3	91.4	55.7	1.95
	300	114.3	93.5	58.3	1.97
	Positive control	112.4	92.7	58.2	1.94

a,b: Values within the same trial and column with different superscript are significantly different ($p < 0.05$).

Table 4: Effect of APSA PHYTAFEED® 20,000 GR on the utilisation of phosphorus and tibia mineralisation parameters and egg phosphorus content in the long-term trials

Trial	Diets		Utilisation of phosphorus (%)	Bone content (% DM)		Egg phosphorus content (g/kg DM)
	Phytase (units/kg feed)	Total P/Ca (g/kg feed)(1)		Ash	Phosphorus	
1	0	4.3/37.8	42.7	52.7^{c}	9.9^{c}	6.57
	150	4.2/40.1	37.9	53.4^{bc}	10.9^{b}	6.47
	300	4.4/40.1	39.7	55.8^{ab}	11.7^{a}	6.46
	450	4.3/41.0	38.6	56.1^{ab}	11.2^{b}	6.57
	600	3.6/37.9	44.0	57.3^{a}	11.2^{b}	6.46
	Positive control	7.4/40.1	39.4	55.1^{abc}	10.8^{b}	6.49
2	0	3.8/39.2	32.6^{a}	55.4	–	–
	150	3.8/38.7	38.8^{b}	56.6	–	–
	300	3.8/39.0	41.9^{b}	56.6	–	–
	Positive control	5.1/38.3	39.8^{b}	55.9	–	–

(1): Intended values for the diets administered during the period in which collection of excreta was done.
a,b,c: Values within the same trial and column with different superscript are significantly different ($p < 0.05$).

3.3.2.1. Conclusions on the efficacy in target species

The results of the studies showed improvements on the phosphorus utilisation in two studies, one from 150 U/kg feed (second long-term trial) and another one from 300 U/kg feed (first short-term trial). In the first long-term trial, the hens that received the phytase showed compared to the control a better laying rate at 150 U/kg feed and improvements on the bone mineralisation in terms of ash content (from 300 U/kg) and phosphorus content (150 U/kg feed). Considering all the available data, the FEEDAP Panel concludes that the additive has the potential to be efficacious in laying hens at 300 U/kg feed. The mode of action of phytases is well known and can reasonably be assumed to be the

same between avian species. Therefore, the conclusion from the data in laying hens can be extrapolated to other birds for laying.

3.4. Post-market monitoring

The FEEDAP Panel considers that there is no need for specific requirements for a post-market monitoring plan other than those established in the Feed Hygiene Regulation[16] and Good Manufacturing Practice.

4. Conclusions

APSA PHYTAFEED® 20,000 GR/L is safe for laying hens and other birds for laying at the recommended level of 300 U/kg complete feed.

There are no concerns for consumer safety and no risks for the environment are expected from the use of APSA PHYTAFEED® 20,000 GR/L in laying hens or other birds for laying. The additive is not a skin or eye irritant, and it is not a dermal sensitiser but it should be considered a respiratory sensitiser.

The FEEDAP Panel concludes that the additive has the potential to be efficacious as a zootechnical additive in birds for laying at 300 U/kg feed.

Documentation as provided to EFSA/Chronology

Date	Event
22/07/2019	Dossier received by EFSA. APSA PHYTAFEED® 20,000 GR/L Submitted by Andrés Pintaluba S.A
17/07/2019	Reception mandate from the European Commission
29/08/2019	Application validated by EFSA – Start of the scientific assessment
18/11/2019	Reception of the Evaluation report of the European Union Reference Laboratory for Feed Additives
29/11/2019	Comments received from Member States
19/09/2019	Reception of spontaneous supplementary information from the applicant -
05/02/2020	Request of supplementary information to the applicant in line with Article 8(1)(2) of Regulation (EC) No 1831/2003 – Scientific assessment suspended. *Issues: safety and efficacy for the target species*
27/03/2020	Reception of supplementary information from the applicant - Scientific assessment re-started
07/05/2020	Opinion adopted by the FEEDAP Panel. End of the Scientific assessment

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Abbreviations

ANOVA	analysis of variance
CGMCC	China General Microbiological Culture Collection Centre
DM	dry matter
EURL	European Union Reference Laboratory
FEEDAP	EFSA Panel on Additives and Products or Substances used in Animal Feed
NOAEL	no observed adverse effect level
QPS	Qualified Presumption of Safety