AMINONews®

Information for the Feed Industry

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AMINODat® 5.0 –

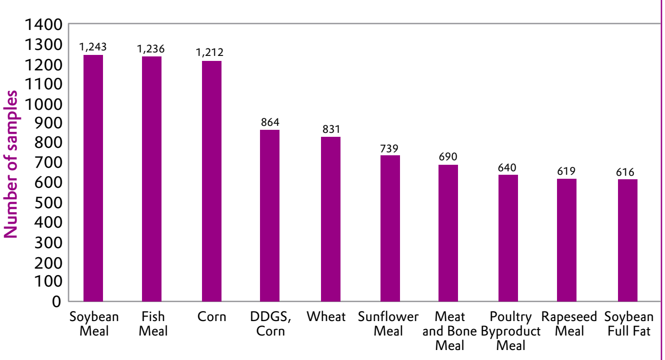
The animal nutritionist's information edge!

In 1997, the first AMINODat® was launched as a book and since then it is recognized worldwide as the reference database for the amino acid composition of feed ingredients. This success is based on the high quality standards, which is a cornerstone of the way we do things at Evonik. From the first version of AMINODat® up to today's AMINODat® 5.0, our global sales force has collected all samples carefully and all were wet-chemically analyzed according to international standard methods and accurately evaluated by an expert team. You are used to finding the best available information on the amino acid composition of feed ingredients in AMINODat® – however – with AMINODat® 5.0 we moved a step ahead, as feed formulators depend on reliable nutritional composition data for the feed ingredients that go into their feed formulations. Proximates, amino acids, minerals and energy values – all of these input variables are key to optimizing feed formulation for nutrition and profitability and AMINODat® 5.0 handles all of them:

- Total amino acids
- Standardized ileal digestible amino acids for pigs and poultry
- Standardized ileal digestibility coefficients for essential amino acids for pigs and poultry
- Proximates
- Minerals
- Energy

In addition to mean values, AMINODat® 5.0 includes information about the minimum and maximum figures, the number of samples analyzed and the coefficient of variation, as these values make the difference!

Figure 1 Top 10 feed ingredients of AMINODat® 5.0 by number of samples analyzed



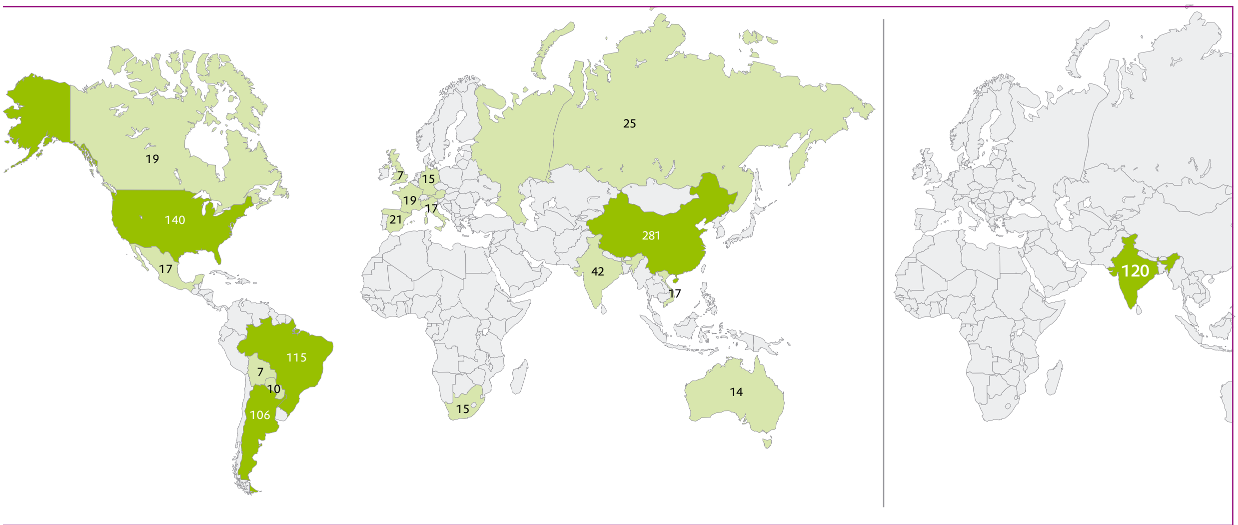
From professionals for professionals – robust, reliable, up-to-date

More than 21,000 feed ingredient samples were collected from feed mills all over the world during the past five years, ensuring both unrivalled robustness and relevance. For some feed ingredients where the number of new samples was small, data from previous years were incorporated. You will find data on more than 140 feed ingredients actually used by the feed industry. All analyses were conducted by wet-chemistry according to international standards by laboratories that are globally recognized as reference laboratories for amino acid analyses – the Evonik labs. The accuracy and precision of our labs is consistently confirmed by third parties who organize international ring tests: this quality of our lab work is the basis for the high quality of AMINODat® 5.0.

The top 10 feed ingredients by number of samples analyzed are depicted in Figure 1. The top three are soybean meal, fish meal and corn with numbers very close together at more than 1200 samples analyzed each. It is not surprising that soybean meal and corn are among the top three, as these feed ingredients are the most important feed ingredients in terms of volumes traded. For fish meal the situation is different. The reason for all these analyses lies in the huge variation of its nutrient composition. The coefficient of variation of lysine in fish meal is more than 4.4-times higher than that of lysine in soybean meal.

The number of samples per country is quite different between the different feed ingredients. On one hand it reflects the local availability of a feed ingredient and on the other, the importance of a feed ingredient for the feed industry. An extreme example is guar meal. Out of 138 samples, 120 originated from India which is not surprising as India is the main producer and consumer of guar meal. The situation is different for globally traded feed ingredients like soybean meal, as AMINODat® 5.0 includes country specific data for 20 countries from all over the world (Figure 2).

Figure 2 Number of analyzed samples per country for soybean meal (left) and guar meal (right)



More than a global snapshot: Representative data you can work with

What makes AMINODat® 5.0 such a valuable reference for feed formulators is the fact that it digs deeper, delivering data that is representative of your country and of the quality offered in your market. Multiple factors influence feedstuff composition and cause variations. With plant-based feed ingredients, planted variety and local growing conditions are factors, as well all post-harvest processing steps. AMINODat® 5.0 brings it all together on a global as well as on a country-specific basis. You will see how the average feed raw material composition and variation is impacted by the country of origin.

Let's take wheat as an example. The global wheat data of AMINODat® 5.0 indicates a coefficient of variation for crude protein of more than 17 %. Meaning that the crude protein content of wheat is quite variable and it ranges from 7.06 to 18.41 %, highlighting the importance of quality control and analysis during feed ingredient purchasing and reception.

At the same time, the starch and sugar content of wheat fluctuates with changing crude protein content. Starch ranges from 52.31 to 65.67 % and sugar from 0.13 to 6.80 % (Table 1). The coefficient of variation of starch is only 4.02 %, whereas that of sugar is 41.10 %. This is due to the fact that the coefficient of variation is calculated relative to the arithmetic mean (CV (%) = SD/Mean*100) and the average starch content of wheat is 60.22% whereas wheat contains only 2.17 % sugar. Consequently, a standard deviation of, for example, one would result in a coefficient of variation for starch of 1.66 % and for sugar of 46.08 %.

On a country specific basis, the lowest average crude protein content of wheat was reported for Great Britain with just 9.77 % (CV = 18.07 %; n = 78) and the highest average crude protein content was reported for Brazil with 15.78 %. However, the Brazilian average is based on 10 samples only and might not be representative. The next highest crude protein content was reported for China with 13.49 % (CV = 10.99, n = 80). This example illustrates the importance of continuous local quality control.

Table 1 Proximate data (%) on global wheat

Name	DM		Crude Protein	Ether Extract*	Crude fiber	NDF	ADF	Starch	Sugar	Ash
Wheat Global, 2010-2015	88	$\bar{x}$	11.68	1.93	2.50	11.61	3.18	60.22	2.17	1.70
		CV	17.05	12.91	16.45	13.66	12.16	4.02	41.10	15.80
		n	831	256	256	256	256	256	254	26
		Min	7.06	1.11	1.60	8.01	2.25	52.31	0.13	0.94
		Max	18.41	2.69	3.83	19.30	4.56	65.67	6.80	2.92

* after HCl hydrolysis

With regard to the amino acid contents, we can observe that the total content of amino acids in high protein wheat from China is higher in comparison to the low protein wheat from Great Britain. For example, the lysine content of wheat from China was 0.36 %, in comparison to 0.29 % of lysine in wheat from Great Britain (Table 2). But how does this look like if we have a look at the amino acid composition of the protein? Did the composition of the protein change?

The impact of the crude protein content of wheat on its amino acid contents is illustrated in Figure 3. It can easily be seen that with increasing crude protein, the content of glutamic acid increases over-proportionally compared to the essential amino acids lysine, methionine, threonine and tryptophan. The relationship between the crude protein content of a feed ingredient and its amino acid composition is described in the regression equation part of AMINODat® 5.0. For the first time it includes regression equations for essential and non-essential amino acids. This function is a pragmatic tool to estimate the amino acid content of feed ingredients based on their crude protein content. This is an especially effective approach when an amino acid analysis of the feed ingredient is not feasible.

Table 2 Amino acid content (%) of wheat samples from China and Great Britain

Name	DM		Lys	Met	Cys	M+C	Thr	Trp	Arg	Ile	Leu	Val	His	Phe
Wheat *CN, 2010-2014*	88	$\bar{x}$	0.36	0.21	0.30	0.51	0.37	0.16	0.64	0.46	0.87	0.56	0.30	0.60
		CV	9.88	10.53	10.60	10.23	9.58	10.32	12.21	11.02	10.59	10.38	11.05	12.20
		n	80	80	80	80	80	32	80	80	80	80	80	80
Wheat *GB, 2010-2015*	87	$\bar{x}$	0.29	0.15	0.22	0.37	0.28	0.13	0.48	0.32	0.65	0.42	0.22	0.44
		CV	11.62	14.43	13.61	13.78	14.79	21.90	14.87	18.50	17.24	15.76	16.89	21.37
		n	78	78	78	78	78	29	78	78	78	78	78	78

Therefore, we express the content of amino acids relative to the crude protein content of a sample. The protein of the low protein wheat from Great Britain contains more essential amino acids like lysine, methionine, threonine and tryptophan than the high protein wheat from China. On the other hand, the protein of the high protein wheat is rich in non-essential amino acids like glutamic acid. The amount of non-amino acid nitrogen was not impacted by the different crude protein levels as indicated by the analyzed ammonia levels. The protein of wheat from China and Great Britain had an ammonia content of 3.28 % and 3.26 % (NH_3 in CP), respectively.

If we have a closer look on the corresponding proximate data it becomes obvious that the low crude protein content of wheat from Great Britain was accompanied by an increased starch and sugar content in comparison to the wheat from China (Table 3).

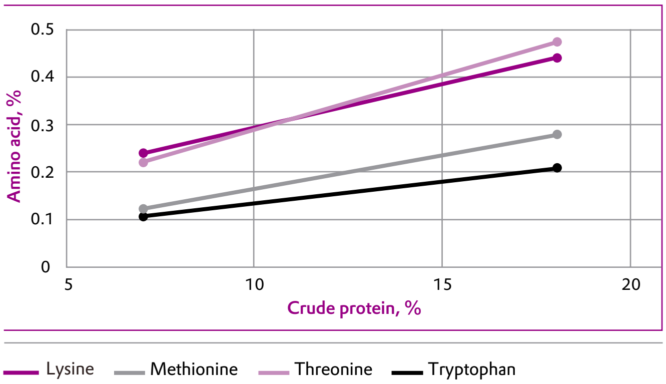
Table 3 Proximate composition of wheat samples from China and Great Britain

Name	DM		Crude Protein	Ether Extract	Crude fiber	NDF	ADF	Starch	Sugar	Ash
Wheat *CN, 2010-2014*	88	$\bar{x}$	13.49	1.92	2.25	12.43	2.92	58.44	1.42	1.73
		CV	10.99	10.90	10.61	18.40	8.74	2.96	20.79	11.34
		n	80	14	14	14	14	14	14	14
Wheat *GB, 2010-2015*	88	$\bar{x}$	9.77	1.90	2.31	11.03	3.15	60.93	2.79	1.55
		CV	18.07	11.15	14.64	13.57	11.11	4.21	27.32	16.66
		n	78	33	33	33	33	33	33	33

The wheat example demonstrated that locally sourced cereals can deviate substantially from global table values and that their composition can be quite variable, too. On the other hand, we have some feed ingredients which are very much standardized, like for example soybean meal. AMINODat® 5.0 includes crude protein and amino acid data of more than 1200 soybean meal samples. The average protein content of soybean meal was 46.5 % with a CV of 4.92 % only. If we subdivide the samples into different quality groups, the variation decreases further. For example, the subgroup 'Soybean meal, CP 48 %' has a CV of crude protein of only 2.52 %.

AMINODat® 5.0 contains sub-groups based on analyzed nutrient contents, e.g. crude protein or crude fiber, whenever sub-populations were identified or the nutrient content of a sub-population showed a significant difference to global figures. With regard to soybean by-products, AMINODat® 5.0 contains a new sub-group called 'Soybean Meal, Fermented'. During the last 5 years we received 93 samples of fermented soybean meal which is a sound basis for further evaluations. The fermented soybean meal had an average crude protein content of 49.39 % and a CV of only 2.66 %. A comparison of the amino acid profile indicates that during the fermentation process some amino acids were lost. This is most obvious for lysine, cystine, tryptophan and arginine (Table 4). It is well known that these amino acids suffer from thermal treatments, especially lysine. The least thermal treatment with regard to soybean by-products is applied during production of soya full-fat and here we find the greatest Lys:CP ratio of 6.18 %. Production of soybean meal includes a toasting process in order to remove the hexane which was added to extract the oil.

Figure 3 Impact of the crude protein content of wheat on its amino acid contents



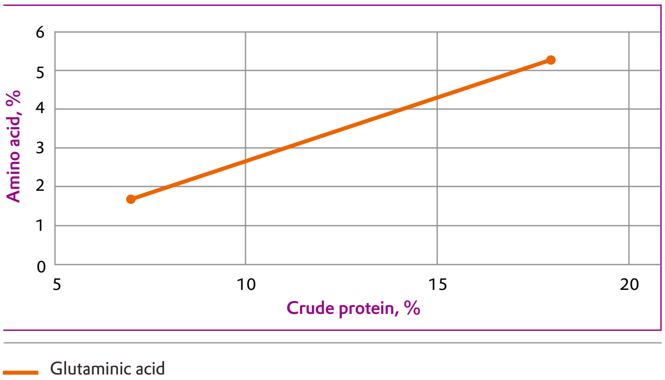


Table 4 Essential amino acid composition of different soybean products sorted by lysine in protein (AA:CP, %)

Name	n	DM		Lys	Met	Cys	M+C	Thr	Trp	Arg	Ile	Leu	Val	His	Phe
Soybean Meal, Fermented *Global, 2010-2015, Soybean Meal*	93	88	$\bar{x}$	5.60	1.29	1.37	2.66	3.85	1.27	6.82	4.54	7.50	4.73	2.57	5.01
Soybean Meal, CP 48 % *Global, 2010-2015, Soybean Meal*	677	88	$\bar{x}$	6.05	1.33	1.43	2.75	3.86	1.34	7.30	4.56	7.60	4.74	2.59	5.10
Soybean Meal, CP 44 % *Global, 2010-2015, Soybean Meal*	469	88	$\bar{x}$	6.11	1.34	1.45	2.79	3.89	1.35	7.32	4.54	7.59	4.76	2.62	5.06

Table 5 Relative drop in amino acid content of untypical yeast sample compared to regular yeast samples

Name	Lys	Met	Cys	M+C	Thr	Trp	Arg	Ile	Leu	Val	His	Phe
Relative Drop, %	−84	−69	−31	−56	−76	−74	−58	−75	−66	−70	−66	−66

This additional thermal process in comparison to production of soya full-fat leads to a reduction of the Lys:CP ratio. Soybean meal with a CP content of 44 % and 48 % has an average Lys:CP ratio of 6.11 % and 6.05 %, respectively. Fermented Soybean meal has an average Lys:CP ratio of only 5.60 % which clearly indicates that the applied processes reduces the amino acid content as the fermentation process did not increase the amount of non-amino acid nitrogen (Fermented Soya, SBM 48, SBM 44: 1.01 %, 0.95 %, 0.87 % NH_3 in DM). Thus, in feed formulation, specific matrix values for fermented soybean meal should be applied.

Figure 4 Amino acid content of regular and untypical yeast samples (%)

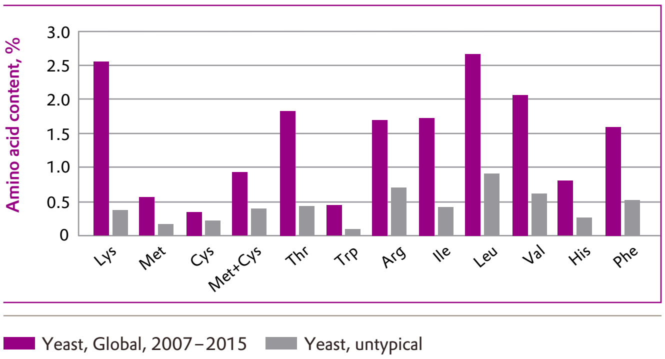
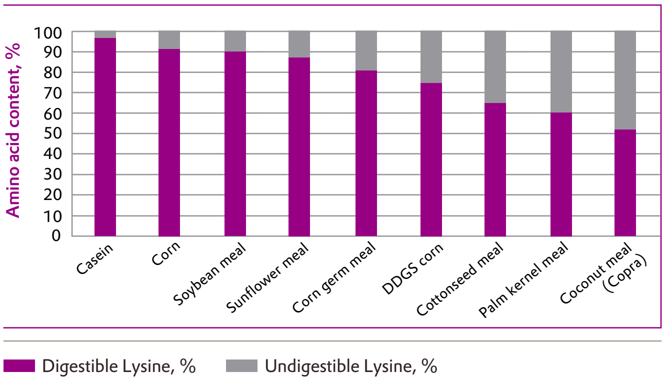


Figure 5 Relative content of digestible and undigestible lysine (poultry) in different feed ingredients (%).



During the data cleaning process we excluded samples with an untypical amino acid pattern. Especially in the case of yeast, a lot of samples had been excluded. Initially we analyzed 314 yeast samples but 53 or 16.9 % had been excluded from the final data set. These samples showed quite a normal crude protein content of 53.1 % on average but strange amino acid contents. As illustrated in Figure 4, the excluded yeast samples had a much lower amino acid content compared to regular yeast samples. The amino acid content of untypical yeast samples was reduced by 31 to 84 % in comparison to regular samples (Table 5).

In regular yeast samples, the sum of amino acids explained on average about 82 % of the crude protein. In case of the untypical yeast samples the situation is completely different. Here the sum of the analyzed amino acids explained only 28.2 % of the crude protein, which indicates that these yeast products contained large amounts of non-amino acid nitrogen. Most of these suspicious samples originated from Russia (n = 16), China (n = 13) and the Philippines (n = 10). This example nicely illustrates that an amino acid analysis delivers more than just analytical results for amino acids. It is a helpful tool to identify suspicious and falsified batches of feed ingredients.

The total amino acid content approach has its limitations

Not all nutrients in feedstuffs, as determined by chemical analyses, are biologically available to the animal. This is most important in amino acid nutrition since diets are usually formulated to meet the requirement for the first limiting amino acids. Amino acid digestibility can vary from one feed ingredient to the next as illustrated in Figure 5. For example, 97 % of the lysine of casein can be digested by poultry but only 52 % of the lysine of coconut meal. Consequently, two diets formulated for total amino acids may well differ in terms of the amount of actually digestible amino acids. Formulating diets on a total amino acid basis can produce feed that either doesn't meet the animal's needs or over-fulfills them.

Many studies show that formulating diets based on digestible rather than total amino acid contents is a better predictor of animal performance. AMINODat® 5.0 provides raw material-specific standardized ileal amino acid digestibility coefficients for pigs and poultry. Based mainly on digestibility trials conducted by Evonik, these coefficients are enriched by carefully selected data from peer-reviewed papers. Only data methodologically in line with Evonik data flowed into the system, guaranteeing robust and reliable digestibility coefficients.

From feed raw materials to diet evaluation

AMINODat® 5.0 is not only available as a book but also as a software. The software offers additional benefits on top of being a reference database for the nutritional composition of feed ingredients. For example, the software includes a function to put together an animal feed using the built-in feed ingredients and in the diet evaluation part, it instantly gives you an idea of the feed's amino acid composition.

However, when formulating animal diets, solid information on the nutritional composition of feed ingredients is nothing without reliable data on the animals' nutritional requirements. The AMINODat® 5.0 software contains updated recommendations for broilers, layers, growing pigs, reproductive sows, turkeys, ducks, salmon, common carp, rainbow trout, Nile tilapia and whiteleg shrimp. In the diet evaluation part you can select the relevant recommendation from this list and the software will indicate if the diet fulfills the animal's needs for essential amino acids. Relative and absolute amino acid deficiencies are highlighted in orange and any amino acid surplus in green. A surplus in the next-limiting amino acid offers the potential to reduce the crude protein content of your diet and in consequence the usage of cost intensive protein sources like soybean meal.

This diet evaluation function of the AMINODat® 5.0 software is also helpful for getting a better idea of diets used in feeding trials. Peer-reviewed papers contain information on raw material nutrient composition as well as the diet composition. With AMINODat® 5.0 you can easily estimate if the amino acid levels of the described diets were adequate for all essential amino acids.

AMINODat® 5.0 is available as a Gold and a Platinum version

AMINODat® 5.0 Gold

AMINODat® 5.0 Gold is an interactive application designed to support the optimization of amino acid nutrition in feed operations. Designed for Tablets, it is available on Google Play and in the Apple App Store. It is intuitive and easy to use. Redesigned from scratch, the set up enables you to easily compare and rank feed ingredients. With the powerful filter function, you can drill down to just the information you've been looking for. AMINODat® 5.0 Gold provides data on the 140 most important feed ingredients on a global basis. AMINODat® 5.0 is a very useful tool to get quick feedback on the amino acid content of animal diets. Using the 'Diet evaluation' function in combination with 76 ready-to-use species and phase-specific amino acid recommendations, you can easily determine whether the amino acid content of a diet fulfills the animal's needs and if the amino acid pattern is balanced.

AMINODat® 5.0 Platinum

AMINODat® 5.0 Platinum is the outstanding premium version. Available only via our global sales force to our partners as a book in combination with an interactive software application. AMINODat® 5.0 Platinum delivers data which is representative of your country and representative for the quality available in your market. This is just one of the reasons why AMINODat® 5.0 Platinum is the reference for today's feed ingredient composition. AMINODat® 5.0 Platinum provides data

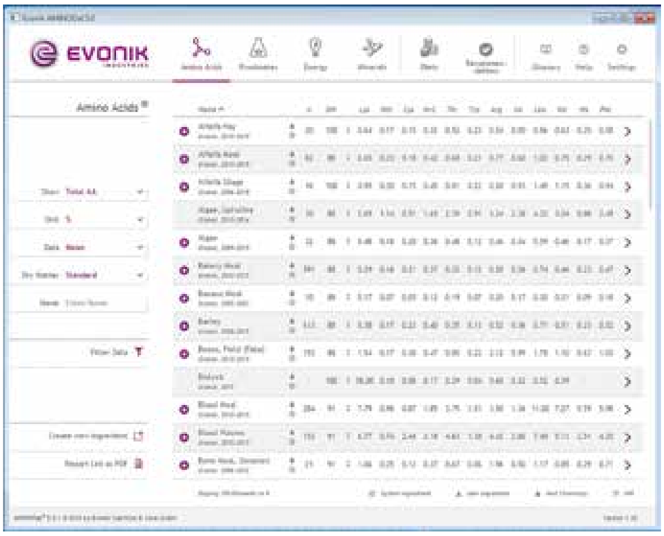
- on more than 720 feed ingredients
- on a global basis
- on a country-specific basis
- on a quality-specific basis

In addition to the functionalities of AMINODat® 5.0 Gold, the Platinum version works with highly accurate regression equations for predicting the amino acid content of feed ingredients. This allows you to easily customize feed ingredients to your needs and to gain the full benefit from other functionalities within AMINODat® 5.0, such as diet evaluation.

AMINODat® 5.0 is easy to use!

The main screen of AMINODat® 5.0 is clearly structured so that it is quite easy to work with (Figure 6). On the top it is highlighted in deep purple color in which section of the software you are at the moment. The first section is the data section and here you can select to display amino acids, proximates, energy or minerals data. The second section includes the diet evaluation function and the recommendations part. The last section on the very right offers a glossary, a help function and the settings.

Figure 6 Main screen of AMINODat® 5.0



The glossary explains all used abbreviations and describes the used methods and applied calculations. Therewith, AMINODat® 5.0 provides the necessary transparency. The help function includes typically asked questions and gives answers how to work effectively with the software. Use the search function to find answers to your questions. In the settings part you can choose between 10 different languages and change the decimal sign.

Figure 6 shows as an example the main screen of the amino acid data. You can see that the data is presented in rows and in the first column you will always find the name of the feed ingredient and under the name you will find some additional information on the sample set. It will be indicated if the data is global data, country specific data or quality specific data and during which time period the samples had been collected. The plus-sign in front of the names indicates that more specific data is available for this feed ingredient. Just click on the plus-sign to see the sub-categories. This structure makes it quite easy to compare the nutrient content of for example barley samples from different countries.

The main screen includes a sorting function for each column. Just click on the column header in order to sort it. If you want to change the order of sorting, just click once again.

In the sidebar on the left hand-side you get further information about the displayed data, like the unit, and you have the possibility to adapt the displayed data to your needs. For example, in the amino acid part you can select to display the essential or non-essential amino acids, you can choose to display the amino acids on total or standardized ileal digestible basis, or you can display the amino acids in % of feed ingredient, in % of crude protein or as % of lysine. On top of these options you can select the dry matter basis. You can choose between as-is, standardized dry matter and 100 % dry matter. If you want to learn a bit more about the variability of a feed ingredient, just go to the sidebar and select the coefficient of variation (CV) and the minimum and maximum. This data will be displayed as additional lines in the order you clicked them. This gives you full control about the viewed data and enables you to just display what you are looking for. To further fine tune the viewed data, you can use the filter function in the sidebar. Just enter the name of a feed ingredient you are interested in, for example 'soybean' and the software will display all the feed ingredients which have 'soybean' in their name. A more advanced filter is available, too. Click on 'Filter Data' below the side bar and the filter will open in a separate window. You can select single feed ingredients by setting check marks in front of their names or you use the side bar options to select a specific category, region, country, method or source or combinations thereof. On top of these drop-down filters you can filter the list by typing in the name of the feed ingredient. If you are for example interested in wheat samples from Germany, France and Poland, it is the easiest to type in 'wheat', select 'Cereals' as a category and select the countries of interest. The filter settings are effective for all data categories (amino acids, proximates, energy, minerals) and are saved if you switch for example to the diets part.

On the bottom left, AMINODat® 5.0 gives you the option to generate PDF reports. The reports will include the information which is actually shown on the main screen and the reports will show it in the same way so that you will get tailor-made reports just covering your needs.

AMINODat® 5.0 contains a lot of information on the nutritional composition of feed ingredients. If you want to get a quick overview on the nutritional data of a specific feed ingredient just click on the deep purple arrow on the very right of the main screen (Figure 6) and the ingredient overview screen will open. Here you will find a summary of the amino acid, proximate, energy and mineral data as shown in Figure 7.

The ingredient overview screen offers you the function to duplicate a feed ingredient and to adapt the data to your needs (bottom left). For example, you identified that the nutritional composition of a feed ingredient fits quite well to the quality you see in your markets, however the variation might be different. Just copy the feed ingredient and adapt the coefficient of variation. In the next step you can use the adapted feed ingredient in the diet evaluation part and evaluate the impact of your changes on the variation of the amino acids in the whole diet.

On the ingredient overview screen (Figure 7) you can see the header 'Regression Equation', if you are working with AMINODat® 5.0 Platinum. Use the regression equation function to adjust the amino acid and/or dry matter content of a feed ingredient to your conditions. In the example for soybean meal (Figure 8), I adapted the crude protein content to 47.38 % and the dry matter content to 89.5 % in the input fields on the bottom. AMINODat® 5.0 uses these input variables to calculate the amino acid content based on the regression equations given in the middle part of the view. The output is given in the right part of the view. In Figure 8 you can see that for soybean meal no regression equations are given for lysine, methionine, cystine, and methionine + cystine. This is due to the fact that the R^2 of the regression equations were lower than 0.5 which indicates that less than 50 % of the change in the content of these amino acids can be explained by a change in the crude protein content. In these cases the amino acid content is proportionally adjusted.

Figure 7 Ingredient Overview screen

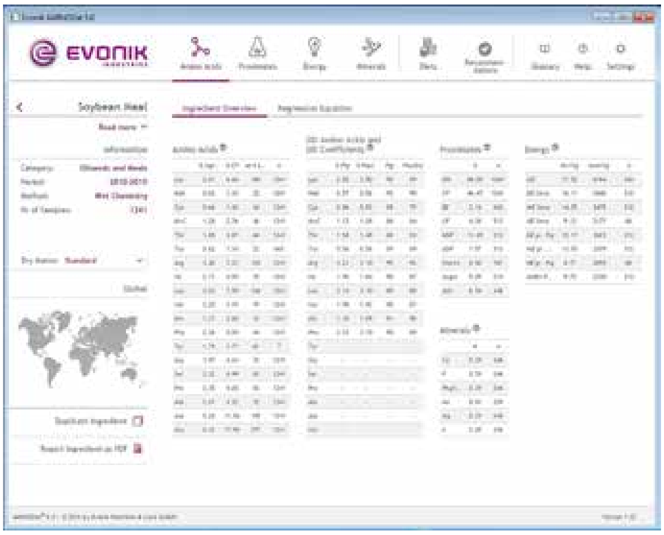
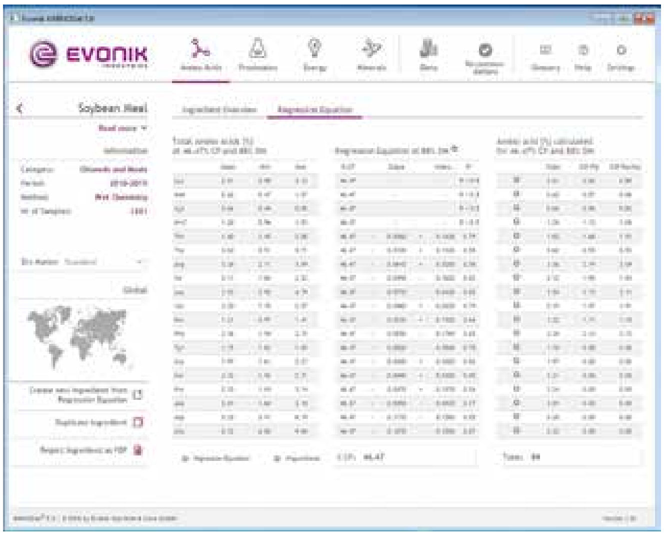


Figure 8 Regression Equation screen



However, this example clearly shows the limitations of this approach and the advantage of, for example estimating the amino acid content of feed ingredients via NIR calibrations.

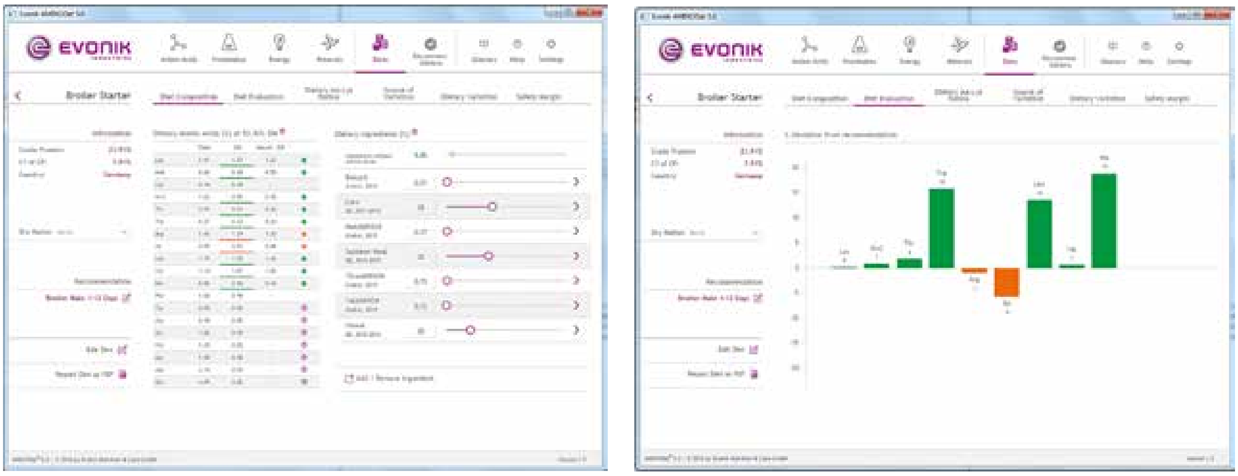
Nevertheless, it is a quite useful tool to adapt the amino acid content of feed ingredients to your conditions. You can use the outcome of the regression equations to create a new feed ingredient. Therefore, adapt the crude protein and dry matter content to your needs and afterwards just click on 'Create New Ingredient from Regression Equation' on the left side of the regression equation screen below the map (Figure 8).

The diet part of AMINODat® 5.0 is sub-divided in six separate views. The first and second view are the diet composition and the diet evaluation screen which are depicted in Figure 9. In the diet composition screen you can put together an animal diet based on your experience. Choose from all the 740 feed ingredients available in AMINODat® 5.0 as well as all the feed ingredients created by yourself by clicking on 'Add/Remove Ingredients' on the bottom right of the screen. Afterwards adjust the inclusion level of the individual feed ingredient via the slider function or via the input fields. Once you select a recommendation on the left hand side under the header 'Recommendations', AMINODat® 5.0 will instantly give you feedback if your diet fulfills the animal's needs. A green color means that the animal's needs are covered and an orange color means that they are not covered.

AMINODat® 5.0 includes ready-to-use recommendations for broilers, laying hens, growing pigs, reproductive pigs, turkeys, ducks, salmon, carp, trout, Nile tilapia and shrimp. The recommendations are an integral part of the diet evaluation function and are used to get quick feedback if a diet meets the animal's requirements for amino acids.

In the example in Figure 9 you can see that isoleucine and valine are marked in orange, so the depicted diet is deficient in these amino acids. To get a better overview you can switch to the Diet Evaluation screen. Here you can see that the deficiency of isoleucine is quite marginal as it is just 2 % below the recommendation. However, in this diet valine is clearly limiting as it is 7 % below the recommended level. This can be corrected easily by adding 0.07 % of L-Valine. After this correction, the amino acid content and pattern of the diet would be quite balanced. The amino acid pattern is graphically displayed in the 'Dietary AA:Lys Ratios' screen.

Figure 9 Diet Composition (left) and Diet Evaluation (right) screen



Sound risk assessment for uncompromising safety

Information on raw material variability is essential for sound risk assessment. That is why AMINODat® 5.0 also calculates the impact of the amino acid variation of individual raw materials on the overall variation of amino acids in the final diet. The results are presented graphically, so you can easily identify which raw material contributes most to the dietary of content amino acids and which raw material contributes most to the overall variation of amino acids in the final diet.

The Source of Variation screen displays graphically the contribution of each feed ingredient to the total dietary content of crude protein and amino acids (upper part) and the contribution of each feed ingredient to the dietary variation of crude protein and amino acids (lower part). Figure 10 shows, as an example, the outcome for a broiler starter feed which contains just 5% Sunflower meal. The sunflower meal is contributing between 4 to 8 % of the total dietary content of amino acids, however, it's contribution to the dietary variation is about 11 to 66 %! This is caused by the highly variable composition of global sunflower meal. The coefficient of variation for the amino acids of global sunflower meal is about 16 – 20 %, whereas that of global soybean meal is only about 5 – 7 %. This function of AMINODat® 5.0 supports you to set the right focus for feed ingredient analyses.

Figure 10 Source of Variation screen

AMINODat® 5.0 identifies opportunities for optimization!

- Compare dietary amino acid levels and patterns with latest recommendations.
- Identify amino acid deficiencies.
- Identify opportunities for reducing the levels of protein-rich feed ingredients.
- Explore which of your dietary ingredients is causing the largest dietary variation.
- Determine the minimum variation possible with the selected raw materials.
- Find out the impact of the dietary variation on dietary target levels and safety margins.

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