IAG ring test feed composition 2017

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- Joint Research Centre, Geel (IRMM-JRC; C. von Holst, A. Boix-Sanfeliu)
- All participants of the ring test
- Competent authorities of EU member states

Contents

Summary

A ring test was organized for the microscopic determination and semi-quantification of botanic ingredients in the formulation of an animal feed, in the framework of the annual ring tests of the IAG - International Association for Feeding stuff Analysis, Section Feeding stuff Microscopy. The organizer of the ring test was RIKILT - Wageningen UR, The Netherlands. The aim of the ring study was to provide the participants information on the performance of the local implementation of the method for composition analysis of feed.
The current ring test consisted of two different strategies: 1) a blind test for the analysis of a botanic composition of an artificially produced ruminant feed without label information, and 2) the evaluation of two label declarations of a broiler feed, one label correct and the second with wrong information. Results were considered under- or overestimations when exceeding the limits of the IAG uncertainty interval model.
A total of 23 sets of results was returned. The results of two sets seem to have no or limited connection with the composition of the samples. These sets were considered outliers and were excluded in the analysis of the results.

Unlabelled sample
A share of 85% of the ingredient estimations for the unlabelled sample was within the limits of the uncertainty model. Two factors seems to influence the result of a composition analysis. Ingredients seems to be overestimated at lowers shares, and specific ingredients are susceptible for underestimation at every level. Furthermore specific formulations can influence the precision of the estimation of the composition of the feed. The current results show a considerable improvement compared to last year, indicating that practice has a positive influence on performance.

Label control for two samples
The part of the test aiming at label control consisted of a pair of samples with label declarations (correct vs. wrong), of which the material was based on the same feed formulation. The correct label was considered wrong by five participants (25%), which can be indicated as false positive conclusions. The wrong label was indicated as such by all participants except one, whose conclusion was not based on a motivated analysis. In general false positives were considered less critical for food safety as false negatives.

The current lack of a complementary system for the analysis of chemical composition (ash, proteins, fat, dietary carbohydrates, fibres, etc.) could be a drawback for the overall performance of the technique for botanic composition analysis. Besides a proper method description and up-to-date descriptions of ingredients, well developed skills of technicians are vital for a good performance. The use of an expert system as tool for maintenance and dissemination of expertise might improve future performance.
The analysis of composition in terms of ingredients is important for detecting economic fraud and for monitoring feed safety. Botanic composition analysis and label control of feed is regulated in Regulation (EC) 767/2009. This technique can support traceability (Regulation (EC) 178/2002) and can be used for detection of fraud (Regulation (EC) 882/2004; Decision (EU) 2015/1918). In a broader view, composition analysis in the entire food chain can improve the effect of monitoring actions. The legislation on food labelling (Regulation (EC) 1169/2011) obliges to provide more detailed information to customers on composition and related topics.

1 Introduction

In the framework of transparency and the demand for traceability of the source of feed ingredients, it is necessary to establish the formulation of a feed. The legal basis for this examination is the obligatory label declaration of feeds, regulated for years by EU legislation and currently part of Regulation (EC) 767/2009. The main objectives are the prevention of economic fraud and a sufficient monitoring of feed safety.
The analysis of composition of feeds by means of microscopic methods has a long history. It has been a major activity of the IAG section Microscopy from its existence in 1959 (www.iag-micro.org). In 1998 a protocol on the microscopic identification of ingredients in feed was established in German, and translations to English and French were decided to be prepared (http://www.iag-micro.org/files/39_wien98.pdf?10,12).
The method IAG-A2 is based on a procedure of sieving the sample and applying several embedding and staining methods. The different sieve fractions consist of a fine, mediate and coarse material. The presence of specific ingredients (e.g. starch, fibres seed hulls) deviates largely among the sieve fractions. Examinations are to be carried out both a binocular microscope (up to 70 x magnification) and a compound microscope (100 – 400 x magnification; IAG, s.n.). At the final stages the share of the different ingredients are summed up over the different sieve fractions. The methods relies on identification of the ingredients supported by handbooks or reference material (IAG, s.n.). The identification of legal ingredients (Feed catalogue: Regulation (EC) 242/2010) is a complicated procedure.
Besides the availability of a protocol, the current practices are heavily based on the existing skills of the technicians. In the view of a process of improvement of monitoring programs, which was established for food in Regulation (EC) 1169/2011, the maintenance and dissemination of these skills needs attention.

In this report the ring test for composition 2017 is presented, which was organised by RIKILT on behalf of the IAG Section Feeding Stuff Microscopy.

2 Methods

2.1 Materials and procedure

The IAG ring test for botanic composition 2017 was chosen to be based on an artificial compound feed for ruminants. The feed material consisted of cornglutenfeed (30%), citruspulp (20%), palmkernelmeal (15%), beetpulp (12%), wheat (7%), wheat semolina (7%), soybeanmeal (7%) and mineral mix (2%).
Two additional samples were intended for label control. This feed was a broiler feed containing wheat (42.6%), corn (25%), sunflower meal (12.5%), soy meal (5%), rapeseed meal (5%), oat husks (2.5%), corn ddgs (2.5%), wheat semolina (1.5%) and premixes (2.9%).
The IAG ring test for botanic composition 2016 was combined with the IAG ring test for animal proteins. Sample 2017-B was intended for composition analysis, and samples 2017-C and 2017-D for label control. Hence, these samples had the same composition, but offered with a correct (2017-C) or a wrong (2017-D) label declaration. The label declarations are presented in Table 1.

Table 1 *Label declaration of samples 2017-C and 2017-D.*

Ingredient	2017-C (correct)	2017-D (wrong)
Wheat	44%	22%
Wheat middlings		18%
Corn	27%	
Maize distillers dried grains		8%
Sunflower meal	12%	16%
Rapeseed meal	6%	12%
Soy bean meal	6%	12%
Oat husks	3%	
Mineral mix	2%	3%
Proteins, amino acids, molasses		9%

Two samples with identical compositions are chosen for label control in order to establish the sole effect of a wrong label. Upon finalising the analysis of composition of the two samples the identical formulation would aid to identify the wrong label.
The ring test composition and label control was combined with the annual ring test for animal proteins. The results of the ring test animal proteins are being published in a separate report (van Raamsdonk et al., 2017).

2.2 Organization of the ring trial

All IAG members, all NRLs, participants of former ring tests and a series of putative interesting laboratories were informed about the ring test for 2017. In all cases an invitation letter included in the IAG Newsletter 2016 and a participation form were distributed. Until the beginning of March a total of 23 participants for the microscopic composition analysis were listed. The samples with an accompanying letter were sent to all participants on Thursday 23rd of March 2017. On Friday March 31st an E-mail message was sent to all participants, together with a file containing a sheet with instructions and the electronic report forms, and the request to confirm the receipt of the package. The information sheet of the report form is shown in Annex 1, the form for the procedural survey is reproduced in Annex 2, the report forms for the results of both the composition analysis and the label control are presented in Annex 3, and the letter sent with the samples is reproduced in Annex 4.

The closing date for reporting results was fixed at Friday May 5th. Several requests were received to extent the period for analysis. Results received after the date at which the evaluation of the results was started were ignored. The analysis of the results was carried out between 26th and 31st May.
The samples were intended to be analysed according to IAG method 2: "Method for the Identification and Estimation of Constituents in Animal Feedingstuff" (IAG, s.n.). Further instructions to the participants were enclosed in the box with samples, which are reproduced in Annex 4. Label control is primarily based on the analysis of the presence of ingredients, as is the situation for composition analysis. The availability of a label declaration can be either supportive or confusing. Therefore, to be able to reconstruct the basic data upon which the final conclusion was based, the assumed composition was requested in the report form.
The draft report was finalised at June 6th.

2.3 Analysis of results

The results are analysed according to the IAG scheme of uncertainty limits as approved during the 2006 meeting in Rostock. These limits are presented in Table 2. The model is graphically presented in Figure 1. Shares of ingredients in the feed formulation outside the limits of the model were indicated as "wrong".

Table 2 *IAG model for uncertainty analysis of the composition of a compound feed.*

Actual amount in %	Accepted uncertainty limits
< 2%	"traces "
2.0 – 5.0%	+/- 100% relative
5.01 – 10.0%	+/- 5% absolute
10.01 – 20.0%	+/- 50% relative
– 50.0%	+/- 10% absolute
> 50%	+/- 20% relative

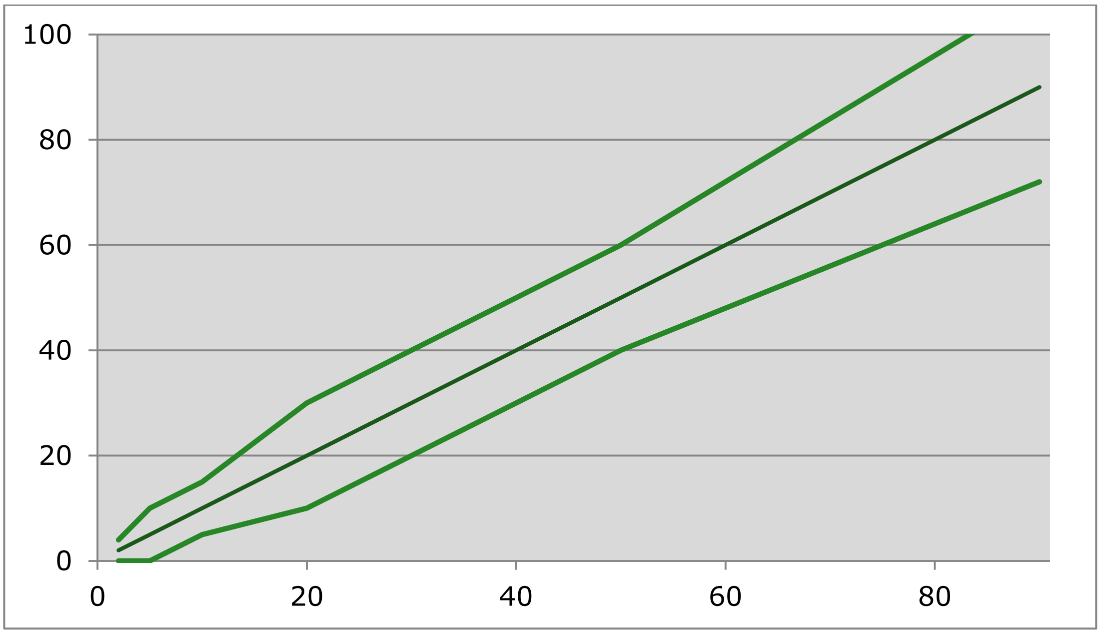

Figure 1 *IAG model for estimating uncertainty. X-axis: correct portion of ingredient in %, Y-axis: estimated portion of ingredient in %. Inner line: correct estimation, outer lines: limits for uncertainty interval at a given percentage.*

3 Results

Twenty-three samples were sent to all participants and results for composition analysis were returned in all cases. Three participants did not submit results for the label control, leaving a total of 20 sets. In all those cases that a participant send in several versions of the report sheet the most recent version was used. All reports were included.
The 23 participants, which successfully submitted their results, originated from 10 countries: 9 member states of the European Union, and one other country. The list of participants is presented in Annex 5. Almost half of the participants originated from Germany (11).

The procedure for the analysis of the composition is described in IAG method A2 (IAG, s.n.). This method, familiar to most participants as members of IAG section Microscopy, was applied by 15 participants. Other applied methods include a VD LUFA method, the AFNOR V18A method, an AOCS method, and internal laboratory procedures.

3.1 Composition

The results of the 23 participants are fully presented in Annex 6 and summarised in Table 3. The evaluations will be based on the pooled results per participants for the wheat products and for the corn products, since some participants did not discriminate between the specific types.

Table 3 *Overview of the main ingredients of the analysed sample, the correct composition, the a-priori calculated uncertainty range, and the statistics of the results in terms of median and numbers of participants that under- or overestimated the share of the ingredients. N = 23.*

ingredient	correct	range:	median	# (%) under est.	# (%) over est.
Corn total	30.0%	20.0-40.0%	24.0%	5 (22%)	0 (0%)
Citrus pulp	20.0%	10.0-30.0%	13.0%	7 (30%)	0 (0%)
Palmkernel meal	15.0%	7.5-22.5%	15.0%	3 (13%)	2 (9%)
Beet pulp	12.0%	6.0-18.0%	16.9%	2 (9%)	8 (35%)
Wheat total	14.0%	7.0-21.0%	17.0%	0 (0%)	5 (22%)
Soy meal	7.0%	2.0-12.0%	6.0%	2 (9%)	3 (13%)

The estimated amounts were within the limits of the uncertainty model in 73.7% of the estimations of the six major ingredients as listed in Table 3. Seven out of 23 participants delivered an errorless composition, which is 30%. Besides this, four participants made one error, four made two errors and five participants made three errors. There is no clear correlation with the method applied. Two participants overlooked the majority of ingredients, declared absent ones or estimated deviating amounts. When considering the total of 18 errors of these two participants as outliers and excluding them from the evaluation, a total of 85% of the estimations appeared to be correct within the limits of the IAG uncertainty model (Figure 2). There is a certain bias in the estimations for beet pulp and citrus pulp.
The indications of the target animal for this type of feed included ruminant (7), cattle (6), calf (1) and pig (2). Seven participants did not provide an indication. Considering the choice to mimic a formulation of a ruminant feed, this result is near to optimal.

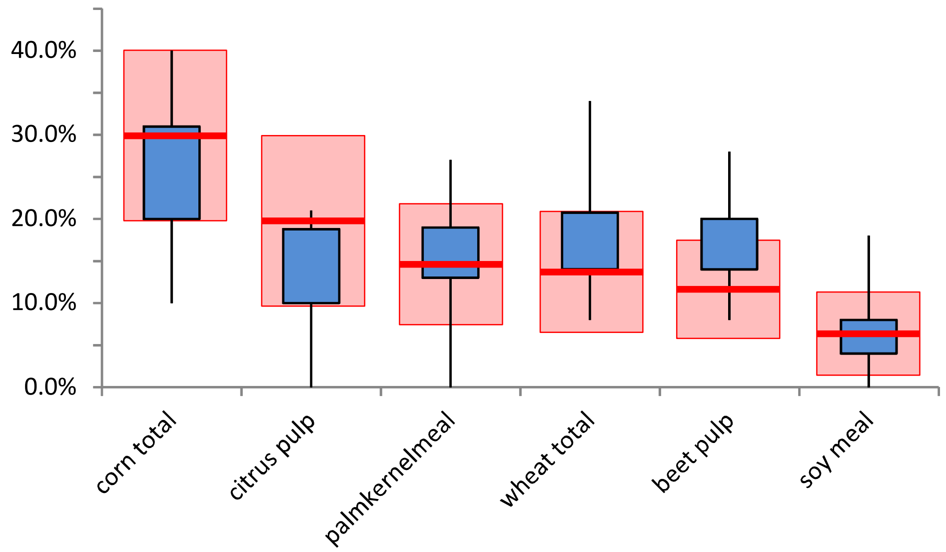

Figure 2 *The results of the IAG ring test composition. Y-axis: share of ingredient. Blue bars: P_{25} – P_{75} percentile interval, vertical line: minimum – maximum range. Red background: upper and lower limit interval of the IAG uncertainty model, horizontal red line: spiked percentage. N=21, two outliers ignored.*

3.2 Label control

The control of a label declaration was carried out for two different declared formulations, but both based on the same matrix. This allows to evaluate the effect of a wrong label declaration. The results are presented in Annex 7.
Seven participants reported full correct compositions and, hence, correct indication of the label contents (participants 1, 6, 7, 8, 14, 19, 34). Two additional participants reported pairs of overestimations for oat husks in both formulations, with still a correct indication of the label contents (2, 20). Together this is 45% of the reports (n=20). Most other participants reported differences among the two estimations for one or more ingredients, but with the same tendency: one estimation just within and the other just exceeding the limits of the uncertainty model:

- Overestimation of oat husks (participant 4, 36).
- Overestimation of soya meal, underestimation of corn (13, 23).
- Overestimation of oat husks, soya meal and rapeseed meal, underestimation of wheat (11).
- Overestimation of oat husks and rapeseed meal, underestimation of sunflower meal (27).
- Overestimation of minerals, underestimation of corn (45).

Principal deviations have been found in four reports:

- Over- vs. underestimation for wheat products, resulting in a notification of a wrong label for sample 2017-C (17).
- Over- vs. underestimation for wheat products and rapeseed meal, no estimation for soya meal, presence of fish, resulting in a notification of a wrong label for sample 2017-C (40).
- Indication of no analysis with the notification of a correct label for sample 2017-D (22).
- Several combinations with the correct label evaluation (47).

The final conclusion of the label evaluation is summarised in Table 4. Only once the incorrect label was indicated as correct, but this was not based on an analysis of composition as far as reported (participant 22). The assumption of a wrong label declaration for the correct label of sample 2017-C was in four out of five cases (partly) based on an overestimation of the oat husks. Also the identification of the different types of wheat causes problems in several cases.

Table 4 *Results of the evaluation of label declaration. N = 20. *: as far as reported, not based on a composition analysis.*

Label:	2017-C (correct information)	2017-D (wrong information)
Evaluation:		
Correct declaration	15	1 *
Incorrect declaration	5	19

4 Discussion

4.1 Composition analysis

The sample for the 2016 version of the IAG test on composition of a compound feed had a comparable formulation as the current sample 2017-B (van Raamsdonk et al., 2016). The comparison of the two tests is given in Figure 3. Especially citrus pulp was underestimated in 2016. The current results show a considerable improvement for the estimated amount of citrus pulp, as well as for corn gluten.
In general an underestimation is visible for ingredients with a higher share and an overestimation for ingredients with a lower share. In the view of the results of two subsequent years with comparable but still different formulations, however, there seems to be a relationship with the type of ingredient as additional factor. Soy meal, in both years at a low share, is not overestimated. The balance between the two types of pulp, beet and citrus pulp, shows that in two different combination of shares the citrus pulp remains to be underestimated. Wheat showed an overestimation in the ring test of 2015 even at a share of 56% (van Raamsdonk et al., 2015). Overestimations at low spike levels was also found in a study into quantification of fish meal in compound feeds (Veys et al., 2008).

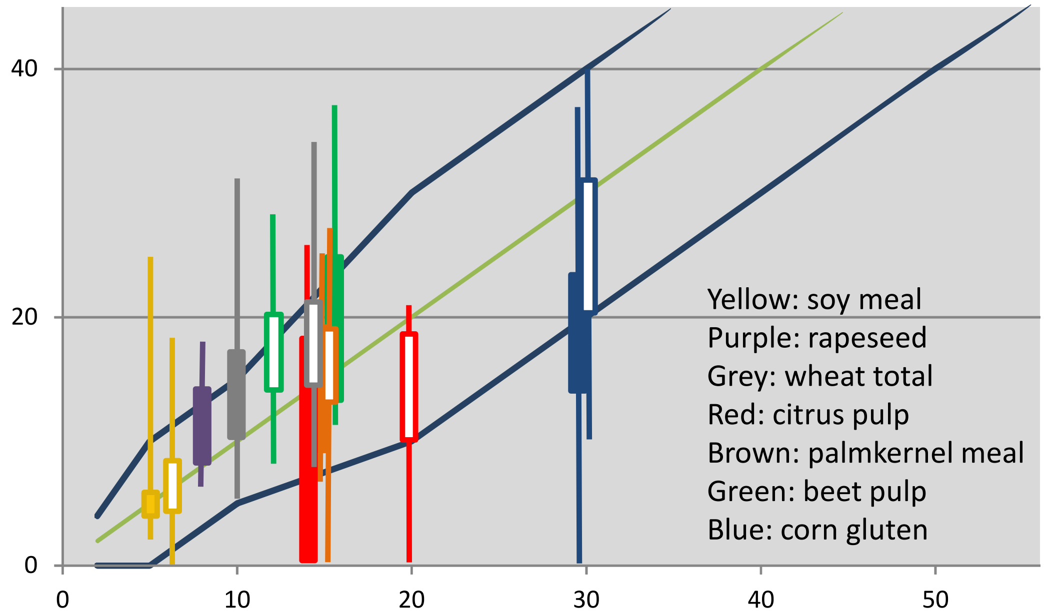

Figure 3 *The results of the IAG ring test composition 2016 (filled bars) and 2017 (white bars) projected on the uncertainty limits of the IAG model. X-axis: real share, Y-axis: estimated share. Bars: P_{25} – P_{75} percentile interval, vertical line: minimum – maximum range. N=25 (2016), n= 21 (2017, two outliers excluded).*

There are two aspects influencing the quality of the results of an analysis of botanic composition. In the past assessment of the biological composition of a feed was supported and, if necessary, adjusted by proximate analysis, of which Weende analysis is the classical approach (German: Weender Analyse; https://de.wikipedia.org/wiki/Futtermittelanalytik). Weende analysis, originally developed in the 19th century (Henneberg and Stohmann, 1859) provides information on basic chemical parameters: moisture, contents of ash, fat, protein and crude fibres. Since extensive information is available on the parameters of individual ingredients, the initial visually estimated shares of the several biological ingredients can be confirmed or optimized using this detail data. Currently several approaches exist for proximate analysis, such as Cornell Net Carbohydrate and Protein System (CNCPS), Van Soest and Near-Infrared Reflectance Spectroscopy, although these systems do not aim at the same set of

parameters (Bovera et al., 2003; Godoy et al., 2016). It needs to be stated that the sole visual analysis of the composition of a compound feed without complementary information lacks the possibility of confirmation and of adjustment, which might influence the precision of the final result. The second aspect is the level of expertise of the technician. A bias in the distribution of the errors as made in the current results, where half of the estimations outside the limits of the IAG uncertainty interval were made by two participants, allows to adjust the general overview. In some other situations a further evaluation of the level of expertise might be not possible. Because of this situation, a knowledge system for identification of ingredients of compound feeds could assist in composition analysis. Such a system should be able to document an identification as well.
A good process description consisting of necessary steps, sieve fractions, the necessary parameters to be established in every step and for every fraction, and the procedure for combining all data in a final conclusion, together with documentation on identifying feed ingredients could help to improve the method.

4.2 Label control

The last version of the IAG ring test on composition with label information was the 2014 version (van Raamsdonk et al., 2014). As in that previous version, the current results of the label control show that ingredients with a high share (wheat products: 44%, corn products: 27.5%) are on average underestimated, whereas ingredients with a lower share, especially oat husks (2.5%), are overestimated.
The final aim of label control is to conclude on the correctness of the label declaration. The correct label was assumed to be wrong in 25% of the cases. Considering that the one report of a correct label for sample 2017-D with incorrect declaration was not justified by a reported analysis, all indications of a wrong declaration were correct. In terms of specificity and sensitivity [1], this can be translated to five false positives and no false negative. The overestimation of the share of oat husks (45% of the participants) might have supported the correct indication of the wrong label declaration in all cases. In this unique case where pairs of estimation are available, the presence of false positives and of false negatives can be evaluated. The existence of false positives is generally considered as less serious compared to false negatives. In the current situation of label control, the incorrect assignment of a correct label as false would aid to focus on certain feed batches, especially in the framework of enforcement of prohibited substances, that might be traced to specific ingredients.

4.3 Justification for the establishment of composition

European legislation requires that feeds and feed materials are labelled according to a range of requirements, including composition. It has been stated that labelling serves enforcement, traceability and control purposes (Regulation (EC) 767/2009, pre-ambule 17).
There are several aspects in the monitoring of feed safety and security where the analysis of botanic composition is a major tool for enforcement:
- Label control (Regulation (EC) 767/2009).
- Traceability (Regulation (EC) 178/2002).
- Detection of fraud (Regulation (EC) 882/2004; Decision (EU) 2015/1918).

Feed materials should be mentioned in order of decreasing share, and additional information on composition should be available on request with uncertainty limits of +/- 15% (Regulation (EC) 767/2009, Article 17). It is not stated if this is a relative or absolute range. Annex IV of Regulation (EC) 767/2009 presents requirements for the labelling of basic parameters such as crude proteins, crude fibres, sugars, starch, oils and fats, minerals, moisture, crude ash and related parameters with a mix of absolute and relative ranges.

[1] This evaluation is based on the assumption that an incorrect label declaration is a presence of an unwanted situation. Justification of a presence is a false negative observation. On the other hand, considering the absence of an unwanted situation as a presence is a false positive observation.

A most important aspect is the possibility to redirect the presence of a prohibited substance to one of the ingredients or fractions. Knowledge of the ingredients in a compound feed eases the traceability of prohibited substances. The fractionation of a sample in a sediment and a flotate can help to pinpoint the presence of contaminants and might improve their traceability. A multidisciplinary approach for evaluating incidences in the area of feed and food safety is a major achievement.
Economic fraud can be based on the replacement of an expensive ingredient by a cheaper one. Another aspect is the possibility that ingredients not fit for animal consumption, i.e. due to mould infestation, can be mixed in compound feeds.
In a broader view, composition analysis in the entire food chain can improve the effect of monitoring actions. The new legislation on food labelling (Regulation (EC) 1169/2011), effective from December 13^{th} 2014, obliges to provide more detailed information to customers on composition and related topics.

5 General conclusions and recommendations

5.1 Conclusions

The current ring test was based on the analysis of a botanic composition without label information and additionally on the evaluation of two label declarations. Results were considered under- or overestimations when exceeding the limits of the IAG uncertainty interval model.
Two factors seems to influence the result of a composition analysis. Ingredients seems to be overestimated at lower shares, and specific ingredients are susceptible for underestimation at every level. Furthermore specific formulations can influence the precision of the estimation of the composition of the feed. The current results show a considerable improvement compared to last year, indicating that practicing can result in improvement of knowledge.
A new element was introduced this year. The participants were asked to verify a pair of labels (correct vs. wrong) which were based on the same formulation. The correct label was considered incorrect by five participants (25%), which can be indicated as false positive conclusions. The conclusion of an incorrect label was predominantly based on overestimation of one or a few ingredients. The incorrect label was indicated as such by all participants except one, whose conclusion was not based on a motivated analysis. In general false positives were considered less critical for food safety as false negatives. The current information on the capability of botanic composition analysis reveals that this technique is valuable as part of the enforcement of feed and food safety. Besides proper label control (Regulation (EC) 767/2009), composition analysis can support traceability (Regulation (EC) 178/2002) and used for detection of fraud (Regulation (EC) 882/2004; Decision (EU) 2015/1918).
The current lack of a complementary system for the analysis of chemical composition (ash, proteins, fat, dietary carbohydrates, fibres, etc.) could be a drawback for the overall approach of. Besides a proper method description and up-to-date descriptions of ingredients, well developed skills of technicians are vital for a good performance.

5.2 Recommendations

- A more detailed process description could help to optimise the method for establishing the composition of a compound feed.
- In the view of the need for proper means for identification, an expert system as tool for maintenance and dissemination of expertise may help to improve future performance.

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Annex 1 Basic instructions for the test procedure

IAG ring test 2017 composition

Instructions for the IAG ring test

1 You have received a box with an introduction letter and either three or four vials containing 50 grams of possibly contaminated animal feed. Please report the receipt of your package as soon as possible by E-mail to the address mentioned below. If subscribed, all four samples are meant for the analysis of animal proteins. Besides the one sample meant for composition analysis, two other samples are additionally meant for label control. The possibility to control the label information is included on request of IAG members. The numbers of these three samples are mentioned on the letter enclosed in the box. There are two separate report forms for composition analysis and for label control.

2 Analysis for composition is preferably carried out using method A2 of the IAG section Microscopy. Other methods, however, are allowed. Take care to homogenise the content of each vial before taking the amount for analysis.

Link to IAG method A2

3 The results need to be reported as percentual estimations on the tab “Results”. The organiser will apply the uncertainty intervals to your estimations as part of the evaluation. Reporting consists of the following steps:

3a Please fill in the questionnaire on the page “Procedure”.

Most of the cells contain a drop-down list. These lists can be used to select an answer as follows. When clicking on a cell, the cursor changes into a hand. A second click will open the drop-down list.

Your unique lab number is mentioned in the introduction letter.

All the fields with a drop-down list have to be completed.

3b Please enter your results in the fields at page “Results”. Your unique lab number automatically shows up after your have entered it at the page Procedure. Enter yourself the unique label of the vial.

4 After completing the two forms “Procedure” and “Results”, they have to be sent to the organisers in two ways:

4a Save the Excel file by using “Save as …”, add your unique lab code to the end of name (**replace the ## signs with your lab number**). The forms have to be sent by E-mail as Excel file and as a scan (*.PDF) to leo.vanraamsdonk@wur.nl and to nastasja.vanderhee@wur.nl.

4b Results will be included in the final evaluation and report only if both forms are sent in by electronic mail, and after the proper receipt of the requested fee.

5 Direct any questions to leo.vanraamsdonk@wur.nl

6 Closing date is May 5th, 2017.

RIKILT Wageningen UR, the Netherlands

Annex 2 Report form for procedure details

Please complete at least all the pink cells with a drop down list that apply to your procedure	select your choice from a drop down list	type in your answer if necessary
IAG ring test 2017 composition		
Please select your unique lab number	**-- select --**	
Have you read the ring test instructions?	-- select --	
Which detection method do you use?	-- select --	

Annex 3 Report forms results

Please complete the necessary pink cells for showing your composition of the ingredients; add your sample number, the sediment amount and the final conclusion on feed type.

IAG ring test 2017 composition

lab number	
sample number	
	estimated %
Total:	0.0
Final conclusion on feed type:	-- select --
Comment if necessary	

Signature:

Date: 6-5-2017

Please complete the necessary pink cells for showing your composition of the ingredients; add your sample number, the ingredients and their share, the final conclusion on feed type and the correctness of the label.

IAG ring test 2017 label control

lab number		
sample number		
ingredient:	estimated %	estimated %
Total:	0.0	0.0
Final conclusion on feed type:	-- select --	-- select --
Label correct:	-- select --	-- select --

Comment if necessary

Signature:

Date:

Annex 4 Additional instructions

Test 2017-B: botanic composition of sample: [ ]

The sample with the number indicated here ↑ is meant for the analysis of the botanic composition. Take care to homogenise the content of the vial before taking the amount for analysis. This sample will be used for two purposes: detection of animal proteins if you have subscribed to this ring test, and analysis of botanic composition.
The report form contains a series of empty rows where the ingredients can be entered in order of their share (highest share on top), together with your estimation of the share in percent in the second column. Finally you are requested to indicate the assumed target of the feed (e.g. broiler feed, calve feed).
All results can be entered in the report form with "composition" in the name.

Test 2017-B: additional samples for label control: [and]

The label control of two samples is additional to the test on composition, on request of the IAG members. The samples with the numbers indicated here ↑ and here ↑ are meant for the evaluation of the label information. Take care to homogenise the content of the vial before taking the amount for analysis. These samples will be used for two purposes: detection of animal proteins if you have subscribed to this ring test, and label control.
The report form "label" is meant for reporting the results of the label control. All declared ingredients are included in the report form, with additional lines for other ingredients in case the label appears to be incorrect.

Annex 5 List of participants

Austrian Agency for Health and Food Safety-AGES	Austria
FLVVT	Belgium
Danish Veterinary and Food Administration	Denmark
Inovalys-Nantes	France
Laboratoire Départemental d’Analyse & de Recherche	France
Bayerisches Landesamt fur Gesundheit und Lebensmittelsicherheit	Germany
BWZ der BFV	Germany
CVUA-RRW	Germany
Futtermittelinstitut Stade (LAVES)	Germany
Landesbetrieb Hessisches Landeslabor, Landwirtschaft und Umwelt	Germany
Landeslabor Berlin-Brandenburg	Germany
LLFG Landesanstalt für Landwirtschaft	Germany
LUFA Nord-West	Germany
LUFA-Speyer	Germany
SGS Germany GmbH	Germany
Veravis GmbH	Germany
Ministero delle politiche agricole alimentari e forestali, Laboratorio di Modena	Italy
Nutreco Nederland BV - Masterlab	Netherlands
Cargill Poland	Poland
Instytut Zootechniki PIB, Pracownia w Szczecinie	Poland
Laboratorio Agrario Reginal Castilla y Leon	Spain
Trouw nutrition Espana	Spain
Agroscope (ALP), Swiss Research Station	Switzerland

Annex 6 Results composition analysis

	correct	range:		lab: 1	2	4	6	7	10	11	12
wheat	7.0%	2.0%	12.0%			11.0%					10.0%
wheat semolina (and bran)	7.0%	2.0%	12.0%			10.0%					10.0%
wheat products				18.3%	20.0%		16.0%	8.0%	14.0%	17.0%	
wheat total	14.0%	7.0%	21.0%	18.3%	20.0%	21.0%	16.0%	8.0%	14.0%	17.0%	20.0%
corn total	30.0%	20.0%	40.0%	32.3%	10.0%	24.0%	30.0%	13.0%	24.0%	34.0%	40.0%
citrus pulp	20.0%	10.0%	30.0%	17.3%	15.0%	12.0%	15.0%	13.0%	18.0%	0.0%	0.0%
palmkernelmeal	15.0%	7.5%	22.5%	14.6%	15.0%	17.0%	11.0%	13.0%	15.0%	20.0%	12.0%
beet pulp	12.0%	6.0%	18.0%	8.0%	20.0%	20.0%	20.0%	28.0%	18.0%	9.0%	22.0%
soy meal	7.0%	2.0%	12.0%	6.1%	10.0%	4.0%	6.0%	18.0%	5.0%	8.0%	2.0%
minerals	2.0%	0.0%	4.0%	3.0%	5.0%	2.0%	2.0%	3.0%	3.0%	2.0%	
wheat DDGS											
wheat husks											
candy pulp											
rapeseed								<2%		2.0%	
pomace										8.0%	
potato								<2%			
blood meal											
saponified fatty acids											
molasses / fat									3.0%		
alfalfa											
barley							trace				
sunflower					5.0%		trace	<2%			
other											
	100%			100%	100%	100%	100%	96%	100%	100%	96%
Final conclusion on feed type				rum	rum	cattle	rum	rum	cattle	cattle	-
				-	IAG	own	VDLU-FA 30.4	IAG	own	IAG	IAG

	correct	range:	lab:	13	14	17	18	19	20	22	23
wheat	7.0%	2.0%	12.0%		5.0%					15.0%	
wheat semolina (and bran)	7.0%	2.0%	12.0%		11.0%					5.0%	
wheat products				20.0%		30.0%	23.0%	25.0%	11.5%		13.0%
wheat total	14.0%	7.0%	21.0%	20.0%	16.0%	30.0%	23.0%	25.0%	11.5%	20.0%	13.0%
corn total	30.0%	20.0%	40.0%	27.0%	31.0%	0.0%	30.0%	20.0%	31.5%	20.0%	21.0%
citrus pulp	20.0%	10.0%	30.0%	20.0%	13.0%	0.0%	12.0%	5.0%	18.8%	0.0%	21.0%
palmkernelmeal	15.0%	7.5%	22.5%	12.0%	15.0%	0.0%	14.0%	24.0%	15.5%	0.0%	19.0%
beet pulp	12.0%	6.0%	18.0%	9.0%	15.0%	0.0%	15.0%	14.0%	16.9%	25.0%	18.0%
soy meal	7.0%	2.0%	12.0%	8.0%	7.0%	20.0%	2.0%	8.0%	4.5%	2.5%	7.0%
minerals	2.0%	0.0%	4.0%	3.0%	3.0%	10.0%	3.0%		1.3%	2.5%	1.0%
wheat DDGS											
wheat husks											
candy pulp										30.0%	
rapeseed				trace		12.0%					
pomace											
potato											
blood meal						5.0%					
saponified fatty acids						10.0%					
molasses / fat						3.0%					
alfalfa							1.0%				
barley									<1%		
sunflower									<1%		
other								4.0%			
	100%			99%	100%	90%	100%	100%	100%	100%	100%
Final conclusion on feed type				-	cattle	pig	rum	pig	rum	cattle	-
				IAG	DM	own	IAG	IAG	IAG	own	IAG

	correct	range:		lab:	27	34	36	40	43	45	47
wheat	7.0%	2.0%	12.0%				11.0%	5.0%			
wheat semolina (and bran)	7.0%	2.0%	12.0%				6.0%	8.0%			
wheat products					17.0%	10.0%			22.0%	34.0%	18.8%
wheat total	14.0%	7.0%	21.0%		17.0%	10.0%	17.0%	13.0%	22.0%	34.0%	18.8%
corn total	30.0%	20.0%	40.0%		23.0%	20.0%	30.0%	20.0%	24.0%	17.0%	0.0%
citrus pulp	20.0%	10.0%	30.0%		0.0%	20.0%	12.0%	20.0%	18.0%	10.0%	0.0%
palmkernelmeal	15.0%	7.5%	22.5%		27.0%	15.0%	22.0%	15.0%	13.0%	15.0%	0.0%
beet pulp	12.0%	6.0%	18.0%		28.0%	15.0%	13.0%	20.0%	10.0%	15.0%	0.0%
soy meal	7.0%	2.0%	12.0%		5.0%	15.0%	3.0%	0.0%	9.0%	5.0%	0.0%
minerals	2.0%	0.0%	4.0%		2.6%	2.0%	3.0%		4.0%	4.0%	9.6%
wheat DDGS											25.9%
wheat husks											6.5%
candy pulp											
rapeseed								5.0%			33.6%
pomace											
potato						3.0%					
blood meal											
saponified fatty acids											
molasses / fat											
alfalfa											
barley					0.2%						
sunflower											
other											5.5%
	100%				103%	100%	100%	93%	100%	100%	100%
Final conclusion on feed type					-	cattle	-	rum	-	-	calf
					IAG	IAG	IAG	AOCS	IAG	IAG	IAG

Annex 7 Results label control

	correct	range:		sample number	66	278	16	28	167	68	126	228
				lab:	1	1	2	2	4	4	6	6
corn	25.0%	15.0%	35.0%									
corn DDGS	2.5%	0.0%	5.0%									
corn total	27.5%	17.5%	37.5%		29.5%	28.8%	20.0%	20.0%	24.0%	20.0%	31.0%	25.0%
sunflower meal	12.5%	6.3%	18.8%		11.4%	10.3%	10.0%	12.0%	16.0%	17.0%	12.0%	14.0%
soya meal	5.1%	0.1%	10.1%		8.3%	8.1%	10.0%	10.0%	5.0%	4.0%	5.0%	6.0%
rapeseed meal	5.1%	0.1%	10.1%		5.1%	6.2%	8.0%	5.0%	5.0%	6.0%	5.0%	6.0%
wheat	42.6%	32.6%	52.6%						34.0%	34.0%		
wheat semolina (and bran)	1.5%	0.0%	3.0%						11.0%	11.0%		
wheat products	44.1%	34.1%	54.1%		39.0%	39.9%	40.0%	35.0%			42.0%	44.0%
oat hulls	2.5%	0.0%	5.0%		5.0%	5.0%	10.0%	15.0%	4.0%	7.0%	3.0%	3.0%
minerals	2.3%	0.0%	4.6%		1.7%	1.6%	2.0%	3.0%	1.0%	1.0%	2.0%	2.0%
fish						0.1%	traces		trace			
MBM							traces					
					100%	100%	100%	100%	100%	100%	100%	100%
Final conclusion on label					yes	no	no	no	yes	no	yes	no

	correct	range:		sample number	186	258	86	239	136	8	206	188
				lab:	7	7	10	10	11	11	13	13
corn	25.0%	15.0%	35.0%									
corn DDGS	2.5%	0.0%	5.0%									
corn total	27.5%	17.5%	37.5%		23.0%	23.0%	25.0%	25.0%	21.0%	18.0%	25.0%	15.0%
sunflower meal	12.5%	6.3%	18.8%		13.0%	13.0%	10.0%	10.0%	14.0%	16.0%	12.0%	15.0%
soya meal	5.1%	0.1%	10.1%		8.0%	8.0%	7.0%	7.0%	9.0%	11.0%	7.0%	12.0%
rapeseed meal	5.1%	0.1%	10.1%		8.0%	8.0%	6.0%	6.0%	12.0%	13.0%	4.0%	3.0%
wheat	42.6%	32.6%	52.6%								47.0%	
wheat semolina (and bran)	1.5%	0.0%	3.0%									
wheat products	44.1%	34.1%	54.1%		43.0%	43.0%	45.0%	45.0%	29.0%	29.0%		40.0%
oat hulls	2.5%	0.0%	5.0%		3.0%	3.0%	5.0%	5.0%	11.0%	5.0%	3.0%	3.0%
minerals	2.3%	0.0%	4.6%		2.0%	2.0%	2.0%	2.0%	3.0%	4.0%	2.0%	3.0%
fish						trace				trace		
MBM												
pomace									1.0%	4.0%		
other												9.0%
					100%	100%	100%	100%	100%	100%	100%	100%
Final conclusion on label					yes	no	yes	no	yes	no	yes	no

	correct	range:		246	288	76	48	6	269	146	78
			lab:	14	14	17	17	19	19	20	20
corn	25.0%	15.0%	35.0%		20.0%						
corn DDGS	2.5%	0.0%	5.0%		7.0%						
corn total	27.5%	17.5%	37.5%	25.0%		15.0%	20.0%	25.0%	27.0%	26.1%	20.3%
sunflower meal	12.5%	6.3%	18.8%	13.0%	13.0%	10.0%	12.0%	16.0%	13.0%	10.1%	14.4%
soya meal	5.1%	0.1%	10.1%	6.0%	6.0%	6.0%	6.0%	5.0%	5.0%	4.0%	6.1%
rapeseed meal	5.1%	0.1%	10.1%	6.0%	6.0%	6.0%	7.0%	7.0%	9.0%	3.5%	5.9%
wheat	42.6%	32.6%	52.6%								
wheat semolina (and bran)	1.5%	0.0%	3.0%								
wheat products	44.1%	34.1%	54.1%	46.0%	40.0%	55.0%	30.0%	40.0%	39.0%	48.1%	45.8%
oat hulls	2.5%	0.0%	5.0%	3.0%	3.0%	6.0%	5.0%	5.0%	4.0%	7.0%	5.5%
minerals	2.3%	0.0%	4.6%	1.0%	1.0%	2.0%	2.0%	2.0%	3.0%	1.2%	2.0%
fish					1.0%						
MBM											
other					3.0%						
				100%	100%	100%	82%	100%	100%	100%	100%
Final conclusion on label						no	no	yes	no	yes	no

	correct	range:		336	38	266	308	36	318	156	238
			lab:	22	22	23	23	27	27	34	34
corn	25.0%	15.0%	35.0%							25.0%	10.0%
corn DDGS	2.5%	0.0%	5.0%								7.5%
corn total	27.5%	17.5%	37.5%	15.0%		20.0%	17.0%	20.0%	23.0%		
sunflower meal	12.5%	6.3%	18.8%	10.0%		9.0%	9.0%	7.0%	5.0%	15.0%	15.0%
soya meal	5.1%	0.1%	10.1%			8.0%	12.0%	5.0%	5.0%	7.5%	10.0%
rapeseed meal	5.1%	0.1%	10.1%	1.0%		2.0%	4.0%	16.0%	18.0%	5.0%	5.0%
wheat	42.6%	32.6%	52.6%					25.0%	21.0%		
wheat semolina (and bran)	1.5%	0.0%	3.0%					14.0%	17.0%		
wheat products	44.1%	34.1%	54.1%	65.0%		54.0%	52.0%			40.0%	35.0%
oat hulls	2.5%	0.0%	5.0%	6.0%		5.0%	4.0%	11.0%	10.0%	5.0%	5.0%
minerals	2.3%	0.0%	4.6%	1.0%		2.0%	2.0%	1.0%	1.0%	2.0%	3.0%
fish							trace				0.5%
MBM											
beet pulp								1.0%	1.0%		
not analysed					100.0%						
other											9.0%
				98%	100%	100%	100%	100%	101%	100%	100%
Final conclusion on label				no	yes	yes	no	no	no	yes	no

			sample number	166	339	216	98	356	218	7	138
	correct range:		lab:	36	36	40	40	45	45	47	47
corn	25.0%	15.0%	35.0%								
corn DDGS	2.5%	0.0%	5.0%								
corn total	27.5%	17.5%	37.5%	19.0%	22.0%	30.0%	20.0%	20.0%	10.0%	25.0%	22.0%
sunflower meal	12.5%	6.3%	18.8%	16.0%	15.0%	12.0%	16.0%	13.0%	14.0%	10.0%	23.0%
soya meal	5.1%	0.1%	10.1%	7.0%	9.0%	0.0%	0.0%	4.0%	9.0%	18.0%	0.0%
rapeseed meal	5.1%	0.1%	10.1%	4.0%	4.0%	3.0%	12.0%	7.0%	10.0%	5.0%	0.0%
wheat	42.6%	32.6%	52.6%			43.0%	22.0%				
wheat semolina (and bran)	1.5%	0.0%	3.0%			5.0%	20.0%				
wheat products	44.1%	34.1%	54.1%	44.0%	45.0%			50.0%	40.0%	35.0%	51.0%
oat hulls	2.5%	0.0%	5.0%	8.0%	4.0%	5.0%	3.0%	4.0%	5.0%	6.0%	
minerals	2.3%	0.0%	4.6%	2.0%	1.0%	2.0%	3.0%	2.0%	12.0%	1.0%	2.0%
fish							2.0%				
MBM											
other											2.0%
	99%			100%	100%	100%	98%	100%	100%	100%	100%
Final conclusion on label				yes	no	no	no	yes	no	yes	no

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RIKILT report 2017.011

To explore the potential of nature to improve the quality of life

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Report 2017.011

The mission of Wageningen University and Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to inding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 10,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.