Crude Fat Determination in Feed
according to the Randall method

Reference:

ISO 11085:2015 Cereals, cereals-based products and animal feeding stuffs -- Determination of crude fat and total fat content by the Randall extraction method

Tested with **VELP Scientifica SER 158/6 Solvent AutoExtractor** (Code S303A0380)

Introduction

Fat is an important nutrient in feed rations for cattle, pig, poultry, sheep, horse and pet foods, as a high energy feed ingredient. Fats and oils, contain about 2.25 times as much digestible energy as the carbohydrates in grain. They are very concentrated sources of energy when added to animal feeds to increase the energy density of the ration. Adding fats and oils will reduce the dustiness of feeds, and reduce 'fines' in pelleted diets, adding desirable characteristics which have value. Fats and oils can also improve a ration by improving palatability. In particular, cow nutrition is dependent upon adequate energy, protein, vitamins and minerals in a balanced diet, but research is showing that fat content in a cow's diet can enhance rebreeding success.

The results here presented obtained with VELP SER158 are part of the **proficiency testing program organized by BIPEA**. The SER 158 results have been compared with the BIPEA expected results and were fully in line with BIPEA tolerance range.

Crude Fat determination in feed

Hot solvent extraction process with SER 158 Series can be summed up in 5 steps, for a fully unattended operation:

STEP 1 IMMERSION	→	STEP 2 REMOVING	→	STEP 3 WASHING	→	STEP 4 RECOVERY	→	STEP 5 COOLING

During IMMERSION the sample is immersed in boiling solvent. Then the REMOVING step automatically lowers the level of the solvent to below the extraction thimble. During WASHING the condensed solvent flows over the sample and through the thimble to complete the extraction process. The fourth step involves solvent RECOVERY. Approximately 90% of the solvent used is collected in the internal recovery tank. The final step is the COOLING of the extraction cups containing the extracted matter. The cups are raised to prevent burning. The extraction cups containing the extract are placed in a drying oven, cooled in a desiccator and weighed for the extract percentage calculation.

BIPEA Samples

Feed for piglet	ID: 12-1513-0207	Crude fat assigned value: 6.7 %	Tolerance range: 6.1–7.3 %
Fish meal	ID: 10-0313-0190	Crude fat assigned value: 6.9 %	Tolerance range: 6.3–7.5 %
Laying hen feed	ID: 15-2413-0052	Crude fat assigned value: 3.4 %	Tolerance range: 2.8–4.0 %
Turkey feed	ID: 10-3613-0231	Crude fat assigned value: 2.8 %	Tolerance range: 2.2–3.4 %

Chemicals and Equipment Required

- Grinder
- Analytical balance, 4 decimal place
- Glass extraction cups (Code A00000290)

- Extraction thimbles (33x80 mm) (Code A00000295)
- Viton seals
- Petroleum Ether 40 – 60 °C as solvent

Sample Preparation

Grind the sample, reducing particle size to 0.75 -1 mm.
Fix the Extraction thimbles with the Extraction thimbles holders (Code A00000312) and weigh 3 g of sample (*Sample*) directly in the VELP extraction thimbles, placed on the balance.

Glass Extraction Cups Preparation

Position the empty extraction cups in a drying oven (105 °C) for 1 hour and cool them in a desiccator to room temperature. Connect the optional Velp barcode reader (Barcode scanner with USB socket code: A00000364 or Wireless barcode scanner Code: A00000365) to SER 158. Select Analysis/Details, scan the extraction cups and weigh the tare (*Tare).* The extraction cups containing the thimbles can now be placed on the ultra-fast heating plate of SER 158.

Extraction Procedure with SER 158

Select "Analysis" on the ControlPad and then method "Crude fat in feed" including the following parameters:

- Immersion Time: 25 minutes
- Removing Time: 10 minutes
- Washing Time: 55 minutes
- Recovery Time 30 minutes
- Cooling Time: 4 minutes
- Petroleum Ether 40-60 °C, 100 ml

Close the safety guard and add the solvent using the automatic solvent dispensing system SolventXpress™ to minimize exposure to the solvent ensuring operator safety.

Press START to begin the extraction process. At the end of analysis position the extraction cups containing the extract in a drying oven (1 hour at 105 °C), cooled them in a desiccator to room temperature. In Results menu select the extraction cups batch ID analyzed, press calculate, scan the extraction cups with barcode reader and weigh (*Total*).

Results on BIPEA Feed samples

Analysis results are calculated automatically and stored in the ControlPad when entering the weights into the software (manually or automatically through a balance). The extract percentage calculation is performed by using the following formulas:

$$Extract\ (g) = (Total - Tare)$$
$$Extract\ (\%) = Extract \times 100 / (Sample)$$

Where:

Sample = sample weight (g)
Tare= weight of the empty extraction cup (g)
Total = weight of the extraction cup + extract (g)

Sample name	Tare (g)	Sample (g)	Total (g)	Extract (g)	Extract (%)
Feed for piglet	134.1359	3.0308	134.3363	0.2004	6.61
	133.5234	3.0330	133.7269	0.2035	6.71
	133.8042	3.0263	134.0079	0.2037	6.73
				Average ± SD%	**6.68 ± 0.06**
				RSD% *	**0.95**
Fish meal	133.8927	3.0105	134.1009	0.2082	6.92
	133.6175	3.0197	133.8273	0.2098	6.95
	132.9321	3.0292	133.1441	0.2120	7.00
				Average ± SD%	**6.95 ± 0.04**
				RSD% *	**0.60**
Laying hen feed	134.1314	3.0095	134.2337	0.1023	3.40
	132.9316	3.0157	133.0325	0.1009	3.35
	138.5382	3.0684	138.6420	0.1038	3.38
				Average ± SD%	**3.38 ± 0.03**
				RSD% *	**0.81**

Turkey feed	135.7200	3.0031	135.8093	0.0893	2.97
	138.1092	3.0113	138.1994	0.0902	3.00
	140.0642	3.0085	140.1552	0.0910	3.02
				Average ± SD%	**3.00 ± 0.03**
				RSD% *	**0.86**

* RSD% = (Standard Deviation x 100) / Average

Conclusion

The results obtained are reliable and reproducible in accordance with the expected values, with a low relative standard deviation (RSD < 1%), that means high repeatability of the results. Therefore, SER 158 Solvent AutoExtractor is ideal for the crude fat determination in feed in accordance with ISO 11085:2015 Method.

Benefits of hot solvent extraction (Randall) by using SER158 Automatic Solvent Extractor:

- up to 5 times faster than Soxhlet (hot solvent vs. cold solvent)
- low solvent consumption (high solvent recovery, approximately 90%) - limited cost per analysis
- no exposure to solvent
- worldwide official method
- full traceability with automatic result calculation and on-board archive
- Cloud connectivity to **VELP Ermes** ensuring software updates, real time monitoring and control, notifications and enhanced service support.