Method for the Determination of palm kernel Stone Shells in Animal Feedingstuff, IAG-Method A7

International Association of Feedingstuff Analysis
Section Feedingstuff Microscopy

1. Objective and field of application

The method is used for both qualitative and quantitative determination of stone shells (ligneous endocarp of palm seeds) in animal feedingstuff.

2. Principle

Stone shells are determined by the macroscopic and microscopic identification of characteristic stone cells of palm kernel residues. Quantification is done by weighing the amount of identified stone shell fragments with particle size > 0.5 mm.

3. Reagents

3.1 Mounting medium

3.1.1 Chloral hydrate (ß = 60 %)

3.1.2 Water

The reagents listed may be replaced by others which produce comparable results.

4. Equipment and accessories

4.1 Optical equipment

4.1.1 Stereo microscope (up to 70x magnification); recommended additional equipment: image support system

4.1.2 Compound microscope (up to 400x magnification); recommended additional equipment: polarization, phase contrast, image support system

4.1.3 Magnifier (up to 10x magnification)

4.2 Mortar and pestle

4.3 Sieves (supporting document (9))

4.4 Analytical balance (accuracy 0.001 g)

4.5 Additional laboratory equipment is listed in supporting document (9)

4.6 Reference material

5. Procedure

Pelleted feedingstuff has to be roughly crushed before analysing (4.2). Qualitative determination is performed macroscopically and microscopically considering the stone shell fragments in all sieve fractions. Quantitative determination is performed by selecting and weighing the stone shell fragments >0.5mm found in the laboratory sample or an aliquot of it.

5.1 Preparation of the laboratory sample

Non-pelleted or roughly crushed laboratory sample (approximately 10 g) is weighed (4.4) and fractionated by density according to the supporting document (9.) using water for separation by slurrying (8.1). Stone shell particles will be found in the sediment. After drying the sediment it is fractionated by particle size (8.2) according to the supporting document (9). The weight of each fraction is recorded (4.4).

5.2 Identification of stone shells

Stone shells are identified based on their characteristic features. The identification of stone shells may be facilitated through comparison with reference material (4.6) and existing descriptions (10).

Stone shells accumulate after oil production from palm fruits (ligneous endocarp) and therefore can occur in oil seed residues used as feedingstuff.

Morphology: Stone shells consist of a hard 2 - 3 mm thick endocarp layer of stone cells. The colour is mostly brown-black, sometimes reddish-brown. The surface is more or less distinctly nerved and shows a matted fatty gloss.

5.3 Quantification of the stone shell fragments

Quantification of stone shell fragments is performed using the sieve fractions > 0.5 mm deriving from the sediment. Material identified as stone shell fragments is selected and weighed. An aliquot of the sieved fractions may be used if necessary.

The weight of the stone shell fragments determined in the different sieve fractions is summarized and recorded as mg stone shell fragments/kg feedingstuff (6.1).

6. Calculation and report

6.1 The amount of stone shell fragments in mg/kg (ppm) of feedingstuff (original sample) is calculated using the following formula:

$$\mathbf{C} = \frac{\mathbf{BC \times 1000}}{\mathbf{E}} \text{ [mg/kg]}$$

C = amount of component in mg/kg (ppm) feedingstuff

BC = selected fragments of component in the laboratory sample or an aliquot of it [mg]

E = total weight of the laboratory sample or an examined aliquot of it [g]

6.2 Report

6.2.1 Negative result:

As far as was discernible using a microscope stone shells of palm kernel were not found in the submitted sample.

6.2.2 Positive result:

As far as was discernible using a microscope x mg/kg (ppm) fragments of stone shells of palm kernel were found in the submitted sample. For quantification stone shell fragments > 0.5 mm are considered.

6.2.3 Possible supplement to the report:

The sieve fraction > 0.5 mm amounts to x mg/kg (ppm) of the laboratory sample.

7. Validation

Not applicable.

8. Remarks

8.1 Separation by water as separation fluid is done according to the supporting document (9 5.3.3.2 - separation by slurrying).

8.2 Fractionating by particle size is done according to the supporting document (9 5.3.1).

8.3 This method has been developed by the International Association of Feedingstuff Analysis (IAG) – Section Feedingstuff Microscopy.

9. Supporting document

Sample Preparation for the Macroscopic and Microscopic Analysis, IAG-Method A1

10. Literature

- FREUND, H. (ED.), 1976: Handbuch der Mikroskopie in der Technik. Band VIII: Mikroskopie der Nahrungs- und Futtermittel, der Drogen und Genußmittel. Umschau-Verlag, Frankfurt/ Main
- GASSNER, G.; HOHMANN, B. und DEUTSCHMANN, F., 1989: Mikroskopische Untersuchung pflanzlicher Lebensmittel. 5. Auflage, Gustav Fischer-Verlag, Stuttgart, New York, 66-70
- HAHN, H. und MICHAELSEN, L., 1996: Mikroskopische Diagnostik pflanzlicher Nahrungs-, Genuß- und Futtermittel, einschließlich Gewürze. Springer-Verlag, Berlin, Heidelberg, New York

- HUß, W., 1969: Methode zur Bestimmung von Hülsen, Spelzen und Schalen. In: Tagungsprotokoll der Internationalen Arbeitsgemeinschaft für Futtermitteluntersuchung, Sektion Futtermittelmikroskopie, Münster (als Manuskript gedruckt)
- HUß, W., 1970: Quantitative Bestimmung von Schalen, Hülsen, Spelzen in Pressfuttermitteln. In: Tagungsprotokoll der Internationalen Arbeitsgemeinschaft für Futtermitteluntersuchung, Sektion Futtermittelmikroskopie, Maastricht (als Manuskript gedruckt)
- MALKOMESIUS, E.; NEHRING, K.; CLAUS, G. und KUMMER, H., 1951: Die Untersuchung von Futtermitteln. In: Handbuch der landwirtschaftlichen Versuchs- und Untersuchungsmethodik (Methodenbuch, Band III, 2. Auflage, Hrsg. R. Herrmann), Neumann-Verlag, Radebeul und Berlin
- MEZAROS, L. und DEUTSCHMANN, F., 1975: Atlas für die Mikroskopie von Nahrungsgrundstoffen und Futtermitteln. Teil I: Ölsaaten und deren Verarbeitungsrückstände. In: Handbuch der landwirtschaftlichen Versuchs- und Untersuchungsmethodik (VDLUFA-Methodenbuch, Bd. XI, Hrsg. L. Schmitt), Verlag Neumann-Neudamm, Melsungen
- RÖZSE, E., 2005: Atlas of Feed Microscopy. Part II: The Examination of Non-desired Materials in Feed. Budapest
- VÖHRINGER, H., 1997: Leitfaden für die Futtermittel-Qualitätskontrolle durch Mikroskopie. Hoffmann-La Roche, 3. Fassung, Wien