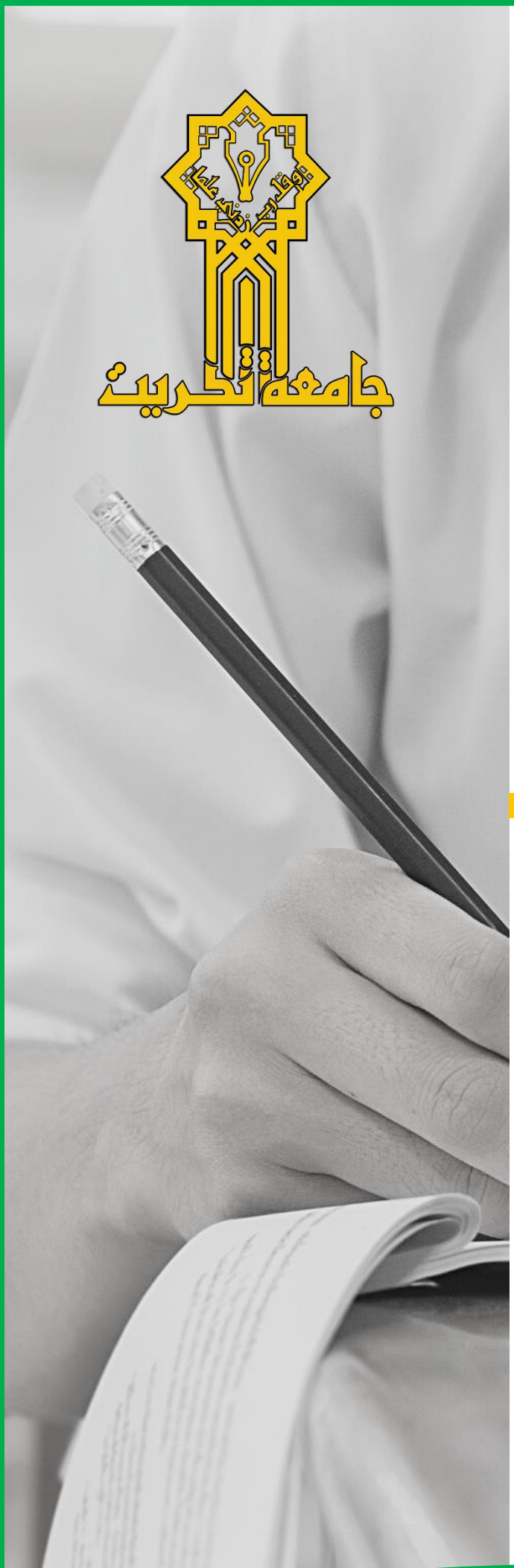

Tikrit University
College of Veterinary Medicine

Lecture Title:
Determination of Ash in Feedstuffs

Subject name: Animal Nutrition

Subject year: Second Year

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Determination of Ash in Feedstuffs

Definition:
Ash is defined as the inorganic residue that remains after burning a feedstuff sample at **600 °C** in a muffle furnace.

During incineration in the muffle furnace, all **organic matter** of the feed sample is completely oxidized, leaving behind inorganic minerals (ash). However, ash may sometimes contain **non-feed contaminants** such as stones, gravel, glass pieces, dust, debris, or sand (silica).

Note: In concentrate feed samples, the percentage of ash should not exceed **10%**; otherwise, the sample may be considered adulterated.

Apparatus

- Porcelain or silica crucibles (preferred over metal cans due to their high heat tolerance).
- Muffle furnace (capable of maintaining 500–600 °C).
- Desiccator.
- Analytical balance (digital scale).

Experimental Procedure

1. **Preparation of the crucible**
    - Place a clean, labeled crucible in the muffle furnace at **500–600 °C** for one hour.
    - Transfer it to a desiccator for cooling.
    - This step sterilizes the crucible and removes any adhering debris.
2. **Weighing before ignition**
    - Weigh the cooled crucible on a digital balance and record the weight (**W1 = weight of empty crucible**).
    - Add **0.5 g** of finely ground feed sample. Record the combined weight (**W2 = weight before burning**).
3. **Ashing process**
    - Place the crucible with the sample in the muffle furnace at **500–600 °C** for three hours.

- The temperature must be raised gradually to avoid **spattering**, which is the ejection of sample particles caused by sudden heating.

4. **Cooling after ignition**
    - After incineration, partially cool the crucible outside the furnace, then place it in a desiccator until completely cooled.
    - Weigh the crucible with ash and record (**W3 = weight after burning**).
    - The crucible containing the ash can be preserved for silica determination.

Note: If the ash percentage exceeds **15%**, the feed sample is regarded as adulterated.

Calculations

1. Weight of sample (Ws) = W2 – W1
2. Weight of ash (Wa) = W3 – W1
3. Percentage of ash $=\frac{Wa}{Ws} \times 100$
4. Percentage of organic matter = Percentage of dry matter – Percentage of ash

Example

A **2 g** sample of ground corn was incinerated in the muffle furnace at **500 °C** for three hours. After burning, the weight of ash was **0.1 g**. The percentage of dry matter of the sample is **95%**.

Solution:

Percentage of ash = Wa/Ws ×100

$$\frac{0.1}{2} \times 100 = 5\%$$

Percentage of organic matter = 95 - 5 = 90 %

Flowchart: Determination of Ash in Feedstuffs

Step 1: Preparation of Crucible

Clean crucible → Heat in muffle furnace at 500–600 °C for 1 hr → Cool in desiccator → Weigh (W1).

Step 2: Sample Weighing

Add 0.5 g of feed sample → Weigh crucible + sample (W2).

Step 3: Ignition (Ashing Process)

Place the crucible in the muffle furnace (500–600 °C) for 3 hrs. Gradual heating to prevent spattering.

Step 4: Cooling & Final Weighing

Partially cool crucible → Transfer to desiccator → Weigh crucible + ash (W3).

Step 5: Calculations

- Weight of sample (Ws) = W2 – W1
- Weight of ash (Wa) = W3 – W1
- % Ash = (Wa / Ws) × 100
- % Organic matter = % Dry matter – % Ash

Note:

- In concentrates, ash should not exceed **10%**.
- If ash > **15%**, sample may be considered adulterated.