



Tikrit University
College of Veterinary Medicine

Lecture Title: **Determination of Silica from Ash of Feedstuffs**

Subject name: Animal Nutrition

Subject year: Second Year

Lecturer name: Dr. Thamer Ahmed –

Dr. Ali Qaeas

Academic

Email: thamer.a.k.@tu.edu.iq

Determination of Silica from Ash of Feedstuffs

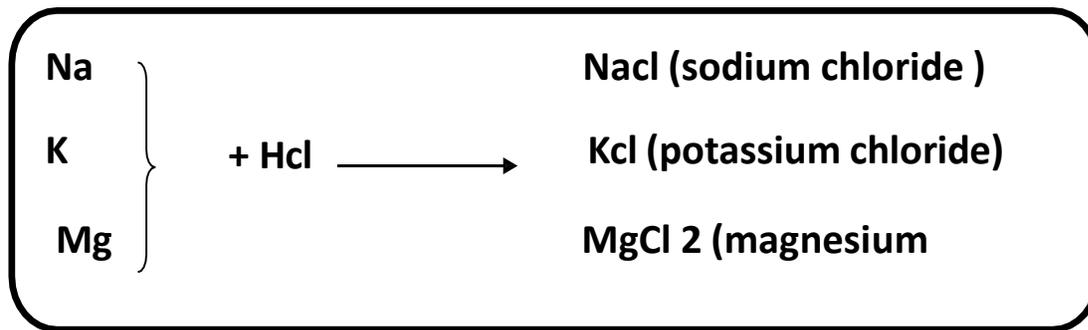
Definition:

Silica is defined as a collection of foreign mineral substances of non-feed origin. These substances are sometimes added deliberately for commercial adulteration. Silica may include sand, soft stones, and dust. Its presence in feedstuffs may also result from poor storage conditions.

Determination of silica content is important when ash content is high, as it may serve as an indicator of adulteration. Excessive silica in feedstuffs reduces their nutritive value and may damage animal health due to irritation of the mucous membranes lining the digestive tract.

The estimation of silica is performed on the ash obtained from burning feedstuffs by treating it with hydrochloric acid (HCl). Both concentrated and diluted HCl are used to separate dietary-origin minerals (converted into chlorides) from foreign mineral matter such as silica.

Note: If the percentage of silica exceeds **10%**, the sample is considered adulterated.



Experimental Procedures

1. Record the weight of an empty crucible (as described in the previous laboratory).
2. Record the weight of the original feedstuff sample.
3. Add **1 ml of concentrated HCl** carefully to the crucible containing ash. Place a metallic tray under the crucible to avoid spillage. Dry the crucible and contents in an oven for 20 minutes.
4. Add **diluted HCl** (prepared by mixing three parts water with one part concentrated HCl) in small portions to the ash. Stir continuously with a glass rod to homogenize the mixture and break down lumps.

5. Filter the mixture through a Büchner funnel. Wash the residue with distilled water (preferably lukewarm) to facilitate filtration. This helps dissolve and draw soluble chlorides into the filtrate.
6. Place the crucible with the residue in a muffle furnace at **500–600°C** for 20 minutes, then cool and weigh.

Calculations

1. Weight of empty crucible = W_1
2. Weight of original sample = W_2
3. Weight of crucible + silica residue after treatment and burning = W_3
4. **Weight of silica:**

$$W_{\text{silica}} = W_3 - W_1$$

5. **Percentage of silica** = $\frac{\text{weight of silica}}{\text{weight of sample}} \times 100$

$$\% \text{ Silica} = \frac{W_{\text{silica}}}{W_{\text{sample}}} \times 100$$

Weight of silica

Example

The weight of the feedstuff sample is (1.6g). after burning the sample in a muffle furnace, the weight is (0.4g). the remaining ash is treated with hydrochloric acid and is burned. The weight after burning is (0.2g). estimate the percentage of ash and silica in the sample. Is the sample is cheat?

- Weight of feedstuff sample = **1.6 g**
- Weight after burning (ash) = **0.4 g**
- Weight of residue after acid treatment and burning (silica) = **0.2 g**

Percentage of ash:

$$\text{Ash}\% = 0.4 / 1.6 \times 100 = 25\%$$

Percentage of silica:

$$\text{Silica}\% = 0.2 / 1.6 \times 100 = 12.5\%$$

Since silica exceeds 10%, the sample is **adulterated**.

Preparation of Ash Extract from Feedstuff Samples

After removing silica and other foreign matter, the filtrate obtained during the acid treatment contains all dietary-origin mineral elements. This filtrate is diluted to **100 ml** with distilled water using a volumetric flask.

The resulting solution is suitable for determination of mineral elements by:

- **Chemical methods**, or
- **Instrumental methods** such as **atomic absorption spectrophotometry (AAS)** and **emission spectrophotometry**, depending on the specific element being analyzed.

