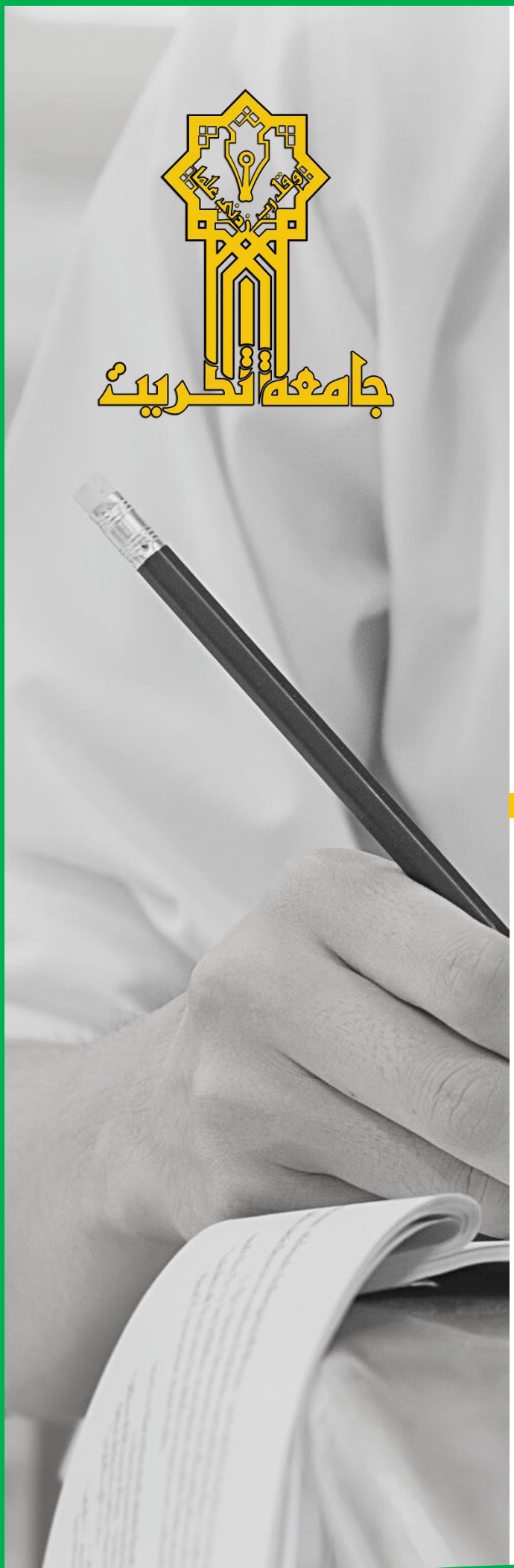

Tikrit University
College of Veterinary Medicine

Lecture Title:
Determination of crude fibers in feedstuffs

Subject name: Animal Nutrition

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Determination of crude fibers in feedstuffs.

Crude fibers are defined as the part of the carbohydrate of the feedstuff that cannot be digested by digestive juices. Also, crude fibers do not analyze at their treatment with hot acids and alkalines of a certain concentration for a limited time. Also, crude fibers are those parts of the vegetable or plant cell walls that cannot be analyzed by enteric enzymes, and it is so-called "non-soluble carbohydrates.

The benefits of crude fibers are greater in non-ruminant animals such as cattle and sheep because it is a bulky substance, causing " physiological satisfaction". In the case of animals having a single stomach, " mono-gastric animals" such as poultry, the benefits of crude fibers are limited. Crude fibers consist basically of three basic constituents which are cellulose, hemicellulose, and lignin. These compounds vary according to the types of plants, and these ratios are different among plants forming feedstuff.

The purpose of crude fiber determination is to evaluate the nutritional value of feedstuffs. The high percentage of crude fiber of the feedstuff refers to the worse on nutritional value. Also, the determination of crude fibers is useful in the judgment of the probability of adulteration in concentrated feedstuffs. The technique followed in the determination of crude fibers is that devised by the German scientists viz., Raulenberg, Stohmann, and Henneberg in 1864, with some alterations and modifications.

The basic thought of determination depends on the treatment of feedstuffs with a solution of (1.25% concentration) of acid and alkaline solutions, as well as boiling for half an hour. There are some important points that should be followed for the determination of crude fibers of a feedstuff sample:

1. The feedstuff sample should be finely ground to facilitate the reaction of chemicals with the fractions of the sample. •

2. Extraction of the fat from the feedstuff sample should be carried out first, and before the determination of crude fibers of the sample, to facilitate digestion and filtration processes. The presence of fat within the feedstuff sample creates the formation of a layer that closes the pores during the filtration process. •

3. If the sample contains a high percentage of moisture, partial drying of the wet sample should be done.

The required preparations:• 1. (5%) sulphuric acid, this concentration can be prepared by dissolving (50ml) of the acid in (1liter) of distilled water or (25ml) of the acid in (500ml) of distil water. • 2. (5%) NaOH Sodium hydroxide: This alkaline can be prepared by dissolving (50 gm.) of the alkaline in (1 liter) of distilled water or (25 gm.) of the alkaline in (500 ml) of distilled water.

Procedures of the experiment: • 1. The sample is taken from the filter paper (for the determination of crude fat). • 2. The weighed sample is conveyed into a graduate flask (beaker) of 400ml

3. Fifty ml of (5%) sulphuric acid solution is added to the flask. The volume is completed to 200ml with hot distilled water. So, the concentration of the sulphuric acid becomes (1.25%). It is known that when the volume is increased by four times, the subsequent concentration will be diluted by four times too.

4. The flask with its contents is put on a heat source till boiling. The solution is lifted for about half an hour from the time of boiling, and the volume of the solution should be stable at 200ml by the continuous addition of hot distilled water. In this process, proteins are digested and disposed of.

5. The solution is filtered using a Buchner funnel and a clean piece of cloth (gauze). The sediment is washed by warm distilled water. The sediment is returned to the same flask using a spatula.

6. Fifty milliliters of sodium hydroxide solution (5%) is added. The volume is completed to 200ml with hot distilled water. The addition of distilled water dilutes the concentration of the alkaline" sodium hydroxide" to 1.25%. The solution is left on the heat source until boiling and be kept and lift for a total of half an hour from the time of boiling. The purpose of this process is to dispose of the carbohydrates.

7. The solution is filtered using a Buchner Funnel and a clean piece of cloth of linen type. The sediment is washed with hot distilled water to dispose of traces of the alkaline material.

8. The sediment is conveyed into a dry, clean, and labeled glass crucible in which it is desiccated at 150C° for half an hour. Then, the crucible is cooled and is weighed.

9. The glass crucible is put in the muffle furnace at 600 °C for an exact hour. Then, it is pulled, cooled, and weighed.

Question: • At the boiling point with the acid, it takes a complete half an hour, as well as noticing the stability of the volume at (200ml) exactly?

Answer: • If the period of time exceeds exactly half an hour, some parts of the fibers will be digested. • If the period of time is less than exactly half an hour, some parts of the protein will be (remain in the sample. • If the volume exceeds 200ml, the concentration will be less than 1.25% and some parts of the protein will remain. • If the volume decreases by less than (200ml), the concentration will exceed more than 1.25% and part of the fibers is digested.

In all cases, the findings will be erroneous. In this context, the same is corresponding with the treatment with the alkaline NaOH 5% concentration

Calculations :

1. Weight of the original sample (known from the previous practical laboratory on fat determination subject).
2. Weight of crude fibers = weight of crucible with its contents before burning – weight of crucible it its contents after burning.
3. The percentage of crude fibers =

$$\frac{\text{Weight of crude fibers}}{\text{---------------------------------------}} * 100$$

Weight of original sample

Notebook: If there is an increase in the crude fibers of the sample of the concentrated ration of more than 20%, it is regarded as an " adulterated sample".

Example: (homework) • The weight of the feedstuff sample is (2.1gm). The crude fiber determination processes were carried out. the crucible with its contents was put in the oven, then it was weighed, which was recorded as (23.2 g). The crucible was burning in the muffle furnace, and the weight after burning is (22.8 gm.) • Estimate the percentage of crude fibers.