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- **Determination of percentage of Soluble carbohydrates in feedstuffs**

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Soluble carbohydrates or nitrogen free extract (N.F.E) is regard as important energy sources of the animal body. Soluble carbohydrates are characterized by high solubility and digestibility. The animal body can easily utilize from those compounds as source of energy



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- **Methods of determination of soluble carbohydrates:**
- **First: The chemical method:-**
 - This method is regarded as an accurate method but it is rather expensive.



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- In this method, multiple chemical compounds are used or the application of an enzyme "amylase". This method is principally based on the conversion of soluble carbohydrates into their simplest forms "Glucose".



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- Later, the percent of glucose in the solution can be determined according to the concentration of colors. The variation of color can be compared with a standard solution containing known quantity of glucose. This measurement is reflected by a technique called chromatography, as shown in the following figure.



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- **Second: The calculation method:**

- This method depends on the determination and finding the percentages of the rest of the feed compounds of the sample and then the subtraction from (100). It can be calculated in the following method:

- The percent of soluble carbohydrates = $100 - (\% \text{ moisture} + \% \text{ crude protein} + \% \text{ ash} + \% \text{ crude fibers} + \% \text{ crude fat})$.



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- The drawbacks of application this method is that it chiefly depends on the determination of the percent of other feedstuffs compounds, so if there is any error in determination of any feedstuff compound, there will be error in estimation of calculated soluble carbohydrates.



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- **The expression of results on the basis on dry matter**
- After the completion of determination of all nutritional compounds, we have got results . (as fed basis). It means that the results of chemical analysis depends on the natural conditions of the type of the matter. However, customs followed in local and international nutrition tables is to include the results on dry matter basis after disposal of moisture and omission.



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- Method of " on dry matter basis" determination:

If it is supposed that the percentage of nutritional compounds of certain feedstuff sample as fed basis is as follows:

Nutritional compounds	Percentage (%)
Moisture	5
Crude protein	20
Ash	15
Crude fiber	10
Crude fat	5
Soluble carbohydrates	45
Total	100%



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- At first: dry matter percentage is estimated = $100 - \%$
moisture =

$$100 - 5 = 95\%$$

in this case, the on dry matter bases the percentage of
moisture = zero

So on dry matter basis = $100 - \text{moisture}\%$

$$= 100 - \text{zero} = 100\%.$$



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- The percentage of the rest or remaining of nutritional compounds is estimated as follows:

- $$\frac{\text{crude protein (\%)}}{20} \quad \frac{\text{dry matter}}{95}$$

- $$X \quad 100 \quad X = \frac{20 * 100}{95} = 21.05\%$$

- $$\frac{\text{Ash (\%)}}{15} \quad \frac{\text{dry matter}}{95}$$

- $$X \quad 100 \quad X = \frac{15 * 100}{95} = 15.78\%$$



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- $\frac{\text{crude fiber (\%)}}{10} \quad \frac{\text{dry matter}}{95}$

- X 100

$$X = \frac{10 * 100}{95} = 10.52\%$$

- $\frac{\text{crude fat (\%)}}{5} \quad \frac{\text{dry matter}}{95}$

- X 100

$$X = \frac{5 * 100}{95} = 5.26\%$$

- $\frac{\text{soluble carbohydrates (\%)}}{45} \quad \frac{\text{dry matter}}{95}$

- X 100

$$X = \frac{45 * 100}{95} = 47.36\%$$



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- Also, the percentage of carbohydrates can be estimated by other method:
- = $100 - (0 + 12.05 + 15.78 + 10.52 + 5.26)$
- = $100 - 52.61 = 47.39$
- The organic matter (As fed basis)
- = $\text{dry matter (\%)} - \text{ash (\%)}$
- = $95 - 15$
- = 80%



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- $\frac{\text{organic matter (\%)}}{80} = \frac{\text{dry matter}}{95}$
- $X = 100 \quad X = \frac{80 * 100}{95} = 84.21 \%$
- Or) The organic matter (on dry matter basis)
- = 100 - ash %
- = 100 - 15.78
- = 84.22%