Package 'FishProxCompAnalyzer'

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Type Package

Title Proximate Composition Analysis of Fish and Feed Ingredients

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Description The proximate composition analysis is the quantification of main components that constitutes nutritional profile of any food and food products including fish, shellfish, fish feed and their ingredients. Understanding this composition is essential for evaluating their nutritional value and for making informed dietary choices. The primary components typically analyzed include; moisture/ water in foods, crude protein, crude fat/ lipid, total ash, fiber and carbohydrates AOAC(2005,ISBN:0-935584-77-3). In case of fish, shellfish and its products, the proximate composition consists of four primary constituents - water, protein, fat, and ash (mostly minerals). Fish exhibit significant variation in their chemical makeup based on age, sex, environment, and season, both within the same species and between individual fish. There is minimal fluctuation in the content of ash and protein. The lipid concentration varies remarkably and is inversely correlated with the water content. In case of fish, carbohydrates are present in minor quantity so that are quantified by subtracting total of other components from 100 to get percentage of carbohydrates.

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Contents

`CrudeFat` *Crude Fat Content measurement in Percentage*

Description

The fat content in fish and shellfish varies widely. Lean fish might contain as little as 1-2% fat, while fatty fish can have up to 20% or more. Shellfish generally have moderate fat content. The fats present include beneficial omega-3 fatty acids (e.g., EPA and DHA) which are known for their cardiovascular benefits.

Fat from dried sample is extracted using Soxhlet apparatus where fat is extracted repeatedly using petroleum ether. The fat, except phospholipids, is soluble in hot petroleum ether and extracted. The extracted crude fat is quantified gravimetrically. Fat content of moisture free sample is determined by extracting the fat with a suitable solvent (diethyl ether or petroleum ether with boiling point of 40 to 60 0C) using Soxhlet apparatus. The solvent is removed from the extract by evaporation and residue is weighed and reported as fat AOAC(2005,ISBN:0-935584-77-3).

Usage

```
CrudeFat(Final_wt_flask_plus_fat, Sample_wt, Empty_flask_wt)
```

Arguments

`Final_wt_flask_plus_fat`	Final weight of flask plus fat
`Sample_wt`	Weight of sample taken for fat extraction
`Empty_flask_wt`	Empty flask weight

Value

Crude Fat Content in Percentage

References

AOAC (2005). Official Method of Analysis of the Association of Analytical Chemists, 18th Edition, AOAC, Washington DC; Method 945.16.

Examples

```
CrudeFat (111.222, 1.8780, 111.1674)
```

CrudeFiber *Crude Fiber Content Measurement in Percentage*

Description

Fiber is not a specific compound, but a mixture of plant components such as lignin, cellulose, hemi cellulose, pentoses and other components that are generally indigestible to fish. Practical diets will contain 3-6% crude fiber and addition of fiber is unlikely to have any significant benefits. Because fiber is indigestible, it adds to faecal matter and increases the BOB in culture system. Crude fiber is estimated by igniting the dried residue remaining after refluxing with 1.25% H2SO4 and 1.25% NaOH solutions under specific conditions. Crude fiber is determined gravimetrically after chemical digestion and solubilization of another materials present. The fiber residue weight is then corrected for ash content after ignition AOAC(2005,ISBN:0-935584-77-3).

Usage

```
CrudeFiber(Dry_wt_residue, Ash_Wt, Sample_wt)
```

Arguments

Dry_wt_residue	Dry weight of residue
Ash_Wt	Weight of ash in the sample
Sample_wt	Weight of the sample

Value

Crude Fiber Content in Percentage

References

AOAC (2005). Official Method of Analysis of the Association of Analytical Chemists, 18th Edition, AOAC, Washington DC; Method 962.09

Examples

```
CrudeFiber (3.5, 3.47, 4)
```

`CrudeProtein` *Crude Protein Content measurement in Percentage using Kjeldahl Method*

Description

Fish and shellfish are excellent sources of high-quality protein. The protein content can range from 15% to 25% of their weight. This protein is rich in essential amino acids that are crucial for human health.

The nitrogenous compound in the sample is converted in to ammonium sulfate following digestion with concentrated sulfuric acid. The ammonia from the formed ammonium sulfate is liberated upon distillation with excess alkali. The liberated ammonia is absorbed in boric acid solution and titrated with a standardized acid for determination of nitrogen content. The nitrogen content is multiplied by a sample-specific protein factor (6.25 for fish products) to obtain the protein content. The Kjeldahl method for determining total nitrogen involves, first heating with concentrated sulphuric acid in a long-necked digestion flask. The reaction rate is accelerated by adding Sodium or potassium sulphate to raise the boiling point from 324 to 400 0C. Carbon and hydrogen of the organic matter are oxidized to CO2 and H2O. A part of H2SO4 is simultaneously reduced to SO2 which in turn reduces nitrogenous material to NH3. The NH3 combines with H2SO4 and remains as (NH4)2SO4. After making alkaline with concentrated NaOH solution, the ammonia is distilled and absorbed in boric acid as ammonium borate. Ammonia is titrated in the standard acid AOAC(2005,ISBN:0-935584-77-3).

Usage

```
CrudeProtein (TV, SWTD, SVMAD, SVTD)
```

Arguments

`TV`	Titration value
`SWTD`	Weight of sample taken for digestion
`SVMAD`	Volume of sample madeup after digestion
`SVTD`	Volume of sample taken for distillation

Value

Crude Protein Content in Percentage

References

AOAC (2005). Official Method of Analysis of the Association of Analytical Chemists, 18th Edition, AOAC, Washington DC; Method 968.06

Examples

```
CrudeProtein (4.81, 1.5,50,5)
```

`Moisture` *Moisture Content in Percentage*

Description

Fish and shellfish have high water content, often ranging from 60% to 85%. This high water content affects the texture and shelf life of these foods.

The principle of the thermo-gravimetric method of moisture content determination is defined as the weight loss of mass that occurs as the material is heated. The sample weight is taken prior to heating and again after reaching a steady-state mass subsequent to drying. Determination of moisture is made by drying the sample at elevated temperature. Moisture content/ water content in percentage from the food product can be determined by simple hot air oven drying method by estimating weight difference between weight of the sample before drying and after drying AOAC(2005,ISBN:0-935584-77-3).

Usage

```
Moisture (Init_wt_plate_plus_sample, Final_wt_plate_plus_sample, Empty_plate_wt)
```

Arguments

`Init_wt_plate_plus_sample`	Initial weight of petriplate and sample before drying
`Final_wt_plate_plus_sample`	Final weight of petriplate and sample after drying
`Empty_plate_wt`	Weight of empty petriplate

Value

Moisture Content in Percentage

References

AOAC (2005). Official Method of Analysis of the Association of Analytical Chemists, 18th Edition, AOAC, Washington DC; Method 950.46

Examples

```
Moisture(115.10, 99.46, 95.11)
```

TotalAsh *Total Ash Content Measurement in Percentage*

Description

Total Ash represents the mineral content of the food. The ash content can provide insights into the mineral composition, including important minerals such as calcium, phosphorus, potassium, and magnesium.

When a known weight of organic matter is ignited to ash, the weight of ash thus obtained is determined gravimetrically and expressed in terms of percentage. Heating is carried out in 2 stages, to remove the water present and finally ashing at 550-600 °C in a muffle furnace. The objective of determining the ash in fish is to have an idea of the mineral content of fish. The general method for determining the total ash involves gently igniting the contents first and then at 550 °C in muffle furnace until the white ash is obtained AOAC(2005,ISBN:0-935584-77-3).

Usage

```
TotalAsh (IWCS, FWCS, WEC)
```

Arguments

IWCS	Initial weight crucible plus sample before ashing
FWCS	Final weight crucible plus sample after ashing
WEC	Weight of empty crucible

Value

Total ash in Percentage

References

AOAC (2005). Official Method of Analysis of the Association of Analytical Chemists, 18th Edition, AOAC, Washington DC; Method 923.03

Examples

```
TotalAsh(60.24,58.35, 58.18)
```

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