

Ash, or mineral matter, is used in the formation of bone, and is therefore of importance in feeding young growing stock. The high value of oats in feeding young animals is due to the fact that oats are especially rich in mineral matter, and are therefore good bone formers, while it is well known that an exclusive grain ration of corn is injurious to young stock, simply because corn is deficient in ash.

Protein contains nitrogen, and is concerned in the formation of flesh, muscle, blood, milk, hair, wool, horn, etc., and, probably to some extent fat. It may also supply heat and mechanical force, enabling the animal to do work. By work is meant any kind of muscular exertion.

Fat undergoes combustion in the body, producing heat which is necessary to create mechanical force. It is also stored up in the body as fat, to be used when required. Thus fat animals can live a long time without food, the fat that has been stored up supplying heat.

Carbohydrates are concerned chiefly in the production of heat and fat. They form the largest part of vegetable foods.

If an animal is fed upon protein alone, it cannot live long, but will become sickly and die in a comparatively short time. Protein is also more expensive than carbohydrates, and therefore it is a wasteful practice to feed more protein than is necessary. At the same time, in order to obtain the best results, a certain amount of protein is necessary, as is also a certain amount of fat; and the object of the feeder is to compound a ration which contains these three substances (protein, carbohydrates and fat) in the most suitable proportions. Such a ration is called a "balanced ration."

The relation which the digestible protein bears to the digestible carbohydrates and fat is called the "nutritive ratio" of a fodder. Thus, if we say that the nutritive ratio of a fodder is 1:7, we mean that there is one part of digestible protein to seven parts of digestible fat and carbohydrates.

The value of a fodder depends upon its composition and its digestibility. No fodders are entirely digestible, though roots and milk are very nearly so. We cannot therefore determine the nutritive ratio of a fodder from its composition only, but we must know what portion of each constituent is digestible.

The only basis upon which the different nutrients can be compared is in respect to their capacity for producing heat. In the production of heat, fat has about 2.2 times the value of carbohydrates; therefore, if we multiply any given amount of fat by 2.2, the product will represent the amount of carbohydrates which the given amount of fat is equal to. By some the fat is multiplied by 2.5, and by others by 2.29, or 2.3, but the factor 2.2 may be regarded sufficient for all practical purposes.

If we wish to find the nutritive ratio of a fodder, we must first find the digestible nutrients which it contains. Then the amount of fat is multiplied by 2.2 to express the amount of carbohydrates that it is equal to. The product thus obtained is then added to the amount of carbohydrates, which gives the total

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