

## **RATION FORMULATION**

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- A ration is the feed allowed for a given animal during a period of 24 hours. The feed may be given at a time or in portions at intervals.
- Ration formulation is a process by which different feed ingredients are combined in a proportion necessary to provide the animal with proper amount of nutrients needed at a particular stage of production.
- It requires the knowledge about
  - Nutrients
  - Feedstuffs
  - Animal
- in the development of nutritionally adequate rations. When consumed in sufficient amount will provide the optimum level of production at a reasonable cost.
- The ration formulated should be palatable and should not cause any serious digestive disturbance or toxic effects to the animal.
- The nutrient requirements can be arrived using feeding standards.
- The list of commonly available feeds in that region should be prepared.
- The nutritional value of the feeds can be obtained from any standard source such as NRC.
- Using the above information rations can be prepared by several methods that include
  - Pearson Square Method
  - Two-by-two Matrix method
  - Trial and Error Method and
  - Linear Programming (LP)

### **Factors to be considered in ration formulations**

- Acceptability to the animal - The ration formulated has to be palatable.
- Digestibility - The nutrients in the feed should be digestible and released into the gastrointestinal tract to be utilized by the animal. Rations with high fiber content cannot be tolerated by poultry and swine.
- Cost - The requirement of the animal can be met through several combinations of feed ingredients. However, when the costs of these ingredients are considered, there can only be one least-cost formulation. The least-cost ration should ensure that the requirements of the animal are met and the desired objectives are achieved.

- Presence of anti-nutritional factors and toxins. The presence of anti-nutritional factors in the feed affects the digestion of some nutrients and makes them unavailable to the animal. The inclusion of these feed ingredients should therefore be limited in the formulation.
- Other factors that should be considered are texture, moisture and the processing the feed has to undergo.

### **DIGESTIBILITY**

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- It is the portion of the feed or nutrient present in the feed that is not excreted in feces by the animal.
- Digestibility can be determined by feeding experiments
- It is usually expressed as
  - Digestible nutrient
  - Digestibility coefficient
- There are various factors that affect feed digestibility.
- They may be grouped as
  - Feed factors
  - Animal factors

### **FEED FACTORS**

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- The most important feed factors that affect digestibility of feed are feed composition, ration composition and preparation of the feed.
  - *Feed composition:* The digestibility of a feed is closely related to its chemical composition. Other feeds, particularly fresh and conserved herbage show variation in composition and therefore vary more in digestibility. The crude fiber fraction of feed has greater influence on its digestibility and both the amount and chemical composition of the crude fibre are important. If the lignin content in crude fibre is more it reduces the digestibility of the feed. Lignin content of any plant tissue increases with maturity.
  - *Ration composition:* The digestibility of feed is influenced not only by its own composition, but also by the composition of other feeds consumed with it. This is known as associative effect. Associative effect of feeds represents a serious

problem on the determination of the digestibility of concentrates by difference method.

- *Preparation of feeds:* Feed preparation also influences its digestibility. The commonest treatment applied to the feeds are chopping or chaffing, crushing or grinding and cooking. chopping or chaffing roughages increases their surface area and hence increases their digestibility. In order to obtain maximum digestibility cereal grains should be crushed for horses and ground for pigs and poultry: otherwise they may pass through the gut intact. Feed processing such as pelleting and extrusion cooking also enhances feed digestibility.

### **ANIMAL FACTORS**

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- The most important animal factors that affect digestibility of feed are the species, age, physiological and health status of the animal and level of feeding:
  - *Species:* There is a wide variation in the digestion of feed according to the species of animals. Hind gut fermenting animals like horses are able to digest fibrous feeds better than poultry and Swine.
  - *Age:* In the young animals the digestive system is not fully functional especially with regard to secretion of enzymes, hence they are not able to digest feed as that in adults.
  - *Physiological and health status of the animal:* Animals in advanced stages of pregnancy are not able to digest feed due to the pressure and suffering exerted by the gravid uterus on the gastrointestinal tract. Sick animals especially those suffering from diseases of gastrointestinal tract have reduced capacity to digest feed.
  - *Level of feeding:* An increase in the quantity of feed eaten by an animal generally causes a faster rate of passage of digesta. The food is then exposed to the action of digestive enzymes for a shorter period, so that there may be reduction in its digestibility.