ANALYTICAL TECHNIQUES IN ANIMAL NUTRITION

The book **"Analytical Techniques in Animal Nutrition"** deals with regular and routine techniques in Animal Nutrition and associated disciplines to meet the requirements of students of Under Graduate (UG) and Post Graduate (PG) programmes in nutrition, together with the professionals working in the nutrition laboratories in different research institutes as well as feed compounding industry. In this book, efforts have been made to cover a wide range of topics encompassing right from establishment of Animal Nutrition Laboratory, precautions to be taken in the laboratory, requirements for various materials for different types of laboratories, sampling, preservation, preparation of standard solutions and chemical analysis of biological materials (feed, blood, urine, milk, etc.) for different parameters, fractionation of fibre and measuring gross energy. The book also contains well-documented nutrition related glossary for ready reference. The language of the book is very simple and lucid.

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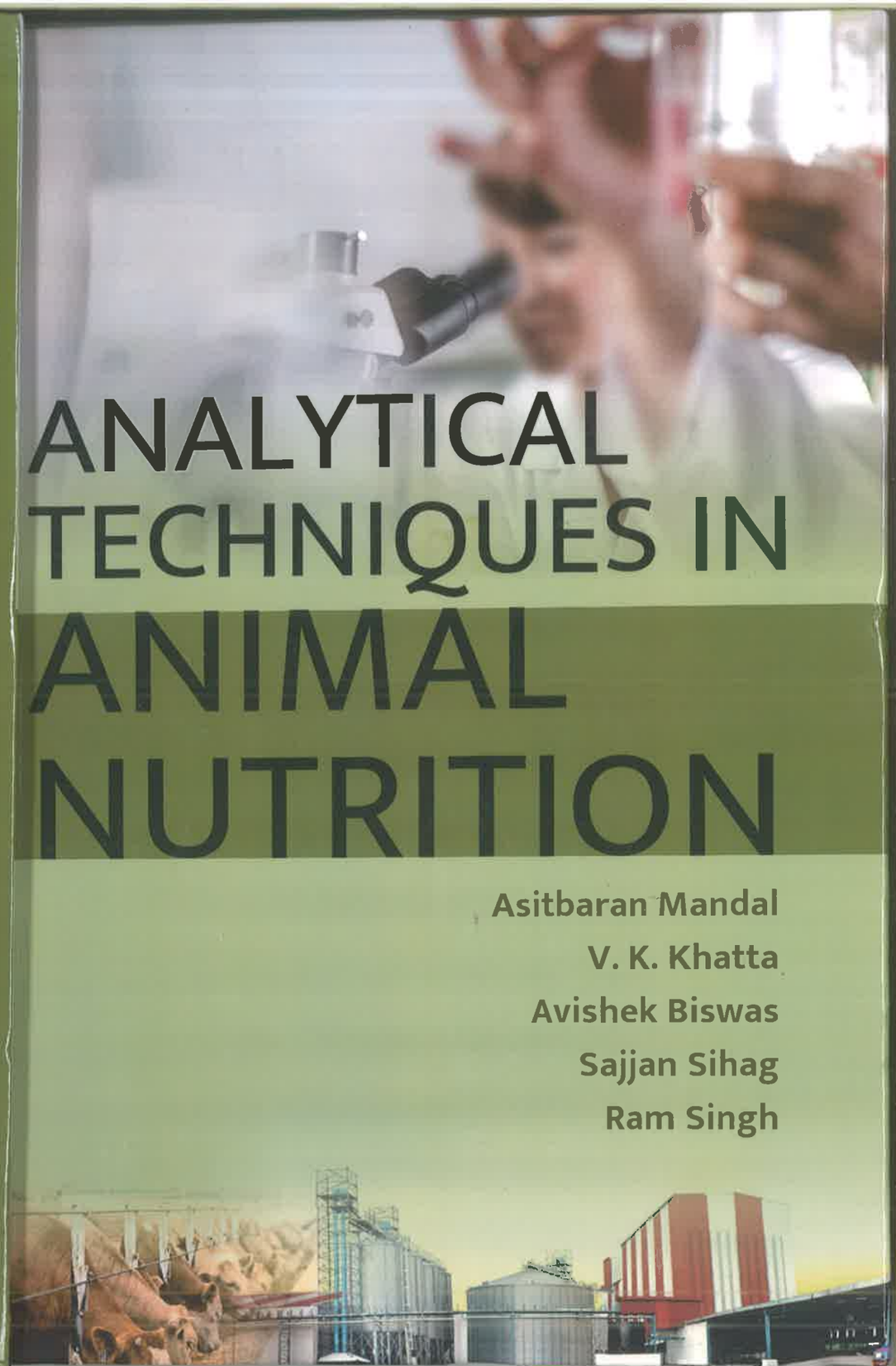

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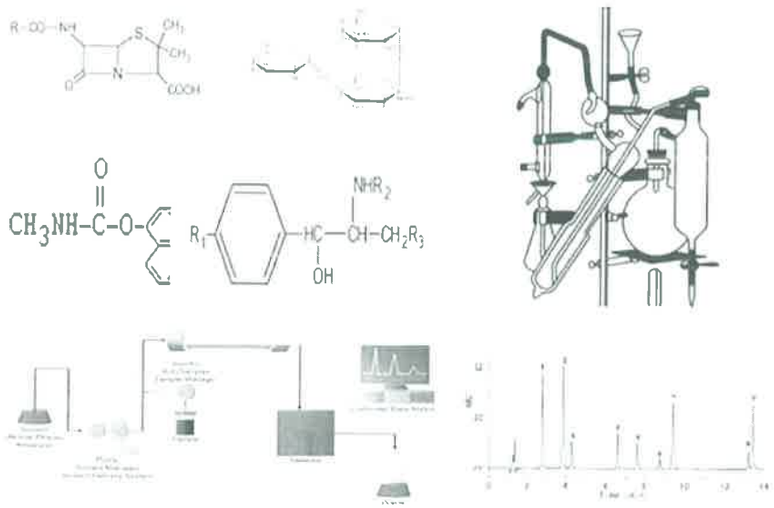

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Preface

Animal Nutrition is an integrated science of Chemistry, Biochemistry, Biotechnology, Physiology, Microbiology and other allied subjects which deals with the nature of nutrients and establishes their role in metabolism and health. The assessment necessitates analysis of a variety of biological materials, such as feed, faeces, urine, body tissues, fluids, etc. The analytical techniques involved in Animal Nutrition needs to be well-documented to meet the requirements of Under Graduate (UG) and Post Graduate (PG) students of nutrition, together with professionals in the nutrition and research workers of Animal Nutrition and associated disciplines including feed compounding industry. In this manual efforts have been made to cover a wide range of topics encompassing right from establishment of Animal Nutrition laboratory and requirements for various materials for different types of laboratories, sampling, preservation, preparation of standard solutions and chemical analysis of biological materials through routine estimation of fibre fractions and gross energy. It also includes estimation of implicating /toxic factors in various unconventional feeds. Methods of conducting digestion and metabolism trials and assessment of *in vitro* nutrient digestibility have been dealt with sufficient details. Detail analysis of blood, milk, and certain aspects of urine and determination of body composition are incorporated, as they are required to be analyzed as supportive parameters in various experimental studies. The manual also contains 2 appendices tables and well-documented nutrition related glossary. The mentioned methods in the manual are prepared by experienced Scientists, Teachers and Research Workers in their respective fields, keeping in view for easy adaptation.

The contributors of various topics would like to express their gratitude to various authors and establishment, as mentioned, from which they have been drawn and tried in the respective laboratories. Constructive suggestions from the users for further improvement of the manual will be highly appreciated.

Authors

General Instructions

Some instructions for working in the laboratory are given here and the students are advised to read these carefully before they begin their work in the laboratory:

1. Apparatus to be used should be neat and clean.
2. For pipetting, rubber bulb should be used invariably.
3. The small amount of liquid remaining in the pipette should not be blown out in standardizing the pipettes; allowance is always made for this. However, a frosted ring near the top of recently manufactured pipettes, indicates that the last drop is to be blown out.

   Drainage time of various pipettes

Capacity (ml)	2	10	20	25	50
Approximate time of drainage (sec)	10	20	28	30	35

4. Most of the measuring devices are made up of glass which has a small temperature coefficient, e.g. a soft glass vessel will lead to a change in volume by about 0.003 per cent per degree change in temperature; with heat resistant glass, the change is about one-third of this. As a general rule, the heating of calibrated equipment should be avoided. Rapid cooling can change the glass structure and causes change in volume.

Laboratory Safety

1. Laboratory should be well-ventilated and fitted with exhaust fans for effective removal of fumes.
2. Use apron and other devices like gloves, goggles, etc. depending upon the material to be handled.
3. Do not add water to acids. Keep acid off skin and protect eyes from spattering. If acids are spilled on the skin, wash off immediately with tap water. Gaseous nitrogen oxides from HNO_3 can cause severe lungs damage. Copious flow of fumes is there, when both concentrated HNO_3 and HCl are mixed together.
4. If acid falls on clothes, neutralize the same with few drops of dilute ammonia solution or some other weak alkali solution.

5. If acid spills on the floor or on the table, neutralize it with some weak alkali and wipe off with duster.
6. If you happen to suck acid into your mouth during pipetting, wash your mouth quickly with water and then rinse with a weak solution of washing soda. It is, however, not a substitute for medical or hospital attention. A doctor should be summoned at the earliest, while the treatment is being given.
7. In case of alkali burns, flush the area with water and apply dry sterilized dressing. However, in case of acid burns, wash the area with weak solution of sodium carbonate and then apply dressing.
8. In case of electric shock, switch off the current or free the person, using any non- conducting object. Check the breathing and treat the burns, as suggested above.
9. Use fume hood to protect against any type of fumes.
10. Avoid use of equipments for purposes other than intended.

Cleaning Laboratory Wares

Since accuracy of results depends, among other things, upon cleanliness of glassware and to ensure this, do glassware washing by following proper procedure.

Never allow any biological material to dry out in glassware. Also, discard the contents of the test tube carrying reaction material immediately after the experiment and rinse the same with tap water and then leave for washing. Transfer glassware rinsed with sufficient water to a trough carrying a detergent solution. Then, it should be extensively rinsed with tap water followed by further rinsing with distilled water.

If a grease film remains after cleaning with detergent, a cleaning solution consisting of sodium or potassium dichromate in concentrated sulphuric acid may be used. After this rinsing is necessary in order to remove the last traces of dichromate ions, which adhere strongly to glass or porcelain surface.

Preparation of Cleaning Solution

Mix 10 to 15 g of potassium dichromate with about 15 ml of water in a 500 ml conical flask. Add concentrated sulphuric acid slowly and stir to bring the mass into solution.

Note:

1. Cleaning solution should be discarded, when it acquires green colour of chromium ions.
2. Cleaning solution is most effective, when warmed up to about 70°C. At this temperature, it rapidly attacks plant and animal matter and, thus it is potentially a dangerous preparation.
3. Spillage, if occurs, should be cleaned with water.

Disposal of Chemical and Other Wastes

Small quantities of reagent chemicals may be washed down the sink with plenty of water. However, chemicals, such as acids and alkalis should be neutralized first before washing them down the sink. For proper disposal of other waste, such as broken glass, filter papers, etc. proper bins should be used.

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