

# CONTENTS

PAGE

## CHAPTER I: INTRODUCTION AND REVIEW OF LITERATURE

|      |                                                                                                  |    |
|------|--------------------------------------------------------------------------------------------------|----|
| 1.   | INTRODUCTION.....                                                                                |    |
| 2.   | REVIEW OF LITERATURE.....                                                                        | 3  |
| 2.1. | Biological availability to chicks of manganese from different inorganic sources .....            | 3  |
| 2.2. | Manganese absorption as affected by dietary level and source of manganese and other factors..... | 7  |
| 2.3. | The role of manganese in bone formation.....                                                     | 9  |
| 2.4. | Manganese and perosis.....                                                                       | 11 |
| 2.5. | Manganese and lipid metabolism.....                                                              | 14 |
| 2.6. | Manganese and egg production.....                                                                | 15 |
| 2.7. | Effect of dietary manganese on chick performance .....                                           | 16 |

## CHAPTER II: MATERIALS AND METHODS..... 19

|        |                                          |    |
|--------|------------------------------------------|----|
| 3.     | MATERIALS AND METHODS.....               | 19 |
| 3.1.   | Experimental design .....                | 19 |
| 3.2.   | Experimental birds .....                 | 20 |
| 3.3.   | Experimental rations .....               | 20 |
| 3.4.   | Management and Allocation of chicks..... | 24 |
| 3.5.   | Digestibility trials .....               | 25 |
| 3.6.   | Analytical methods.....                  | 26 |
| 3.6.1. | Moisture .....                           | 26 |
| 3.6.2. | Ash.....                                 | 27 |
| 3.6.3. | Crude fiber.,.....                       | 27 |
| 3.6.4. | Ether extract.....                       | 27 |

|         |                                                                       |    |
|---------|-----------------------------------------------------------------------|----|
| 3.6.5.  | Crude protein.....                                                    | 27 |
| 3.6.6.  | Nitrogen free extract.....                                            | 27 |
| 3.7.    | Determination of faecal nitrogen.....                                 | 28 |
| 3.8.    | Calculation of urinary organic matter .....                           | 28 |
| 3.9.    | Calorific value.....                                                  | 28 |
| 3.10.   | Slaughter test and meat analysis.....                                 | 29 |
| 3.11.   | Blood sampling.....                                                   | 30 |
| 3.12.   | Determination of manganese .....                                      | 30 |
| 3.13.   | Biological assay for manganese of different<br>manganese sources..... | 31 |
| 3.14.   | Methods of interpreting results.....                                  | 32 |
| 3.14.1. | Average live body weight.....                                         | 32 |
| 3.14.2. | Average live body weight gain.....                                    | 32 |
| 3.14.3. | Growth rate .....                                                     | 33 |
| 3.14.4. | Feed intake.....                                                      | 33 |
| 3.14.5. | Feed conversion.....                                                  | 33 |
| 3.14.6. | Mortality rate.....                                                   | 33 |
| 3.15.   | Economical efficiency of production.....                              | 34 |
| 3.16.   | Statistical analysis.....                                             | 34 |

#### **CHAPTER III : RESULTS AND DISCUSSION**

|        |                                                                    |           |
|--------|--------------------------------------------------------------------|-----------|
| 4.     | <b>RESULTS AND DISCUSSION.....</b>                                 | <b>35</b> |
| 4.1.   | Evaluation of the experimental rations.....                        | 35        |
| 4.1.1. | Proximate analysis.....                                            | 35        |
| 4.1.2. | Digestibility coefficients.....                                    | 37        |
| 4.1.3. | Energy metabolizability of different<br>experimental rations ..... | 41        |

|                                    |                                                                                                                                            |            |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 4.1.4.                             | Nitrogen metabolism.....                                                                                                                   | 42         |
| 4.2.                               | Effect of manganese source and level on the<br>performance of Hubbard broiler chicks.....                                                  | 43         |
| 4.2.1.                             | Average live body weight.....                                                                                                              | 43         |
| 4.2.2.                             | Live body weight gain.....                                                                                                                 | 46         |
| 4.2.3.                             | Feed Intakke .....                                                                                                                         | 49         |
| 4.2.4.                             | Feed conversion.....                                                                                                                       | 51         |
| 4.2.5.                             | Effect of treatments on the growth rate of<br>growing chicks.....                                                                          | 52         |
| 4.3.                               | Effect of manganese source and level on blood<br>manganese level.....                                                                      | 56         |
| 4.4.                               | Effect of source and level of dietary manganese<br>on manganese concentration of tissues and<br>bone ash percentage of broiler chicks..... | 59         |
| 4.5.                               | Manganese retention as affected by dietary<br>manganese source and level.....                                                              | 68         |
| 4.6.                               | Leg scores and abnormalities as affected by<br>manganese source and level.....                                                             | 71         |
| 4.7.                               | Effect of treatments on slaughter characteristics..                                                                                        | 74         |
| 4.8.                               | Effect of dietary manganese source and level on<br>the economic efficiency of the experimental<br>rations.....                             | 78         |
| <b>SUMMARY AND CONCLUSION.....</b> |                                                                                                                                            | <b>82</b>  |
| <b>REFERENCES.....</b>             |                                                                                                                                            | <b>90</b>  |
| <b>APPENDIX.....</b>               |                                                                                                                                            | <b>101</b> |
| <b>ANALYTIC SUMMARY .....</b>      |                                                                                                                                            |            |

## LIST OF TABLES

| Table No. | Page                                                                                                                                                                            |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | Chemical analysis of tested manganese sources..... 21                                                                                                                           |
| 2         | Composition and chemical analysis of basal ration..... 22                                                                                                                       |
| 3         | Minerals content of basal ration..... 23                                                                                                                                        |
| 4         | Digestibility coefficients of nutrients, nitrogen<br>balance and energy metabolizability of the experimental<br>treatments..... 38                                              |
| 5         | Average live body weight, total body weight gain, total<br>feed intake and feed conversion of the different<br>treatments at the end of 8 weeks of age..... 47                  |
| 6         | Growth rate values of chicks of different treatments..... 54                                                                                                                    |
| 7         | Effect of manganese source and level on blood manganese<br>content at 4 and 8 weeks of age..... 57                                                                              |
| 8         | Effect of dietary manganese source and level on bone<br>ash (%) and tissue manganese concentration [ppm] of<br>chicks at 4 and 8 weeks of age ..... 62                          |
| 9         | Relative biological availability of manganese sources based<br>on linear regression analysis of tissue manganese with<br>respect to dietary manganese at 8 weeks of age..... 65 |
| 10        | Intake, output and retention of manganese as affected by<br>different manganese sources and levels..... 69                                                                      |
| 11        | Leg scores and mortality rate [M.R.] as affected by<br>manganese sources and level ..... 72                                                                                     |

| Table No.                                                                                                                                                       | Page |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 12 Average weight [gm] of live body weight, blood, feather, offals, drawn weight, bones and different organs of the experimental birds at 8 weeks of age.....   | 75   |
| 13 Average percentage [%] of blood, feather, drawn weight, and total edible parts relative to live body weight of the experimental birds at 8 weeks of age..... | 77   |
| 14 Input-output analysis and economical efficiency [E.E] of different treatments.....                                                                           | 79   |

\*\*\*

\*\*\*

\*\*\*