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**CHARACTERISTICS OF VOLCANIC ASH SOILS OF
SOUTHERN AREA OF MOUNT RUAPEHU,
NORTH ISLAND, NEW ZEALAND**

A thesis presented in partial fulfilment of the requirements for the degree
of Master of Applied Science in Soil Science
at Massey University

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1998


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ABSTRACT

Geochemical and pedological properties of five volcanic soils were examined to characterise the effects of weathering. The five soils studied are from the southern area of Mount Ruapehu, New Zealand.

The principal parent materials are rhyolitic and andesitic tephra. Soils examined in this study are characterised by thick and dark A horizons, crumb and nut structure, and sandy to clay texture. All pedons contain allophane, mostly as Al-rich allophane with Al:Si ratio \cong 2.0. Mineralogical analysis data demonstrate the differences in parent materials, including quartz, plagioclase feldspar, hypersthene, augite, hornblende and magnetite. Halloysite and kaolinite are also present in the soils. When allophane is the dominant material in the clay fraction, the chemical properties are characterised by accumulation of humus, high fluoride pH and high phosphate retention.

State factors of soil formation are reviewed and discussed. This study reveals that weathering processes are key determinants of site-specific environmental conditions, whereas compositional factors, including tephra age, may determine Al behaviour, and control the concentration of Al in soil solution and its distribution throughout the profile.

Four soils meet the andic criteria and qualify for the Andisols order. They are: Typic Udivitrand, *ashy, isofrigid*; Typic Hapludand, *medial, isofrigid*; Typic Hydrudand, *hydrous, isofrigid*; and Hydric Endoaquand, *medial, isofrigid*. Another soil is under the Entisols order and is classified as Vitrandic Udifluent, *sandy, mixed, isofrigid*. The Andisols are correlated with Allophanic Soils in the New Zealand Soil Classification. The complete classification is: vitric Orthic Allophanic Soil, vitric Orthic Allophanic Soil, typic Orthic Allophanic Soil, and typic Impeded Allophanic Soil. The Vitrandic Udifluent is correlated with typic Orthic Pumice Soil.

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CONTENTS

| | |
|---|-----|
| TITLE PAGE | i |
| ABSTRACT | iii |
| ACKNOWLEDGMENTS | iv |
| CONTENTS | v |
| LIST OF FIGURES | vii |
| LIST OF PLATES | ix |
| LIST OF TABLES | x |
| LIST OF APPENDICES | xi |
| | |
| CHAPTER 1. INTRODUCTION | 1 |
| 1.1. Background | 1 |
| 1.2. Objectives | 2 |
| 1.3. Operations | 2 |
| 1.4. Organisation of the Thesis | 3 |
| 1.5. General Description of the Study Area | 3 |
| 1.5.1. Location | 3 |
| 1.5.2. Geology | 3 |
| 1.5.3. Physiography | 6 |
| 1.5.4. Climate | 7 |
| 1.5.4.1. Wind | 8 |
| 1.5.4.2. Rainfall | 8 |
| 1.5.4.3. Temperature | 9 |
| 1.5.5. Vegetation and Land Use | 10 |
| | |
| CHAPTER 2. PROPERTIES OF VOLCANIC ASH SOILS | 12 |
| 2.1. Introduction | 12 |
| 2.2. Review of Literature | 12 |
| 2.2.1. Mineralogical Properties | 12 |
| 2.2.1.1. Primary Minerals | 13 |
| 2.2.1.2. Secondary Minerals | 13 |
| 2.2.2. Chemical Properties | 20 |
| 2.2.2.1. Active Aluminum and Iron | 20 |
| 2.2.2.2. Organic Constituents | 21 |
| 2.2.2.3. Soil Acidity | 22 |
| 2.2.2.4. Ion Exchange Equilibrium | 23 |
| 2.2.2.5. Anion Sorption | 24 |
| 2.2.3. Physical Properties | 24 |
| 2.2.3.1. Bulk Density | 25 |
| 2.2.3.2. Particle Size Distribution | 25 |
| 2.2.3.3. Water Retention | 26 |
| 2.3. Research Methodology | 27 |
| 2.3.1. Selection of Profile Sites | 27 |
| 2.3.2. Description of Soil Profiles | 27 |
| 2.3.3. Samples For Laboratory Analyses | 27 |
| 2.3.4. Laboratory Analyses | 28 |
| 2.3.4.1. Mineralogical Analyses | 28 |

| | |
|---|-----|
| 2.3.4.2. Chemical Analyses | 30 |
| 2.3.4.3. Physical Analyses | 32 |
| 2.4. Results and Discussion | 33 |
| 2.4.1. Morphological Characteristics | 33 |
| 2.4.2. Mineralogical Characteristics | 36 |
| 2.4.2.1. Sand Fraction (20-200 μm) | 39 |
| 2.4.2.2. Silt Fraction (2-20 μm) | 40 |
| 2.4.2.3. Heavy Mineral Fraction | 41 |
| 2.4.2.4. Clay Fraction (< 2 μm) | 42 |
| 2.4.3. Chemical Characteristics | 50 |
| 2.4.4. Physical Characteristics | 56 |
| 2.5. Conclusion | 59 |
| | |
| CHAPTER 3. WEATHERING PROCESSES OF VOLCANIC ASH SOILS . | 60 |
| 3.1. Factors of Soil Formation | 61 |
| 3.1.1. Time | 61 |
| 3.1.2. Parent Material | 62 |
| 3.1.3. Climate | 69 |
| 3.1.3.1. Temperature | 69 |
| 3.1.3.2. Precipitation and Soil Moisture | 69 |
| 3.1.4. Organisms | 70 |
| 3.1.5. Topography | 71 |
| 3.2. Results and Discussion | 72 |
| 3.2.1. Controls and Processes of Weathering | 72 |
| 3.2.2. Product of Weathering | 73 |
| 3.3. Conclusion | 79 |
| | |
| CHAPTER 4. SOIL CLASSIFICATION | 80 |
| 4.1. Descriptions of Profiles | 80 |
| 4.2. Soil Taxonomy | 91 |
| 4.2.1. Classification to Subgroup | 93 |
| 4.2.2. Families of the Soils | 97 |
| 4.3. New Zealand Soil Taxonomy | 98 |
| 4.4. Discussion | 101 |
| 4.5. Conclusion | 104 |
| | |
| CHAPTER 5. CONCLUSION | 105 |
| | |
| REFERENCES | 108 |
| APPENDICES | 121 |

LIST OF FIGURES

| | |
|---|----|
| 1.1. The location map of the study area | 4 |
| 1.2. The geology map of the study area | 5 |
| 1.3. The physiography of the study area | 7 |
| 2.1. (a) Outline diagram of structure of allophane: single hollow spherical unit, Al:Si atomic ratio= 2.0 (Wada 1980); (b) a model of proto-imogolite allophane showing a pore site and phosphate attached. The pore was created by omitting 2Si and 2Al from six imogolite unit cells (Parfitt and Henmi 1980)..... | 15 |
| 2.2. (a) Postulated relationship between the structure unit of imogolite and that of gibbsite. SiOH groups that would lie at the cell corners in imogolite are omitted from the diagram (Cradwick, <i>et al.</i> 1972); (b) cross section of an imogolite tube viewed down the tube axis. The outside diameter is 2.14 nm and the inside is 0.64 nm. The external surface of the tube comprises a gibbsite-like Al octahedral structure but the internal surface has exposed Si-OH groups (SiO ₃ OH) with the Si in isolated tetrahedral sites (Parfitt 1980); (c) curling of the gibbsite (hydroxide sheet induced by contraction of one surface to accommodate SiO ₃ OH tetrahedra (Cradwick, <i>et al.</i> 1972) | 15 |
| 2.3. (a) Diagrammatic representation of a structural model of Silica Springs allophane. Possible 1:3 Al-for-Si substitution in tetrahedral sheet; (b) fragment of curved aluminosilicate with incomplete octahedral sheet (Childs <i>et al.</i> 1990)..... | 16 |
| 2.4. The horizons of the studied soils..... | 33 |
| 2.5 Representative X-ray diffractograms of the Taupo pumice layer at P1 soil (55-85 cm): (a) sand fraction; (b) heavy minerals fraction; (c) silt fraction; (d) clay fraction | 37 |
| 2.6. Representative X-ray diffractograms of P2 soil (21-34 cm): (a) sand fraction; (b) heavy minerals fraction; (c) silt fraction; (d) clay fraction..... | 38 |
| 2.7. X-ray diffractograms of clay fraction of P4 (0-17 cm) after different treatments: (a) Mg-air; (b) Mg-gly; (c) K-air; (d) K-heat | 45 |
| 2.8. Differential thermal curve for P2 (30-37 cm) | 45 |
| 2.9. X-ray diffractogram of clay fraction of P2 (0-21 cm): (a) Mg-air; (b) after formamide treatment | 46 |
| 2.10. Electron micrographs of crystalline minerals in the studied soils..... | 47 |
| 2.11. Electron micrographs of amorphous minerals in P3 soil | 48 |
| 2.12. Electron micrographs of opaline silica minerals in the studied soil | 49 |
| 2.13. Metal-humus complexes in the studied soils..... | 56 |

| | |
|---|-----|
| 3.1. Stratigraphy of the pedons | 64 |
| 3.2. Allophane figure in the studied pedons | 77 |
| 3.3. Clay content in different pedons | 78 |
| 4.1. The soil map of the study area | 102 |

LIST OF PLATES

| | |
|---|----|
| 4.1. Pedon 1 at Desert Road (GR T20/415956); (a) Landscape, (b) Profile | 82 |
| 4.2. Pedon 2 at Tangiwai, beside Whangaehu River (GR T21/303875); (a) Landscape, (b) Profile | 84 |
| 4.3. Pedon 3 at Blackwood paddock oppositeTangiwai Mill (GR T21/304895); (a) Landscape, (b) Profile | 86 |
| 4.4. Pedon 4 at Young's farm in Horopito (GR S20/123026); (a) Landscape, (b) Profile..... | 88 |
| 4.5. Pedon 5 at Young's farm in Horopito (GR S20/122023); (a) landscape, (b) Profile | 90 |

LIST OF TABLES

| | |
|---|-----|
| 1.1. Rainfall distribution from selected stations in the study area (in mm) | 8 |
| 1.2. Water balance: percentage frequency of months with deficits | 9 |
| 1.3. Temperature of the air at selected stations (in degree Celsius) | 10 |
| 1.4. Temperature of the ground (in degree Celsius) | 10 |
| 2.1. Location of soil samples | 27 |
| 2.2. Selected morphological features of the studied pedons | 34 |
| 2.3. Mineralogy of the sand (20-200 μm) fraction | 39 |
| 2.4. Mineralogy of the silt (2-20 μm) fraction | 41 |
| 2.5. Mineralogy of the heavy mineral fraction | 42 |
| 2.6. Mineralogy of the clay (< 2 μm) fraction | 44 |
| 2.7. Chemical properties of the studied pedons | 51 |
| 2.8. Selective dissolution analyses | 53 |
| 2.9. Physical properties | 57 |
| 3.1. Factors of soil formation | 61 |
| 4.1. Selected andic properties of the studied soils | 92 |
| 4.2. Substitutes for the non-fragmental particle-size classes | 98 |
| 4.3. Proposed classification and correlation | 101 |

LIST OF APPENDICES

| | |
|---|-----|
| Appendix 1. Sand fraction properties (%) | 121 |
| Appendix 2. Silt fraction properties (%) | 122 |
| Appendix 3. Heavy mineral fraction properties (%) | 123 |
| Appendix 4. Clay fraction properties (%) | 124 |