



UNIVERSITI PUTRA MALAYSIA

**PEDOLOGICAL STUDY AND CLASSIFICATION OF
SOME SOILS DEVELOPED ON VOLCANIC ROCKS
IN JERANTUT DISTRICT, PAHANG**

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By

IBRAHIM BIN SALEH

**Thesis submitted in Fulfilment of requirements
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LIST OF ABBREVIATIONS

ACEC	-	apparent cation exchange capacity
ARI	-	agricultural rainfall index
CEC	-	cation exchange capacity
ECEC	-	effective cation exchange capacity
FAO	-	Food and Agriculture Organization of The United Nations
UNESCO	-	United Nations Educational Scientific and Cultural Organization
USDA	-	United States Department of Agriculture



Abstract of thesis submitted to the Senate of Universiti Pertanian Malaysia in fulfilment of requirements for the degree of Master of Agricultural Science

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Chairman : Assoc. Prof. Dr. Siti Zaayah Darus
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Six soil profiles, comprising four soils developed over andesite and two developed over rhyolite were sampled in Jerantut District, State of Pahang. The soils were characterized by physical, chemical, mineralogical and micromorphological techniques. Classification of the soils were carried out according to Soil Taxonomy (USDA, 1996), FAO/UNESCO Legend (1990) and Malaysian Classification Systems (1992).



In general, the particle size distribution, colour and some of chemical properties of the soils are directly associated with their parent materials and stage of weathering. The high clay content and redder colouration suggest an advanced stage of weathering and the presence of a high content of mafic minerals in the parent materials.

Soil reaction is slightly acidic to moderately acidic in both parent materials with pH(water) ranging from 4.7 to 5.2 and with negative Δ pH values. The soils developed over andesite have a CEC ranging from 10 cmol(+)/ kg soil to 15 cmol(+)/ kg soil, while in rhyolitic soils, CEC ranges between 5 cmol(+)/ kg soil and 10 cmol(+)/ kg soil. The more weathered soils have base saturation less than 50% by NH_4OAc .

The organic carbon, nitrogen, available phosphorus and exchangeable Al content are low for all the soils studied. The free iron oxide content is higher for the soils derived from andesite which are deep soils when compared to soils on rhyolitic materials which are moderately deep soils. The free iron oxide of the soils is 'active' in nature based on the Fe_o/Fe_d ratio of more than 0.05 except for one of the profiles over andesite (profile 1) which is less than 0.05 and reflected an advanced stage of weathering.

Mineralogically, both of the parent materials are dominated by feldspar and quartz. Calcite, pyroxene, mica and chlorite are present as accessory minerals in andesite while rhyolite only contain chlorite and cristobalite. Kaolinite is the most



dominant alumina-silicate clay mineral for these soils. Traces of interstratified layer and varying amount of feldspar, calcite, quartz, mica, halloysite and iron oxide are present. However, in one of the profile over andesite (profile 4), vermiculite is present in large quantity.

The soils over andesite have granular and subangular blocky microstructure while soils over rhyolite have spongy microstructure. Clay coatings are present along voids and in matrix. The matrix of the soils developed over andesite are reddish brown, showed cloudy appearance and contain some iron oxide nodules while for the soils developed over rhyolite are yellowish, have clear appearance and lack iron oxide nodules. Some crystalline feldspar grains were observed in all the B horizons of the profiles studied indicating that the soils contain some nutrient reserves.

The soils studied are all in the intermediate stage of weathering based on some criterion such as presence of weatherable minerals, clay coating and fine silt/clay ratio. According to Soil Taxonomy (USDA, 1996) the soils studied are classified as Ultisols and Alfisols. While according to the FAO/UNESCO Legend (1990), the soils are classified as Acrisols, Alisols and Luvisols.



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**KAJIAN PEDOGENESIS DAN PENGKELASAN
TANAH-TANAH YANG TERBENTUK DARIPADA BATUAN VOLKANIK
DI DAERAH JERANTUT, PAHANG**

Oleh

IBRAHIM BIN SALEH

FEBRUARI, 1997

Pengerusi : Prof.Madya Dr. Siti Zauyah Darus

Fakulti : Pertanian

Sebanyak 6 profil tanah telah dibuat persampelan di sekitar Jerantut, negeri Pahang yang mana 4 profil terdiri dari tanah yang terbentuk daripada batuan andesit dan 2 dari tanah yang terbentuk daripada riolit. Tanah-tanah tersebut ditentukan sifat-sifat fizik, kimia, mineralogi dan mikromorfologi. Pengkelasan tanah dibuat berdasarkan kepada sistem oleh USDA(1996), Lagenda FAO/UNESCO (1990) dan Malaysia (1992).



Pada umumnya, taburan saiz partikel, warna tanah dan sesetengah sifat kimia tanah adalah bergantung kepada jenis batuan induk dan peringkat luluhawa. Kandungan lempung yang tinggi dan berwarna kemerahan adalah disebabkan peringkat luluhawa yang lebih tinggi dan kandungan mineral mafik yang terdapat didalam batuan induk.

Tanah-tanah yang dikaji merupakan tanah agak asid ke sederhana asid iaitu pH diantara 4.7 ke 5.2 dan Δ pH yang negatif. Tanah-tanah yang terbentuk daripada batuan andesit mempunyai KPK diantara 10 - 15 cmol(+)/ kg tanah sementara tanah daripada riolit pula adalah diantara 5 - 10 cmol(+)/ kg tanah. Tanah yang sangat dalam mempunyai ketepuan bes yang kurang daripada 50% (dengan NH_4OAc).

Kandungan karbon organik, nitrogen, fosforus tersedia dan Al tukarganti adalah rendah didalam kedua-dua batuan induk. Kandungan oksida ferum bebas tinggi pada tanah yang terbentuk daripada andesit dan tanah yang dalam berbanding dengan tanah yang terbentuk daripada riolit dan tanah sederhana dalam. Oksida ferum menunjukkan berada didalam keadaan aktif dimana kadar Fe_o/Fe_d lebih daripada 0.05 kecuali profil 1. Ini disebabkan ianya merupakan tanah yang lebih tinggi peringkat luluhawanya.

Feldspar dan kuartza adalah merupakan mineral utama didalam kedua-dua batuan induk. Lain-lain mineral yang kedapatan adalah adalah sedikit iaitu kalsit, piroksin, mika dan klorit bagi batuan andesit sementara riolit pula hanya klorit dan kristobalit. Kaolinit adalah merupakan mineral lempung yang utama didalam tanah-tanah yang dikaji. Disamping itu terdapat juga sedikit mineral lapisan berlapis dan mineral feldspar, kalsit, kuartza, mika, haloysit dan oksida ferum dengan berbagai