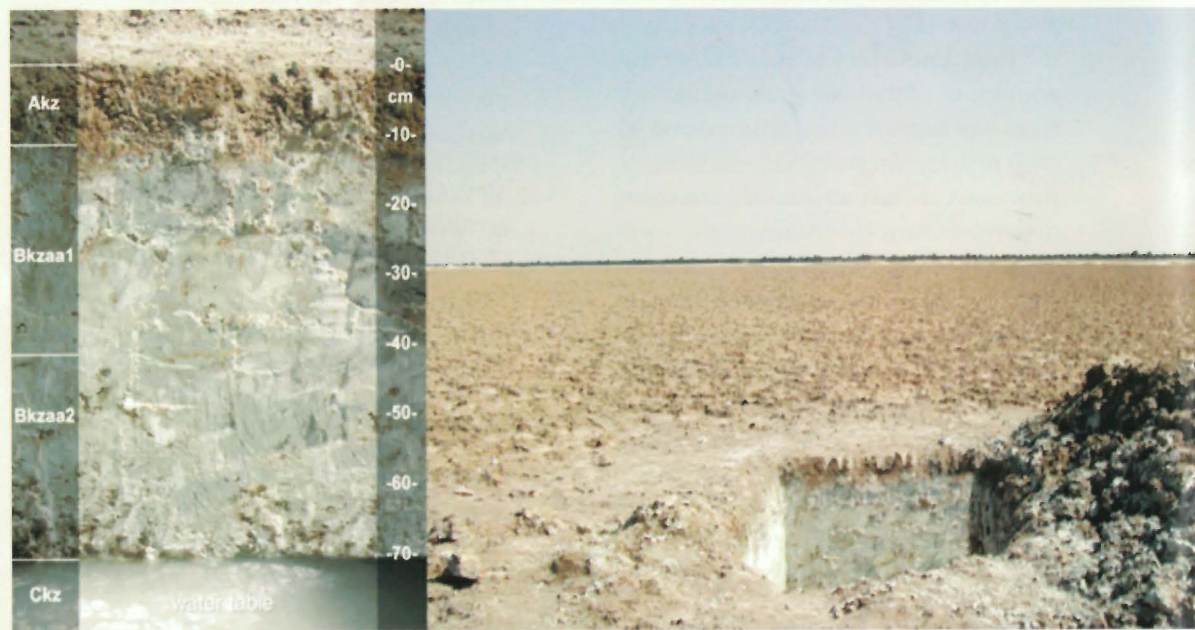


A Landmark in Soil Taxonomy International Recognition of New Soil Discovered in UAE

Shabbir A Shahid and Mahmoud A Abdelfattah



An anhydritic (CaSO₄) soil discovered in the coastal lands of the United Arab Emirates has recently been recognized in the 12th edition of USDA-NRCS Keys to Soil Taxonomy. This mineral has unique occurrence in soils and has properties and uses that make it different than other soil minerals that are commonly recognized in arid and desert environments. This note records the International Recognition of Anhydrite Soil Discovered in the United Arab Emirates



It is well established that anhydrite (CaSO₄) on hydration is transformed into gypsum (CaSO₄.2H₂O). In this regards, the occurrence of anhydrite in the coastal lands raises many questions, such as “how does anhydrite remain stable under an environment where water table reaches 70 cm, the anhydrite layer is wet and the site experiences seasonal water flooding” Why is anhydrite not converted into gypsum”. Such features were observed during a coastal land survey of Abu Dhabi emirate of UAE in the years 2003-2004. Anhydrite in the coastal land is regarded as both a neoformed mineral and a product of gypsum-anhydrite transformation.

The challenge

The challenge for the survey team was to assign a soil taxa name as per US Soil Taxonomy; surprisingly there was no mention of anhydrite soil in US Soil Taxonomy. As a follow up to this finding, pioneer work appeared in Soil Survey Horizons (Shahid et al 2007) published by Soil Science Society of America, which called for its inclusion in the future version to provide the opportunity for better placement to a soil taxa. Thus, the cooperation between United States Department of Agriculture (USDA), Dubai based International Center for Biosaline Agriculture (ICBA) and Environment Agency - Abu Dhabi (EAD) was initiated to resolve questions of the presence and quantification of mineral anhydrite in soils of coastal and inland sabkhas, through collection of soil samples and analyses by the NRCS Soil Survey laboratory. Later through

a series of scientific publications (Shahid et al 2009; Wilson et al 2013) the properties, commercial aspects, aerial extent, genetic pathways and quantification of mineral anhydrite were documented.

Soil survey of EAD

Further to coastal land survey, soil survey of Abu Dhabi Emirate (EAD) was completed between 2006 and 2009, and the results were shared (in a side workshop) with the soil science community from over 35 countries in an International conference “Soil Classification and Reclamation of Degraded Lands in Arid Environments” jointly organized by EAD and ICBA, held in Abu Dhabi on 17-19 May 2010, where a new landmark in soil taxonomy was presented and discussed.

In post-conference field excursion key scientists from USDA-NRCS, CSIRO Australia along with soil scientists from EAD and ICBA visited the site where anhydrite soil was first discovered.

Anhydrite soils recognized

After all these initial work a formal proposal “Adding Anhydrite Soils to US Soil Taxonomy” was submitted to USDA and discussion started. The proposal included the addition of anhydrite to the US Soil Taxonomy at three levels: 1) anhydrite soil mineralogy class; 2) a diagnostic horizon; & 3) two new subgroups, resulting in modifications to the Key to Subgroups for Aquisalids and Haplosalids. In recognition to the importance of the anhydrite mineral,



On site discussion where anhydrite soil was first discovered



Scientists from USDA-NRCS, CSIRO Australia, ICBA and EAD jointly visited anhydrite site



Sharing analyses of anhydrite profile



Viewing anhydrite samples



Preparing anhydrite profile



In depth observation of anhydrite formation

the US National Cooperative Soil Survey decided to expand Soil Taxonomy, the classification system of soils, to include this mineral.

Through an iterative communication process between soil scientists from EAD, ICBA and the USDA-NRCS, the proposed changes have been included

in the 12th edition of Soil Taxonomy. David W. Smith (Soil Science Division Director, Natural Resources Conservation Service) in the Foreword of Keys to Soil Taxonomy (12th edition) has stated about the change "One change in this edition is recognizing the occurrence of anhydrite (CaSO_4) in soils with the addition of a new diagnostic horizon, a new mineralogy class, and new anhydritic subgroups for use in soil survey. These are significant improvements to soil taxonomy which resulted from international collaboration with soil scientists of the United Arab Emirates, where the soils with anhydrite were discovered".

The impact

The discovery of anhydrite soil and its inclusion in soil taxonomy is very important and this has unlocked some of the key questions raised earlier to assign soil taxa to anhydritic soils. With the inclusion of a soil mineralogy class, a diagnostic horizon and 2 subgroups, now worldwide soil mineralogy classes have increased to 33, subsurface diagnostic horizons to 20, and 4 subgroups under aquisalids great group, and 6 subgroups under haplosalids great group.

The contributors are Dr Shabbir A Shahid, Soil Correlator/Lead Soil Taxonomist International Center for Biosaline Agriculture and Dr Mahmoud A Abdelfattah, Soil Scientist, Soil Quality Department, Environment Agency – Abu Dhabi, Abu Dhabi, United Arab Emirates

The authors are proud of international recognition of the newly discovered anhydritic soil in the United Arab Emirates, which shows their diligent work over the past many years.

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