



Physical and hydric behavior of sand-bentonite mixtures subjected to salinity and sodicity constraints

Benkhelifa Mohammed (1), Belkhodja Moulay (2), Daoud Youcef (3), and Cambier Philippe (4)

(1) Department of Agronomy, Faculty SNV, University A. IbnBadis of Mostaganem (UMAB), PoBox 227, 27000 Mostaganem, Algeria (benkhelifa@hotmail.com), (2) Department of plant biology, University Essenia, PoBox 1524, El Mnaouer 31000 Oran , Algeria (moulay2009@yahoo.fr), (3) Department of Pedology, National School of Agronomy (ENASA), Hassan Badi El Harrach, 16000 Algiers, Algeria (ydina16@yahoo.fr), (4) INRA-Agroparitech, UMR Environment and Culture, EGER, PoBox 01, 78850, Thiverval-Grignon, France (pcambier@grignon.inra.fr)

Data show that 64% of arid and 97% of those hyper-arid, in world, are located in Africa and Asia. Soils in these regions, predominantly sandy, differ from those of wetlands by properties related to moisture deficiency. Organic matter is less than 1% and cation exchange capacity does not exceed the meq.100 g⁻¹ soil. Therefore, they are vulnerable to physical, chemical and biological degradation phenomena. Algeria is among the countries most affected since 95% of the area is arid and semi-arid.

The addition of clay is an ancient technic used locally in Algeria in arid and semi-arid areas to improve water reserve and resistance to wind erosion of sandy soils. The literature reports that sandy soils amended with 10% of their dry weight in bentonite, registers a yield increases ranging from 10 to 40% depending on the crop.

If works of the role of clay on the physical, chemical and hydric characteristics of sandy soils are relatively abundant, the effects of this mineral on the edaphic behavior of the substrate and the crops in abiotic conditions of salinity and sodicity remain insufficiently studied. These are related to an accumulation of soluble salts in the rhizosphere. In Algeria, 10 to 15% of irrigated land are affected by salinization.

In this work, we studied the physical and hydric evolution of sand-clay mixtures subjected to abiotic stress of salinity and sodicity. Indeed, it is important to understand the scientific basis of clays properties, when they are added to the sand in order to optimize the characteristics of the blends and enhance this traditional amendment technic in the context where it is practiced in Algeria.

The first result shows that bentonite modifies completely the physical and hydric properties of clay-sand mixtures. In addition to its beneficial effect on the hydration properties, it allows to attenuate the stress effects of salinity and sodicity observed on the properties of the mixture and the morphological properties of a bioindicator : tomato (*Lycopersicum esculentum* Mill.). The bentonite appears thus well adapted to the sandy soil improvement, not only for its mineralogical characteristics but also for its natural cationic form and for the calcite presence in it.