Improvement of sandy soils by the use of hydrogels derived from agricultural and industrial wsstes

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The agriclture sector has to increase food production through vertical and horizontal extension programs. Sand soils reclamation is the hope in increasing the agriculture production and subsequently in overcoming the deficiency in food requirement. In the management of sandy soils, we have to keep in mind that they are single grain in the structure. poor in their n hyDROPhysical and nutritional status. These soils are subjected to serious problems leading to their degradation such as wind erOSIOn, water erosion, irrigation water and nutrients losses through deep percolation. For sustainable production in sandysoil. different techniques including using the hydrogels have been tried. The present work aims at studying the effect of carboxymethyl cellulose (CMC) and cellulose xanthate (CX) on some physical properties of sandy soil, plant growth, water consumptive use, water use efficiency and nutrients uptake using maize as an indicator plant. Laboratory and greenhouse experiments were conducted to study the effect of incorporating carboxymethyle cellulose (Cf.1C) and cellulose xanthate (eX) at different rates (0.0, 0.2, 0.5. 1.0, 2.0 and 4.0g/100 g soil) in sandy soils. The soil has been classified as: Entisols, Psamments, Torripsamments taken from Abu-Rawash, Giza Governorate at the depth of 30 em on: a) the following soil physical characteristics: 1) water stable aggregates (WSA), 2) aggregate mean weight diameter (MWD), 3) soil bulk density (SBD), total porosity (TP) and void ratio (VR). 4) pore size distribution (PSD), 5) soil water retention (SWR), 6) soil hydraulic conductivity (SHe) and soil hydraulic resistivity (SHR) and 7) soil intrinsic permeability (SIP), and mean pore diameter (MPD). b) Maize plant three way cross-310) growth (germination; dry matter yield), water consumptive use (WCU), water use efficiency (WUE), evapotranspiration ratio (ET ratio) and NPK uptake. In view of the results obtained and their discussion, the following conclusion may be stated. a) Soil physical charaderistics: 1- Water stable aggregates (WSA): 1- Increasing the CMC application rates from 0.0 up to 4.0 g/100 g soil, increased the percentage of the WSA > 0.25 mm in diameter. Most of the formed aggregates < 2.0 mm in 2- Increasing the application rate of the (CX) from 0.0 to 4.0 g/100 g soil increased the percentages of the WSA > 0.25 mm in diameter. The formed aggregates were mostly in the large size fraction (2.0-8.0 mm in diameter). 3- Differences in the aggregates percentages of the WSA between different application rates within the polymers and between polymers at the same rate of application were significant at the 5% level. 11- Aggregate mean weight diameter (MWD): 1)The MWD of the water stable aggregates increased with increasing the application rates of CMC and CX from 0.0 to 4.0 g/100 g soil. 2) The MWD of water stable aggregates of the CX treatments exceeded that of the CMC ones at all application ratesunder investigation. 3) The differences in MWD between the CX and CMC treatments were significant at the 50/0 level, only at the application rates > 10 gllOO g soil. 111- Soil bulk density (BD), total porosity (TP), and void ratio (VR): 1)The soil BD decreased but both the TP and VR increased with increasing the application rates of the CMC and the CX from 0.0 to 4.0 gJI00 g soil. 2) Differences in BD, TP and VR between the application rates of both the CMC and CX were significant at the 5% in most cases. 3) At the same application rates (:::,1.0 gJIOOg soil) the effect of the CMC on BD, IP and VR significantly exceeded that of the CX at the 5% in most cases.