



Polyacrylamide effect on hydraulic conductivity of hardsetting soils in Northeast of Brazil

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Among soil hydro-physical properties, hydraulic conductivity is more sensitive to changes in soil structure. Hydraulic conductivity describes the ease with which a fluid (usually water) can move through pore spaces or fractures. It depends on the intrinsic permeability of the material and on the degree of saturation, and on the density and viscosity of the fluid. Hardsetting soils present very low hydraulic conductivity values. When dry, these soils show high penetration resistance and consistency extremely hard, but change to friable when moist. In this condition are poorly structured, slaking when moist, limit agricultural machinery use and it may reduce the growth of the root system. In Brazil, these soils occur throughout of coastal zone in flat areas called “coastal tableland”. Chemical ameliorant, such as polymers based on anionic polyacrylamide (PAM), improve hydraulic conductivity of soil in hardsetting soils. The primary functions of polyacrylamide soil conditioners are to increase soil tilth, aeration, and porosity and reduce compaction and water run-off. PAM effect is attributed to its ability to expand when placed in water, storing it in soil pore space, releasing it gradually to the plants. This process occurs by reducing the water flow through the pores of the soil, due to water molecules can be absorbed by PAM, providing water gradually. Thus, this study tested the hypothesis that PAM reduces the soil hardsetting character. The area is located in coastal zone in Goiana city, Pernambuco, northeastern of Brazil. This soil is typical hardsetting soil. Intact soil cores were collected from four horizons until 70cm depth. In the laboratory, the soil cores were saturated with different PAM concentrations (0.01, 0.005, 0.00125%) and H₂O (control). Saturated hydraulic conductivity (K_{sat}) was determined using a constant head method, according to Klute and Dirksen (1986). Four replicates were used for each horizon and Tukey test at 5% probability was used by Assisat 7.6 beta. The sandy horizon had higher hydraulic conductivity in natural conditions, and the PAM, especially the concentration of 0.010%, reduced K_{sat}. This result confirms the action agglutinant of PAM organizing sand particles on aggregates, providing higher water retention, reducing water drainage and also K_{sat} values. In the other, especially in hardsetting horizon, when the lowest concentration (0.00125%) was applied reduced the effect of cohesion realized by increasing K_{sat} value. In conclude, PAM in hardsetting soils improve its physico-water proprieties when low concentrations.