Sunland Analytical
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What is CEC?

CEC or Cation Exchange Capacity is the ability of soil particles to bind positively charged ions (cations) like Sodium, Potassium, Calcium, Magnesium, Hydrogen, Iron, Copper, Aluminum, Manganese, Zinc; to indicate several that are relevant to plant growth. The ones that are most considered in evaluating Cation Exchange Capacity are Sodium, Potassium, Calcium and Magnesium because of their predominance in the water bathing the soil particles.

Soil particles, typically silicates, are negatively charged and are able to attract and bind positively charged elements (called cations) as described above. Of importance is that this binding in not so strong as to keep the cations tightly adherent to the soil particles, rather the cations are weakly adherent to the soil particles such that they can pull away, dissociate from the soil particles. This happens when the soil particles are bathed in "soil water" filling the spaces between the soil particles. At any point in time a portion of the cations are dissociated from the soil particles. Thus, the makeup of cations on any specific soil particle can change over time. Typically the proportion of different cations on the soil particles reflect the proportion of cations in the "soil water" surrounding the particles.

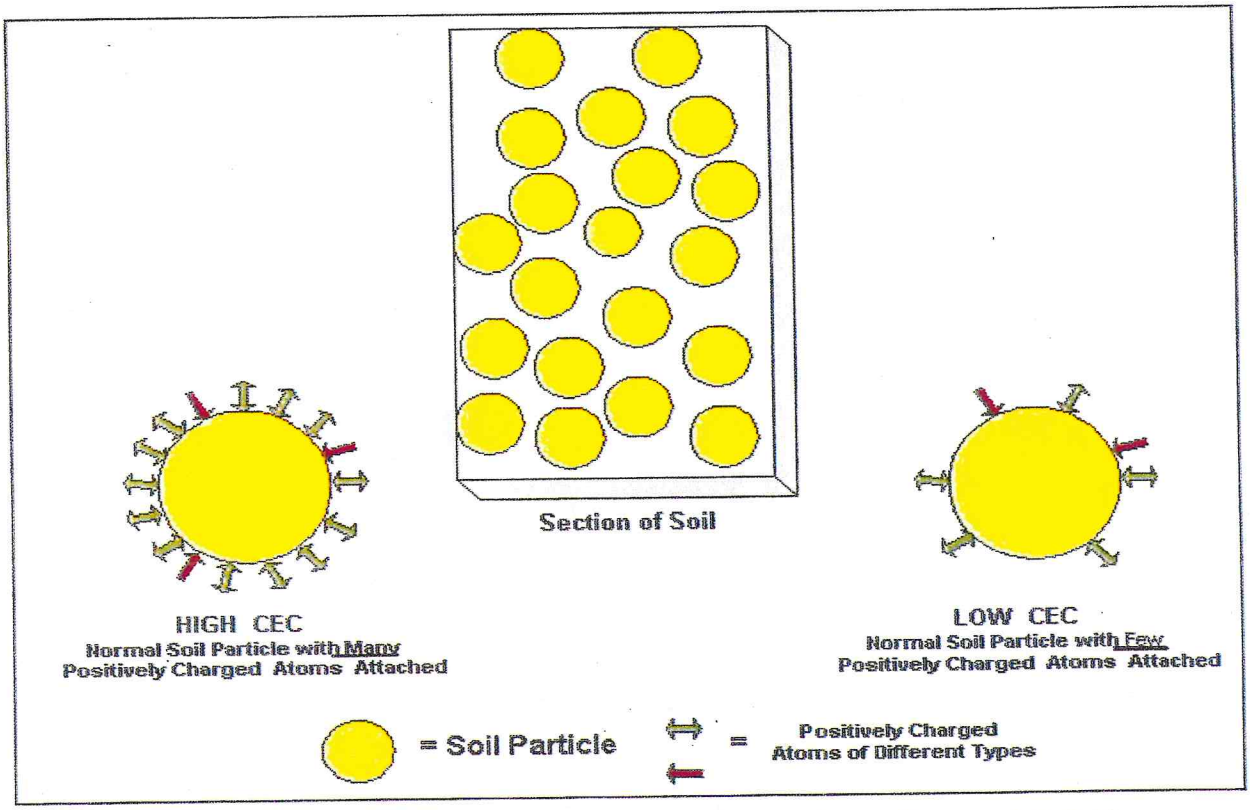

Figure 1. Difference in CEC Based On Materials of Different Origin (Parent Materials)

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How much of these cations bind to the soil particles is the capacity of the particle and hence the Cation Exchange Capacity. The CEC is usually expressed as milliequivalents per 100 grams. The makeup of the soil particle effects the this capacity. Different sources of clay or humas can have very different binding capacities (Figure 1), clays in the western U.S. may differ from clays of the southeast by ten times. Another factor in binding capacity is particle size. The same mass of particles with smaller particle size will have a greater surface area than large particles. Thus, the smaller particles have a greater CEC. Sandy may have a CEC of 4 while a sandy loam or clay from similar parent material would have a CEC of 12 or 35, respectively.

The CEC is relevant to plant growth in that the soil particles can hold nutrients like Potassium, Calcium or Magnesium in a manner that they are available for utilization by the plant. Recall the soil particles allow dissociation of these cations, thus, they can be taken up by the growing plant. Most apparently, holding other factors constant, the soil with the higher CEC can hold and have available more nutrients for plant growth than soils with lower CEC. Conclusion, Sand holds less nutrients that Clay. Of course, there may be other reasons that a sandy soil may be preferable to the clay soils.