



knowledge to grow



Cation Exchange Capacity

Soil cation exchange capacity (CEC) is a measure of a soil's ability to hold onto positively charged ions, called cations. CEC is sometimes called "total exchange capacity, base exchange capacity, or cation adsorption capacity".¹ Soil cations are important for plant growth because they include essential nutrients like calcium, magnesium, and potassium. A soil with a high CEC can hold onto more cations, which means that it can provide plants with more nutrients over time. When a plant takes up these nutrients, the soil's CEC decreases.

CEC is an indication of the total ability of the soil to hold cation nutrients that serve as an indicator for its potential fertility. It's inappropriate to use CEC for fertilizer recommendations, but CEC does provide insight into general soil fertility and can point towards some potential soil deficit problems.^{1,2} CEC is determined by the type and amount of clay and organic matter in the soil. Clay particles have a negative charge, which attracts positively charged cations. Organic matter also has a negative charge, and it can hold onto cations even more tightly than clay. Soils with high amounts of clay and organic matter have a high CEC, while sandy soils have a low CEC. It is important to note that different types of clay minerals have different CEC values, some clay minerals have higher CEC than others.³

CEC is just one of many soil properties that can affect plant growth and overall soil health. For example, a soil with a high CEC may not require as much fertilization as a soil with a low CEC. Additionally, a soil with a high CEC may retain more water and require less irrigation. This can save farmers and gardeners money and reduce the amount of water used for irrigation. However, it is also important to understand that CEC should be considered in context with other soil properties like pH, nutrient availability, and soil structure.

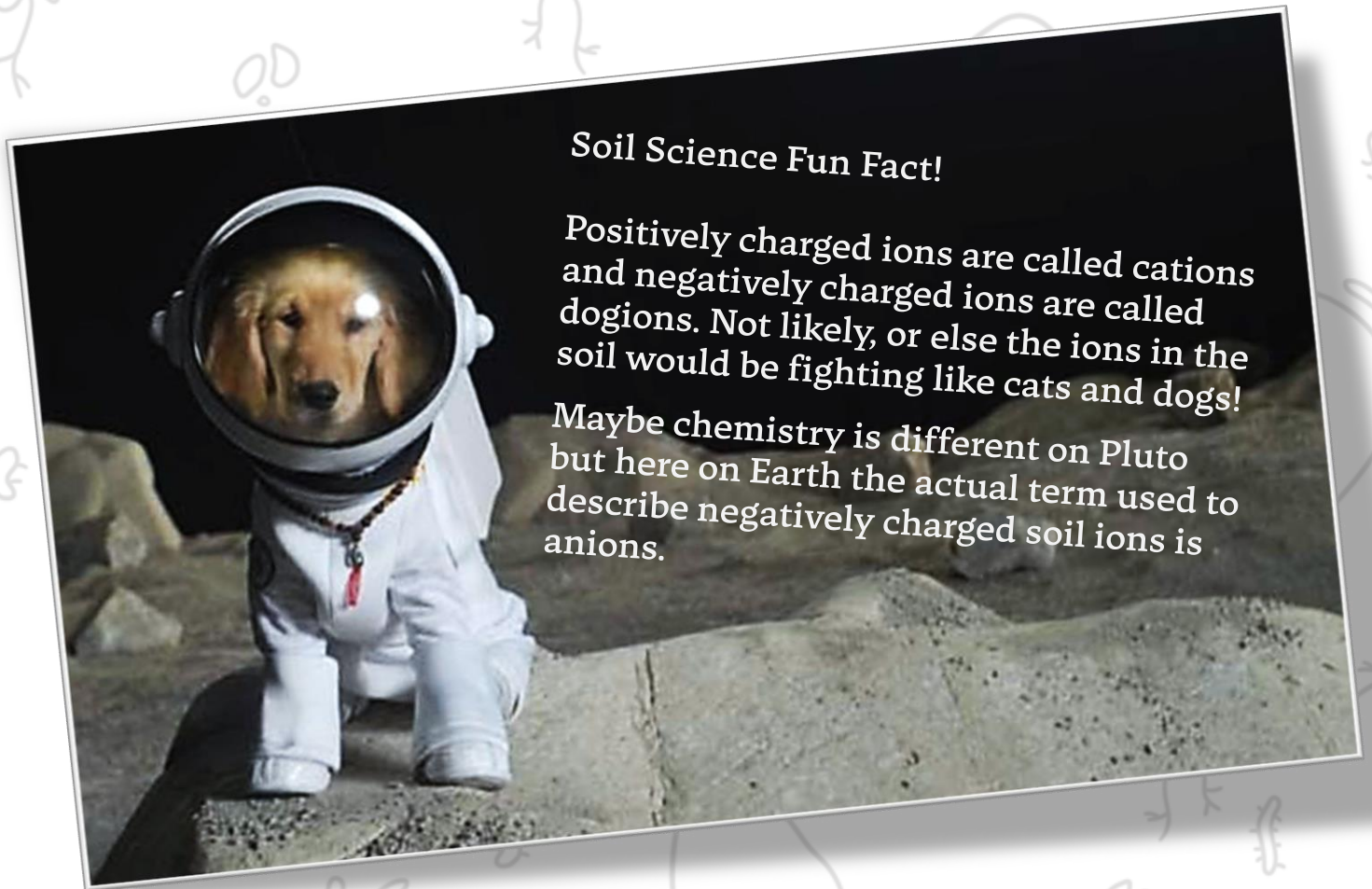
Moreover, a high CEC is not always an indicator of good soil health, as high CEC can also mean that the soil is retaining too much of certain cations, like aluminum or manganese, which can be toxic





to plants.^{3,4} A well-balanced soil with a balanced CEC, pH, organic matter, and nutrient availability is crucial for overall soil health.

Maintaining or improving soil health is not a one-time task, it's an ongoing process that requires management and understanding of the soil. One of the most accurate and reliable ways to determine the CEC of your soil is by laboratory soil test.



References:

1. Gregorich, E.G., et al. (Eds.). *Soil and Environmental Science Dictionary*. Canadian Society of Soil Science. CRC Press, 2001.
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3. Weil, Ray R., and Brady, Nyle C. *The Nature and Properties of Soils, Fifteenth Edition*. Pearson Education, 2017
4. Brown, Christine et al. (Eds). *Agronomy Field Guide for Crops Publication 811*. Ontario Ministry of Agriculture, Food, and Rural Affairs. Queen's Printer for Ontario, 2017.