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Beneficial binding

I read your article "What's the scoop on gypsum?" *and I have also been reading soil books about the importance of Mg for adhesive properties. They say that the Ca:Mg ratio is very important to maintain proper soil aggregation. Do you subscribe to this theory?*

Jim Hermann
New Jersey

Ca and Mg are both positively charged and attracted to the negative charges of soil particles. Other competitive cations such as Al, H, K, Na, and Mn can compete with Ca and Mg to remove them from the soil. A Ca:Mg ratio of (8.5 simply assures us that there is sufficient Mg present for plant growth.

Ca and Mg are sometimes given too much credit for improving soil structure by creating stable soil aggregates. Theoretically Ca and Mg do contribute to aggregation, but in your practical example it has only a very minor influence on aggregation and the ability to grow grass on your field. As long as the Ca:Mg ratio is acceptable for plant growth you should not give it another thought.

Certainly you should not consider fertilization with Ca or Mg as a strategy for increasing soil structure on intense traffic areas of a sports field. If Ca and Mg could improve soil structure in this situation I would be buying stock in it, but it simply does not happen.

Soil aggregates can be as small as a grain of sand or as big as marbles. Soil particles are bound together mostly by organic compounds in the soil. Aggregates naturally occur when the soils are physically moved by wetting/drying, freeze/thaw, physical root activity, and decaying organic matter. Certain types of aggregates can be very stable and resistant to change under modest mechanical disruption such as plowing a farm field. These "crumbs of soil" or granular clods bridge to form macropores as opposed to a soil containing many individually dispersed particles that pack tightly together. Thus aggregates give us macropores for better air and water movement in the soil.

Under normal non-traffic conditions, simply growing grass roots has an amazing capacity to develop very good aggregation. Most soils that are fertile enough to grow grass also have sufficient nutrition for aggregation. In your high traffic goal mouth area the aggregates have been mechanically broken down and continued traffic and weak growth of grass does not allow aggregation to occur.

Smearing of exposed and wet soil breaks down even the most stable aggregates. If you seeded the goal area and did not use it for 5-10 years then the soil would likely return to a well-aggregated status through root growth, humus formation, and earth worm activity. So, while we talk about good soil structure and soil aggregates, it is simply not found in these high traffic areas where the soils are mechanically dispersed into individual particles. Dig up some soil from a non-traffic area of your field or facility and compare it with the soccer goal mouth and see if you can see the difference in aggregation.

Can deflocculation caused by excessive compaction as in a soccer goal mouth render a soil unable to sustain plant life due to an inability to hold nutrients? How does this relate to CEC?

It just seems like goal mouth soils are dead and that they will never be able to grow any thing again, but in fact they still have the same CEC that they had when good grass was growing there. Cation Exchange Capacity is based on the ability of individual particles to hold nutrients, not on the amount of aggregation. Therefore mechanically dispersed soils are still fertile enough (still have the same CEC as when aggregated) to support plant growth. Mechanically dispersed soils have problems that are far more important than fertility. Compaction, poor drainage, and high water holding make it difficult to get any grass started.

Can soil aggregation be reestablished through proper cultural practices alone or is soil modification necessary?

As mentioned above it is unlikely that cultural practices alone will increase aggregation as long as the soil continues to be mechanically dispersed from continual traffic. If you wear the grass off each year and soil is exposed then you are keeping aggregates from forming.

One of aggregation's important benefits is forming macropores. Since we can't get this on intensely trafficked areas we try to fight compaction and make large pores by using mechanical cultivation (aerator, spiker, slicer, etc.) or by adding physical amendments or sometimes compost.

Aggregation is a slow and natural process and grass is the best type of vegetation to produce good aggregation. It's like the chicken and the egg, you won't get aggregates where you can't keep the grass—so you're fried. **ST**

Have Questions?

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