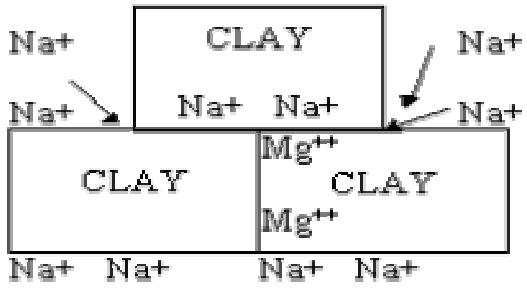
SOIL AND SALT ... A DEADLY MIXTURE – Part 1

Following is an illustration example of how Sodium (Na+) Chloride (Cl) affects the chemical and physical structure of the soil.

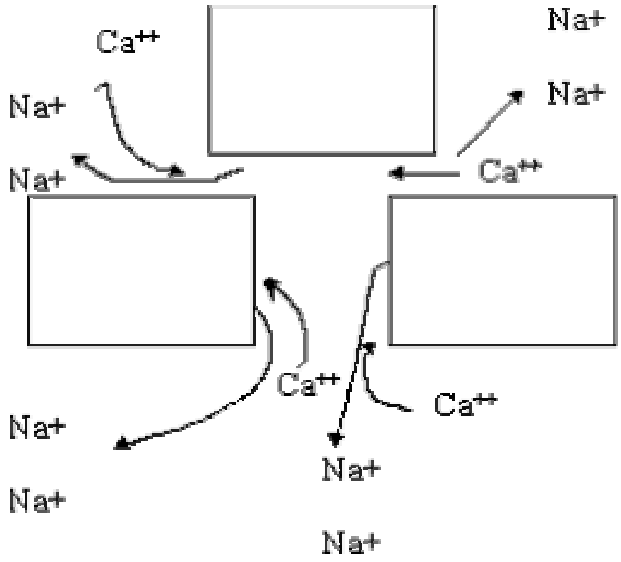
SALTY SOIL

HIGH IN SODIUM (Na+) CONTENT



Clay platelets are glued together by Sodium (Sometimes by Magnesium)

This can only happen if there is significant sodium in the soil water solution to replace calcium on the clay platelets.



Calcium can replace sodium on clay. It then becomes unglued.

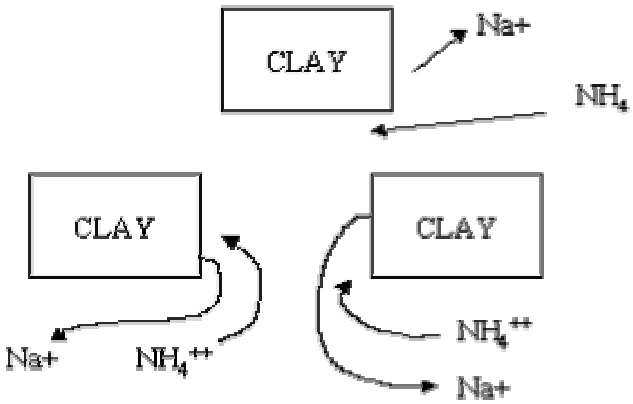
When a large quantity of soluble calcium is added to the soil water solution, calcium replaces sodium on the clay by mass action.

- Calcium MUST be soluble in the soil water solution
- The more calcium that is soluble in the soil water solution at any one moment in time, the more sodium will be replaced on the clay's exchange sites. This is called mass action in chemistry terms.
- It does no good to add high levels of low soluble calcium to the soil. Pounds of calcium are not important .... even if it all dissolves in 300 days.
- The important consideration is the amount in the soil water solution at any moment in time.

IF HIGH CALCIUM SOILS CONTAIN SODIUM ON THE CLAY PARTICLES, HOW MUCH OF THE CALCIUM IN THESE SOILS IS SOLUBLE?

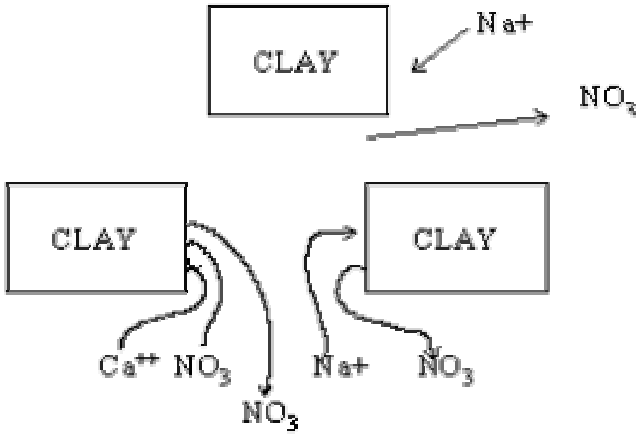
(VERY LITTLE)

Ammonium Nitrogen is very effective in replacing Sodium on the clay exchange site.



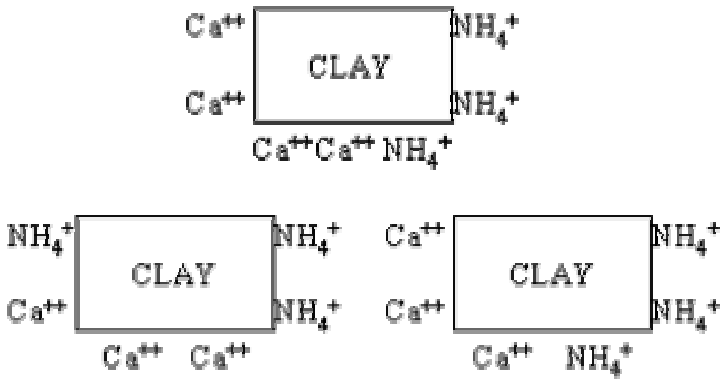
NH_4^+ can also replace Na+ on the clay.

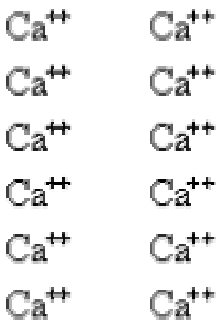
BUT BEWARE .....



Bacteria will change NH_4^+ to NO_3 and it will leave the clay.

Sodium will go back on the clay when NH_4^+ is changed to NO_3 --- unless there is ample calcium in the soil water to go onto the clay rather than sodium.



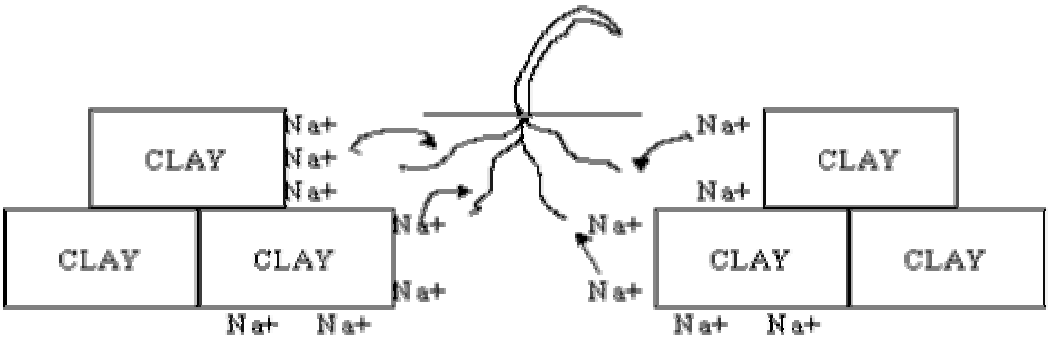


The ideal treatment to remove sodium from the clay particle is the addition of an ammonium containing solution that is high in soluble calcium.

EXAMPLE "Aqua Cal 5" 5% (NH2) - 0 - 0 – 8% (Ca) – 1.5% (Mg)

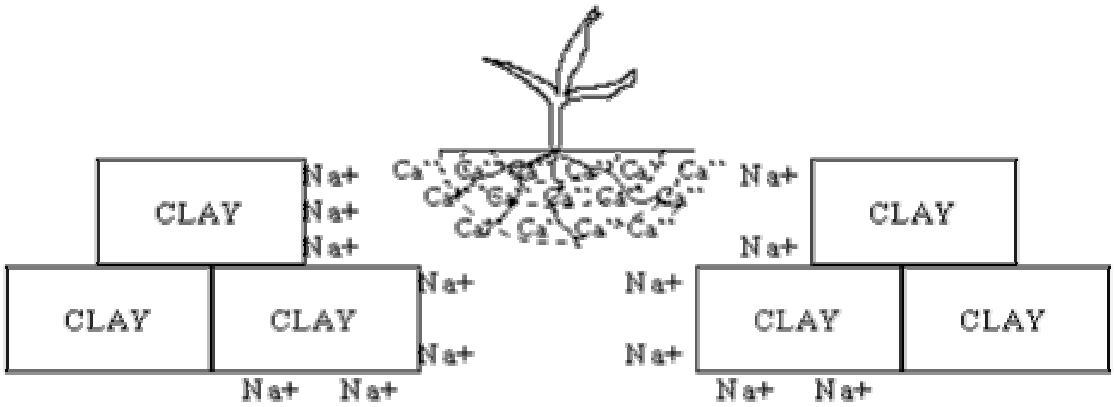
Calcium and ammonium will replace the sodium on the clay.

- When the ammonium nitrogen is converted to Nitrate, ample calcium will be available to take the position occupied by NH_4^+.



- Sodium leaves the clay particles and goes into the water solution. The small plant's roots absorb large quantities of sodium. As absorption increases, levels in the plant raise to toxic levels.

If sodium can not be removed from the soil, what can we do?



Add large quantities of soluble calcium to the soil zone directly under the plant roots. If sodium levels increase, just add more calcium.

See "Soil and Salts … A deadly mixture – Part 2".