

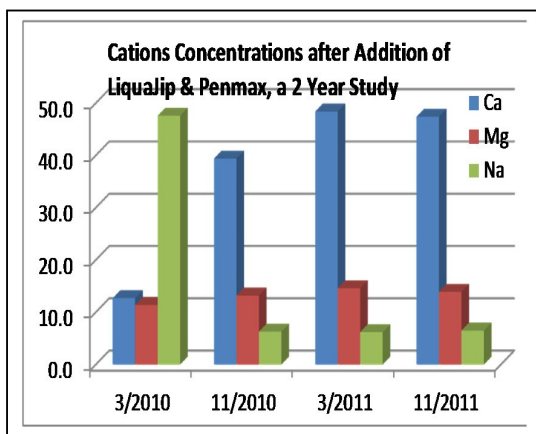


Liqua-Jip and Penmax® Promotes Cation Balance in the Soil in Both Seasonal & Permanent Cropping:

Seasonal Cropping

The key to promoting and maintaining improved percolation of water into problem soils is to improve the balance of the calcium, magnesium, and sodium cations in the soil. **Liqua-Jip** provides a reliable source of soluble calcium ions which can displace sodium ions from the negative sites on the clay particles. If sodium ions build in the soil and bond with the negative sites on the clay particles in the soil the soil structure is altered and the rate of water movement through the soil is restricted. The soil structure can be rapidly improved by replacing the sodium ions in the clay with calcium ions. As the clay structure is altered and improved by the addition of the calcium ions, the water can percolate through the soil more rapidly and the soil becomes more flocculent.

The graph below gives an example of the efficiency of **Liqua-Jip** when used in conjunction with **Penmax®**. Two applications of the **Liqua-Jip** at 60 litres per hectare were applied along with **Penmax®** applied at 10L litres per hectare to promote **leaching excess of excess salts** from the soil profile.



The applications were made at very low application rates throughout a full irrigation cycle followed by three irrigations before the next application of the **Liqua-Jip** and **Penmax®**. This regiment provided rapid leaching of the excess sodium ions from the soil profile by rapidly increasing the calcium ion concentration in the soil. The following year the rate of application of **Liqua-Jip** was reduced to 2 x 30 litres per hectare with the **Penmax®** applied at 2 x 5 litres per hectare rate. Please note that the sodium concentration continued to remain low.

The calcium ion in the subsequent applications helped to keep sodium ions from bonding with the negative clay sites. Because the calcium forms a stronger bond with those negative sites than does sodium, the sodium remains in solution and the excesses can be carried away from the root zone.

The value of the **SAR** decreased from 13.7 down to 1.23, a 91% decrease during the first year (2010), and **SAR** has remained at or below 1.24 through 2013.

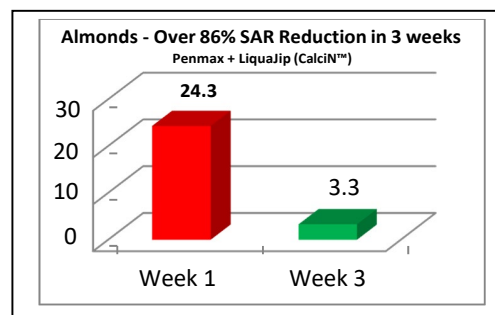
Permanent Cropping - Almonds

A rapid remediation of high SAR correction was documented at an almond orchard on the west side of Bakersfield, CA where the sodium ion concentration had been increased each year for the previous five years.

$$SAR = \frac{Na}{\sqrt{(Ca + Mg) / 2}}$$

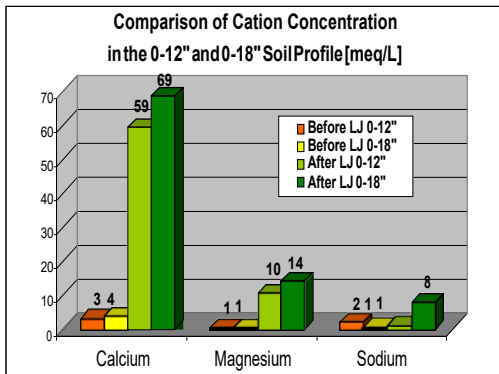
After the initial application of **Liqua-Jip** and **Penmax** the SAR value was lowered by over 86% in a total of three weeks.

This rapid reduction in the SAR was accomplished by only the two applications of **Liqua-Jip** and **Penmax®** followed by the normal irrigation regiment.



This particular orchard utilized micro-sprinklers for irrigation and fertigation. Because **Liqua-Jip** is already in solution, it may be either injected or metered into any irrigation water.

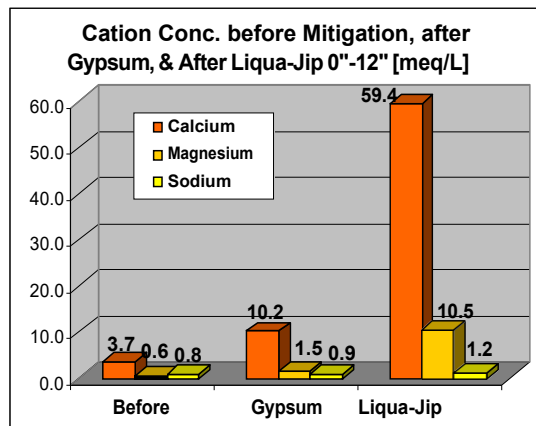
Because the calcium ion in **Liqua-Jip** is completely soluble, the calcium ions are very efficiently displacing sodium ion from the clay sites. In addition additives have been included in **Liqua-Jip** to facilitate more efficient



movement of the displaced excess sodium ions down through the soil profile.

Note that in the graph to the left, the calcium ion concentration increased by 20 fold after the application of **Liqua-Jip** and the sodium concentration decreased by a factor of two in the first 30cm (12 inches) of soil. The sodium ions that are displaced are moved deeper in the soil. These changes were observed after one application of **Liqua-Jip with Penmax®** followed by the normal irrigation schedule over the next month.

How quickly results are observed depends on the soil's composition and physical properties as well as the salt concentration in the water used for irrigation. In the graph to the right the concentration of the cations are observed after an application of gypsum and **Liqua-Jip**. Please note the much greater concentration of calcium in the soil treated with **Liqua-Jip**. The soil texture is observed to quickly improve once the negative sites are populated with calcium ion rather than sodium.



A healthy and diverse series of organisms are able to thrive in the **Liqua-Jip** treated soil. This is related to the flocculent structure with more air spaces that are able to form in the calcium rich soil. A balanced population of aerobic and anaerobic organisms will be more able to thrive in the **Liqua-Jip** treated soil. The possibility of



an particular organism becoming dominant in the aerated soil will allow a healthy and more balanced population to be maintained. In addition the **Penmax®** has proven to foster the growth of a wide range of organisms, maintaining a healthy competition where no one particular organism is favored. On the left in the picture, Penmax treated petri fostered the growth of organism populations which cover the surface completely.

The fostering of this competition in the soil has proven for over thirty years to minimize outbreaks of any particular organism or pathogen under a wide range of weather conditions and soil types. This soil organism competition between the various populations keeps any one organism from becoming dominant in the soil profile. Balance is the key!

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