SOIL SECRETS
Unlocking the Secrets of Healthy Soil!
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Saline and Sodic Soil: Using Mycorrhizal Fungus & Supramolecular Humic Acid

From the desk of Michael Martin Meléndrez - Managing Member of Soil Secrets LLC:

Much attention and concern has been recently paid to the increasing problem of salinity in soils, particularly soils found in arid and semiarid lands that are being irrigated. Where frequent irrigation is necessary, a residue of salts is left behind from the evaporation of water, gradually but imminently concentrating the salts until the soil can no longer support production. Plant roots generally do not absorb all the salts, so the proportion in the soil of salts gradually increases to a point of toxicity. The problem can be made worse by the use of animal manure based soil amendments in the form of raw manure or compost and from acid based fertilizers. The retention of salt in the root zone can cause negative **'Fluid Dynamics of Plants'** inhibiting the movement of water and nutrition into the plant. Water water everywhere but not a drop to drink! Soil compaction and the dispersion of soil particles can further compound the problem. The constant increase in irrigated farm soil salinity is a threat and a limiting factor, as soil salinity results in low crop yields and a dramatic increase in water use! So how do we fix the problem of soils? An emphasis on breeding plants that can tolerate salt has been a major focus of our Agriculture Universities, however the real key to success must be the implementation of better biological soil management and using inputs that help crops tolerate the salinity while also contributing to stopping and reducing the salinity of soils. The goal while practicing the **'biological management of soil'** must be improved soil health! Two tools in the tool box that meet that benchmark include using mycorrhizal inoculation and fortifying the soil with Humic Acids that are Supramolecular. See a chart on the last page, showing a salt reduction test using Humic Acids. The test was sponsored by the North Texas Oil and Gas Association in 1995. This trial used raw Humate, a geological ore called Oxidized Lignite that's not Supramolecular. The results were surprising because Humic Acids from such a source are very polymorphic and are most likely not Supramolecular. In fact, university and commercial soil labs are not capable of performing a true Humic acid purification from Lignite or from soil, required to perform a true chemical molecular analysis of Humic Acids or their molecular characterization and functionality. Therefore we have no idea what quality of material was actually used by the North Texas study in 1995, however when Soil Secrets tried to replicate the test using the

highest % Humic Acid Oxidized Lignite available, the test failed to achieve the same results. However when we used Humic Acids that were formulated by Soil Secrets to be Supramolecular (tested and measured by the Technology Transfer Program of Los Alamos National Laboratory and Sandia National Laboratories), we got excellent results, matching and sometimes exceeding the 1995 North Texas Oil and Gas Association tests.

Some research has also looked at the possibility that inoculating a crop with the Glomus species of Mycorrhizal fungus can also help a crop tolerate Salinity. See the attached Abstract on the subject.

My conclusion is that implementing an input program with both Mycorrhizal inoculation onto the seed of crops, while also adding at least 2000 pounds of active ingredient of Supramolecular Humic Acids into the top 6 inches of soil can have a positive influence in the Sodium Absorption Ratio (the SAR) and the PPM of Sodium in problematic Sodic and Saline soils.

See below a published study on a type of Mycorrhizal Fungi called Endo or VAM, supporting the hypothesis that plants can be helped by a Mycorrhizal relationship when grown in Saline Soils

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Improved Growth of Tomato in Salinized Soil by Vesicular-Arbuscular Mycorrhizal Fungi Collected from Saline Soils

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Abstract

Vesicular-arbuscular (VA) mycorrhizal fungi were collected and identified from saline locations throughout southern and central California and Nevada. From this collection, 38 soil samples containing VA mycorrhizal fungi from 22 plant species were used to inoculate tomato seedlings and evaluate their growth under artificial salinization. Six samples significantly improved growth of tomato in salinized soil when compared to a salinized, non-mycorrhizal control. Growth with 14 samples in salinized soil was as good as growth of a non-mycorrhizal control in non-salinized soil. Negative correlations were found between the amount of mycorrhizal colonization on tomato roots in the greenhouse and electrical conductivity, Na concentration, and osmotic potential of the saline soil samples from the field. The amount of mycorrhizal colonization on host plants in the field from which the soil samples were collected was not correlated to growth response or mycorrhizal colonization of tomato in the greenhouse.

Salt Contaminated Soil Clean-Up Test

Method: Soil samples for analysis were taken at several points in the salt spill area. Samples were taken from the surface, four inches deep and at 8 inches. All samples were blended together in equal number and submitted to the lab for analysis.
Humic substances containing Humic acids were then cultivated into the soil to a depth of 6 inches, at the rate of 40 pounds per 1000 square feet. 5 pounds of organic matter per 1000 square feet was spread on the site . The site and the organic matter were then tilled to a depth of 4 inches. The site was then left undisturbed for a period of eight weeks and then cultivated again. The test was completed and evaluated at 16 weeks.

Results

Component Value	Initial	8 day	16 week	Unit
pH	7.1	6.4	6.7	
Electrical Conductivity	62.7	54.6	43.4	Mmho./cm.
Sodium	15,570	9472	911	ppm
Potassium	746	610	67	ppm
Calcium	8060	5722	5148	ppm
Magnesium	1983	1383	1132	ppm
Na Absorb. Ratio (SAR)	40.2	29.1	3	

Results: Analysis of the above data shows a reduction in sodium of 94%, a 91% reduction in Potassium and a drop in the sodium absorption ratio from 40.2 to 3.0. Of significant interest was the 40% sodium drop at the eight-day test. A plot of sodium absorption ratio against time indicated the SAR level of 12 was reached at week 10 and continued to drop to a level of 3 by the end of the study at week 16.

Sponsors of this study: North Texas Oil and Gas Association, June 1995. Remediation of Salt Damaged Soils, Stallworth, W.B.
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