Assessing Salinity in Cotton and Tomato Plants by Using Reflectance Spectroscopy

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Irrigated lands in semi-arid and arid areas are subjected to salinization processes. An example of this phenomenon is the Jezreel Valley in northern Israel where soil salinity has increased over the years. The increase in soil salinity results in the deterioration of the soil structure and crops damage.

In this experiment we quantified the relation between the chemical and spectral features of cotton and tomato plants and their mutual relationship to soil salinity. The experiment was carried out as part of ongoing research aiming to detect and monitor saline soils and vegetation by combining different remote sensing methods.

The aim of this study was to use vegetation reflectance measurements to predict foliar Cl and Na concentration and assess salinity in the soil and in vegetation by their reflectance measurements.

The model developed for determining concentrations of chlorine and sodium in tomato and cotton produced good results ($R^2 = 0.92$ for sodium and 0.85 for chlorine in tomato and $R^2 = 0.84$ for sodium and 0.82 for chlorine in cotton).

Lately, we extend the method to calculate vegetation salinity, by doing correlation between the reflectance slopes of the tested crops CL and Na from two research areas. The developed model produced a good results for all the data ($R^2=0.74$)

Our method can be implemented to assess vegetation salinity ahead of planting, and developed as a generic tool for broader use for agriculture in semi-arid regions.

In our opinion these results show the possibility of monitoring for a threshold level of salinity in tomato and cotton leaves so remedial action can be taken in time to prevent crop damage.

Our results strongly suggest that future imaging spectroscopy remote sensing measurements collected by airborne and satellite platforms could measure the salinity of soil and vegetation over larger areas.

These results can be the first steps for generic a model which includes more vegetation for salinity measurements.