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Salinity effect of irrigation with treated wastewater in basal soil respiration in SE of Spain

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The use of treated wastewater for the irrigation of agricultural soils is an alternative to utilizing better-quality water, especially in semiarid regions where water shortage is a very serious problem. Wastewater use in agriculture is not a new practice, all over the world this reuse has been common practice for a long time, but the concept is of greater importance currently because of the global water crisis. Replacement of freshwater by treated wastewater is seen as an important conservation strategy contributing to agricultural production, substantial benefits can derive from using this nutrient-rich waste water but there can also be a negative impact. For this reason it is necessary to know precisely the composition of water before applying it to the soil in order to guarantee minimal impact in terms of contamination and salinization.

In this work we have been studying, for more than three years, different parameters in calcareous soils irrigated with treated wastewater in an agricultural Mediterranean area located at Biar (Alicante, SE Spain), with a crop of grape (Vitis labrusca). Three types of waters were used for the irrigation of the soil: fresh water (control) (TC), and treated wastewater from secondary (T2) and tertiary treatment (T3). Three different doses of irrigation have been applied to fit the efficiency of the irrigation to the crop and soil type during the study period. A soil sampling was carried out every four months.

We show the results of the evolution of basal soil respiration (BSR), and its relationship with other parameters. We observed a similar pattern of behavior for BSR between treatments, a decrease at the first eighteen months of irrigation and an increase at the end of study. In our study case, the variations of BSR obtained for all the treatments seem to be closely related to the dose and frequency of irrigation and the related soil wetting and drying cycles. However, the results showed a negative correlation between BSR and saline content in soils irrigated with wastewater. The lower values of BSR were detected at T2 and T3 treatments and higher in TC, corresponding with an increase of electrical conductivity (EC) in soil especially in that irrigated with the secondary treatment. The increase of EC in any case was so high as to produce big problems with crop productivity or soil salinization. An increasing trend was observed in BSR after a period of leaching of salts and a decrease of EC.

An exhaustive control of EC of treated wastewater is necessary to avoid undesirable effects on crop yield and to assess the feasibility of using these waters in this type of soil.

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