Introduction
Land application is the main method of waste disposal currently used for many organic wastes. This is a major agricultural research priority in order to maintain sustainability of production systems and environmental quality. The organic residues in the winery waste may stimulate microbial activities and the possible use of wastewater for irrigation may help to cut down the use of nitrogen and phosphorus based fertilisers. However, repeated application of winery wastewater could result in long-term effects on soil properties and soil dwelling organisms. The main aim of this study was to assess the changes/impacts due to long-term application of saline winery wastewater at selected sites in the Barossa and McLaren Vale regions.

Methodology
• In order to investigate the impact of winery wastewater on soil status in terms of microbial health and general soil properties (e.g. physico-chemical characteristics), surveys were undertaken from several sites. Site details are given in Table 1.
• The following soil physico-chemical characteristics parameters were measured: TOC, EC (dS/m), Calcium, Magnesium, Sodium (mg/kg; 1:5 soil:water for the determination of Sodium Adsorption Ratio (SAR)), pH (pH units; 1:5 soil:water), Total available phosphorous (mg/kg; Bicarbonate extraction method), Potassium (mg/kg; Bicarbonate extraction method), Total Kjeldahl nitrogen (mg/kg).
• Soil microbial assays conducted under this study are provided in Table 2.

Results
• Higher organic carbon content of the winery wastewater resulted in increased total organic carbon content in the soils irrigated with winery wastewater.
• Woodlot soils irrigated with winery wastewater exhibited increased SIR in comparison to the control woodlot soils (Figure 1). Nitrification (conversion of NH4+ in NO3-, the major source of nitrogen for plants) followed the same trend.
• Microbial enzyme analyses also confirmed that the winery wastewater irrigation of soils was not adversely impacting the microbial activity of soils (Figures 2 and 3).
• Salinity, sodicity and available potassium in soils, were noted to be elevated in the wastewater treated plots, especially woodlot and pasture sites, in comparison with the control plots (Figure 4, Table 3).

Conclusions
Soil microbiological activity was not adversely affected in the wastewater treated plots. Greater microbial activity was observed in wastewater treated plots, most likely due to the build up of organic carbon content. However, indirect effects due to excessive water application leading to prolonged waterlogging conditions and structural decline were not tested. Currently, very little information exists on the loads of salts that different soil types can tolerate before ecological effects could be observed. Therefore, information on the tolerance of different soil types to winery wastewater in terms of adverse soil biological functions and/or soil chemistry parameters is urgently required.

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