

Management of Winery Wastewater by Re-using it for Crop Irrigation - A Review

C.L. Howell*, P.A. Myburgh

ARC Infruitec-Nietvoorbij (The Fruit, Vine and Wine Institute of the Agricultural Research Council), Private Bag X5026, 7599, Stellenbosch, South Africa

Submitted for publication: July 2017

Accepted for publication: October 2017

Key words: Chemical oxygen demand, grapevines, potassium, water quality, wine

In South Africa, grapes are an important crop in the Western and Northern Cape provinces. The wine industry makes a significant contribution to the economy in these regions. Wineries generate large volumes of poor quality wastewater, particularly during harvest. Information on actual amounts of water used by wineries is limited and appears to be inconsistent. Usually, most of the raw water entering wineries ends up as wastewater. Winery wastewater has high levels of chemical oxygen demand (COD) and contains high levels of K^+ and Na^+ . There is considerable variation in wastewater quality parameters between wineries, as well as a strong seasonal variation. In most cases, the wastewater is used for the irrigation of small, permanent-pasture grazing paddocks. The use of winery wastewater for vineyard irrigation could have many potential benefits for the wine industry. Irrigation with wastewater containing high levels of K^+ could be beneficial to soil fertility, although long-term application could have negative effects on soil chemical properties. In terms of South African guidelines, wineries must register their intended wastewater use with the Department of Water and Sanitation. The quantity of wastewater irrigated on a weekly basis has to be monitored and the wastewater quality has to be measured monthly. Weekly water balances should be drawn up with the assistance of a soil scientist. When selecting crops for irrigation with winery wastewater, soil characteristics and climatic conditions, as well as wastewater quality and quantity, should be considered. It is important to quantify soil chemical responses to the application of winery wastewater every three months.

INTRODUCTION

In South Africa, grapes are an important crop in regions such as the Western Cape province and the Lower Orange River region in the Northern Cape province. The wine industry makes a significant contribution to the economy in these regions. In 2014, there were 3 314 primary wine grape growers (South African Wine Industry Information and Systems [SAWIS], 2015). Furthermore, the wine industry provides a large number of employment opportunities, particularly in the rural areas. In 2014, the vineyards planted for wine production in South Africa amounted to 99 463 hectares, of which *c.* 93% were considered as producing, *i.e.* four years and older (SAWIS, 2015). The number of wineries that crush grapes almost doubled from 1991 to 2002 (Table 1). Since 2005, the number of wineries appeared to be more or less stable. During this period, the industry produced around one billion litres of grape-related products annually (Table 2).

Using raw water is an integral part of wine production processes. However, these processes generate wastewater of low quality that cannot be disposed of in natural

systems. Winery wastewater can cause the salinisation and eutrophication of water resources, *i.e.* natural streams, rivers, dams, groundwater and wetlands (Van Schoor, 2005 and references therein; Laurenson *et al.*, 2012). Furthermore, wastewaters can cause soil sodicity, salinity, contamination with a wide range of chemicals, waterlogging and anaerobiosis, as well as loss of soil structure and increased susceptibility to erosion. Where solid wastes are present, offensive odours may be generated and seepage may result in the contamination of soil and water resources, giving rise to the inhibition of vegetative performance (Van Schoor, 2005 and references therein).

VOLUME OF WATER USED BY THE WINE INDUSTRY Water used for winemaking

Information on the actual amounts of water used by wineries is limited and appears to be inconsistent. A survey carried out in South Africa, which included wineries that crush up to 22 000 tonnes of grapes annually, showed that the volume of raw water increases significantly with the amount of grapes

*Corresponding author: E-mail address: howellc@arc.agric.za

Acknowledgments: This literature review paper forms part of Project K5/2561//4, funded by the Water Research Commission (WRC), Winetech and the Agricultural Research Council (ARC).

