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GRAPE QUALITY OF CV. VIOGNIER (*Vitis Vinifera* L.) IN RESPONSE TO DRIP IRRIGATION USING TREATED DOMESTIC WASTEWATER: FIRST RESULTS

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Introduction

The Mediterranean climate in the South of France is becoming more arid for the past ten years with a water balance in deficit every year, unlike previous decades. Despite a favorable level of sunshine, this generates a decrease in yield but also sometimes in the quality of the wine produced. The 'Irri-Alt'Eau' R&D program aims at implementing a veritable strategy for treated wastewater reuse and grapevine drip-irrigation management which provides a sustainable access to good quality water, whilst preserving wine quality and the environment. It has been demonstrated in many parts of the world that the reuse of treated wastewater for irrigation was beneficial for grape production (Acosta-Zamorano et al., 2013; McCarthy, 2010; Mendoza-Espinosa et al., 2008; Sakellariou-Makrantonaki et al., 2006), thus encouraging the use of alternative water for the irrigation of vines in places where freshwater resources are limited. No research project has been conducted on this topic in France. The ongoing and future research includes a complete analytical program in order to establish the effects of drip irrigation of vines with treated domestic wastewater on soil, groundwater, plant, fruit and wine.

Methodology

This study was conducted at INRA UE Pech Rouge in Gruissan, France, on an experimental vineyard using 'Viognier B' grafted onto SO4 rootstock in a sandy loam soil (planted in 1996). The region has a Mediterranean climate and annual rainfall of approximately 550 mm. This experimental vineyard consisted of four vine rows adjacent to each other, for each irrigation treatment (with two buffer vine rows between each irrigation treatment). These experimental rows were divided into three plots (with buffer vines at the start and end of each row), each considered as field replicates. Four types of water were used: drinking water (control); domestic treated wastewater of B* (filtration, disinfection UV and Chlorine injection) and C* (filtration and chlorine injection) quality; agricultural water (surface source of canal Sainte-Marthe near Narbonne, France). All vines received 12.5 L/plant/irrigation through a drip irrigation system, according to a leaf water potential-based model for vine irrigation strategies adapted to white wine production (Ojeda, 2007). Irrigation started at

pea-size berry and continued until harvest also including a postharvest irrigation (450m^3/ha/year). Physicochemical and microbiological characterization of irrigation water was realized and grape ripeness composition was determined.

** Level of sanitary quality of treated wastewater according to parameters from the French decree of 25 June 2014 (NOR: AFSP1410752A).*

Results and discussion

The results of treated wastewater analysis indicated that all physicochemical parameters were consistent with French legislation for the irrigation of crops and green spaces (NOR: AFSP1410752A). Fluctuations of COD, TSS, and conductivity were observed for the treated wastewater and agriculture water between the two irrigation periods (2013-2014). These seasonal fluctuations depend of wastewater quality before treatments. In general, vines irrigated with treated wastewater received the highest concentrations of nutrients. These results coincide with similar studies in other countries (Sakellariou-Makrantonaki et al., 2006; Mendoza-Espinosa et al., 2008; Acosta-Zamorano et al., 2013). In terms of microbiological parameters, the norms in the reduction of spores of sulfito-reducing anaerobic bacteria was sometimes difficult to comply with, mostly due to their low content in wastewater at the entry to the wastewater-treatment plant. All this can be controlled through improved practices in the tertiary treatment management (filtration, UV and chlorination). No bacterial regrowth was observed between the pilot outlet and the vineyard (distance of 1 km) and no human pathogens were detected in produced grapes.

At harvest, none of the fruit components measured were altered by the different type of water used for irrigation, similar to the results of Mendoza-Espinosa et al. (2008). Furthermore, fruit composition was more sensitive to the year characteristics than the supplied water quality. The first results of this study suggest that the fruit quality would not be modified by applying treated wastewater to vines crops. Ongoing research and development will also encourage the use of recycled water for irrigation purposes as well as increasing public confidence.

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