

A STUDY ON WINERY EFFLUENT TO EVALUATE ITS POLLUTION LOAD IN DIFFERENT SEASONS

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ABSTRACT

A study was undertaken to evaluate the pollution load of winery effluent on its seasons. Winery effluent sample on vintage and non-vintage season was collected and some Physico-chemical parameters were analyzed as per the standard procedure. In the analysis made vintage season showed comparatively higher concentration of pollution load than the non-vintage season. Effluent was acidic with more EC value having more dissolved ions in it. Solid particles in the effluent were also high. Effluent showed the presence of organic and inorganic pollutants to cause environmental threat. Besides, heavy metals were also present in winery effluent to cause environmental pollution.

KEY WORDS : Environment, Pollution, Season, Winery

INTRODUCTION

Industrial advancement in a country leads to its development and its economy. Industries discharge all kinds of waste into the nearby surroundings and deteriorate the environment. Environmental deterioration has become a serious worldwide problem. So environmentalists are facing a serious issue in maintaining our ecosystem health (Vivek and Jaswant, 2006).

In the industrial list, wine industry is the agricultural based industry and it discharges wastewater with different composition of chemicals. In wine industry, activities is of seasonal types called as vintage and non-vintage types, Generally vintage is a harvesting and crushing period of grapes and Non vintage is a non crushing period of grapes in wine production. So the wastewater discharged is also considered according to their seasonal activities of wine production, as vintage season and non-vintage season effluent. Vintage and non vintage period of wine making depends mainly on the climatic condition of the vineyard and winery location. Bigger amount of winery wastewater is generated and released during vintage season than the non vintage season (Mahajan *et al.*, 2009).

High volume of wastewater is generated during winemaking and it varies between wineries depending upon the period of production and method of winemaking (Agustina *et al.*, 2007). In wineries rinse water, equipment and floor cleaning water, alkali salts in washwater, earth filtering and ion exchange process produces wastewater as an effluent (Kyzas, 2016). The chemical composition of the winery effluent varies highly and it depends upon the grape variety, influent wash water chemistry, the cellar activities and cleaning producers employed (Vlyssides *et al.*, 2005 and Bolzonella and Rosso, 2013).

It is more essential to keep the equipments and winery clean and hygeinic. So, contamination and spoilage are avoided by using more cleaning and sanitizing agents in winery which reflects in the wastewater. The exact composition of the winery wastewater is not known and it varies highly within and between wineries (Mosse *et al.*, 2011). So, there is an essential need to evaluate the winery effluent to know it's pollution level for utilization.

MATERIALS AND METHODS

Collection of Effluent: The vintage and non-vintage season effluent was collected separately from the

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wine industry (winery) located at 9°46'26"N and 77°22'07"E of Tamil Nadu in a 25 L pre sterilized container after rinsing with the effluent before collection.

Analysis of Effluent : The collected vintage and non-vintage season effluent was used for the present work to study some physico-chemical parameters like pH which was measured in pH meter, EC was measured in conductivity meter; TDS, TSS and TS was measured by Gravimetric method; sodium and potassium was measured in Flame Photometer; calcium and magnesium by Volumetric method; chloride by Tritrimetric method; sulphate and phosphate by Spectrophotometric method and bicarbonate by Tritrimetric method following the standard procedure (APHA, 2012), Heavy metals present in the effluents were measured using AAS and Percent sodium (%) was calculated by Wilcox (1948) method and the result was compared with the TNPCB standards.

RESULTS AND DISCUSSION

The Physico-chemical characterization of vintage season and non-vintage season winery effluent was represented in Table 1. pH was acidic in vintage season and slightly acidic in non-vintage season. pH of the vintage season effluent was below the range

of standard. Similarly it was reported that pH was acidic and below 4 during harvest period in winery wastewater (Mulidzi *et al.*, 2009). Acidic nature may be due to organic acids present in it and it may be reduced by spilling of wine (Howell *et al.*, 2016).

EC value was higher in vintage than the non-vintage season. Howell *et al.* (2016) reported higher EC value in harvest period and increase in EC might be due to using of cleaning agent, spillages during the process of grape fermentation. Acidification and Stabilization increases EC and COD value in effluent and it also reduces wastewater pH (Van Schoor, 2005).

TDS, TSS and TS were more in vintage season than the non-vintage season. Solids in the vintage season effluent may be because of more use of salts in wineries for cleaning operations. Dissolved and suspended solids in the vintage season effluent exceeded the standard limit.

Monovalent (Sodium and Potassium) and divalent cations (Calcium and Magnesium) level was comparatively much higher in vintage season than the non-vintage season. This may be because of the usage of more cleaning and sanitizing agent used in winery during vintage season. In the cations analyzed sodium level was more in the effluent and it may be because of the usage of sodium based cleaning agent than potassium based due to high expensive (Welz *et al.*, 2016). Calcium and

Table 1. Characteristics of winery effluent on vintage and non-vintage season.

S.No.	Parameters	Vintage	Non-Vintage	Standards
1	pH	4.8	6.4	5.5 to 9
2	EC	11.6	4.2	-
3	TDS	9460	2714	2100
4	TSS	744	279	200
5	TS	10204	2993	-
6	Sodium	689.7	229.9	-
7	Potassium	273.7	78.2	-
8	Calcium	260.5	130.3	-
9	Magnesium	48.6	30.4	-
10	Chloride	141.8	106.4	600
11	Sulphate	720.4	336.2	1000
12	Phosphate	28.5	15.8	-
13	Bicarbonate	1952.5	274.6	-
14	Percent Na (%)	68.5	57.1	60
15	BOD	2985	321	100
16	COD	6023	610	250
17	Copper	2.1141	0.0933	3
18	Zinc	1.3563	0.0655	1.5
19	Nickel	0.9272	0.0428	3

*All the values are expressed in mg L⁻¹ except pH, Electrical conductivity (dS m⁻¹) and Percent sodium

Magnesium were present in low level in the analyzed effluents, similar report was recorded (Mosse *et al.*, 2012). But also high level of calcium and magnesium were reported in winery wastewater (Bustamante *et al.*, 2005).

Like cations, anion was also higher in vintage season than the Non-vintage season. Generally high concentration of bicarbonate in winery wastewater may be due to the usage of alkaline cleaning agent and irrigation of such wastewater increase soil pH (Suarez *et al.*, 2006). Most of the anion level in winery wastewater was at low concentration (Buelow *et al.*, 2015). BOD and COD value of vintage season was much higher than the non-vintage season in the study, indicating the presence of organic matter in the effluent (Arora *et al.*, 2017). Quality of an effluent was analyzed by calculating percent sodium and it was higher in vintage season than the non-vintage season. Vintage season percent sodium level was more than the standard level. Copper and Zinc ranks a position in the heavy metals analyzed. Present study showed that the heavy metals of vintage season were more than the non-vintage season. Andreottola *et al.* (2007) reported higher concentration of Cu and Zn and Bustamante *et al.* (2005) reported Pb and Cu in their study.

From the study it is clear that vintage season effluent had high pollution load than the non-vintage season and it is recommended that without treatment, practicing the usage of winery effluent is not ideal.

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