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Physicochemical and spectroscopic characteristics of compost from vineyard waste and wine lees valorization

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Abstract The present study deals with the analysis of chemical and spectroscopic characteristics of compost as a valorization product of vineyard and winery wastes within circular economy.The C/N ratio showed a stabilized compost. HA was increased at the final stage and low E4/E6 values denoted a mature compost.

Keywords: compost, wine lees, humification

1. Study-Results

Composting is an economical and sustainable process of converting the organic waste inevitably produced by various activities into useful organic matter. Considering circular economy approach a soil organic amendment was produced by co-composting vineyard wastes and wine lees. Quality assessment of composts by quantification of favorable properties is a crucial issue in terms of ecological and economic aspects. [1].In the present study the compost maturity and stability were assessed by means of organic matter evolution characterization. Compost analyses were performed at six time intervals (40 to 162 days) after initial day during composting procedure. Elemental analysis showed an increment of %C from 45.8 to 52.4% and a C/N ratio of 12.4 at the final stage which corresponds to stabilized compost. The Total Phenolic Content was determined in compost extracts by Folin-Ciocalteu method and ranged between 0.05 to 0.09 mg GAE/g DM similar to previous reported values of mineral composts [1].UV-Vis spectrophotometric measurements were performed on compost organic matter extracts and the absorbance ratio at 472 and 664 nm (E4/E6) the most indicative parameter related to the humification degree, was recorded. The final compost showed low values close to 5 that characterize the aromatic constituent dominance in a mature compost. The dried compost samples were analyzed using ATR-FT-IR spectrometry for the determination of the functional groups of compost (Fig.1).The main absorbance bands noted in the samples of final compost were a broad band at around 3400cm^{-1} (OH groups and H-bond), 1650cm^{-1}(C=C in aromatic structures, hydrogen bonded C=O), 1030cm^{-1} (carbohydrates components), in initial stage 1510-1550cm^{-1} (amideII and lignin components).The evolution of carbon was measured in the fractions of total humic matter (THM), fulvic acids (FA) and humic acids (HA). HA fractions show a slight carbon loss in the initial phase, which increases as the humification process progresses.

Table1. Characteristic chemical and spectrometric parameters of compost

Parameters	Initial stage	Final stage
N%	3.1 ± 0.6	4.2 ± 0.6
C%	45.8 ± 5.2	52.4 ± 5.2
H%	4.7 ± 0.8	5.4 ± 0.8
C/N	15.2 ± 0.7	12.4 ± 0.7
THM Carbon loss (%)	24.5	26.5
TPC (mg GAE/g DM)	0.05 ± 0.03	0.09 ± 0.03
Absorb. ratio E4/E6	6.51	5.72

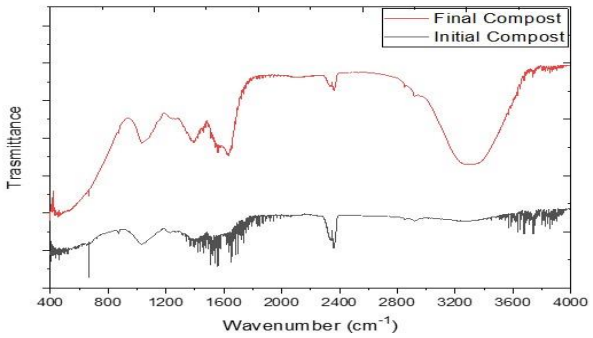

Figure 1. ATR-FT-IR spectra of composted materials at initial and final stages.

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References

[1] M. Cascant.(…)M.dela Guardia (2016)*Talanta*, **153**, 360-365.

[2]W.A. Doctor, .(…) E. Amar (2020) *Journal of Environmental Management*,**264**,110492.