

4. Conclusion

The study concludes that olive mill waste for all type of trituration are suitable feedstock for earthworms *Eisenia andrei* which is able to convert it into a value added product. The addition of cattle manure to olive mill waste enhance earthworm biomass during vermicomposting. The resulting vermicompost were characterized by slightly acidic to neutral pH, and optimal EC and C/N ratios. The mature vermicompost has higher nutrient content (Phosphorus, potassium, calcium, sodium). Moreover the *Eisenia andrei* are able to degrade the polyphenol. The phytotoxicity screening (GI) submitted the suitability of vermicomposting olive mill waste mixtures for agronomic purposes.

References

- [1] Ait Baddi,G. , Albuquerque,J.A., González,J. , Cegarra,J.,Hafidi,M.,: Chemical and spectroscopic analyses of organic matter transformations during composting of olive mill wastes, Int. Biodeterior. Biodegrad. 54, (39–44), 2004.
- [2] Ait Baddi,G., Cegarra,J., Merlina,G., Revel, J.C., Hafidi, M.,: Qualitative and quantitative evolution of polyphenolic compounds during composting of an olive-mill waste. Journal of Hazardous Materials 165, 1119–1123, 2009.
- [3] Albuquerque JA, González J, García D, Cegarra J: Effects of bulking agent on the composting of “alperujo”, the solid by-product of the two-phase centrifugation method for olive oil extraction. Process Biochem 41:127–132, 2006.
- [4] Altieri, R., Esposito, A., Nair, T.: Novel static composting method for bioremediation of olive mill waste. International Biodeterioration and Biodegradation 65, 786-789, 2011.
- [5] Aviani,I., Laor,Y.,Medina,Sh.,Krassnovsky,A.,Raviv,M.: Co-composting of solid and liquid olive mill wastes: Management aspects and the horticultural value of the resulting composts. Bioresource Technology, 101, 6699–6706, 2010.
- [6] Benitez Emilio, Sainz H, Melgar Raquel, Nogales Rogelio: Vermicomposting of a lignocellulosic waste from olive oil industry: a pilot scale study. Waste Management and Research, 20, 134–142, 2002.
- [7] Caputo Maria Clementina, Maria De Girolamo Anna, Volpe Angela: Soil amendment with olive mill wastes: Impact on ground water. Journal of Environmental Management 131, 2 216-221, 2013.
- [8] Domínguez Jorg, Martínez-Cordeiro Hugo, Álvarez-Casas Marta, Lores Marta: Vermicomposting grape marc yields high quality organic biofertiliser and bioactive polyphenols. Waste Management & Research, Vol. 32(12) 1235–1240, 2014.
- [9] El Mouhtadi Issam, Agouzzal Mohamed, Guy François: L'olivier au Maroc. OCL, 21(2) D203, 2014.
- [10] Elvira C, Goicoechea M, Sampedro L, Mato S, Nogales R: Bioconversion of solid paper-pulp mill sludge by earthworms. Bioresour Technol 75:173–177. 1996a.
- [11] Elvira C, Sampedro L, Benitez E, Nogales R: Vermicomposting of sludges from paper mill and dairy industries with *Eisenia andrei*: a pilot scale study. Bioresour Technol 63:205–211, 1998.
- [12] Fernández-Hernández Antonia , Roig Asunción, Serramiá Nuria , García-Ortiz Civantos Concepción , Sánchez-Monedero Miguel A.: Application of compost of two-phase olive mill waste on olive grove: Effects on soil, olive fruit and olive oil quality. Waste Management , 2014.
- [13] Hanc Ales, Chadimova Zuzana: Nutrient recovery from apple pomace waste by vermicomposting technology. Bioresour. Technol, 2014.
- [14] Kiston R. E, Mellon M. G.: Colorimetric Determination of Phosphorus as Molybdivanadophosphoric Acid. Ind. Eng. Chem. Anal. Ed. 2, 379-383, 1944.
- [15] Macci, C., Masciandaro, G., Ceccanti, B.: Vermicomposting of olive oil mill wastewaters. Waste management and research 28, 738-739, 2010.
- [16] Melgar Raquel, Benitez Emilio, Nogales Rogelio: Bioconversion of wastes from olive oil industries by vermicomposting process using the epigeic earthworm *Eisenia andrei*. Journal of Environmental Science and Health, Part B: Pesticides, Food Contaminants, and Agricultural Wastes, 44:5, 488-495, 2009.
- [17] Pansu Marc, Gautheyrou Jacques: Handbook of Soil Analysis: Mineralogical, Organic and Inorganic Methods. New York: Springer, 332-335, 2006.
- [18] Prakash, M., M. Jeyakumar and N. Karmegam.: Vermistabilisation of paper mill sludge using the earthworm *Perionyx ceylanensis*: Influence on physico-chemical and microbiological status. Indian J. Applied Microbiol, 10: 20-25. 2009
- [19] Selim, Sh. M., S. Zayed Mona, M. Atta Houssam: Evaluation of Phytotoxicity of Compost During Composting Process. Nature and Science; 10(2):69-77, 2012.
- [20] Senesi, N.: Composted materials as organic fertilizers. Sci Total Environ 81, 521–542, 1989. Suthar Surindra, Sharma Priyanka: Vermicomposting of toxic weed — Lantana camara biomass: Chemical and microbial properties changes and assessment of toxicity of end product using seed bioassay. Ecotoxicology and Environmental Safety 95, 179–187. 2013
- [21] Suthar Surindra: Recycling of agro-industrial sludge through vermitechnology. Ecological Engineering: 36, 1028–1036, 2010.
- [22] Wani K.A., Mamta, Raob R.J.: Bioconversion of garden waste, kitchen waste and cow dung into value-added products using earthworm *Eisenia fetida*. Saudi Journal of Biological Sciences 20, 149–154, 2013.
- [23] Yadav Anoop, Garg V. K.: Industrial wastes and sludges management by vermicomposting. Rev Environ Sci Biotechnol 10:243–276, 2011.
- [24] Zenjari.B, Nejmeddine Ahmed: Impact of spreading olive mill wastewater on soil characteristics: laboratory experiments. Agronomie, EDP Sciences, 21 (8), 749-755, 2001.
- [25] Zucconi F., Pera, A., Forte, M., De Bertoldi, M.: Evaluating toxicity of immature compost, Biocycle 22, 54–57, 1981.