



PHENOLEXA



Guidelines for the incorporation and transformation of the agri-waste in the PHENOLEXA biorefinery

General Information

The present guidelines summarise all the key aspects of the selected agro-industrial residues of onions, chicory, olive trees and vineyard cultures under study by PHENOLEXA taking into account very important aspects of the cultivation processes and processing chains that will make it easier to process these wastes.

Providing an overview of aspects as: the key actors, which, in terms of production volume across the European Union, are ideal to start looking for the key points where our prized base product is generated, the main actors involved in its generation and processing, process it and transport it for greater efficiency and their costs.

Other important aspects to take into account are the environmental impact and the energy required for their transformation, since the uses proposed by PHENOLEXA for a specific residue may be associated to undesirable environmental effects or energy costs that the

current use of it. On the other hand, the current use of waste, makes the environmental and economic impact of the processing by PHENOLEXA much better.

The main interest of these guidelines is to establish a multicriteria assessment with all this information to rank it according to effectiveness and environmental impact that helps decision-making.

With the aim of giving all this information clearly and practically all the material will be condensed by developing these guidelines that identify the process followed by each waste and the actors involved at any given time.

At the end of these guidelines, recommendations of the optimal points for obtaining raw materials for the PHENOLEXA biorefinery based on the best environmental and economic profitability is given as the main conclusion.

AUTHORSHIP

Please cite these guidelines as: González, M.; San José, E.; Pablos, L.; Gómez Valle, S.; Guidelines developed in the framework of D2.3 Report on the overview and assessment of the best practices for agri-waste utilization and disposal. PHENOLEXA project funded under grant agreement n. 101023225 of the European Union's Horizon 2020 research and innovation programme.



This project has received funding from the Bio-based Industries Joint Undertaking (JU) under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101023225. The JU receives support from the European Union's Horizon 2020 research and innovation programme and the Bio-based Industries Consortium.



Guidelines: General Information



REFERENCES

- AGRIVI. (2022).
Chicory Harvest.
<https://www.agrivi.com/blog/chicory-harvest/>
- Blanco, I., De Bellis, L., & Luvisi, A. (2022).
Bibliometric Mapping of Research on Life Cycle Assessment of Olive Oil Supply Chain. *Sustainability*, **14**, 3747.
<https://doi.org/10.3390/su14073747>
- Brancoli, P., Bolton, K., & Eriksson, M. (2020).
Environmental impacts of waste management and valorisation pathways for surplus bread in Sweden. *Waste Management*, **117**, 136–145.
<https://doi.org/10.1016/j.wasman.2020.07.043>
- Buzby, J. C., & Hyman, J. (2012).
Total and per capita value of food loss in the United States. *Food Policy*, **37**(5), 561–570.
<https://doi.org/10.1016/j.foodpol.2012.06.002>
- Caldeira, C., Vlysidis, A., Fiore, G., De Laurentiis, V., Vignali, G., & Sala, S. (2020).
Sustainability of food waste biorefinery: A review on valorisation pathways, techno-economic constraints, and environmental assessment. *Bioresource Technology*, **312**, 123575.
<https://doi.org/10.1016/j.biortech.2020.123575>
- Compés-López, R. (2020).
Estudio de costes de producción de uva para la elaboración de vinos en España.
- Conesa Fernández-Vitora, V., Conesa Ripoll, V., Conesa Ripoll, L. A., Ros Garro, V., & Esteban Bolea, M. T. (1997).
Guía metodológica para la evaluación del impacto ambiental (3rd Edition). Mundi-Prensa.
- IRTA, & CREAF. (2021).
¿Cómo afecta el cambio climático a la viña?
<https://www.irta.cat/es/afecta-canvi-climatic-vinya/>
- EOS. (2021, December 8).
Chicory Route.
<https://eostrace.be/traces/trace-van-witloof>
- Espadas-Aldana, G., Vialle, C., Belaud, J. P., Vaca-Garcia, C., & Sablayrolles, C. (2019).
Analysis and trends for Life Cycle Assessment of olive oil production. *Sustainable Production and Consumption*, **19**, 216–230.
<https://doi.org/10.1016/j.spc.2019.04.003>
- Espeso, J., Isaza, A., Lee, J. Y., Sørensen, P. M., Jurado, P., Avena-Bustillos, R. de J., Olaizola, M., & Arboleya, J. C. (2021).
Olive Leaf Waste Management. *Frontiers in Sustainable Food Systems*, **5**, 660582.
<https://doi.org/10.3389/fsufs.2021.660582>
- FAO. (2012).
The role of producer organizations in reducing food loss and waste.
- Fernández, O. (2020).
Promoviendo el aprovechamiento de la poda de viñedo.
- Foods and Wines From Spain. (2017).
Wine in Figures.
<https://www.foodswinesfromspain.com/>
- Fritzsche U. R., Eberle, U. (2009).
Greenhouse-Gas Emissions from the Production and Processing of Food. In *Food Climate Report - Öko-Institut e.V.*
www.gemis.de%5Cnwww.oeko.de



This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101023225



Guidelines: General Information



REFERENCES

- Gancedo-Alonso, S. (2018).
Impactos Ambientales Derivados de la Producción de Vino de la D.O.P. Cangas [Universidad de Oviedo]. In Trabajo Fin de Máster.
http://digibuo.uniovi.es/dspace/bitstream/10651/48215/6/TFM_SamuelGancedoAlonso.pdf
- Garcia, G., & Vázquez, L. (2015).
Guía de prácticas correctas de higiene para vegetales y derivados, frescos, mondados, troceados o envasados. Agencia de Salud Pública de Catalunya.
- García Martín, J. F., Cuevas, M., Feng, C., Álvarez-Mateos, P., Torres-García, M., & Sánchez, S. (2020).
Energetic Valorisation of Olive Biomass: Olive-Tree Pruning, Olive Stones and Pomaces. Processes, 8, 511.
- Giménez-Martínez, J. (2020).
Caracterización y valorización de los restos de poda en viñedo como sustrato para la elaboración de cultivo ornamental. Universitat Politècnica de València.
- Göbel, C., Teitscheid, P., Ritter, G., Blumenthal, A., Friedrich, S., Frick, T., Grostellen, L., Möllenbeck, C., Rottstegge, L., & Pfeiffer, C. (2012).
Verringerung von Lebensmittelabfällen–Identifikation von Ursachen und Handlungsoptionen in Nordrhein-Westfalen. In Fachhochschule Münster - Institut für Nachhaltige Ernährung und Ernährungswissenschaft (iSuN).
https://www.fh-muenster.de/isun/downloads/Studie_Verringerung_von_Lebensmittelabfaellen.pdf%5Cnhttp://hrzvs01-www01.hrz.isc.fh-kiel.de/fileadmin/data/praeisdium/Hochschule_mit_Zukunft/Interdisziplinaere_Wochen/Material_zum_Download/zu_14_iSuN-Studie_zur_V
- Grethe, H., Dembélé, A., & Duman, N. (2011).
How to Feed The World's Growing Billions.
- Gustavsson, J., Cederberg, C., & Sonesson, U. (2011).
Global Food Losses and Food Waste. FAO.
<https://doi.org/10.4337/9781788975391>
- Gustavsson, J., Cederberg, C., Sonesson, U., & Emanuelsson, A. (2013).
The methodology of the FAO study : “Global Food Losses and Food Waste - extent, causes and prevention.” In SIK report No. 857.
<https://www.diva-portal.org/smash/get/diva2:944159/FULLTEXT01.pdf>
- IDAE (Institute for Energy Diversification and Saving.)
<https://www.idae.es/tecnologias/energias-renovables/uso-termico/biomasa>
- Ilarioni, L., & Proietti, P. (2014).
Olive tree cultivars. In C. Peri (Ed.), *The Extra-Virgin Olive Oil Handbook* (pp. 59–67). John Wiley & Sons, Ltd.
- IOC. (2007).
International Olive Council.
<https://www.internationaloliveoil.org/>
- Lang, T., & Rayner, G. (2012).
Waste lands? In N. Doron (Ed.), *Revaluing Food* (pp. 7–8). Fabian Society.
- Lee, P., & Willis, P. (2010).
Waste arisings in the supply of food and drink to households in the UK.
<http://www.wrap.org.uk/content/waste-arisings-supply-food-and-drink-uk-households>



This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101023225



Guidelines: General Information



REFERENCES

- Leverenz, D., Schneider, F., Schmidt, T., Hafner, G., Nevárez, Z., & Kranert, M. (2021). *Food waste generation in Germany in the scope of European legal requirements for monitoring and reporting*. *Sustainability*, 13, 6616. <https://doi.org/10.3390/su13126616>
- López-Urrea, R., Sánchez, J. M., Montoro, A., Mañas, F., & Intrigliolo, D. S. (2020). *Effect of using pruning waste as an organic mulching on a drip-irrigated vineyard evapotranspiration under a semi-arid climate*. *Agricultural and Forest Meteorology*, 291, 108064. <https://doi.org/10.1016/j.agrformet.2020.108064>
- Lozano-García, B., Parras-Alcántara, L., & del Toro Carrillo de Albornoz, M. (2011). *Effects of oil mill wastes on surface soil properties, runoff and soil losses in traditional olive groves in southern Spain*. *Catena*, 85, 187–193. <https://doi.org/10.1016/j.catena.2011.01.017>
- MAPA. (2022). *Agricultural Machinery*. <https://www.mapa.gob.es/en/ministerio/servicios/informacion/plataforma-de-conocimiento-para-el-medio-rural-y-pesquero/observatorio-de-tecnologias-probadas/maquinaria-agricola/remolacha-cosech.aspx>
- Maroto, J. V., & Baixaulli, C. (2017). *Cultivos hortícolas al aire libre*. Cajamar Caja Rural.
- Monier, V., Mudgal, S., Escalon, V., O'Connor, C., Gibon, T., Anderson, G., & Montoux, H. (2010). *Preparatory Study on Food Waste Across EU-27 (Issue October)*. http://ec.europa.eu/environment/eussd/pdf/bio_food-waste_report.pdf

- Noleppa, S., & Witzke, H. Von. (2012). *Tonnen für die Tonne*.
- Observatorio de Precios de los Alimentos. (2012). *Estudio de la cadena de valor y formación de precios del sector de la cebolla*. http://www.magrama.gob.es/es/alimentacion/servicios/observatorio-de-precios-de-los-alimentos/ESTUDIO_ZANAHORIA_14112010_tcm7-182799.pdf
- Oldershaw, M. R. (2021, April 18). *Improved composting of onion waste, and its use to control Allium white rot*. http://randd.defra.gov.uk/Document.aspx?Document=HL0140LFV_1398_EXE.pdf
- Olivares Vivos. (2021). <https://olivaresvivos.com/>
- Osojnik Črnivec, I. G., Skrt, M., Šeremet, D., Sterniša, M., Farčnik, D., Štrumbelj, E., Poljanšek, A., Cebin, N., Pogačnik, L., Smole Možina, S., Humar, M., Komes, D., & Poklar Ulrich, N. (2021). *Waste streams in onion production: Bioactive compounds, quercetin and use of antimicrobial and antioxidative properties*. *Waste Management*, 126, 476–486. <https://doi.org/10.1016/j.wasman.2021.03.033>
- Prodromidis, P., Mourtzinos, I., Biliaderis, C. G., & Mouschakis, T. (2022). *Stability of natural food colorants derived from onion leaf wastes*. *Food Chemistry*, 386, 132750. <https://doi.org/10.1016/j.foodchem.2022.132750>



This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101023225



Guidelines: General Information



REFERENCES

Sagar, N. A., Kumar, Y., Singh, R., Nickhil, C., Kumar, D., Sharma, P., Om Pandey, H., Bhoj, S., & Tarafdar, A. (2022).

Onion waste based-biorefinery for sustainable generation of value-added products. *Bioresource Technology*, 362, 127870.

<https://doi.org/10.1016/j.biortech.2022.127870>

Sharma, K., Mahato, N., Nile, S. H., Lee, E. T., & Lee, Y. R. (2016).

Economical and environmentally-friendly approaches for usage of onion (Allium cepa L.) waste. *Food & Function*, 7(8), 3354–3369.

Shellie, K. C. (2007).

Viticultural performance of red and white wine grape cultivars in southwestern Idaho. *HortTechnology*, 17(4), 595–603.

<https://doi.org/10.21273/horttech.17.4.595>

Soceanu, A., Dobrinas, S., Sirbu, A., Manea, N., & Popescu, V. (2021).

Economic aspects of waste recovery in the wine industry. A multidisciplinary approach. *Science of the Total Environment*, 759, 143543.

<https://doi.org/10.1016/j.scitotenv.2020.143543>

Tadesse-Teferra, F. (2019).

Direct and Indirect Actions of Inulin as Prebiotic Polysaccharide: A Review. *CPQ Nutrition*, 3(6), 1–15.

Venkat, K. (2011).

The Climate Change Impact of U.S. Food Waste: Vol. CleanMetri.

Vermeulen, S. J., Campbell, B. M., & Ingram, J. S. I. (2012).

Climate change and food systems. *Annual Review of Environment and Resources*, 37, 195–222.

<https://doi.org/10.1146/annurev-enviro-020411-130608>

Vojvodić-Cebin, A., Šeremet, D., Mandura, A., Martinić, A., & Komes, D. (2020).

Onion Solid Waste as a Potential Source of Functional Food Ingredients. *Engineering Power: Bulletin of the Croatian Academy of Engineering*, 15(3), 7–13.

<https://hrcak.srce.hr/244899>

Zabaniotou, A., Rovas, D., Libutti, A., & Monteleone, M. (2015).

Boosting circular economy and closing the loop in agriculture: Case study of a small-scale pyrolysis-biochar based system integrated in an olive farm in symbiosis with an olive mill. *Environmental Development*, 14, 22–36.

<https://doi.org/10.1016/j.envdev.2014.12.002>



This project has received funding from the Bio Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101023225