

Implementation of innovation and project management best practices in technological development. Case study: natural antioxidants from olive pomace in the main olivegrowing area of Argentina.

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This document presents the remarkable progress made in developing a sustainable biorefinery model that transforms olive pomace into high-value products applying innovation and project management best practices. The primary focus is on producing an Olive Bio-Phenols Concentrate (OBC), a natural antioxidant with commercial potential. Both the OBC and its production process represent the first Minimum Viable Products (MVPs) of this technological development, marking crucial milestones in a viable pomace biorefinery model.

MATERIALS AND METHODS

Technology Readiness Levels (TRL)

methodology was used to assess systematically the technology maturity of the biorefinery model from laboratory-scale to commercial viability.

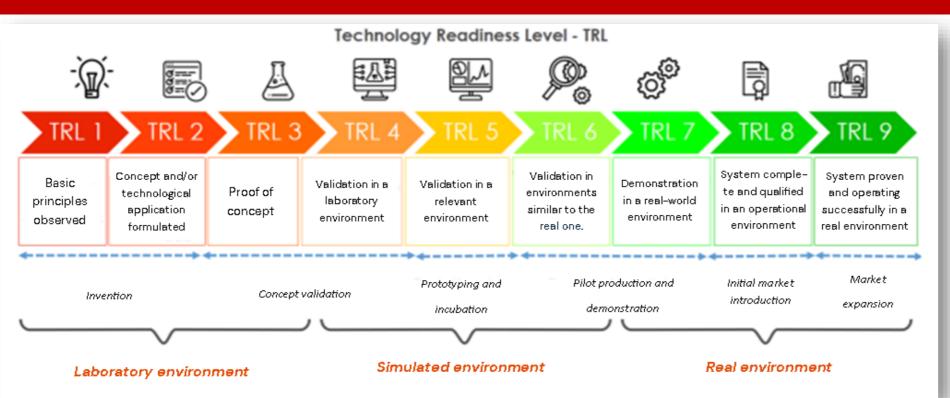


Figure 1: Research, technological development and innovation stages and their relationship with Technology Readiness Levels (TRL)

intended uses. A regulatory

inquiry to SENASA generated

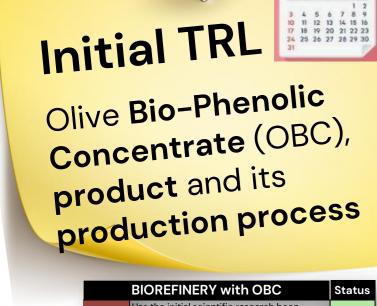
interest at ANMAT and CONAL

Best practices of **Project** Management (PM) were implemented, including business analysis approach, schedule optimization, stakeholder engagement, monitoring and control of execution and risk management protocols.

Agile approach and Lean PM methodologies were applied to navigate technological uncertainties and accelerate MVP development cycles.



Final TRL



TRL 2 Concept and technological application OBC, rich in hydroxytyrosol,

was obtained from the liquid fraction of thermally treated alperujo (70 °C, 60 min) through a simplified lab process including centrifugation, evaporation, and sedimentation. The hydroxytyrosol was preserved. The resulting natural phenolic concentrate (OBC) showed high antioxidant capacity and potential to replace synthetic antioxidants in animal feed (Figure 2) which became the first MPV 1.

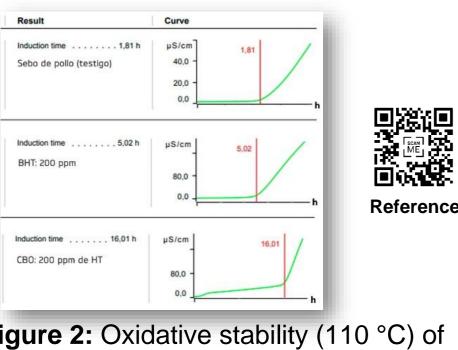


Figure 2: Oxidative stability (110 °C) of chicken tallow + BHT (200 ppm) vs. tallow + OBC (200 ppm HT). Green = conductivity; Red = induction time (h).

TRL 7: Demonstration

+ market readiness Figure 8. Pilot plant results served as inputs for the Economic-financial feasibility (ArgOliva '24).

Figure 1: Initial TRL (TRL 1), with progress towards TRL3 (Dev.)

for possible human food applications. **=** senasa Figure 3: OBC prototype technical data sheet (MVP 1) MVPs: CBO + PROCESS **EFFECTIVE MONTHS OF WORK TECHNOLOGICAL INSTITUTIONS** INTA-INTI Figure 8: Economic-financial feasibility of

the "Biorefinery with OBC" model: results

across multiple scenarios.

Risk and TRL methods were set for application. Reference

TRL 4: Potential producers and TRL 3: Lab scale: proof of users concept Figure 3 shows the technical Industrial outreach. 1- Raising data sheet of OBC with its awareness in animal nutrition organoleptic, physicochemical and functional features, and

anmal

CONA

RESULTS

sector on OBC commercialization opportunities. Links were established with pet food manufacturers, formulators and Cámara Argentina de Empresas de Nutrición Animal (CAENA). (Figure 4).

Figure 4: article published in one of the main web portals about petfood.

2- OBC development was presented to olive oil companies (Figure 5) to match their expectations.



Figure 5: XIV ArgOliva 2024 Technical Conferences fostered meetings between olive-oil companies, INTA and INTI, promoting viable innovative uses of pomace,

TRL 8: System complete in an operational Although it still requires

environment. iterative optimizations to reach full market readiness, its development marks a key milestone in validating the olive pomace biorefinery model.

TRL 9: Technology fully developed and available This development constitutes the first initiative

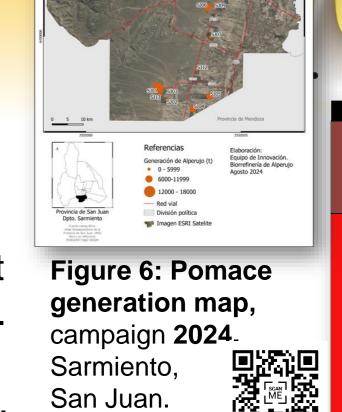
undertaken at INTA-Nodo de Innovación Cuyo at INTA-EEA San Juan, within the framework of a collaborative agreement with INTI.

TRL 5: Validation in relevant environment

A survey conducted in 2024 on pomace generation forms part of the four-year series (2022–2025), confirming the consistent availability of significant quantity of raw material.

conditions

Figure 6 shows the pomace generation map.



TRL 6: Validation in near-real

The OBC production process (MVP 2) was designed to be comparable to olive oil extraction due to its simplicity. It was tested at pilot scale at the INTA EEA San Juan Olive Oil Extraction Plant (Figure 7). The design prioritizes low investment and operating costs to facilitate adoption and maximize environmental benefits through process-water recovery.

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Figure 7: OBC production process MPV 2. (1) thermokneader (2) decanter (3) sedimentation (4) evaporation, equipment provided by INTI (5) fractionated OBC.

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Figure 9: Development from TRL 1 to TRL 5, with progress towards TRL 9

in six months.

CONCLUSIONS

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with significant commercial potential, and its associated production process represent the first Minimum Viable Products (MVPs) achieved through this technological development, marking key milestones in the creation of a viable pomace biorefinery model. The convergence of industry interest with the technical capabilities and infrastructure of INTA and INTI provides a strong foundation for continued progress toward market deployment.

The Olive Bio-Phenols Concentrate (OBC), a natural antioxidant In summary, the application of innovation and project management best practices enabled the acceleration of the technological maturation process of this biorefinery model—from TRL 1 to TRL 5, with progress toward TRL 9—in just six effective months of work. This achievement contributes to promote productive diversification within the olive oil industry and related sectors, paving the way for sustainable value creation from by-products.

Funding: Convenio No. 146028906 INTI-INTA San Juan-Mendoza and Proyecto INTA PE 1005



