

BEXYL
BEYOND XYLELLA

Policy Brief

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BACKGROUND

Xylella fastidiosa is one of the most serious plant health threats to European agriculture, nurseries, landscapes and natural ecosystems. The bacterium infects a broad and expanding range of hosts, including olive, almond, grapevine and many ornamental, forest and wild species, and is transmitted by widespread xylem-feeding insect vectors. Infections may remain asymptomatic for long periods, currently there are no curative treatments, and eradication is extremely difficult once the pathogen is established. Its impacts are not only agricultural but also ecological, economic, social and cultural, and management measures impose real costs on nurseries, growers, communities and authorities.

The BeXyl project (2022–2026, 31 partners) was designed to move beyond the emergency response and deliver an integrated, sustainable and economically viable management system for the diseases caused by *X. fastidiosa*. Its results span the whole intervention chain: understanding the drivers of the epidemics, detecting and monitoring the pathogen and its vectors, producing and trading healthy plant material, breeding and deploying resistant germplasm, controlling the vector and the bacterium with environmentally sound solutions, and assessing the ecological, social and economic consequences of the measures adopted.

This brief summarises the main policy-relevant results and recommendations. This policy brief (Deliverable 9.9) is a summarized version of the consolidated BeXyl Policy Brief, which integrates the contributions of the leaders of all BeXyl work packages (WP1–WP8) and draws on the BeXyl Exploitation Plan (Deliverable D9.8). A longer, fully referenced version of this policy brief, including detailed evidence by topic, implementation needs, barriers and enabling conditions, is available at this **LINK**.

1. WHAT BEXYL DELIVERED

- **Smarter surveillance and earlier detection.** EU-scale relative-risk maps integrating pathogen occurrence with climatic and soil variables; a harmonized network of sentinel plots across Europe and the Americas; over 500 *X. fastidiosa* genome sequences (more than 100 from European strains) supporting outbreak investigation; molecular diagnostics with high taxonomic resolution, including a digital PCR protocol validated by 15 laboratories in 11 countries; remote-sensing pipelines that detect infection-associated physiological and spectral changes before or at early symptom stages and support the prioritization of ground inspections; algorithms optimising statistical survey designs and simulating outbreak management strategies before implementation; and demonstrated canine olfactory detection at ports and nurseries. These tools can feed future revisions of EFSA survey guidelines, EPPO diagnostic standards and Commission Implementing Regulation (EU) 2020/1201.
- **Safe planting material.** BeXyl developed and validated hot-water treatment (HWT) protocols for pathogen inactivation with the potential of being implemented at nursery-scale defining equipment requirements and economic feasibility. It emphasized that no single treatment schedule can be extrapolated to all hosts: grapevine-type protocols

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perform well, whereas in olive the thermal regimes evaluated showed reduced rooting capacity. A draft EPPO Standard on HWT for several host plants to control *X. fastidiosa* (50 °C for 45 min reference treatment) is progressing through technical consolidation. A European nursery-sector survey (151 respondents) showed strong support (77%) for *Xylella*-free certification, preferably voluntary.

- **Resistant plant material.** Screening of thousands of olives, almond and other perennial-crop genotypes identified resistant or less susceptible cultivars. In olive 'Leccino' and 'Frantoio' plus additional candidates from field trials in Apulia and Mallorca were identified, and in almond 'Antoñeta' and 'Avijor' were the most promising cultivars. Haplotype-resolved olive genomes, candidate markers and breeding populations of more than 1,000 seedlings were also obtained. Field evidence from Apulia confirms resistant cultivars are essential for restoring production but must be combined with vector management and epidemiological monitoring.

- **Vector control and new bioproducts for use in Integrated Pest Management (IPM).** Validated IPM components include entomopathogenic fungi applied against nymphs or ovipositing females, ground-cover management that suppresses spittlebug populations, and a phenology model predicting the best local intervention windows. New bioproducts including synthetic microbial communities (SynComs), antimicrobial and defence-elicitor peptides, botanical extracts and bacteriophages have provided proof-of-concept for prevention and mitigation. At the moment, long-term field validation in a network of trials in Italy and Spain is being carried out. A Decision Support System (DSS) has been developed which aids in the selection of complete, context-specific IPM schemes for olive, almond and grapevine.

- **Economic, social and ecological evidence.** Studies showed that under unmanaged spread, EU olive-for-oil yields would collapse by more than 50% while under intensive IPM losses would be reduced to 13-15%. Growers strongly prefer structured IPM (87-90% adoption even at zero subsidy), but needs differ sharply between outbreak, containment and disease-free regions. Citizens in Puglia, Italy, and Alicante, Spain Spain are willing to pay €25-31 per household per year for biodiversity-friendly landscape restoration. Ecological analyses show that both infection and eradication measures can alter soil functioning, and social research shows that legitimacy, trusted communication and locally tailored support determine whether measures are accepted.

2. KEY MESSAGES

- **Early detection and risk-based surveillance are critical.** Because *X. fastidiosa* infections may remain asymptomatic, surveillance systems must combine field inspection, molecular diagnostics, vector monitoring, remote/proximal sensing where applicable, and risk-based prioritisation of host species, production areas and trade pathways. BeXyl developed diagnostic tools with high taxonomic resolution that are essential for informed phytosanitary decision-making.

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- **Surveillance resources should be spatially targeted and climate-informed.** Relative-risk maps integrating pathogen occurrence with climatic and other environmental variables can help prioritize host species, production areas and inspection resources.
- **Evidence on host range must be interpreted consistently.** Regulatory assessments should distinguish between experimental detection, systemic colonization, symptom development and natural field infection.
- **Genomic information should support outbreak investigation and risk assessment.** Curated genomic resources linked to reliable epidemiological and sampling metadata can improve strain characterization, traceability and understanding of pathogen diversity and adaptive potential.
- **New sensing technologies should complement molecular diagnostics.** Proximal sensing and hyperspectral phenotyping can support the rapid screening of large plant populations and prioritize samples for confirmatory testing, but should not be used as stand-alone diagnostic methods.
- **Safe production and movement of planting material must remain a priority.** Because infected propagation material can move *X. fastidiosa* over long distances, phytosanitary policy should support the production and trade of *Xylella*-free planting material and the use of validated sanitation treatments where appropriate. BeXyl demonstrated that HWT can inactivate *X. fastidiosa* in suitable propagation material, but treatment schedules must balance pathogen elimination with preservation of plant viability and therefore need to be validated for the specific species, cultivar, type and dimensions of propagation material. Implementation should be supported by harmonised treatment standards, suitable equipment, traceability, quality control and trained operators.
- **Resistant and tolerant plant material can reduce disease impact.** BeXyl has identified and characterized resistance or tolerance traits within diverse genetic resources of key perennial crops. The use of BeXyl-identified resistant or tolerant cultivars should be promoted in affected and high-risk areas to help slow epidemic spread and reduce yield losses, supported by investment in long-term, genomics-assisted breeding to expand durable resistance. Stakeholder preferences across case-study regions indicate strong support for resistant and tolerant cultivars, highlighting their importance as a cornerstone of future management strategies.
- **Vector management must be integrated into outbreak preparedness and mitigation.** Reducing vector populations and disrupting pathogen transmission are essential components of disease management, particularly in areas where the bacterium is established or at high risk of introduction. Vector control measures should be embedded within broader landscape-scale management approaches that consider surrounding vegetation, host plant distribution and environmental conditions influencing vector abundance and movement, and should be aligned with existing agricultural and biodiversity policies and funding mechanisms.
- **Vector control should be timed according to local vector phenology.** Climate-driven differences in spittlebug development and emergence can substantially affect the

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optimal timing of interventions. Stage-specific monitoring and predictive phenological models should therefore be used to identify local intervention windows and improve control effectiveness.

- **IPM and plant resilience approaches are needed where eradication is not feasible.** In established outbreak areas, no single measure is sufficient to contain disease spread. Sustainable mitigation should combine resistant or tolerant cultivars, targeted vector control, ground-cover management, agronomic practices, epidemiological monitoring and validated treatments within locally adapted IPM strategies. Management should move beyond tree-focused interventions and incorporate soil health, climatic stressors and landscape context to strengthen the long-term resilience of agricultural systems.

- **Decision support should focus on complete IPM schemes rather than isolated measures.** The BeXyl DSS aids in the selection of context-specific combinations of management measures for olive, almond and grapevine, helping translate scientific evidence and expert knowledge into integrated and adaptable management strategies.

- **Growers want structured IPM - design and delivery are the bottleneck.** Approximately 90% of growers would adopt a combined vector-and-plant programme with resistant varieties even at zero subsidy. The priority is therefore not persuasion but programme design: subsidy levels, pesticide mandates and collective-adoption thresholds must be tailored to local epidemic conditions, participatory and delivered through trusted knowledge intermediaries.

- **Policy must be regionally differentiated.** Growers in established outbreak areas (e.g. Apulia) accept even 100% pesticide reduction without additional compensation; those in containment zones (e.g. Alicante) require around €180/ha/year for the same mandate; and in disease-free but at-risk areas (e.g. Andalusia), awareness-building must precede any formal programme design. One-size-fits-all approaches will underperform.

- **Research outputs must be translated into operational tools.** BeXyl has generated risk maps, protocols, datasets, algorithms, diagnostic approaches, biological knowledge, candidate technologies and decision-support elements that require validation, standardisation, training and exploitation pathways to reach end-users and companies.

- **Stakeholder engagement is essential for policy uptake.** While there is a degree of commonality in stakeholder attitudes towards and experiences with *X. fastidiosa*, their needs and preferences relating to policy interventions are diverse and specific to local conditions, socio-cultural contexts and outbreak status. Farmers, nurseries, regulatory bodies, inspectors, diagnostic laboratories, advisors, plant health authorities, botanical gardens, industry actors and local communities must be involved in the design, communication and implementation of surveillance and management strategies to ensure their relevance, legitimacy and long-term acceptance. Transparent communication through trusted networks and locally tailored support are particularly important in building trust and enhancing the legitimacy of management measures.

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3. POLICY RECOMMENDATIONS

- **Strengthen risk-based surveillance and early detection**, combining risk maps, high-resolution diagnostics, vector monitoring and validated screening technologies, with harmonised protocols and data sharing across Member States.
- **Reinforce safe nursery production and movement of planting material**, including finalisation and adoption of the draft EPPO HWT Standard, crop-specific validation, authorised facilities, traceability and operator training.
- **Promote resistant and tolerant cultivars as part of long-term management and recovery**, supported by multi-site validation, certified propagation, genomics-assisted breeding and integration with vector management.
- **Integrate vector management into preparedness and outbreak response**, timed to local vector phenology using predictive models, and embedded in landscape-scale approaches.
- **Promote complete, context-specific IPM schemes in infected or high-risk areas**, supported by decision-support tools, field validation of bioproducts and regulatory clarity for disease-mitigation products.
- **Improve cross-border coordination and data sharing**, with interoperable databases and common standards aligned with EU, EFSA, EPPO and IPPC frameworks.
- **Include socio-economic and ecological considerations in management decisions**, calibrating programmes regionally on the basis of economic impact modelling, farmer adoption costs and citizen preferences, and monitoring social and ecological outcomes over time.
- **Support exploitation and operational uptake of BeXyl results**, through validation, demonstration pilots, follow-up funding and engagement with companies and end-users.

4. FROM RESEARCH TO PRACTICE

The BeXyl Exploitation Plan (Deliverable D9.8) consolidates fifty-two declared results and selects **fifteen Key Exploitable Results** (KER) distributed across four exploitation routes - spanning strain-level typing, molecular detection toolboxes, remote-sensing pipelines, canine detection, surveillance-design toolkits, the thermotherapy package, resistant germplasm, entomopathogenic fungi, plant-protection actives, synthetic microbial communities, bacteriophages, IPM decision support platform, the socio-economic evidence base and the draft EPPO HWT Standard - each with a named custodian, exploitation route, target users and uptake indicators. Three results are already advanced towards use: the draft EPPO Standard is heading for country consultation, and two entomopathogenic fungal strains are moving to commercial development with biocontrol companies. Beneficiaries are committed to exploiting their results up to four years after the end of the action (31 August 2030).

The call to action: Europe can strengthen preparedness and response to *X. fastidiosa* but converting BeXyl's validated evidence into operational standards, registered products, deployed cultivars and adopted IPM programmes requires sustained investment in validation, standardisation, demonstration and training, and continued cooperation among policymakers, plant health authorities, industry and end-users.

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