Scheda Proposta Progetto

CIP PLJTRQ

Dati proposta

Acronimo	PATHO-SHIFT (rev.1)
Titolo	Evolutionary Dynamics of the Pseudomonas syringae Plant Pathobiome under Climatic and Anthropogenic Pressures (PATHO-SHIFT)
Durata in mesi	36

Descrizione

PATHO-SHIFT aims to decipher how anthropogenic pressures and climate change shape the evolution, adaptation, and ecological fitness of plant-pathogenic bacteria within a pathobiome framework, using the Pseudomonas syringae species complex (PSSC) as a model across Mediterranean woodycrops. The project originates from the discovery of emergent P. syringae strains associated with grape berry soft rot displaying an unusual phenotypecharacterized by L-tartrate utilization (GATTa^{+}), loss of L-lactate metabolism, and absence of canonical lipodepsipeptide toxin biosynthetic clusters. This profile offers a unique opportunity to investigate the eco-evolutionary processes driving pathogen emergence in agroecosystems under increasing environmental pressures.

PATHO-SHIFT is based on three hypotheses: (i) host jumps and connectivity among environmental reservoirs drive pathogen diversification and emergence;(ii) microbial competition and intensive biological crop protection promote metabolic rewiring and selection of specialized variants; and (iii) long-term copperuse favors resistant populations while destabilizing disease-suppressive microbial communities.

To test these hypotheses, the project integrates bacterial biology, genomics, metagenomics, proteomics, metabolomics, culturomics, plant physiology, andnanotechnology. Four objectives will reconstruct evolutionary trajectories, identify molecular mechanisms of adaptation and host interaction, characterizepathogen–host–microbiome networks, and develop innovative copper-free management strategies.

The project is organized into six interconnected milestones integrating comparative genomics, population monitoring, microbiome analyses, and functionalmulti-omics to identify the genetic, metabolic, and ecological determinants of emergent variants. In parallel, sustainable plant protection solutions based onnatural antimicrobials, nanocarriers, and plasma-assisted delivery systems will be developed and validated under laboratory, greenhouse, and in plantaconditions.

The consortium combines complementary expertise from the University of Bari Aldo Moro (Departments of Soil, Plant and Food Sciences; Chemistry;Biosciences, Biotechnology and Environment), the University of Catania, the National Research Council (CNR-ISA and CNR-NANOTEC), and thePolytechnic University of Bari, spanning plant pathology, microbiology, multi-omics, chemistry, plant physiology, nanotechnology, and plasma engineering,with support from technology-transfer organizations and agricultural stakeholders.

By combining fundamental research and innovation, PATHO-SHIFT will generate new knowledge on pathogen emergence under global change whiledelivering sustainable alternatives to copper-based crop protection, contributing to resilient agriculture, biodiversity conservation, and One Health objectives.

Stato	INVIATA
Proponente	CIRVILLERI, Gabriella
Struttura proponente	DI3A
Ambito	NAZIONALE
Ente finanziatore	MIUR - MINISTERO ISTRUZIONE, UNIVERSITA' E RICERCA
Bando di riferimento	PRIN: PROGETTI DI RICERCA DI RILEVANTE INTERESSE NAZIONALE - Bando PRIN 2026
Capofila	-Università degli Studi di BARI ALDO MORO
Partner	-Università degli Studi di CATANIA

-Politecnico di BARI
-Consiglio Nazionale delle Ricerche

Dati economici

Costo complessivo	€ 1.566.444
Finanziamento complessivo atteso	€ 1.171.948
Finanziamento previsto UNICT	€ 293.938
Cofinanziamento previsto UNICT	€ 60.750

Componenti (2)

#	Nominativo	Ruolo	Carriera**	Struttura	ERC	Ore*
1	CIRVILLERI, Gabriella	RESP_SCIENTIFICO	PO	DI3A	LS	375
2	CATARA, VITTORIA	COMPONENTE	PO	DI3A	LS	375

* ore stimate
** PO - Professore Ordinario; PA - Professore Associato; RD o RM - Ricercatore TD; RU - Ricercatore

Distribuzione componenti per struttura